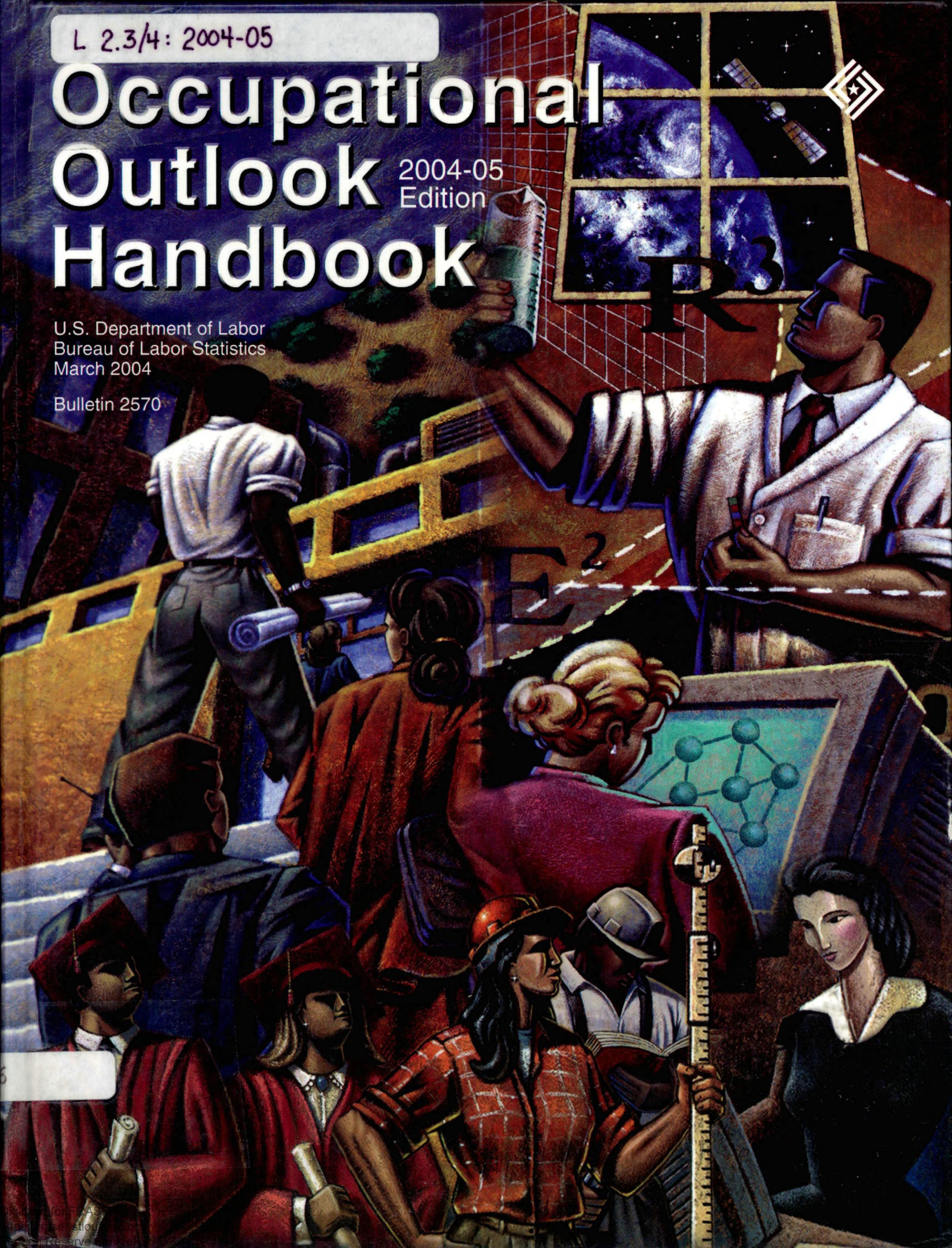
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Occupational Outlook Handbook

2004-05 Edition

U.S. Department of Labor
Bureau of Labor Statistics
March 2004

Bulletin 2570



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Occupational Outlook Handbook

2004-05 Edition

U.S. Department of Labor
Elaine L. Chao, Secretary

Bureau of Labor Statistics
Kathleen Utgoff, Commissioner

March 2004

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Note

Many trade associations, professional societies, unions, industrial organizations, and government agencies provide career information that is valuable to counselors and jobseekers. For the convenience of *Handbook* users, some of these organizations and, in some cases, their Internet addresses are listed at the end of each occupational statement. Although these references were carefully compiled, the Bureau of Labor Statistics has neither authority nor facilities for investigating the organizations or the information or publications that may be sent in response to a request and cannot guarantee the accuracy of such information. The listing of an organization, therefore, does not constitute in any way an endorsement or recommendation by the Bureau either of the organization and its activities or of the information it may supply. Each organization has sole responsibility for whatever information it may issue.

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Additional Information About the 2002-12 Projections

Readers interested in more information about the projections; about the methods and assumptions that underlie them; or about details on economic growth, the labor force, or industry and occupational employment, should consult the February 2004 *Monthly Labor Review,* or the Winter 2003-04 *Occupational Outlook Quarterly.*

For more information about employment change, job openings, earnings, unemployment rates, and training requirements by occupation, consult *Occupational Projections and Training Data, 2004-05 Edition*, BLS Bulletin 2572.

For occupational information from an industry perspective, including discussions of some occupations and career paths that the *Occupational Outlook Handbook* does not cover, consult the *Career Guide to Industries, 2004-05 Edition*, BLS Bulletin 2571.

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Tomorrow's Jobs

Making informed career decisions requires reliable information about opportunities in the future. Opportunities result from the relationships between the population, labor force, and the demand for goods and services.

Population ultimately limits the size of the labor force—individuals working or looking for work—which constrains how much can be produced. Demand for various goods and services determines employment in the industries providing them. Occupational employment opportunities, in turn, result from demand for skills needed within specific industries. Opportunities for medical assistants and other health care occupations, for example, have surged in response to rapid growth in demand for health services.

Examining the past and projecting changes in these relationships is the foundation of the Occupational Outlook Program. This chapter presents highlights of Bureau of Labor Statistics projections of the labor force and occupational and industry employment that can help guide your career plans. Sources of detailed information about the projections appear on page viii.

Population

Population trends affect employment opportunities in a number of ways. Changes in population influence the demand for goods and services. For example, a growing and aging population has increased the demand for health services. Equally important, population changes produce corresponding changes in the size and demographic composition of the labor force.

The U.S. population is expected to increase by 24 million over the 2002-12 period, at a slower rate of growth than during both the 1992-2002 and 1982-92 periods (chart 1). Continued growth will mean more consumers of goods and services, spurring demand for workers in a wide range of occupations and industries. The effects of population growth on various occupations will differ. The differences are partially accounted for by the age distribution of the future population.

The youth population, aged 16 to 24, will grow 7 percent over the 2002-12 period. As the baby boomers continue to age, the group aged 55 to 64 will increase by 43.6 percent or 11.5 million persons, more than any other group. Those aged 35 to 44 will decrease in size, reflecting the birth dearth following the baby boom generation.

Minorities and immigrants will constitute a larger share of the U.S. population in 2012. The number of Hispanics is projected to continue to grow much faster than those of all other racial and ethnic groups.

Labor force

Population is the single most important factor in determining the size and composition of the labor force—that is, people who are either working or looking for work. The civilian labor force is projected to increase by 17.4 million, or 12 percent, to 162.3 million over the 2002-12 period.

The U.S. workforce will become more diverse by 2012. White, non-Hispanic persons will continue to make up a decreasing share of the labor force, falling from 71.3 percent in 2002 to 65.5 percent in 2012 (chart 2). However, despite relatively slow growth, white, non-Hispanics will remain the largest group in the labor force in 2012. Hispanics are projected to account for an increasing share of the labor force by 2012, growing from 12.4 to 14.7 percent. By 2012, Hispanics will constitute a larger proportion of the labor force than will blacks, whose share will grow from 11.4 percent to 12.2 percent. Asians will continue to be the fastest growing of the four labor force groups.

The numbers of men and women in the labor force will grow, but the number of women will grow at a faster rate than the number of men. The male labor force is projected to grow by 10 percent from 2002 to 2012, compared with 14.3 percent for women. As a result, men's share of the labor force is expected to decrease from 53.5 to 52.5 percent, while women's share is expected to increase from 46.5 to 47.5 percent.

Chart 1. **Percent change in the population and labor force, 1982–92, 1992–2002, and projected 2002–2012**

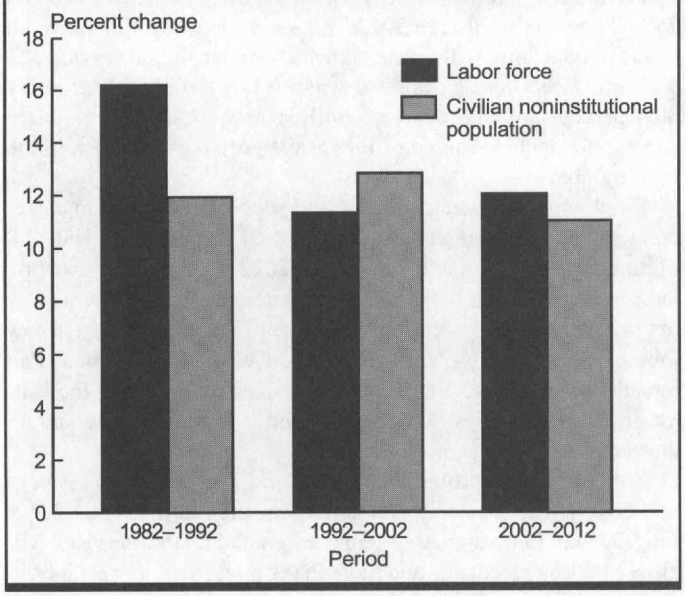
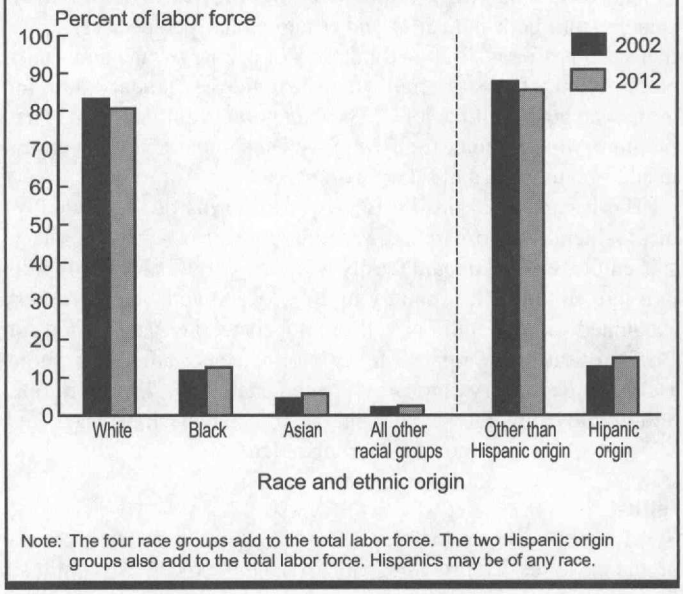


Chart 2. **Percent of labor force by race and ethnic origin, 2002 and projected 2012**



Note: The four race groups add to the total labor force. The two Hispanic origin groups also add to the total labor force. Hispanics may be of any race.

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Chart 3. **Percent of labor force by age group, 2002 and projected 2012**

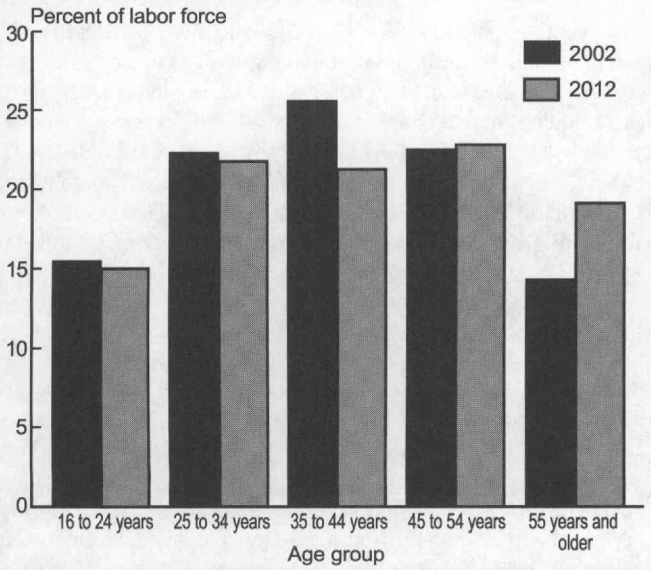
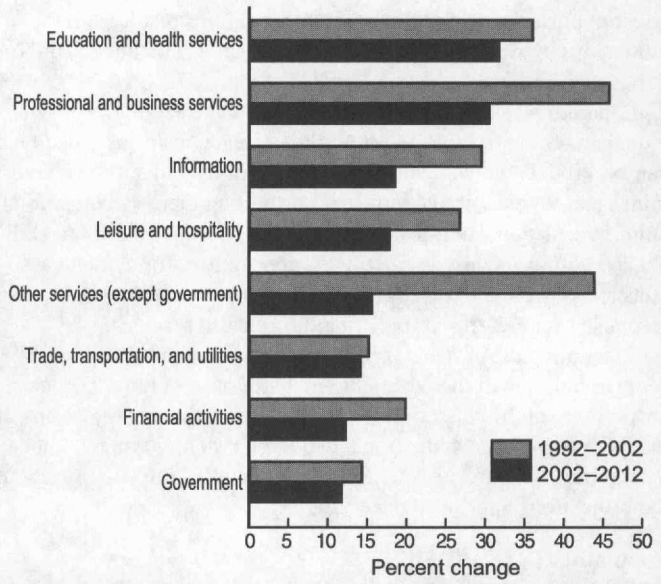


Chart 4. **Percent change in wage and salary employment, service-providing industry divisions, 1992–2002 and projected 2002–2012**



The youth labor force, aged 16 to 24, is expected to slightly decrease its share of the labor force to 15 percent by 2012. The primary working age group, between 25 and 54 years old, is projected to decline from 70.2 percent of the labor force in 2002 to 65.9 percent by 2012. Workers 55 and older, on the other hand, are projected to increase from 14.3 percent to 19.1 percent of the labor force between 2002 and 2012, due to the aging of the baby-boom generation (chart 3).

Employment

Total employment is expected to increase from 144 million in 2002 to 165 million in 2012, or by 14.8 percent. The 21 million jobs that will be added by 2012 will not be evenly distributed across major industrial and occupational groups. Changes in consumer demand, technology, and many other factors will contribute to the continually changing employment structure in the U.S. economy.

The following two sections examine projected employment change from both industrial and occupational perspectives. The industrial profile is discussed in terms of primary wage and salary employment. Primary employment excludes secondary jobs for those who hold multiple jobs. The exception is employment in agriculture, which includes self-employed and unpaid family workers in addition to wage and salary workers.

The occupational profile is viewed in terms of total employment—including primary and secondary jobs for wage and salary, self-employed, and unpaid family workers. Of the nearly 144 million jobs in the U.S. economy in 2002, wage and salary workers accounted for 132 million; self-employed workers accounted for 11.5 million; and unpaid family workers accounted for about 140,000. Secondary employment accounted for 1.7 million jobs. Self-employed workers held 9 out of 10 secondary jobs; wage and salary workers held most of the remainder.

Industry

Service-providing industries. The long-term shift from goods-producing to service-providing employment is expected to continue. Service-providing industries are expected to account for approximately 20.8 million of the 21.6 million new wage and salary jobs generated over the 2002-12 period (chart 4).

Education and health services. This industry supersector is projected to grow faster, 31.8 percent, and add more jobs than any other industry supersector. About 1 out of every 4 new jobs created in the U.S. economy will be in either the healthcare and social assistance or private educational services sectors.

Healthcare and social assistance—including private hospitals, nursing and residential care facilities, and individual and family services—will grow by 32.4 percent and add 4.4 million new jobs. Employment growth will be driven by increasing demand for healthcare and social assistance because of an aging population and longer life expectancies. Also, as more women enter the labor force, demand for childcare services is expected to grow.

Private educational services will grow by 28.7 percent and add 759,000 new jobs through 2012. Rising student enrollments at all levels of education will create demand for educational services.

Professional and business services. This group will grow by 30.4 percent and add nearly 5 million new jobs. This industry supersector includes some of the fastest growing industries in the U.S. economy.

Employment in administrative and support and waste management and remediation services will grow by 37 percent and add 2.8 million new jobs to the economy by 2012. The fastest growing industry in this sector will be employment services, which will grow by 54.3 percent and will contribute almost two-thirds of all new jobs in administrative and support and waste management and remediation services. Employment services ranks among the fastest growing industries in the Nation and is expected to be among those that provide the most new jobs.

Employment in professional, scientific, and technical services will grow by 27.8 percent and add 1.9 million new jobs by 2012. Employment in computer systems design and related services will grow by 54.6 percent and add more than one-third of all new jobs in professional, scientific, and technical services. Employment growth

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will be driven by the increasing reliance of businesses on information technology and the continuing importance of maintaining system and network security. Management, scientific, and technical consulting services also will grow very rapidly, by 55.4 percent, spurred by the increased use of new technology and computer software and the growing complexity of business.

Management of companies and enterprises will grow by 11.4 percent and add 195,000 new jobs.

Information. Employment in the information supersector is expected to increase by 18.5 percent, adding 632,000 jobs by 2012. Information contains some of the fast-growing computer-related industries such as software publishers; Internet publishing and broadcasting; and Internet service providers, Web search portals, and data processing services. Employment in these industries is expected to grow by 67.9 percent, 41.1 percent, and 48.2 percent, respectively. The information supersector also includes telecommunications, broadcasting, and newspaper, periodical, book, and directory publishers. Increased demand for residential and business land-line and wireless services, cable service, high-speed Internet connections, and software will fuel job growth among these industries.

Leisure and hospitality. Overall employment will grow by 17.8 percent. Arts, entertainment, and recreation will grow by 28 percent and add 497,000 new jobs by 2012. Most of these new job openings will come from the amusement, gambling, and recreation sector. Job growth will stem from public participation in arts, entertainment, and recreation activities—reflecting increasing incomes, leisure time, and awareness of the health benefits of physical fitness.

Accommodation and food services is expected to grow by 16.1 percent and add 1.6 million new jobs through 2012. Job growth will be concentrated in food services and drinking places, reflecting increases in population, dual-income families, and dining sophistication.

Trade, transportation, and utilities. Overall employment in this industry supersector will grow by 14.1 percent between 2002 and 2012. Transportation and warehousing is expected to increase by 914,000 jobs, or by 21.7 percent through 2012. Truck transportation will grow by 20.5 percent, adding 275,000 new jobs, while rail and water transportation are both projected to decline. The warehousing and storage and the couriers and messengers industries are projected to grow rapidly at 28.6 percent and 41.7 percent, respectively. Demand for truck transportation and warehousing services will expand as many manufacturers concentrate on their core competencies and contract out their product transportation and storage functions.

Employment in retail trade is expected to increase by 13.8 percent, from 15 million to 17.1 million. Increases in population, personal income, and leisure time will contribute to employment growth in this industry, as consumers demand more goods. Wholesale trade is expected to increase by 11.3 percent, growing from 5.6 million to 6.3 million jobs.

Employment in utilities is projected to decrease by 5.7 percent through 2012. Despite increased output, employment in electric power generation, transmission, and distribution and natural gas distribution is expected to decline through 2012 due to improved technology that increases worker productivity. However, employment in water, sewage, and other systems is expected to increase 46.4 percent by 2012. Jobs are not easily eliminated by technological gains in this industry because water treatment and waste disposal are very labor-intensive activities.

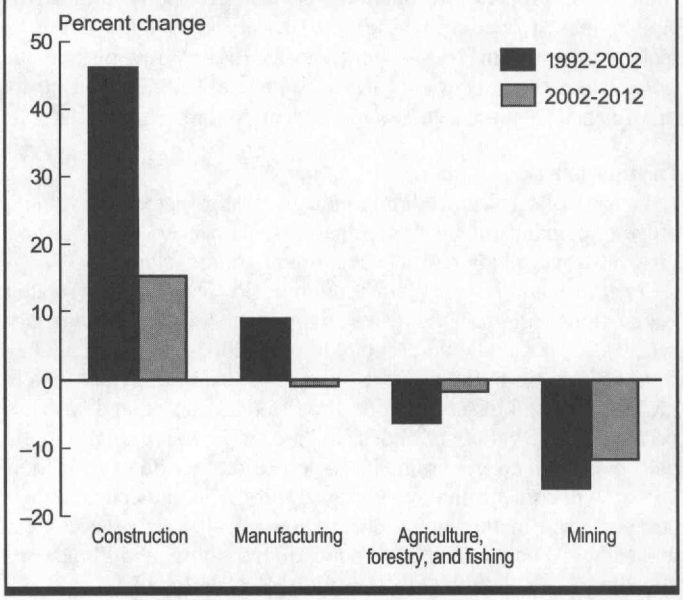
Financial activities. Employment is projected to grow 12.3 percent over the 2002-12 period. Real estate and rental and leasing is expected to grow by 18.4 percent and add 374,000 jobs by 2012. Growth will be due, in part, to increased demand for housing as the population grows. The fastest growing industry in the financial activities supersector will be commercial and industrial machinery and equipment rental and leasing, which will grow by 39.8 percent.

Finance and insurance is expected to increase by 590,000 jobs, or 10.2 percent, by 2012. Employment in securities, commodity contracts, and other financial investments and related activities is expected to grow 15.5 percent by 2012, reflecting the increased number of baby boomers in their peak savings years, the growth of tax-favorable retirement plans, and the globalization of the securities markets. Employment in credit intermediation and related services, including banks, will grow by 10.9 percent and add about half of all new jobs within finance and insurance. Insurance carriers and related activities is expected to grow by 7.5 percent and add 168,000 new jobs by 2012. The number of jobs within agencies, brokerages, and other insurance related activities is expected to grow about 14.5 percent, as many insurance carriers downsize their sales staffs and as agents set up their own businesses.

Government. Between 2002 and 2012, government employment, including that in public education and hospitals, is expected to increase by 11.8 percent, from 21.5 million to 24 million jobs. Growth in government employment will be fueled by growth in State and local educational services and the shift of responsibilities from the Federal Government to the State and local governments. Local government educational services is projected to increase 17.5 percent, adding over 1.3 million jobs. State government educational services also is projected to grow 17.5 percent, adding 388,000 jobs. Federal Government employment, including the Postal Service, is expected to increase by less than 1 percent as the Federal Government continues to contract out many government jobs to private companies.

Other services (except government). Employment will grow by 15.7 percent. More than 4 out of 10 new jobs in this supersector will

Chart 5. **Percent change in wage and salary employment, goods-producing industry divisions, 1992–2002 and projected 2002–2012**



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be in religious organizations, which is expected to grow by 24.4 percent. Personal care services will be the fastest growing industry 27.6 percent. Also included among other services is private household employment, which is expected to decrease 7.2 percent.

Goods-producing industries. Employment in the goods-producing industries has been relatively stagnant since the early 1980s. Overall, this sector is expected to grow 3.3 percent over the 2002-12 period. Although employment is expected to increase more slowly than in the service-providing industries, projected growth among goods-producing industries varies considerably (chart 5).

Construction. Employment in construction is expected to increase by 15.1 percent, from 6.7 million to 7.7 million. Demand for new housing and an increase in road, bridge, and tunnel construction will account for the bulk of job growth in this supersector.

Manufacturing. Employment change in manufacturing will vary by individual industry, but overall employment in this supersector will decline by 1 percent or 157,000 jobs. For example, employment in plastics and rubber products manufacturing and machinery manufacturing is expected to grow by 138,000 and 120,000 jobs, respectively. Due to an aging population and increasing life expectancies, pharmaceutical and medicine manufacturing is expected to grow by 23.2 percent and add 68,000 jobs through 2012. However, productivity gains, job automation, and international competition will adversely affect employment in many other manufacturing industries. Employment in textile mills and apparel manufacturing will decline by 136,000 and 245,000 jobs, respectively. Employment in computer and electronic product manufacturing also will decline by 189,000 jobs through 2012.

Agriculture, forestry, fishing, and hunting. Overall employment in agriculture, forestry, fishing, and hunting is expected to decrease by 2 percent. Employment is expected to continue to decline due to advancements in technology. The only industry within this supersector expected to grow is support activities for agriculture and forestry, which includes farm labor contractors and farm management services. This industry is expected to grow by 18.4 percent and add 17,000 new jobs.

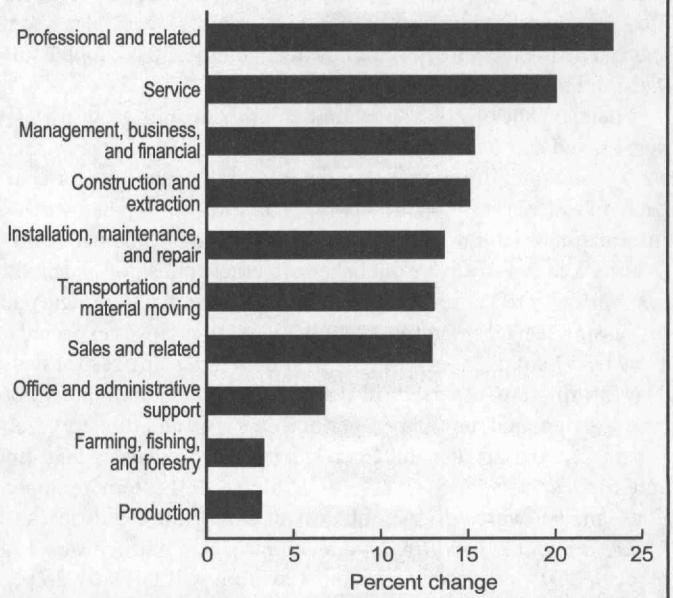
Mining. Employment in mining is expected to decrease 11.8 percent, or by some 60,000 jobs, by 2012. Employment in coal mining and metal ore mining is expected to decline by 30.2 percent and 38.8 percent, respectively. Employment in oil and gas extraction also is projected to decline by 27.8 percent through 2012. Employment decreases in these industries are attributable mainly to technology gains that boost worker productivity, growing international competition, restricted access to Federal lands, and strict environmental regulations that require cleaning of burning fuels.

Occupation

Expansion of service-providing industries is expected to continue, creating demand for many occupations. However, projected job growth varies among major occupational groups (chart 6).

Professional and related occupations. Professional and related occupations will grow the fastest and add more new jobs than any other major occupational group. Over the 2002-12 period, a 23.3-percent increase in the number of professional and related jobs is projected, a gain of 6.5 million. Professional and related workers perform a wide variety of duties, and are employed throughout private industry and government. About three-quarters of the job growth will come from three groups of professional occupations—computer and mathematical occupations, healthcare practitioners and technical occupations, and education, training, and library occupations—which will add 4.9 million jobs combined.

Chart 6. **Percent change in total employment by major occupational group, projected 2002–2012**



Service occupations. Service workers perform services for the public. Employment in service occupations is projected to increase by 5.3 million, or 20.1 percent, the second largest numerical gain and second highest rate of growth among the major occupational groups. Food preparation and serving related occupations are expected to add the most jobs among the service occupations, 1.6 million by 2012. However, healthcare support occupations are expected to grow the fastest, 34.5 percent, adding 1.1 million new jobs.

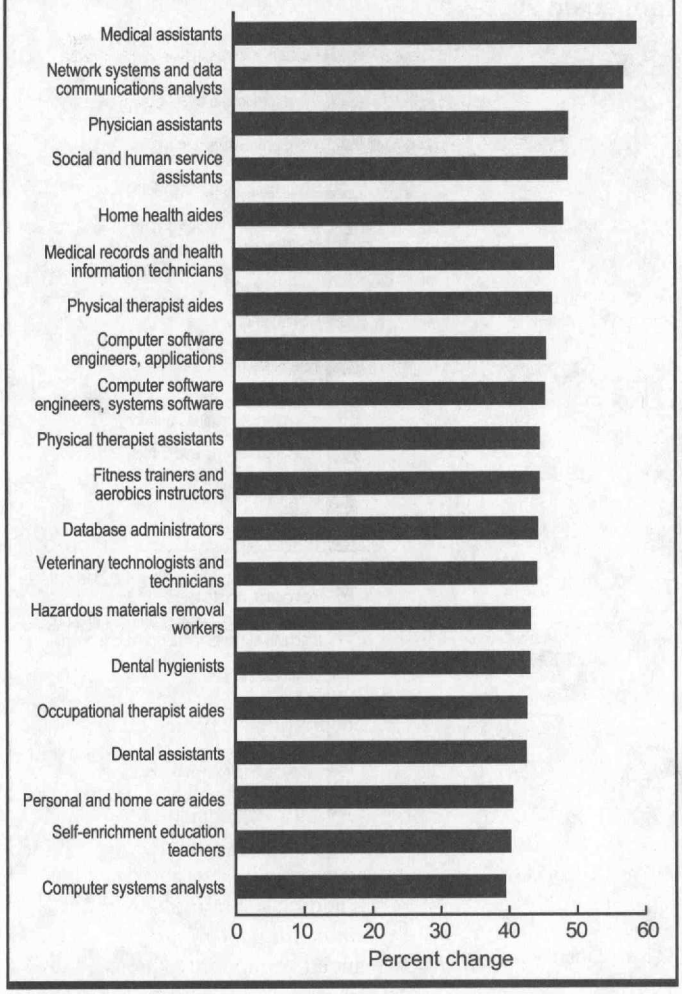
Management, business, and financial occupations. Workers in management, business, and financial occupations plan and direct the activities of business, government, and other organizations. Their employment is expected to increase by 2.4 million, or 15.4 percent, by 2012. Among managers, the numbers of computer and information systems managers and of preschool and childcare center/program educational administrators will grow the fastest, by 36.1 percent and 32 percent, respectively. General and operations managers will add the most new jobs, 376,000, by 2012. Farmers and ranchers are the only workers in this major occupational group whose numbers are expected to decline, losing 238,000 jobs. Among business and financial occupations, accountants and auditors and management analysts will add the most jobs, 381,000 combined. Management analysts also will be one of the fastest growing occupations in this group, along with personal financial advisors, with job increases of 30.4 percent and 34.6 percent, respectively.

Construction and extraction occupations. Construction and extraction workers construct new residential and commercial buildings, and also work in mines, quarries, and oil and gas fields. Employment of these workers is expected to grow 15 percent, adding 1.1 million new jobs. Construction trades and related workers will account for more than three-fourths of these new jobs, 857,000, by 2012. Many extraction occupations will decline, reflecting overall employment losses in the mining and oil and gas extraction industries.

Installation, maintenance, and repair occupations. Workers in installation, maintenance, and repair occupations install new equipment and maintain and repair older equipment. These occupations will add 776,000 jobs by 2012, growing by 13.6 percent. Automo-

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Chart 7. **Percent change in employment in occupations projected to grow fastest, 2002–2012**



tive service technicians and mechanics and general maintenance and repair workers will account for more than 4 in 10 new installation, maintenance, and repair jobs. The fastest growth rate will be among heating, air-conditioning, and refrigeration mechanics and installers, an occupation that is expected to grow 31.8 percent over the 2002-12 period.

Transportation and material moving occupations. Transportation and material-moving workers transport people and materials by land, sea, or air. The number of these workers should grow 13.1 percent, accounting for 1.3 million additional jobs by 2012. Among transportation occupations, motor vehicle operators will add the most jobs, 760,000. Rail transportation occupations are the only group in which employment is projected to decline, by 5.4 percent, through 2012. Material moving occupations will grow 8.9 percent and will add 422,000 jobs.

Sales and related occupations. Sales and related workers transfer goods and services among businesses and consumers. Sales and related occupations are expected to add 2 million new jobs by 2012, growing by 12.9 percent. The majority of these jobs will be among retail salespersons and cashiers, occupations that will add more than 1 million jobs combined.

Office and administrative support occupations. Office and administrative support workers perform the day-to-day activities of the office, such as preparing and filing documents, dealing with the public, and distributing information. Employment in these occupations is expected to grow by 6.8 percent, adding 1.6 million new jobs by 2012. Customer service representatives will add the most new jobs, 460,000. Desktop publishers will be among the fastest growing occupations in this group, increasing by 29.2 percent over the decade. Office and administrative support occupations account for 11 of the 20 occupations with the largest employment declines.

Farming, fishing, and forestry occupations. Farming, fishing, and forestry workers cultivate plants, breed and raise livestock, and catch animals. These occupations will grow 3.3 percent and add 35,000 new jobs by 2012. Agricultural workers, including farmworkers and laborers, accounted for the overwhelming majority of new jobs in this group. The numbers of both fishing and logging workers are expected to decline, by 26.8 percent and 3.2 percent, respectively.

Production occupations. Production workers are employed mainly in manufacturing, where they assemble goods and operate plants. Production occupations will have the slowest job growth among the major occupational groups, 3.2 percent, adding 354,000 jobs by 2012. Jobs will be created for many production occupations, including food processing workers, machinists, and welders, cutters, solderers, and brazers. Textile, apparel, and furnishings occupations, as well as assemblers and fabricators, will account for much of the job losses among production occupations.

Among all occupations in the economy, computer and healthcare occupations are expected to grow the fastest over the projection period (chart 7). In fact, healthcare occupations make up 10 of the 20 fastest growing occupations, while computer occupations account for 5 out of the 20 fastest growing occupations in the economy. In addition to high growth rates, these 15 computer and healthcare occupations combined will add more than 1.5 million new jobs. High growth rates among computer and healthcare occupations reflect projected rapid growth in the computer and data processing and health services industries.

The 20 occupations listed in chart 8 will account for more than one-third of all new jobs, 8 million combined, over the 2002-12 period. The occupations with the largest numerical increases cover a wider range of occupational categories than do those occupations with the fastest growth rates. Health occupations will account for some of these increases in employment, as well as occupations in education, sales, transportation, office and administrative support, and food service. Many of these occupations are very large, and will create more new jobs than will those with high growth rates. Only 2 out of the 20 fastest growing occupations—home health aides and personal and home care aides—also are projected to be among the 20 occupations with the largest numerical increases in employment.

Declining occupational employment stems from declining industry employment, technological advancements, changes in business practices, and other factors. For example, increased productivity and farm consolidations are expected to result in a decline of 238,000 farmers and ranchers over the 2002-12 period (chart 9). The majority of the 20 occupations with the largest numerical decreases are office and administrative support and production occupations, which are affected by increasing plant and factory automation and the implementation of office technology that reduces the needs for these workers. For example, employment of word processors and typists is expected to decline due to the proliferation of personal computers, which allows other workers to perform duties formerly assigned to word processors and typists.

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Chart 8. **Occupations with the largest numerical increases in employment, projected 2002–2012**

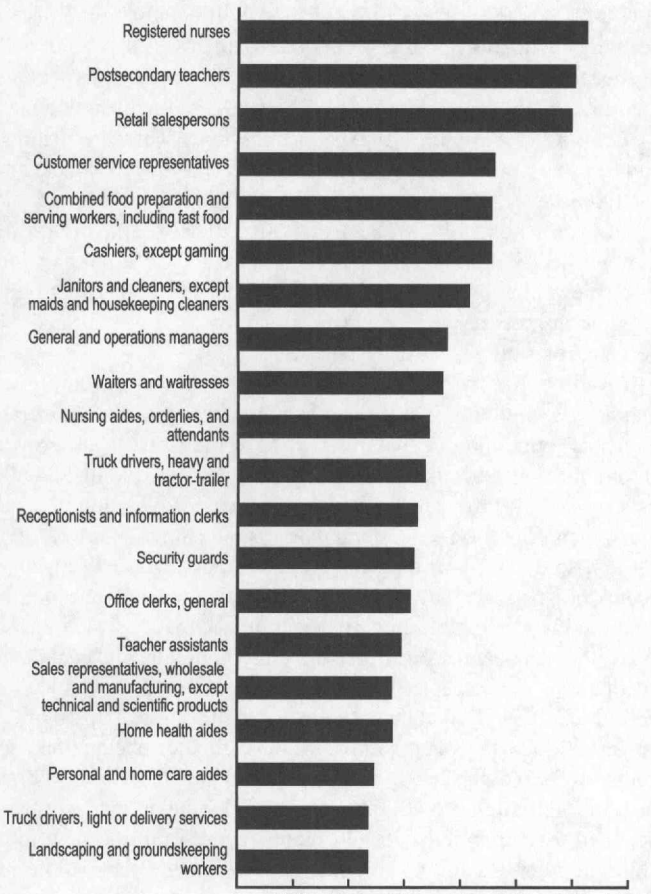
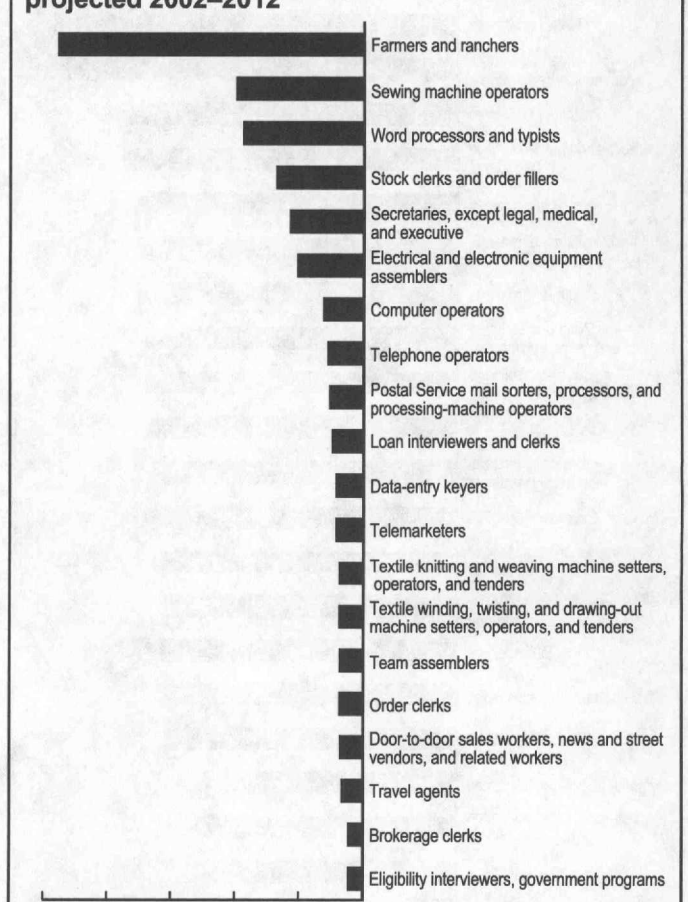


Chart 9. **Job declines in occupations with the largest numerical decreases in employment, projected 2002–2012**



Education and training

Education is essential in getting a high-paying job. In fact, for all but 1 of the 50 highest paying occupations, a college degree or higher is the most significant source of education or training. Air traffic controllers is the only occupation of the 50 highest paying for which this is not the case.

Among the 20 fastest growing occupations, a bachelor's or associate degree is the most significant source of education or training for 10 of them—network systems and data communications analysts; physician assistants; medical records and health information technicians; computer software engineers, applications; computer software engineers, systems software; physical therapist assistants; database administrators; veterinary technologists and technicians; dental hygienists; and computer systems analysts. On-the-job training is the most significant source of education or training for another 8 of the 20 fastest growing occupations—medical assistants, social and human service assistants, home health aides, physical therapist aides, hazardous materials removal workers, occupational therapist aides, dental assistants, and personal and home care aides. In contrast, on-the-job training is the most significant source of education or training for 17 of the 20 occupations with the largest numerical increases; 3 of these 20 occupations—registered nurses, postsecondary teachers, and general and operations managers—have an associate or higher degree as the most significant source of education or training. On-the-job training also is the most significant source of education or training for 19 of the 20 occupations with the largest numerical decreases; one of these 20 occupations—travel agents—has a postsecondary vocational award as the most significant source of education or training. Table 1 lists the fastest growing occupations and occupations projected to have the largest numerical increases in employment between 2002 and 2012, by level of education or training.

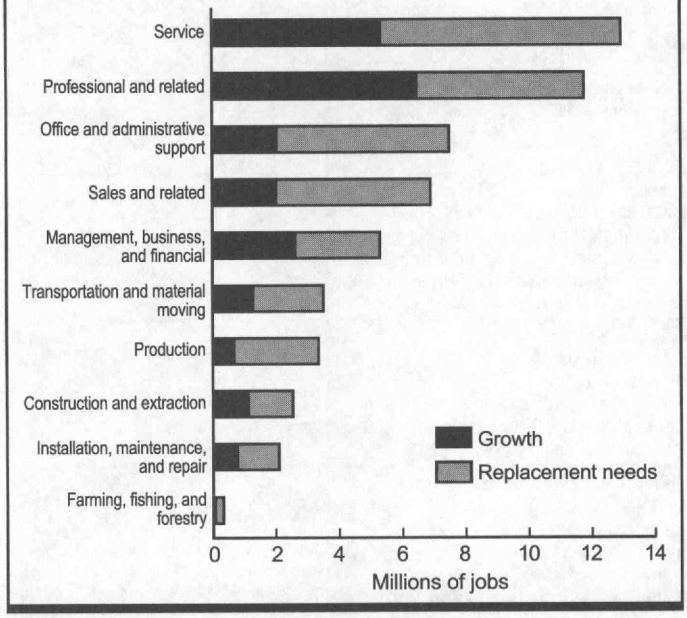
Total job openings

Job openings stem from both employment growth and replacement needs (chart 10). Replacement needs arise as workers leave occupations. Some transfer to other occupations while others retire, return to school, or quit to assume household responsibilities. Replacement needs are projected to account for 60 percent of the approximately 56 million job openings between 2002 and 2012. Thus, even occupations projected to experience little or no growth or to decline in employment still may offer many job openings.

Professional and related occupations are projected to grow faster and add more jobs than any other major occupational group, with 6.5 million new jobs by 2012. Three-fourths of the job growth in professional and related occupations is expected among computer

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Chart 10. **Number of jobs due to growth and replacement needs by major occupational group, projected 2002–2012**



and mathematical occupations; healthcare practitioners and technical occupations; and education, training, and library occupations. With 5.3 million job openings due to replacement needs, professional and related occupations are the only major group projected to generate more openings from job growth than from replacement needs.

Service occupations are projected to have the largest number of total job openings, 13 million, reflecting high replacement needs. A large number of replacements will be necessary as young workers leave food preparation and service occupations. Replacement needs generally are greatest in the largest occupations and in those with relatively low pay or limited training requirements.

Office automation will significantly affect many individual office and administrative support occupations. Overall, these occupations are projected to grow more slowly than average, while some are projected to decline. Office and administrative support occupations are projected to create 7.5 million job openings over the 2002-12 period, ranking third behind service and professional and related occupations.

Farming, fishing, and forestry occupations are projected to have the fewest job openings, approximately 335,000. Because job growth is expected to be slow, and levels of retirement and job turnover high, more than 85 percent of these projected job openings are due to replacement needs.

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Table 1. Fastest growing occupations and occupations projected to have the largest numerical increases in employment between 2002 and 2012, by level of education or training

Fastest growing occupations	Education or training level	Occupations having the largest numerical job growth
	First professional degree	
Pharmacists		Lawyers
Veterinarians		Physicians and surgeons
Chiropractors		Pharmacists
Physicians and surgeons		Clergy
Optometrists		Veterinarians
	Doctoral degree	
Postsecondary teachers		Postsecondary teachers
Computer and information scientists, research		Clinical, counseling, and school psychologists
Medical scientists, except epidemiologists		Medical scientists, except epidemiologists
Clinical, counseling, and school psychologists		Computer and information scientists, research
Biochemists and biophysicists		Biochemists and biophysicists
	Master's degree	
Physical therapists		Physical therapists
Mental health and substance abuse social workers		Rehabilitation counselors
Rehabilitation counselors		Educational, vocational, and school counselors
Survey researchers		Mental health and substance abuse social workers
Epidemiologists		Market research analysts
	Bachelor's or higher degree, plus work experience	
Computer and information systems managers		General and operations managers
Education administrators, preschool and childcare center/program		Management analysts
Sales managers		Financial managers
Management analysts		Sales managers
Medical and health services managers		Computer and information systems managers
	Bachelor's degree	
Network systems and data communications analysts		Elementary school teachers, except special education
Physician assistants		Accountants and auditors
Computer software engineers, applications		Computer systems analysts
Computer software engineers, systems software		Secondary school teachers, except special and vocational education
Database administrators		Computer software engineers, applications
	Associate degree	
Medical records and health information technicians		Registered nurses
Physical therapist assistants		Computer support specialists
Veterinary technologists and technicians		Medical records and health information technicians
Dental hygienists		Dental hygienists
Occupational therapist assistants		Paralegals and legal assistants
	Postsecondary vocational award	
Fitness trainers and aerobics instructors		Preschool teachers, except special education
Preschool teachers, except special education		Licensed practical and licensed vocational nurses
Respiratory therapy technicians		Automotive service technicians and mechanics
Emergency medical technicians and paramedics		Hairdressers, hairstylists, and cosmetologists
Security and fire alarm systems installers		Fitness trainers and aerobics instructors
	Work experience in a related occupation	
Self-enrichment education teachers		First-line supervisors/managers of retail sales workers
Emergency management specialists		First-line supervisors/managers of food preparation and serving workers
Private detectives and investigators		First-line supervisors/managers of office and administrative support workers
First-line supervisors/managers of protective service workers, except police, fire, and corrections		First-line supervisors/managers of construction trades and extraction workers
Detectives and criminal investigators		Self-enrichment education teachers
	Long-term on-the-job training	
Heating, air-conditioning, and refrigeration mechanics and installers		Electricians
Audio and video equipment technicians		Police and sheriff's patrol officers
Tile and marble setters		Carpenters
Police and sheriff's patrol officers		Cooks, restaurant
Electricians		Plumbers, pipefitters, and steamfitters
	Moderate-term on-the-job training	
Medical assistants		Customer service representatives
Social and human service assistants		Truck drivers, heavy and tractor-trailer
Hazardous materials removal workers		Sales representatives, wholesale and manufacturing, except technical and scientific products
Dental assistants		Medical assistants
Residential advisors		Maintenance and repair workers, general
	Short-term on-the-job training	
Home health aides		Retail salespersons
Physical therapist aides		Combined food preparation and serving workers, including fast food
Occupational therapist aides		Cashiers, except gaming
Personal and home care aides		Janitors and cleaners, except maids and housekeeping cleaners
Security guards		Waiters and waitresses

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Sources of Career Information

This section identifies sources of information about career planning, counseling, training, education, and financial aid. Handbook statements also include a section on sources of additional information, which lists organizations that can be contacted for more information about particular occupations including, in some cases, the required training and education.

Career information

Listed below are several places to begin collecting information on careers and job opportunities.

Personal contacts. The people close to you—your family and friends—can be extremely helpful in providing career information. They may be able to answer your questions directly or put you in touch with someone else who can. Networking can lead to meeting someone who can answer your questions about a specific career or company and provide inside information and other helpful hints. It is an effective way to learn the type of training they found necessary for a certain position, how they entered the field, their prospects for advancement, and what they like and dislike about the work.

Public libraries, career centers, and guidance offices. These institutions maintain a great deal of up-to-date material. To begin your library search, look at the computer listings under "vocations" or "careers," and then under specific fields. Check the periodicals section, where trade and professional magazines and journals about specific occupations and industries are located. Become familiar with the concerns and activities of potential employers by skimming their annual reports and other public documents. Occupational information on video cassettes and computerized information systems or the Internet can be valuable. Don't forget the librarians; they can be a great source and can save you valuable time by directing you to relevant information.

Check your school's career centers for resources such as individual counseling and testing, guest speakers, field trips, books, career magazines, and career days.

Always assess career guidance materials carefully. The information should be current and objective. Beware of materials that seem to glamorize the occupation, overstate the earnings, or exaggerate the demand for workers.

Counselors. These professionals are trained to help you discover your strengths and weaknesses, evaluate your goals and values, and determine what you would like in a career. Counselors will not tell you what to do. However, they may administer interest inventories and aptitude tests, interpret the results, and help you explore various options. Counselors also may discuss local job markets and the entry requirements and costs of schools, colleges, or training programs. Counselors are found in:

- High school guidance offices
- College career planning and placement offices
- Placement offices in private vocational or technical schools and institutions
- Vocational rehabilitation agencies
- Counseling services offered by community organizations
- Private counseling agencies and private practices
- State employment service offices

Before employing the services of a private counselor or agency, you may want to seek recommendations and check their credentials. The International Association of Counseling Services (IACS) accredits counseling services throughout the country. Most of these accredited services are college and university services restricted to students of those schools. To receive a listing of accredited services for your region, send a self-addressed, stamped, business-size envelope to:

➤ IACS, 101 South Whiting St., Suite 211, Alexandria, VA 22304. Telephone: (703) 823-9840. Internet: **http://www.iacsinc.org.**

The Directory of Counseling Services, an IACS publication providing employment counseling and other assistance, may be available in your library or school career counseling center. A list of certified career counselors—most of whom are private, for-fee counselors—by city or State is available from:

➤ National Board of Certified Counselors, 3 Terrace Way, Suite D, Greensboro, NC 27403-3660. Telephone: (336) 547-0607. Internet: **http://www.nbcc.org**.

Internet networks and resources. The growth of online listings has made countless resources instantly available at any time. Most companies, professional societies, academic institutions, and government agencies maintain Internet sites that highlight the organization's latest information and activities.

Listings may include information such as government documents, schedules of events, and job openings. Corporate and government Web sites often provide job application information, including links for submitting resumes. Listings for academic institutions often provide links to career counseling and placement services through career resource centers, as well as information on financing your education. Colleges and universities also offer online guides to campus facilities and admission requirements and procedures.

The career information available through the Internet provides much of the same information available through libraries, career centers, and guidance offices. However, no single network or resource will contain all desired information, so be prepared to search in a variety of places. As in a library search, look through various lists by field or discipline, or by using keywords.

Career sites can be an excellent place to obtain information about job opportunities. They provide a forum for employers to list job openings and for individuals to post their resumes. Some Internet sites also may provide an opportunity to research a particular industry or company.

A major portion of the U.S. Department of Labor's Labor Market Information System is the CareerOneStop site, which operates as a Federal-State partnership. This site includes America's Job Bank (AJB), America's Career InfoNet, and America's Service Locator. CareerOneStop, along with the National Tollfree Helpline (877-US2-JOBS) and the local One-Stop Career Centers in each State, combine to provide a wide range of workforce assistance and resources. Internet: **http://www.careeronestop.org.**

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America's Job Bank (AJB), administered by the U.S. Department of Labor, lists more than 1 million job openings on any given day. These job openings are compiled by State employment service offices throughout the Nation. AJB is accessible at: **http://www.ajb.org.**

America's Career InfoNet is an especially useful site. It provides data on employment growth and wages by occupation; the knowledge, skills, and abilities required by an occupation; and links to employers. Internet: **http://www.acinet.org/acinet.**

America's Service Locator is a partnership between the U.S. Department of Labor, State governments, and local agencies to provide a comprehensive database of service providers accessible via telephone or the Internet by the public. Use of the database is free of charge and directs customers to a range of services available in their area, including unemployment benefits, job training, youth programs, seminars, education opportunities, and disabled or older worker programs, among others. Internet: **http://www.servicelocator.org.**

Career Voyages is the result of a collaboration between the U.S. Department of Labor and the U.S. Department of Education. It is designed to provide information on high-growth, high-demand occupations along with the skills and education needed to attain those jobs. Career Voyages is accessible at: **http://www.careervoyages.gov.**

Professional societies, trade associations, labor unions, business firms, and educational institutions. These organizations provide a variety of free or inexpensive career material. Many of these are listed in the sources of additional information section at the end of individual Handbook statements. For information on occupations not covered in the *Handbook*, consult directories in your library's reference section for the names of potential sources. You may start with *The Guide to American Directories* or *The Directory of Directories*. Another useful resource is *The Encyclopedia of Associations*, an annual publication listing trade associations, professional societies, labor unions, and fraternal and patriotic organizations.

The National Technical Information Service Audiovisual Center, a central source for audiovisual material produced by the U.S. Government, sells material on jobs and careers. For a catalog, contact:

- NTIS Audiovisual Center, Springfield, VA 22161. Telephone: (703) 605-6000 or (800) 553-6847. Internet: **http://www.ntis.gov/nac.**

Federal Government. Information on employment with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov.**

Information and resources for potential applicants and current employees pertaining to Federal employment of people with disabilities is available at: **http://www.opm.gov/disability.**

Organizations for specific groups. The organizations listed below provide information on career planning, training, or job opportunities prepared for specific groups. Consult directories in your library's reference center or a career guidance office for information on additional organizations associated with specific groups.

Disabled workers:
Counseling, training, and placement services for those with disabilities are available from the State Vocational Rehabilitation Agency: Internet:
http://bccol02.ed.gov/Programs/EROD org_list.cfm?category_ID=SVR.

Information on employment opportunities for people with all types of disabilities is available from:

- National Organization on Disability, 910 Sixteenth St. NW., Suite 600, Washington, DC 20006. Telephone: (202) 293-5960. TTY: (202) 293-5968. Internet: **http://www.nod.org/economic.**
- Half the Planet Foundation, 1875 Eye St. NW., 12th Floor, Washington, DC 20006. Internet: **http://www.halftheplanet.org.**
- Job Accommodation Network (JAN). Internet: **http://ww.jan.wvu.edu.**

A comprehensive Federal Web site of disability-related resources is accessible at: **http://www.disabilityinfo.gov.**

Blind workers:
Information on the free national reference and referral service for the blind can be obtained by contacting:

- National Federation of the Blind, Job Opportunities for the Blind (JOB), 1800 Johnson St., Baltimore, MD 21230. Telephone: (410) 659-9314. Internet: **http://www.nfb.org.**

Older workers:

- National Council on the Aging, 300 D St. SW., Suite 8010, Washington, DC 20024. Telephone: (202) 479-1200. Internet: **http://www.ncoa.org.**
- National Caucus and Center on Black Aged, Inc., Senior Employment Programs, 1220 L St. NW., Suite 800, Washington, DC 20005. Telephone: (202) 637-8400. Fax: (202) 347-0895. Internet: **http://www.ncba-aged.org.**

Veterans:
Contact the nearest regional office of the U.S. Department of Labor Veterans' Employment and Training Service or:

- Credentialing Opportunities On-Line (COOL), which explains how Army soldiers can meet civilian certification and license requirements related to their Military Occupational Specialty (MOS). Internet: **https://www.cool.army.mil/index.htm.**

Women:

- Department of Labor, Women's Bureau, 200 Constitution Ave. NW., Washington, DC 20210. Telephone: (800) 827-5335. Internet: **http://www.dol.gov/wb.**
- Wider Opportunities for Women, 1001 Connecticut Ave. NW., Suite 930, Washington, DC 20036. Telephone: (202) 464-1596. Internet: **http://www.WOWonline.org.**

Federal laws, executive orders, and selected Federal grant programs bar discrimination in employment based on race, color, religion, sex, national origin, age, and handicap. Information on how to file a charge of discrimination is available from U.S. Equal Employment Opportunity Commission offices around the country. Their addresses and telephone numbers are listed in telephone directories under U.S. Government, EEOC. Telephone: (800) 669-4000 (TTY 1-800-669-6820). Internet: **http://www.eeoc.gov.**

Education and training information

Colleges, schools, and training institutes readily reply to requests for information about their programs. When contacting these institutions, you may want to keep in mind the following items:

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- Admission requirements
- Courses offered
- Certificates or degrees awarded
- Cost
- Available financial aid
- Location and size of school
- Placement rate of graduates

Check with professional and trade associations for lists of schools that offer career preparation in a field in which you are interested. High school guidance offices and libraries usually have copies of the directories listed below, as well as college catalogs that can provide more information on specific institutions.

The U.S. Department of Education's IPEDS (Integrated Postsecondary Education Data System) program has an interactive school search system. You can search for any postsecondary school, focusing your search for a school based upon many factors: Number of students, type of school (2-year colleges, 4-year colleges, trade schools), public or privately funded institutions, instructional programs and fields of study (majors), accreditation, and geographic location. Once you've narrowed your choices, the site provides more detailed information on specific schools, including contact information. There also are links to other helpful sites. Internet: **http://nces.ed.gov/ipeds/cool/index.asp.**

The *Directory of Private Career Schools and Colleges of Technology,* put out by the Accrediting Commission of Career Schools and Colleges of Technology, is a helpful resource. Be sure to use the latest edition because these directories and catalogs are revised periodically.

Information about home or correspondence study programs appears in the *Directory of Accredited Institutions*. Send requests for the *Directory* and a list of other publications to:

➤ Distance Education and Training Council, 1601 18th St. NW., Washington, DC 20009-2529. Telephone: (202) 234-5100. Internet:**http://www.detc.org.**

Information about apprenticeships is available from local labor unions, school guidance counselors, and State employment offices or from:

➤ U.S. Department of Labor, Employment and Training Administration, 200 Constitution Ave. NW., Washington, DC 20210. Telephone: (202) 693-3812. Internet: **http://www.doleta.gov.**

Completing an internship is an excellent way for students and others to learn about an occupation and to make valuable contacts. Many employers offer internships that provide short-term or part-time job experience that can lead to a permanent position. Contact your school's career guidance center or employers directly regarding internship opportunities.

Financial aid information

Information about financial aid is available from a variety of sources. Contact your high school guidance counselor and college financial aid officer for information concerning qualifications and applications for scholarships, fellowships, grants, loans, and work-study programs. Every State administers financial aid programs; contact State Departments of Education for information. Banks and credit unions will provide information about student loans. You also may want to consult the directories and guides available in guidance offices and public libraries for sources of student financial aid.

The Federal Government provides grants, loans, work-study programs, and other benefits to students. Information about programs administered by the U.S. Department of Education is presented in The Student Guide to Federal Financial Aid Programs, updated annually. To receive a copy, write to:

➤ Federal Student Aid Information Center, c/o Federal Student Aid Programs,P.O. Box 84, Washington, DC 20044-0084. Telephone: (800) 433-3243. Internet: **http://www.ed.gov/offices/OSFAP/Students.**

The U.S. Department of Health and Human Services offers student loan, scholarship, and faculty loan repayment programs for health-related professions. For information, contact:

➤ HRSA, Bureau of Health Professions, Division of Student Assistance, Parklawn Bldg., Room 8-34, 5600 Fishers Lane, Rockville, MD 20857. Telephone: (888) 275-4772. Internet: **http://www.bhpr.hrsa.gov/dsa index.htm.**

College is Possible—a resource guide prepared by the Coalition of America's Colleges and Universities and the U.S. Department of Education—lists books, pamphlets, and Internet sites that help students prepare for, choose, and pay for college. It includes information on scholarships and is available in English and Spanish. Telephone: (800) 433-3243. Internet: **http://www.collegeispossible.org.**

The Armed Forces have several educational assistance programs. These include the Reserve Officers' Training Corps (ROTC), the new G.I. bill, and tuition assistance. Information can be obtained from military recruiting centers, located in most cities. Internet: **http://www.defenselink.mil/other_info/careers.html.**

State and local information

The *Handbook* provides information for the Nation as a whole. State or local area information is available from:

State Employment Security Agencies. These agencies develop detailed information about local labor markets, such as current and projected employment by occupation and industry, characteristics of the work force, and changes in State and local area economic activity. Listed below are the Internet addresses of these agencies and addresses and telephone numbers of the directors of research and analysis in these agencies.

Most States have career information delivery systems (CIDS). Look for these systems in secondary schools, postsecondary institutions, libraries, job training sites, vocational rehabilitation centers, and employment service offices. The public can use the systems' computers, printed material, microfiche, and tollfree hotlines to obtain information on occupations, educational opportunities, student financial aid, apprenticeships, and military careers. Ask counselors for specific locations.

State occupational projections also are available on the Internet: **http://www.projectionscentral.com**

Alabama
Chief, Labor Market Information Division, Department of Industrial Relations, 649 Monroe St., Room 427, Montgomery, AL 36131-2280. Telephone: (334) 242-8859. Internet: **http://www.dir.state.al.us/lmi**

Alaska
Chief, Research and Analysis Section, Department of Labor and Workforce Development, 1111 West 8th St., Juneau, AK 99802-5501. Telephone: (907) 465-6035. Internet: **http://almis.labor.state.ak.us**

Arizona
Research Administrator, Department of Economic Security, 1789 West Jefferson St., 733A, Phoenix, AZ 85007-3295. Telephone: (602) 542-3871. Internet: **http://www.workforce.az.gov**

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Arkansas
Director, Labor Market Information, Employment Security Department, P.O. Box 2981, Little Rock, AR 72203-2981. Telephone: (501) 682-3159. Internet: **http://www.state.ar.us/esd**

California
Chief, Labor Market Information Division, MIC57, Employment Development Department, 7000 Franklin Blvd., Building 1100, Sacramento, CA 95823. Telephone: (916) 262-2160. Internet: **http://www.calmis.cahwnet.gov**

Colorodo
Director, Labor Market Information, Department of Labor and Employment, 1515 Arapahoe St., Tower 2, Suite 300, Denver, CO 80202-2117. Telephone: (303) 318-8898. Internet: **http://www.coworkforce.com/lmi**

Connecticut
Director, Employment Security Division, Research and Information, Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109-1114. Telephone: (860) 263-6255. Internet: **http://www.ctdol.state.ct.us/lmi/index.htm**

Delaware
Chief, Office of Occupational and Labor Market Information, Department of Labor, 4425 N. Market St.-Fox Valley Annex, Wilmington, DE 19809-1307. Telephone: (302) 761-8050. Internet: **http://www.oolmi.net**

District of Columbia
Chief, Office of Labor Market Research and Information, 64 New York Ave. NE., Suite 3035, Washington, D.C. 20002. Telephone: (202) 671-1633. Internet: **http://does.ci.washington.dc.us/info/labor_mkt.shtm**

Florida
Process Manager, Labor Market Statistics, Agency for Workforce Innovation, MSC G-020, 107 E. Madison St., Tallahassee, FL 32399-4111. Telephone: (850) 488-1048. Internet: **http://www.labormarketinfo.com**

Georgia
Director, Workforce Information and Analysis, Room 300, Department of Labor, 223 Courtland St., CWC Building, Atlanta, GA 30303. Telephone: (404) 232-3875. Internet: **http://www.dol.state.ga.us/lmi**

Guam
Director, Government of Guam, Sunny Plaza, 2nd Floor, 125 Tun Jesus Crisostomo, Tamuning, GU 96911. Telephone: (671) 647-7066.

Hawaii
Chief, Research and Statistics Office, Department of Labor and Industrial Relations, 830 Punchbowl St., Room 304, Honolulu, HI 96813. Telephone: (808) 586-8999. Internet: **http://www.state.hi.us/dlir/rs/loihi**

Idaho
Chief, Research and Analysis Bureau, Department of Labor, 317 Main St., Boise, ID 83735-0670. Telephone: (208) 334-6170. Internet: **http://www.labor.state.id.us/lmi/id-lmi.htm**

Illinois
Director, Economic Information and Analysis, Illinois Department of Employment Security, 401 South State St., 7th Floor-North, Chicago, IL 60605. Telephone: (312) 793-2316. Internet: **http://lmi.ides.state.il.us**

Indiana
Director, Labor Market Information - South E211, Department of Workforce Development, 10 North Senate Ave., Indianapolis, IN 46204-2277. Telephone: (317) 232-7460. Internet: **http://www.dwd.state.in.us**

Iowa
Division Administrator, Information and Policy Division, Iowa Workforce Development, 1000 East Grand Ave., Des Moines, IA 50319-0209. Telephone: (515) 281-0255. Internet: **http://www.state.ia.us/iwd**

Kansas
Chief, Labor Market Information Services, Department of Human Resources, 401 SW Topeka Blvd., Topeka, KS 66603-3182. Telephone: (785) 296-5058. Internet: **http://laborstats.hr.state.ks.us**

Kentucky
Manager, Research and Statistics Branch, Department for Employment Services, Workforce Development Cabinet, 275 East Main St., 2 W-G, Frankfort, KY 40621. Telephone: (502) 564-7976. Internet: **http://www.workforcekentucky.ky.gov**

Louisiana
Director, Research and Statistics Section, Department of Labor, 1001 North 23rd St., Baton Rouge, LA 70804-4094. Telephone: (225) 342-3141. Internet: **http://www.laworks.net**

Maine
Director, Division of Labor Market Information Services, Maine Department of Labor, 20 Union St., Augusta, ME 04330-6826. Telephone: (207) 287-2271. Internet: **http://www.state.me.us/labor/lmis/index.html**

Maryland
Director, Labor Market Analysis and Information, Department of Labor, Licensing and Regulations, 1100 North Eutaw St., Room 316, Baltimore, Md. 21201-2206. Telephone: (410) 767-2250. Internet: **http://www.dllr.state.md.us/lmi/index.htm**

Massachusetts
Assistant Director for Research, Division of Employment and Training, 19 Staniford St., Boston, MA 02114. Telephone: (617) 626-6556. Internet: **http://www.detma.org/lmiinfo.htm**

Michigan
Director, Labor Market Information Division, Department of Career Development, 3032 West Grand Blvd., 9th Floor, Detroit, MI 48202. Telephone: (313) 456-3090. Internet: **http://www.michlmi.org**

Minnesota
Labor Market Information Director, Department of Employment and Economic Development, 390 N. Robert St., 5th Floor, St. Paul, MN 55101. Telephone: (651) 296-4087. Internet: **http://www.mnwfc.org/lmi.htm**

Mississippi
Chief, Labor Market Information Division, Employment Security Commission, 1520 West Capitol St., Jackson, MS 39215-1699. Telephone: (601) 961-7424. Internet: **http://www.mesc.state.ms.us/lmi/index.html**

Missouri
Research Manager, Labor Market Information, Department of Economic Development, 301 West High St., Jefferson City, MO 65102. Telephone: (573) 751-3609. Internet: **http://www.works.state.mo.us/lmi**

Montana
Director, Research and Analysis, Department of Labor and Industry, 1327 Lockey and Roberts Sts., Helena, MT 59601. Telephone: (406) 444-2430. Internet: **http://rad.dli.state.mt.us**

Nebraska
Administrator, Labor Market Information Center, Nebraska Workforce Development, 550 South 16th St., Lincoln, NE 68508. Telephone: (402) 471-9964. Internet: **http://www.dol.state.ne.us/nelmi.htm**

Nevada
Chief, Research and Analysis, Department of Employment Training and Rehabilitation, 500 East Third St., Carson City, NV 89713-0020. Telephone: (775) 684-0387. Internet: **http://www.detr.state.nv.us/lmi/index.htm**

New Hampshire
Director, Economic and Labor Market Information, Department of Employment Security, 32 South Main St., Concord, NH 03301-4587. Telephone: (603) 228-4123. Internet: **http://www.nhworks.state.nh.us/lmipage.htm**

New Jersey
Director, Labor Market and Demographic Research, Department of Labor, John Fitch Plaza, 5th Floor, Trenton, NJ 08625. Telephone: (609) 292-0099. Internet: **http://www.state.nj.us/labor/lra**

New Mexico
Research Chief, Economic Research and Analysis, Department of Labor, 501 Mountain Rd., Albuquerque, NM 87102. Telephone: (505) 841-8645. Internet: **http://www.dol.state.nm.us/dol_lmif.html**

New York
Director, Division of Research and Statistics, New York State Department of Labor, State Campus, Building 12, Room 402, Albany, NY 12240-0020. Telephone: (518) 457-6369. Internet: **http://www.labor.state.ny.us**

North Carolina
Director, Labor Market Information Division, Employment Security Commission, 700 Wade Ave., Raleigh, NC 27605. Telephone: (919) 733-2936. Internet: **http://www.ncesc.com**

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North Dakota
LMI Director, Research and Statistics, Job Service North Dakota, 1000 East Divide, Bismarck, ND 58501. Telephone: (701) 328-2868.Internet: **http://www.state.nd.us/jsnd warehouse.htm?bookmark=warehouse**

Ohio
Director, Labor Market Information Division, Department of Job and Family Services, 4300 Kimberly Pkwy., 3rd Floor, Columbus, OH 43232. Telephone: (614) 752-9494. Internet: **http://lmi.state.oh.us**

Oklahoma
Director, Economic Research and Analysis, Employment Security Commission, 2401 N. Lincoln, Room 402-1, Oklahoma City, OK 73105. Telephone: (405) 557-7265. Internet: **http://www.oesc.state.ok.us/lmi/default.htm**

Oregon
Manager, Workforce and Economic Research, Oregon Employment Department, 875 Union St., NE., Room 207, Salem, OR 97311-9986. Telephone: (503) 947-1212. Internet: **http://olmis.emp.state.or.us**

Pennsylvania
Director, Center for Workforce Information and Analysis, Department of Labor and Industry, Seventh and Forster Sts., Room 220, Harrisburg, PA 17121-0001. Telephone: (717) 787-3266. Internet: **www.dli.state.pa.us/workforceinfo**

Puerto Rico
Director, Bureau of Labor Statistics, Department of Labor and Human Resources, 505 Munoz Rivera Ave., 17th Floor, Hato Rey, PR 00918. Telephone: (787) 754-5340.

Rhode Island
Director, Labor Market Information, Department of Employment and Training, 1511 Pontiac Ave., Cranston, RI 02920. Telephone: (401) 462-8767. Internet: **http://www.dlt.ri.gov/lmi**

South Carolina
Director, Labor Market Information Division, Employment Security Commission, 631 Hampton St., Columbia, SC 29201. Telephone: (803) 737-2660. Internet: **http://www.sces.org/lmi/index.asp**

South Dakota
Director, Labor Market Information Division, Department of Labor, 420 S. Roosevelt St., Aberdeen, SD 57401-5131. Telephone: (605) 626-2314. Internet: **http://www.state.sd.us/dol/lmic/index.htm**

Tennessee
Director, Research and Statistics Division, Department of Labor and Workforce Development, 500 James Robertson Pkwy., 11th Floor, Nashville, TN 37245-1000. Telephone: (615) 741-2284. Internet: **http://www.state.tn.us/labor-wfd/lmi.htm**

Texas
Director, Labor Market Information, Texas Workforce Commission, 9001 North IH-35, Suite 103A, Austin, TX 75753. Telephone: (512) 491-4802. Internet: **http://www.tracer2.com**

Utah
LMI Director, Workforce Information, Department of Workforce Services, 140 East 300 South, Salt Lake City, UT 84111. Telephone: (801) 526-9401. Internet: **http://jobs.utah.gov/wi**

Vermont
Chief, Research and Analysis, Department of Employment and Training, 5 Green Mountain Dr., Montpelier, VT 05602. Telephone: (802) 828-4153. Internet: **http://www.vtlmi.info**

Virgin Islands
Chief, Bureau of Labor Statistics, Department of Labor, 53-A, 54 A and B, Kronprindsens Gade, Charlotte Amalie, VI 00801. Telephone: (340) 776-3700.

Virginia
Director, Economic Information Services, Virginia Employment Commission, 703 East Main St., Richmond, VA 23219. Telephone: (804) 786-7496. Internet: **http://www.vec.state.va.us/index.cfm?loc=lbrmkt&info=lmi**

Washington
Director, Labor Market and Economic Analysis, Employment Security Department, 605 Woodland Square Loop, Lacey, WA 98506. Telephone: (360) 438-4804. Internet: **http://www.wa.gov/esd/lmea**

West Virginia
Director, Research Information and Analysis Division, Bureau of Employment Programs, 112 California Ave., Room 107, Charleston, WV 25305-0112. Telephone: (304) 558-2660. Internet: **http://www.state.wv.us/bep/lmi/default.htm**

Wisconsin
Director, Bureau of Workforce Information, Department of Workforce Development, 201 E. Washington Ave., Madison, WI 53702. Telephone: (608) 267-9705. Internet: **http://www.dwd.state.wi.us/dwelmi**

Wyoming
Manager, Research and Planning, Department of Employment, 246 South Center St., 2nd floor, Casper, WY 82601. Telephone: (307) 473-3807. Internet: **http://wydoe.state.wy.us**

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Finding a Job and Evaluating a Job Offer

Finding information on available jobs

It takes some people a great deal of time and effort to find a job they enjoy. Others may walk right into an ideal employment situation. Do not be discouraged if you have to pursue many leads. Friends, neighbors, teachers, and counselors may know of available jobs in your field of interest. Read the classified ads. Consult State employment service offices and consider private employment agencies. You also may contact employers directly.

Where to learn about job openings

Personal contacts
School career planning and placement offices
Employers
Classified ads
—National and local newspapers
—Professional journals
—Trade magazines
Internet networks and resources
State employment service offices
Federal Government
Professional associations
Labor unions
Private employment agencies and career consultants
Community agencies

Job search methods

Personal contacts. Your family, friends, and acquaintances may offer one of the most effective ways to find a job. They may help you directly or put you in touch with someone else who can. Such networking can lead to information about specific job openings, many of which may not be publicly posted.

School career planning and placement offices. High school and college placement offices help their students and alumni find jobs. They set up appointments and allow recruiters to use their facilities for interviews. Placement offices usually have a list of part-time, temporary, and summer jobs offered on campus. They also may have lists of jobs for regional, nonprofit, and government organizations. Students can receive career counseling and testing and job search advice. At career resource libraries, they may attend workshops on such topics as job search strategy, resume writing, letter writing, and effective interviewing; critique drafts of resumes and watch videotapes of mock interviews; explore files of resumes and references; and attend job fairs conducted by the placement office.

Employers. Through your library and Internet research, develop a list of potential employers in your desired career field. Employer Web sites often contain lists of job openings. Websites and business directories can provide you with information on how to apply for a position or whom to contact. Even if no open positions are posted, do not hesitate to contact the employer and the relevant department. Set up an interview with someone working in the same area in which you wish to work. Ask them how they got started, what they enjoy or dislike about the work, what type of qualifications are necessary for the job, and what type of personality succeeds in that position. Even if they don't have a position available, they may be able to put you in contact with other people who might hire you, and they can keep you in mind if a position opens up. Make sure to send them your resume and a cover letter. If you are able to obtain an interview, be sure to send a thank-you note. Directly contacting employers is one of the most successful means of job hunting.

Classified ads. The "Help Wanted" ads in newspapers list numerous jobs. You should realize, however, that many other job openings are not listed, and that the classified ads sometimes do not give all of the important information. They may offer little or no description of the job, working conditions, or pay. Some ads do not identify the employer. They may simply give a post office box to which you can mail your resume, making followup inquiries very difficult. Some ads offer out-of-town jobs; others advertise employment agencies rather than actual employment opportunities.

When using classified ads, keep the following in mind:

- Do not rely solely on the classifieds to find a job; follow other leads as well.
- Answer ads promptly, because openings may be filled quickly, even before the ad stops appearing in the paper.
- Read the ads every day, particularly the Sunday edition, which usually includes the most listings.
- Beware of "no experience necessary" ads. These ads often signal low wages, poor working conditions, or commission work.
- Keep a record of all ads to which you have responded, including the specific skills, educational background, and personal qualifications required for the position.

Internet networks and resources. The Internet provides a variety of information, including job listings and job search resources and techniques. However, no single Web site or resource will contain all of the information available on employment or career opportunities, so be prepared to search for what you need. Remember that job listings may be posted by field or discipline, so begin your search using keywords. Some Web sites provide national or local classified listings and allow jobseekers to post their resumes online. Other sites offer advice on how to search for a job, prepare for an interview, or write your resume. When searching employment databases on the Internet, it usually is possible to send your resume to an employer by e-mail or to post it online.

State employment service offices. The State employment service, sometimes called the Job Service, operates in coordination with the U.S. Department of Labor's Employment and Training Administration. Local offices, found nationwide, help jobseekers to find jobs and help employers to find qualified workers at no cost to either. To find the office nearest you, look in the State government telephone listings under "Job Service" or "Employment."

Job matching and referral. At the State employment service office, an interviewer will determine if you are "job ready" or if you need help from counseling and testing services to assess your

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occupational aptitudes and interests and to help you choose and prepare for a career. After you are "job ready," you may examine available job listings and select openings that interest you. A staff member can then describe the job openings in detail and arrange for interviews with prospective employers.

America's Job Bank, sponsored by the U.S. Department of Labor, is an Internet site that allows you to search through a database of more than 1 million jobs nationwide, create and post your resume online, and set up an automated job search. The database contains a wide range of mostly full-time private sector jobs that are available all over the country. Jobseekers can access America's Job Bank at: **http://www.ajb.org**. Computers with access to the Internet are available to the public in any local public employment service office, school, library, or military installation.

Using Internet Resources to Plan your Future, a U.S. Department of Labor publication, offers advice on organizing your Internet job search. It is primarily intended to provide instruction for jobseekers on how to use the Internet to their best advantage, but recruiters and other career service industry professionals will find information here to help them also. How to Use the Internet in your Job Search; The Job Search Process; and the Career-Related Pages, other U.S. Department of Labor Internet publications, each discusses specific steps that jobseekers can follow to identify employment opportunities. Included are daily tips and hints, plus a large database of links and job search engines. Many Department of Labor and other publications for jobseekers are available at: **http://safetynet.doleta.gov/netsourc.htm.** Check with your State employment service office, or order a copy of these and other publications from the U.S. Government Printing Office's Superintendent of Documents. Telephone: (202) 512-1800. Internet: **http://bookstore.gpo.gov or http://www.doleta.gov.**

Services for special groups. By law, veterans are entitled to priority for job placement at State employment service centers. If you are a veteran, a veterans' employment representative can inform you of available assistance and help you to deal with problems.

State employment service offices refer people to opportunities available under the Workforce Investment Act (WIA) of 1998. WIA reforms Federal employment, adult education, and vocational rehabilitation programs to create an integrated, "one-stop" system of workforce investment and education activities for adults and youths. Services are provided to employers and jobseekers, including adults, dislocated workers, and youths. WIA's primary purpose is to increase the employment, retention, skills, and earnings of participants. These programs help to prepare people to participate in the State's workforce, increase their employment and earnings potential, improve their educational and occupational skills, and reduce their dependency on welfare, which will improve the quality of the workforce and enhance the productivity and competitiveness of the Nation's economy.

Federal Government. Information on obtaining a position with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call the Federal Relay Service for the hearing impaired (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site at: **http://www.usajobs.opm.gov.**

Professional associations. Many professions have associations that offer employment information, including career planning, educational programs, job listings, and job placement. To use these services, associations usually require that you be a member; information can be obtained directly from an association through the Internet, by telephone, or by mail.

Labor unions. Labor unions provide various employment services to members, including apprenticeship programs that teach a specific trade or skill. Contact the appropriate labor union or State apprenticeship council for more information.

Private employment agencies and career consultants. These agencies can be helpful, but they are in business to make money. Most operate on a commission basis, with the fee dependent upon a percentage of the salary paid to a successful applicant. You or the hiring company will pay the fee. Find out the exact cost and who is responsible for paying associated fees before using the service.

Although employment agencies can help you save time and contact employers who otherwise might be difficult to locate, the costs may outweigh the benefits if you are responsible for the fee. Contacting employers directly often will generate the same type of leads that a private employment agency will provide. Consider any guarantees that the agency offers when determining if the service is worth the cost.

Community agencies. Many nonprofit organizations, including religious institutions and vocational rehabilitation agencies, offer counseling, career development, and job placement services, generally targeted to a particular group, such as women, youths, minorities, ex-offenders, or older workers.

Applying for a job

Resumes and application forms. Resumes and application forms are two ways to provide employers with written evidence of your qualifications and skills. Generally, the same information appears on both the resume and the application form, but the way in which it is presented differs. Some employers prefer a resume and others require an application form. The accompanying box presents the basic information you should include in your resume.

There are many ways of organizing a resume. Depending on the job, you should choose the format that best highlights your skills, training, and experience. It may be helpful to look in a variety of books and publications at your local library or bookstore for different examples.

What Usually Goes Into a Resume

- Name, address, e-mail address, and telephone number.
- Employment objective. State the type of work or specific job you are seeking.
- Education, including school name and address, dates of attendance, curriculum, and highest grade completed or degree awarded. Consider including any courses or areas of focus that might be relevant to the position.
- Experience, paid and volunteer. For each job, include the job title, name and location of employer, and dates of employment. Briefly describe your job duties.
- Special skills, computer skills, proficiency in foreign languages, achievements, and membership in organizations.
- Keep it short; only one page for less experienced applicants.
- Avoid long paragraphs; use bullets to highlight key skills and accomplishments.
- Have a friend review your resume for any spelling or grammatical errors.
- Print it on high quality paper.

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When you fill out an application form, make sure you fill it out completely and follow all instructions. Do not omit any requested information and make sure that the information you provide is correct.

Cover letters. A cover letter is sent with a resume or application form, as a way of introducing yourself to prospective employers. It should capture the employer's attention, follow a business letter format, and usually should include the following information:

- The name and address of the specific person to whom the letter is addressed.
- Your main qualifications for the position.
- Request for an interview.
- Your home and work telephone numbers.

Interviewing. An interview gives you the opportunity to showcase your qualifications to an employer, so it pays to be well prepared. The information in the accompanying box provides some helpful hints.

Job interview tips

Preparation:

Learn about the organization.
Have a specific job or jobs in mind.
Review your qualifications for the job.
Prepare answers to broad questions about yourself.
Review your resume.
Practice an interview with a friend or relative.
Arrive before the scheduled time of your interview.

Personal appearance:

Be well groomed.
Dress appropriately.
Do not chew gum or smoke.

The interview:

Relax and answer each question concisely.
Respond promptly.
Use good manners.
Learn the name of your interviewer and shake hands as you meet.
Use proper English—avoid slang.
Be cooperative and enthusiastic.
Ask questions about the position and the organization.
Thank the interviewer when you leave and, as a followup, in writing.

Test (if employer gives one):

Listen closely to instructions.
Read each question carefully.
Write legibly and clearly.
Budget your time wisely and don't dwell on one question.

Information to bring to an interview:

Social Security card.
Government-issued identification (driver's license).
Resume. Although not all employers require applicants to bring a resume, you should be able to furnish the interviewer information about your education, training, and previous employment.
References. Employers typically require three references. Get permission before using anyone as a reference. Make sure that they will give you a good reference. Try to avoid using relatives as references.

Evaluating a job offer

Once you receive a job offer, you are faced with a difficult decision and must evaluate the offer carefully. Fortunately, most organizations will not expect you to accept or reject an offer immediately.

There are many issues to consider when assessing a job offer. Will the organization be a good place to work? Will the job be interesting? Are there opportunities for advancement? Is the salary fair? Does the employer offer good benefits? If you have not already figured out exactly what you want, the following discussion may help you to develop a set of criteria for judging job offers, whether you are starting a career, reentering the labor force after a long absence, or planning a career change.

The organization. Background information on an organization can help you to decide whether it is a good place for you to work. Factors to consider include the organization's business or activity, financial condition, age, size, and location.

You generally can get background information on an organization, particularly a large organization, on its Internet site or by telephoning its public relations office. A public company's annual report to the stockholders tells about its corporate philosophy, history, products or services, goals, and financial status. Most government agencies can furnish reports that describe their programs and missions. Press releases, company newsletters or magazines, and recruitment brochures also can be useful. Ask the organization for any other items that might interest a prospective employee. If possible, speak to current or former employees of the organization.

Background information on the organization may be available at your public or school library. If you cannot get an annual report, check the library for reference directories that may provide basic facts about the company, such as earnings, products and services, and number of employees. Some directories widely available in libraries include:

- *Dun & Bradstreet's Million Dollar Directory*
- *Standard and Poor's Register of Corporations*
- *Moody's Industrial Manual*
- *Thomas Register of American Manufacturers*
- *Wards Business Directory*

Stories about an organization in magazines and newspapers can tell a great deal about its successes, failures, and plans for the future. You can identify articles on a company by looking under its name in periodical or computerized indexes in libraries. However, it probably will not be useful to look back more than 2 or 3 years.

The library also may have government publications that present projections of growth for the industry in which the organization is classified. Long-term projections of employment and output for detailed industries, covering the entire U.S. economy, are developed by the Bureau of Labor Statistics and revised every 2 years—see the February 2004 Monthly Labor Review for the most recent projections, covering the 2002-12 period, on the Internet at: **http://www.bls.gov/opub/mlr/mlrhome.htm**. Trade magazines also may include articles on the trends for specific industries.

Career centers at colleges and universities often have information on employers that is not available in libraries. Ask a career-center representative how to find out about a particular organization.

Does the organization's business or activity match your own interests and beliefs?

It is easier to apply yourself to the work if you are enthusiastic about what the organization does.

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How will the size of the organization affect you?
Large firms generally offer a greater variety of training programs and career paths, more managerial levels for advancement, and better employee benefits than do small firms. Large employers also may have more advanced technologies. However, many jobs in large firms tend to be highly specialized.

Jobs in small firms may offer broader authority and responsibility, a closer working relationship with top management, and a chance to clearly see your contribution to the success of the organization.

Should you work for a relatively new organization or one that is well established?
New businesses have a high failure rate, but for many people, the excitement of helping to create a company and the potential for sharing in its success more than offset the risk of job loss. However, it may be just as exciting and rewarding to work for a young firm that already has a foothold on success.

Does it make a difference if the company is private or public?
An individual or a family may control a privately owned company and key jobs may be reserved for relatives and friends. A board of directors responsible to the stockholders controls a publicly owned company and key jobs usually are open to anyone.

Is the organization in an industry with favorable long-term prospects?
The most successful firms tend to be in industries that are growing rapidly.

Nature of the job. Even if everything else about the job is attractive, you will be unhappy if you dislike the day-to-day work. Determining in advance whether you will like the work may be difficult. However, the more you find out about the job before accepting or rejecting the offer, the more likely you are to make the right choice. Actually working in the industry and, if possible, for the company would provide considerable insight. You can gain work experience through part-time, temporary, or summer jobs, or through internship or work-study programs while in school, all of which can lead to permanent job offers.

Where is the job located?
If the job is in another section of the country, you need to consider the cost of living, the availability of housing and transportation, and the quality of educational and recreational facilities in that section of the country. Even if the job location is in your area, you should consider the time and expense of commuting.

Does the work match your interests and make good use of your skills?
The duties and responsibilities of the job should be explained in enough detail to answer this question.

How important is the job in this company?
An explanation of where you fit in the organization and how you are supposed to contribute to its overall objectives should give you an idea of the job's importance.

Are you comfortable with the hours?
Most jobs involve regular hours—for example, 40 hours a week, during the day, Monday through Friday. Other jobs require night, weekend, or holiday work. In addition, some jobs routinely require overtime to meet deadlines or sales or production goals, or to better serve customers. Consider the effect that the work hours will have on your personal life.

How long do most people who enter this job stay with the company?
High turnover can mean dissatisfaction with the nature of the work or something else about the job.

Opportunities offered by employers. A good job offers you opportunities to learn new skills, increase your earnings, and rise to positions of greater authority, responsibility, and prestige. A lack of opportunities can dampen interest in the work and result in frustration and boredom.

The company should have a training plan for you. What valuable new skills does the company plan to teach you?

The employer should give you some idea of promotion possibilities within the organization. What is the next step on the career ladder? If you have to wait for a job to become vacant before you can be promoted, how long does this usually take? When opportunities for advancement do arise, will you compete with applicants from outside the company? Can you apply for jobs for which you qualify elsewhere within the organization, or is mobility within the firm limited?

Salaries and benefits. Wait for the employer to introduce these subjects. Some companies will not talk about pay until they have decided to hire you. In order to know if their offer is reasonable, you need a rough estimate of what the job should pay. You may have to go to several sources for this information. Try to find family, friends, or acquaintances who recently were hired in similar jobs. Ask your teachers and the staff in placement offices about starting pay for graduates with your qualifications. Help-wanted ads in newspapers sometimes give salary ranges for similar positions. Check the library or your school's career center for salary surveys such as those conducted by the National Association of Colleges and Employers or various professional associations.

If you are considering the salary and benefits for a job in another geographic area, make allowances for differences in the cost of living, which may be significantly higher in a large metropolitan area than in a smaller city, town, or rural area.

You also should learn the organization's policy regarding overtime. Depending on the job, you may or may not be exempt from laws requiring the employer to compensate you for overtime. Find out how many hours you will be expected to work each week and whether you receive overtime pay or compensatory time off for working more than the specified number of hours in a week.

Also take into account that the starting salary is just that—the start. Your salary should be reviewed on a regular basis; many organizations do it every year. How much can you expect to earn after 1, 2, or 3 or more years? An employer cannot be specific about the amount of pay if it includes commissions and bonuses.

Benefits also can add a lot to your base pay, but they vary widely. Find out exactly what the benefit package includes and how much of the cost you must bear.

National, State, and metropolitan area data from the Bureau's National Compensation Survey are available from:

➤ Bureau of Labor Statistics, Office of Compensation Levels and Trends, 2 Massachusetts Ave. NE., Room 4175, Washington, DC 20212-0001. Telephone: (202) 691-6199. Internet: **http://www.bls.gov/ncs**.

Data on earnings by detailed occupation from the Occupational Employment Statistics (OES) Survey are available from:

➤ Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections, 2 Massachusetts Ave. NE., Room 2135, Washington, DC 20212-0001. Telephone: (202) 691-6569. Internet: **http://www.bls.gov/oes.**

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Occupational Information Included in the *Handbook*

The *Occupational Outlook Handbook* is best used as a reference; it is not meant to be read from cover to cover. Instead, start by looking at the table of contents, in which related occupations are grouped in clusters, or look in the alphabetical index in the back of the *Handbook* for specific occupations that interest you. For any occupation that sounds interesting, use the Handbook to learn about the type of work that is performed in the occupation, the working conditions, the education and training requirements, the possibilities for advancement, earnings in the occupation, the job outlook, and related occupations. Each occupational statement, or description, in the *Handbook* follows a standard format, making it easier for you to compare occupations.

Two previous sections—"Tomorrow's Jobs" and "Sources of Career Information"—highlight the forces that are likely to determine employment opportunities in industries and occupations through the year 2012 and indicate where to obtain additional information. The current section is an overview of how the occupational statements are developed and organized. It highlights information presented in each section of a *Handbook* statement and the source of the information, gives examples of specific occupations in some cases, and offers some hints on how to interpret the information provided.

Unless otherwise noted, the source of employment and earnings data presented in the *Handbook* is the Bureau of Labor Statistics. Nearly all *Handbook* statements cite employment and earnings data from the Occupational Employment Statistics (OES) survey. Some statements include data from outside sources. OES data may be used to compare earnings among occupations; however, outside data may not be used in this manner, because characteristics of these data vary widely.

About those numbers at the beginning of each statement

The numbers in parentheses that appear just below the title of every detailed occupational statement are from the Occupational Information Network (O*NET)—a system used by State employment service offices to classify applicants and job openings, and by some career information centers and libraries to file occupational information.

Occupational Information Network Coverage, a section beginning on page 665, cross-references O*NET codes to occupations covered in the *Handbook*. O*NET codes are based on the 2000 Standard Occupational Classification (SOC) system.

Significant Points

This section highlights key occupational characteristics discussed in the statement.

Nature of the Work

This section discusses what workers do on the job, what tools and equipment they use, and how closely they are supervised. Individual job duties may vary by industry or employer. For instance, workers in larger firms tend to be more specialized, whereas those in smaller firms often have a wider variety of duties. Most occupations have several levels of skills and responsibilities through which workers may progress. Beginners may start as trainees performing routine tasks under close supervision. Experienced workers usually undertake more difficult tasks and are expected to perform with less supervision.

Some statements mention common alternative job titles or occupational specialties. For example, the statement on accountants and auditors discusses a few specialties, such as public accountants, management accountants, and internal auditors. Some statements—such as that on advertising, marketing, promotions, public relations, and sales managers—discuss titles or specialties that are detailed OES survey occupations. For these occupations, such as sales managers or marketing managers, separate employment projections are developed and their O*NET codes appear at the beginning of the statement.

Information in this section may be updated for several reasons. One is the emergence of occupational specialties. For instance, Webmasters—who are responsible for the technical aspects of operating a Web site—constitute a specialty within computer systems analysts, database administrators, and computer scientists. Information also may be updated due to changing technology that affects the way in which a job is performed. For example, the Internet allows purchasers to acquire supplies with a click of the mouse, saving time and money. Furthermore, job duties may be affected by modifications to business practices, such as organizational restructuring or changes in response to government regulations. An example is paralegals and legal assistants, who are increasingly being utilized by law firms in order to lower costs and increase the efficiency and quality of legal services.

Many sources are consulted in researching changes to the nature of the work section or any other section of a Handbook statement. Usual sources include articles in newspapers, magazines, and professional journals. Useful information also appears on the Web sites of professional associations, unions, and trade groups. Information found on the Internet or in periodicals is verified through interviews with individuals employed in the occupation, professional associations, unions, and others with occupational knowledge, such as university professors and counselors in career assistance centers.

Working Conditions

This section identifies the typical hours worked, the workplace environment, physical activities and susceptibility to injury, special equipment, and the extent of travel required. In many occupations, people work regular business hours—40 hours a week, Monday through Friday—but many do not. For example, waiters and waitresses often work evenings and weekends.

The work setting can range from a hospital, to a mall, to an offshore oil rig. Truck drivers might be susceptible to injury, while paramedics have high job-related stress. Semiconductor processors may wear protective clothing or equipment, some construction laborers do physically demanding work, and top executives may travel frequently.

Information on various worker characteristics, such as the average number of hours worked per week, is obtained from the Current Population Survey (CPS)—a survey of households conducted by the U.S. Census Bureau for BLS.

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Employment

This section reports the number of jobs that the occupation provided in 2002, the key industries in which those jobs were found, and the number or proportion of self-employed workers in the occupation, if significant. Self-employed workers accounted for about 8 percent of the workforce in 2002; however, they were concentrated in a small number of occupations, such as farmers and ranchers, childcare workers, lawyers, health practitioners, and the construction trades.

BLS develops the National Employment Matrix, which presents current and projected employment for 284 detailed industries and 725 detailed occupations over the 2002–12 period. Data in the matrix come primarily from the OES survey, which reports employment of wage and salary workers for each occupation in almost all industries. The CPS survey provides information on the total number of self-employed and unpaid family workers in each occupation. The CPS also provides employment data on agriculture and private households. The Office of Personnel Management (OPM) furnishes employment data on Federal Government workers.

Because total employment in each occupation combines data from several different sources, employment numbers cited in the *Handbook* often differ from employment data provided by the OES, CPS, and other employment surveys. This may be a source of confusion for some readers.

When significant, the geographic distribution of jobs and the proportion of part-time workers (those working less than 35 hours a week) are mentioned, reflecting CPS data. On the basis of OES survey data, some *Handbook* statements, such as those on textile, apparel, and furnishings occupations, list States that employ substantial numbers of workers in the occupation.

Training, Other Qualifications, and Advancement

After knowing what a job is all about, it is important to understand how to train for it. This section describes the most significant sources of education and training, including the education or training preferred by employers, the typical length of training, and the possibilities for advancement. Job skills sometimes are acquired through high school, informal on-the-job training, formal training (including apprenticeships), the U.S. Armed Forces, home study, hobbies, or previous work experience. For example, sales experience is particularly important for many sales jobs. Many professional jobs, on the other hand, require formal postsecondary education—postsecondary vocational or technical training, or college, postgraduate, or professional education.

In addition to training requirements, the *Handbook* mentions desirable skills, aptitudes, and personal characteristics. For some entry-level jobs, personal characteristics are more important than formal training. Employers generally seek people who read, write, and speak well; compute accurately; think logically; learn quickly; get along with others; and demonstrate dependability.

Some occupations require certification or licensing to enter the field, to advance in the occupation, or to practice independently. Certification or licensing generally involves completing courses and passing examinations. Many occupations increasingly are requiring workers to participate in continuing education or training in relevant skills, either to keep up with the changes in their job or to improve their advancement opportunities.

Revisions to the training section may focus on changes in educational, certification, or licensing requirements, such as an increase in the number of hours of required training or in the number of States requiring a license. Information also is updated if new skills are needed to complete the job, such as those arising from the adoption of new technology.

Information in this section comes from personal interviews with individuals employed in the occupation or from Web sites, published training materials, and interviews with the organizations that grant the degree, certification, or license. Some occupations have numerous professional designations granted by different organizations. Generally, the most widely recognized organizations are listed in the *Handbook*.

Some statements list the number of training programs. For example, the statement on pharmacists indicates the number of colleges of pharmacy accredited by the American Council on Pharmaceutical Education. The minimum requirements for Federal Government employment cited in some statements are based on standards set by the U.S. Office of Personnel Management.

Job Outlook

In planning for the future, it is important to consider potential job opportunities. This section describes the factors that will result in employment growth or decline. Projecting occupational employment is the final step in the employment projections process. (A more detailed description of the projections process is discussed in the *Handbook* section entitled "Assumptions and Methods Used in Preparing Employment Projections.") The job outlook section reflects the occupational projections in the National Employment Matrix. Each occupation is assigned a descriptive phrase on the basis of its projected percent change in employment over the 2002–12 period. (All of the phrases are listed at the end of this section.)

A number of factors are examined in developing employment projections and updating the job outlook section. One factor is job growth or decline in industries that employ a significant percentage of workers in the occupation. If workers are concentrated in a rapidly growing industry, their employment will likely also grow quickly. For example, the growing need for business expertise is fueling demand for consulting services. Hence, management, scientific, and technical consulting services is projected to be among the fastest growing industries through 2012. Projected rapid growth in this industry helps to spur faster than average growth in employment of management analysts.

Demographic changes, which affect what services are required, can influence occupational growth or decline. For example, an aging population demands more healthcare workers, from registered nurses to pharmacists.

Technological change is another key factor. New technology can either create new job opportunities or eliminate jobs by making workers obsolete. The Internet has increased the demand for workers in the computer and information technology fields, such as computer support specialists and systems administrators. However, the Internet also has adversely affected travel agents, because many people now book tickets, hotels, and rental cars online.

Another factor affecting job growth or decline is changes in business practices, such as the outsourcing of work or the restructuring of businesses. In the past few years, insurance carriers have been outsourcing sales and claims adjuster jobs to large, 24-hour call centers in order to reduce costs. Corporate restructuring also has made many organizations "flatter," resulting in fewer middle management positions.

The substitution of one product or service for another can affect employment projections. For example, consumption of plastic products has grown as they have been substituted for metal goods in many consumer and manufactured products in recent years. The process is likely to continue and should result in stronger demand for machine operators in plastics than in metal.

Competition from foreign trade usually has a negative impact on employment. Often, foreign manufacturers can produce goods

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U.S. manufacturers cannot compete. Increased international competition is a major reason for the decline in employment among textile, apparel, and furnishings workers.

In some cases, the *Handbook* mentions that an occupation is likely to provide numerous job openings or, in others, that an occupation likely will afford relatively few openings. This information reflects the projected change in employment, as well as replacement needs. Large occupations that have high turnover, such as food and beverage serving occupations, generally provide the most job openings—reflecting the need to replace workers who transfer to other occupations or who stop working.

Some *Handbook* statements discuss the relationship between the number of jobseekers and the number of job openings. (The phrases used to describe that relationship appear at the end of this section.) In some occupations, there is a rough balance between jobseekers and job openings, resulting in good opportunities. In other occupations, employers may report difficulty finding qualified applicants, resulting in excellent job opportunities. Still other occupations are characterized by a surplus of applicants, leading to keen competition for jobs. On the one hand, limited training facilities, salary regulations, or undesirable aspects of the work—as in the case of private household workers—can result in an insufficient number of entrants to fill all job openings. On the other hand, glamorous or potentially high-paying occupations, such as actors or musicians, generally have surpluses of jobseekers. Variation in job opportunities by industry, educational attainment, size of firm, or geographic location also may be discussed. Even in crowded fields, job openings do exist. Good students or highly qualified individuals should not be deterred from undertaking training for, or seeking entry into, those occupations.

Key phrases in the *Handbook*

This box explains how to interpret the key phrases used to describe projected changes in employment. It also explains the terms used to describe the relationship between the number of job openings and the number of jobseekers. The description of this relationship in a particular occupation reflects the knowledge and judgment of economists in the BLS Office of Occupational Statistics and Employment Projections.

Changing employment between 2002 and 2012

If the statement reads:	Employment is projected to:
Grow much faster than average	increase 36 percent or more
Grow faster than average	increase 21 to 35 percent
Grow about as fast as average	increase 10 to 20 percent
Grow more slowly than average	increase 3 to 9 percent
Little or no growth	increase 0 to 2 percent
Decline	decrease 1 percent or more

Opportunities and competition for jobs

If the statement reads:	Job openings compared with jobseekers may be:
Very good to excellent opportunities	More numerous
Good or favorable opportunities	In rough balance
May face, or can expect, keen competition	Fewer

Earnings

This section discusses typical earnings and how workers are compensated—by means of annual salaries, hourly wages, commissions, piece rates, tips, or bonuses. Within every occupation, earnings vary by experience, responsibility, performance, tenure, and geographic area. Almost every statement in the *Handbook* contains 2002 OES-survey earnings data for wage and salary workers. Information on earnings in the major industries in which the occupation is employed, also supplied by the OES survey, may be given as well.

In addition to presenting earnings data from the OES survey, some statements contain additional earnings data from non-BLS sources. Starting and average salaries of Federal workers are based on 2003 data from the U.S. Office of Personnel Management. The National Association of Colleges and Employers supplies information on average salary offers in 2003 for students graduating with a bachelor's, master's, or Ph.D. degree in certain fields. A few statements contain additional earnings information from other sources, such as unions, professional associations, and private companies. These data sources are cited in the text.

Benefits account for a significant portion of total compensation costs to employers. Benefits such as paid vacation, health insurance, and sick leave may not be mentioned, because they are so widespread. Although not as common as traditional benefits, flexible hours and profit-sharing plans may be offered to attract and retain highly qualified workers. Less common benefits also include childcare, tuition for dependents, housing assistance, summers off, and free or discounted merchandise or services. For certain occupations, the percentage of workers affiliated with a union is listed. These data come from the CPS survey.

Related Occupations

Occupations involving similar duties, skills, interests, education, and training are listed.

Sources of Additional Information

No single publication can describe all aspects of an occupation. Thus, the *Handbook* lists the mailing addresses of associations, government agencies, unions, and other organizations that can provide occupational information. In some cases, tollfree telephone numbers and Internet addresses also are listed. Free or relatively inexpensive publications offering more information may be mentioned; some of these publications also may be available in libraries, in school career centers, in guidance offices, or on the Internet. Most of the organizations listed in this section were sources of information on the nature of the work, training, and job outlook discussed in the *Handbook*.

For additional sources of information, also read the earlier chapter, "Sources of Career Information."

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Management and Business and Financial Operations Occupations

Management Occupations

Administrative Services Managers

(0*NET 11-3011.00)

Significant Points

- Administrative services managers work in private industry and government and have a wide range of responsibilities, experience, earnings, and education.
- Applicants face keen competition due to the substantial supply of competent, experienced workers seeking managerial jobs.

Nature of the Work

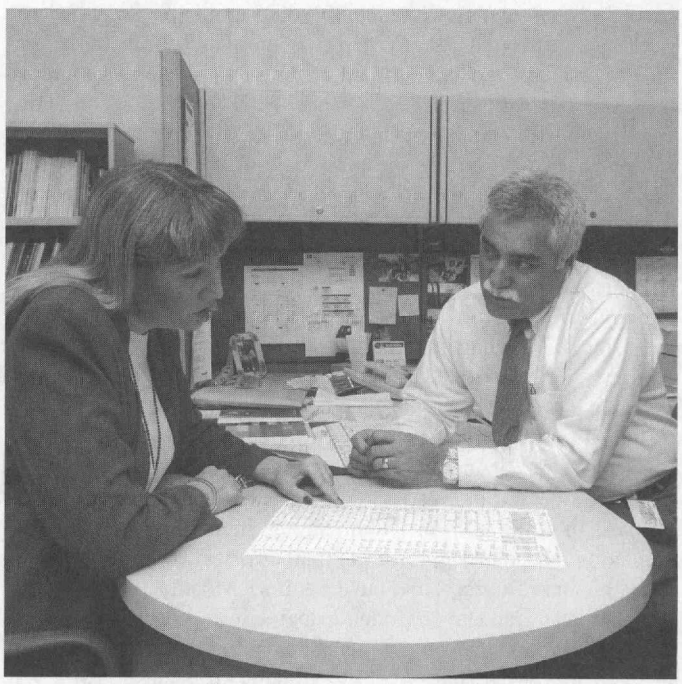
Administrative services managers perform a broad range of duties in virtually every sector of the economy. They coordinate and direct support services to organizations as diverse as insurance companies, computer manufacturers, and government offices. These workers manage the many services that allow organizations to operate efficiently, such as secretarial and reception, administration, payroll, conference planning and travel, information and data processing, mail, materials scheduling and distribution, printing and reproduction, records management, telecommunications management, security, parking, and personal property procurement, supply, and disposal.

Specific duties for these managers vary by degree of responsibility and authority. First-line administrative services managers directly supervise a staff that performs various support services. Mid-level managers, on the other hand, develop departmental plans, set goals and deadlines, implement procedures to improve productivity and customer service, and define the responsibilities of supervisory-level managers. Some mid-level administrative services managers oversee first-line supervisors from various departments, including the clerical staff. Mid-level managers also may be involved in the hiring and dismissal of employees, but they generally have no role in the formulation of personnel policy. Some of these managers advance to upper level positions, such as vice president of administrative services, which are discussed in the *Handbook* statement on top executives.

In small organizations, a single administrative services manager may oversee all support services. In larger ones, however, first-line administrative services managers often report to mid-level managers who, in turn, report to owners or top-level managers. As the size of the firm increases, administrative services managers are more likely to specialize in specific support activities. For example, some administrative services managers work primarily as office managers, contract administrators, or unclaimed property officers. In many cases, the duties of these administrative services managers are similar to those of other managers and supervisors, some of which are discussed in other *Handbook* statements.

Because of the range of administrative services required by organizations, the nature of these managerial jobs also varies significantly. Administrative services managers who work as contract administrators, for instance, oversee the preparation, analysis, negotiation, and review of contracts related to the purchase or sale of equipment, materials, supplies, products, or services. In addition, some administrative services managers acquire, distribute, and store supplies, while others dispose of surplus property or oversee the disposal of unclaimed property.

Administrative services managers who work as facility managers plan, design, and manage buildings and grounds in addition to people. They are responsible for coordinating the physical workplace with the people and work of an organization. This task requires integrating the principles of business administration, architecture, and behavioral and engineering science. Although the specific tasks assigned to facility managers vary substantially depending on the organization, the duties fall into several categories, relating to operations and maintenance, real estate, project planning and management, communication, finance, quality assessment, facility function, technology integration, and management of human and environmental factors. Tasks within these broad categories may include space and workplace planning, budgeting, purchase and sale of real estate, lease management, renovations, or architectural planning and design. Facility managers may suggest and oversee renovation projects for a variety of reasons, ranging from improving



Administrative services managers coordinate and direct support services that allow organizations to operate efficiently.

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efficiency to ensuring that facilities meet government regulations and environmental, health, and security standards. Additionally, facility managers continually monitor the facility to ensure that it remains safe, secure, and well-maintained. Often, the facility manager is responsible for directing staff, including maintenance, grounds, and custodial workers.

Working Conditions

Administrative services managers generally work in comfortable offices. Managers involved in contract administration and personal property procurement, use, and disposal may travel between their home office, branch offices, vendors' offices, and property sales sites. Also, facility managers who are responsible for the design of workspaces may spend time at construction sites and may travel between different facilities while monitoring the work of maintenance, grounds, and custodial staffs. However, new technology has increased the number of managers who telecommute from home or other offices, and teleconferencing has reduced the need for travel.

Most administrative services managers work a standard 40-hour week. However, uncompensated overtime frequently is required to resolve problems and meet deadlines. Facility managers often are "on call" to address a variety of problems that can arise in a facility during nonwork hours.

Employment

Administrative services managers held about 321,000 jobs in 2002. About 9 out of 10 worked in service-providing industries, including Federal, State, and local government, health services, financial services, professional, scientific, and technical services, and education. Most of the remaining workers worked in manufacturing industries.

Training, Other Qualifications, and Advancement

Educational requirements for these managers vary widely, depending on the size and complexity of the organization. In small organizations, experience may be the only requirement needed to enter a position as office manager. When an opening in administrative services management occurs, the office manager may be promoted to the position based on past performance. In large organizations, however, administrative services managers normally are hired from outside and each position has formal education and experience requirements. Some administrative services managers have advanced degrees.

Specific requirements vary by job responsibility. For first-line administrative services managers of secretarial, mailroom, and related support activities, many employers prefer an associate degree in business or management, although a high school diploma may suffice when combined with appropriate experience. For managers of audiovisual, graphics, and other technical activities, postsecondary technical school training is preferred. Managers of highly complex services, such as contract administration, generally need at least a bachelor's degree in business, human resources, or finance. Regardless of major, the curriculum should include courses in office technology, accounting, business mathematics, computer applications, human resources, and business law. Most facility managers have an undergraduate or graduate degree in engineering, architecture, construction management, business administration, or facility management. Many have a background in real estate, construction, or interior design, in addition to managerial experience.

Whatever the manager's educational background, it must be accompanied by related work experience reflecting demonstrated ability. For this reason, many administrative services managers have advanced through the ranks of their organization, acquiring work experience in various administrative positions before assuming first-line supervisory duties. All managers who oversee departmental supervisors should be familiar with office procedures and equipment. Managers of personal property acquisition and disposal need experience in purchasing and sales, and knowledge of a variety of supplies, machinery, and equipment. Managers concerned with supply, inventory, and distribution should be experienced in receiving, warehousing, packaging, shipping, transportation, and related operations. Contract administrators may have worked as contract specialists, cost analysts, or procurement specialists. Managers of unclaimed property often have experience in insurance claims analysis and records management.

Persons interested in becoming administrative services managers should have good communication skills and be able to establish effective working relationships with many different people, ranging from managers, supervisors, and professionals, to clerks and blue-collar workers. They should be analytical, detail-oriented, flexible, and decisive. They must also be able to coordinate several activities at once, quickly analyze and resolve specific problems, and cope with deadlines.

Most administrative services managers in small organizations advance by moving to other management positions or to a larger organization. Advancement is easier in large firms that employ several levels of administrative services managers. Attainment of the Certified Administrative Manager (CAM) designation offered by the Institute of Certified Professional Managers, through work experience and successful completion of examinations, can increase a manager's advancement potential. In addition, a master's degree in business administration or related field enhances a first-level manager's opportunities to advance to a mid-level management position, such as director of administrative services, and eventually to a top-level management position, such as executive vice president for administrative services. Those with enough money and experience can establish their own management consulting firm.Advancement of facility managers is based on the practices and size of individual companies. Some facility managers transfer from other departments within the organization or work their way up from technical positions. Others advance through a progression of facility management positions that offer additional responsibilities. Completion of the competency-based professional certification program offered by the International Facility Management Association can give prospective candidates an advantage. In order to qualify for this Certified Facility Manager (CFM) designation, applicants must meet certain educational and experience requirements.

Job Outlook

Employment of administrative services managers is projected to grow about as fast as the average for all occupations through 2012. Like persons seeking other managerial positions, applicants face keen competition because there are more competent, experienced workers seeking jobs than there are positions available. However, demand should be strong for facility managers because businesses increasingly are realizing the importance of maintaining, securing, and efficiently operating their facilities, which are very large investments for most organizations. Administrative services managers employed in management services and management consulting also should be in demand, as public and private organizations con-

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tinue to streamline and, in some cases, contract out administrative services functions in an effort to cut costs.

At the same time, continuing corporate restructuring and increasing utilization of office technology should result in a flatter organizational structure with fewer levels of management, reducing the need for some middle management positions. This should adversely affect administrative services managers who oversee first-line mangers. Because many administrative services managers have a wide range of responsibilities, however, the effects of these changes on employment should be less severe than for other middle managers who specialize in only certain functions. In addition to new administrative services management jobs created over the 2002-12 projection period, many job openings will stem from the need to replace workers who transfer to other jobs, retire, or stop working for other reasons.

Earnings

Earnings of administrative services managers vary greatly depending on the employer, the specialty, and the geographic area. In general, however, median annual earnings of administrative services managers in 2002 were $52,500. The middle 50 percent earned between $36,190 and $74,590. The lowest 10 percent earned less than $26,120, and the highest 10 percent earned more than $99,870. Median annual earnings in the industries employing the largest numbers of these managers in 2002 are shown below:

Management of companies and enterprises	$66,700
Elementary and secondary schools	59,220
Colleges, universities, and professional schools	56,960
State government	55,710
Local government	51,570

In the Federal Government, contract specialists in nonsupervisory, supervisory, and managerial positions earned an average of $66,309 a year in 2003. Corresponding averages were $63,509 for facilities operations, $62,552 for industrial property managers, $58,880 for property disposal specialists, $62,751 for administrative officers, and $52,824 for support services administrators.

Related Occupations

Administrative services managers direct and coordinate support services and oversee the purchase, use, and disposal of personal property. Occupations with similar functions include office and administrative support worker supervisors and managers; cost estimators; property, real estate, and community association managers; purchasing managers, buyers, and purchasing agents; and top executives.

Sources of Additional Information

For information about careers and education and degree programs in facility management, as well as the Certified Facility Manager designation, contact:

➤ International Facility Management Association, 1 East Greenway Plaza, Suite 1100, Houston, TX 77046-0194. Internet: **http://www.ifma.org**

General information regarding facility management and a list of facility management education and degree programs may be obtained from:

➤ Association of Higher Education Facilities Officers, 1643 Prince St., Alexandria, VA 22314-2818. Internet: **http://www.appa.org**

For information about the Certified Manager or Certified Administrative Manager designations, contact:

➤ Institute of Certified Professional Managers, James Madison University, College of Business, Harrisonburg, VA 22807. Internet: **http://cob.jmu.edu/icpm**

Advertising, Marketing, Promotions, Public Relations, and Sales Managers

(0*NET 11-2011.00, 11-2021.00, 11-2022.00, 11-2031.00)

Significant Points

- Keen competition for jobs is expected.
- College graduates with related experience, a high level of creativity, and strong communication skills should have the best job opportunities.
- High earnings, substantial travel, and long hours, including evenings and weekends, are common.

Nature of the Work

The objective of any firm is to market and sell its products or services profitably. In small firms, the owner or chief executive officer might assume all advertising, promotions, marketing, sales, and public relations responsibilities. In large firms, which may offer numerous products and services nationally or even worldwide, an executive vice president directs overall advertising, promotions, marketing, sales, and public relations policies. (Executive vice presidents are included in the *Handbook* statement on top executives.) Advertising, marketing, promotions, public relations, and sales managers coordinate the market research, marketing strategy, sales, advertising, promotion, pricing, product development, and public relations activities.

Managers oversee advertising and promotion staffs, which usually are small, except in the largest firms. In a small firm, managers may serve as a liaison between the firm and the advertising or promotion agency to which many advertising or promotional functions are contracted out. In larger firms, advertising managers oversee in-house account, creative, and media services departments. The *account executive* manages the account services department, assesses the need for advertising, and, in advertising agencies, maintains the accounts of clients. The creative services department develops the subject matter and presentation of advertising. The *creative director* oversees the copy chief, art director, and associated staff. The *media director* oversees planning groups that select the communication media—for example, radio, television, newspapers, magazines, Internet, or outdoor signs—to disseminate the advertising.

Promotions managers supervise staffs of promotion specialists. They direct promotion programs that combine advertising with purchase incentives to increase sales. In an effort to establish closer contact with purchasers—dealers, distributors, or consumers—promotion programs may involve direct mail, telemarketing, television or radio advertising, catalogs, exhibits, inserts in newspapers, Internet advertisements or Web sites, instore displays or product endorsements, and special events. Purchase incentives may include discounts, samples, gifts, rebates, coupons, sweepstakes, and contests.

Marketing managers develop the firm's detailed marketing strategy. With the help of subordinates, including *product development managers* and *market research managers,* they determine the demand for products and services offered by the firm and its competitors. In addition, they identify potential markets—for example, business firms, wholesalers, retailers, government, or the general public. Marketing managers develop pricing strategy with an eye towards maximizing the firm's share of the market and its profits while ensuring that the firm's customers are satisfied. In collaboration with sales, product development, and other managers, they monitor trends that indicate the need for new products and services and oversee product development. Marketing managers work with

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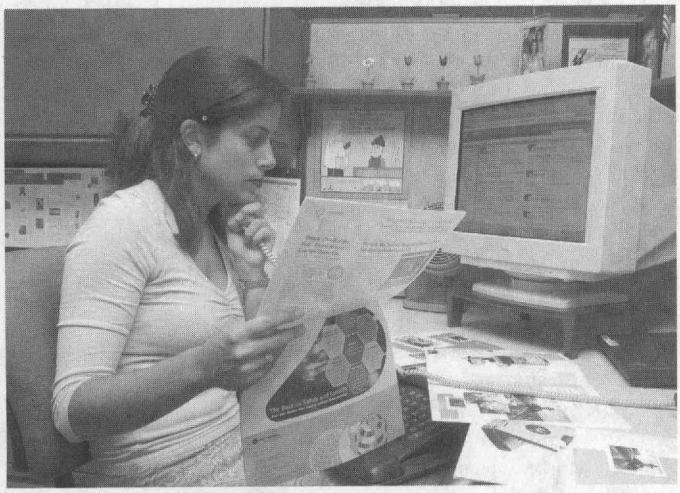
advertising and promotion managers to promote the firm's products and services and to attract potential users.

Public relations managers supervise public relations specialists. (See the *Handbook* statement on public relations specialists.) These managers direct publicity programs to a targeted public. They often specialize in a specific area, such as crisis management—or in a specific industry, such as healthcare. They use every available communication medium in their effort to maintain the support of the specific group upon whom their organization's success depends, such as consumers, stockholders, or the general public. For example, public relations managers may clarify or justify the firm's point of view on health or environmental issues to community or special interest groups.

Public relations managers also evaluate advertising and promotion programs for compatibility with public relations efforts and serve as the eyes and ears of top management. They observe social, economic, and political trends that might ultimately affect the firm and make recommendations to enhance the firm's image based on those trends.

Public relations managers may confer with labor relations managers to produce internal company communications—such as newsletters about employee-management relations—and with financial managers to produce company reports. They assist company executives in drafting speeches, arranging interviews, and maintaining other forms of public contact; oversee company archives; and respond to information requests. In addition, some handle special events such as sponsorship of races, parties introducing new products, or other activities the firm supports in order to gain public attention through the press without advertising directly.

Sales managers direct the firm's sales program. They assign sales territories, set goals, and establish training programs for the sales representatives. (See the *Handbook* statement on sales representatives, wholesale and manufacturing.) Managers advise the sales representatives on ways to improve their sales performance. In large, multiproduct firms, they oversee regional and local sales managers and their staffs. Sales managers maintain contact with dealers and distributors. They analyze sales statistics gathered by their staffs to determine sales potential and inventory requirements and monitor the preferences of customers. Such information is vital to develop products and maximize profits.



Advertising, marketing, promotions, public relations, and sales managers coordinate market research, marketing strategy, sales, advertising, promotion, pricing, product development, and public relations activities.

Working Conditions

Advertising, marketing, promotions, public relations, and sales managers work in offices close to those of top managers. Long hours, including evenings and weekends are common. About 44 percent of advertising, marketing, and public relations managers worked more than 40 hours a week in 2002. Working under pressure is unavoidable when schedules change and problems arise, but deadlines and goals must still be met.

Substantial travel may be involved. For example, attendance at meetings sponsored by associations or industries often is mandatory. Sales managers travel to national, regional, and local offices and to various dealers and distributors. Advertising and promotions managers may travel to meet with clients or representatives of communications media. At times, public relations managers travel to meet with special interest groups or government officials. Job transfers between headquarters and regional offices are common, particularly among sales managers.

Employment

Advertising, marketing, promotions, public relations, and sales managers held about 700,000 jobs in 2002. The following tabulation shows the distribution of jobs by occupational specialty:

Sales managers	343,000
Marketing managers	203,000
Advertising and promotions managers	85,000
Public relations managers	69,000

These managers were found in virtually every industry. Sales managers held almost half of the jobs; most were employed in manufacturing, wholesale and retail trade, and finance and insurance industries. Marketing managers held more one-fourth of the jobs; manufacturing, and professional, scientific, and technical services industries employed more than one-third of marketing managers. More than one-third of advertising and promotions managers worked in professional, scientific, and technical services, and information industries, including advertising and related services, and publishing industries. Most public relations managers were employed in services industries, such as other services (except government), professional, scientific, and technical services, finance and insurance, health care and social assistance services, and educational services.

Training, Advancement, and Other Qualifications

A wide range of educational backgrounds is suitable for entry into advertising, marketing, promotions, public relations, and sales managerial jobs, but many employers prefer those with experience in related occupations plus a broad liberal arts background. A bachelor's degree in sociology, psychology, literature, journalism, or philosophy, among other subjects, is acceptable. However, requirements vary, depending upon the particular job.

For marketing, sales, and promotions management positions, some employers prefer a bachelor's or master's degree in business administration with an emphasis on marketing. Courses in business law, economics, accounting, finance, mathematics, and statistics are advantageous. In highly technical industries, such as computer and electronics manufacturing, a bachelor's degree in engineering or science, combined with a master's degree in business administration, is preferred.

For advertising management positions, some employers prefer a bachelor's degree in advertising or journalism. A course of study should include marketing, consumer behavior, market research, sales, communication methods and technology, and visual arts—for example, art history and photography.

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For public relations management positions, some employers prefer a bachelor's or master's degree in public relations or journalism. The applicant's curriculum should include courses in advertising, business administration, public affairs, public speaking, political science, and creative and technical writing.

For all these specialties, courses in management and completion of an internship while in school are highly recommended. Familiarity with word processing and database applications also is important for many positions. Computer skills are vital because marketing, product promotion, and advertising on the Internet are increasingly common. The ability to communicate in a foreign language may open up employment opportunities in many rapidly growing areas around the country, especially in cities with large Spanish-speaking populations.

Most advertising, marketing, promotions, public relations, and sales management positions are filled by promoting experienced staff or related professional personnel. For example, many managers are former sales representatives, purchasing agents, buyers, or product, advertising, promotions, or public relations specialists. In small firms, where the number of positions is limited, advancement to a management position usually comes slowly. In large firms, promotion may occur more quickly.

Although experience, ability, and leadership are emphasized for promotion, advancement can be accelerated by participation in management training programs conducted by many large firms. Many firms also provide their employees with continuing education opportunities, either in-house or at local colleges and universities, and encourage employee participation in seminars and conferences, often provided by professional societies. In collaboration with colleges and universities, numerous marketing and related associations sponsor national or local management training programs. Course subjects include brand and product management, international marketing, sales management evaluation, telemarketing and direct sales, interactive marketing, promotion, marketing communication, market research, organizational communication, and data processing systems procedures and management. Many firms pay all or part of the cost for those who successfully complete courses.

Some associations offer certification programs for these managers. Certification—a sign of competence and achievement in this field—is particularly important in a competitive job market. While relatively few advertising, marketing, promotions, public relations, and sales managers currently are certified, the number of managers who seek certification is expected to grow. For example, Sales and Marketing Executives International offers a management certification program based on education and job performance. The Public Relations Society of America offers a certification program for public relations practitioners based on years of experience and performance on an examination.

Persons interested in becoming advertising, marketing, promotions, public relations, and sales managers should be mature, creative, highly motivated, resistant to stress, flexible, and decisive. The ability to communicate persuasively, both orally and in writing, with other managers, staff, and the public is vital. These managers also need tact, good judgment, and exceptional ability to establish and maintain effective personal relationships with supervisory and professional staff members and client firms.

Because of the importance and high visibility of their jobs, advertising, marketing, promotions, public relations, and sales managers often are prime candidates for advancement to the highest ranks. Well-trained, experienced, successful managers may be promoted to higher positions in their own, or other, firms. Some become top executives. Managers with extensive experience and sufficient capital may open their own businesses.

Job Outlook

Advertising, marketing, promotions, public relations, and sales manager jobs are highly coveted and will be sought by other managers or highly experienced professionals, resulting in keen competition. College graduates with related experience, a high level of creativity, and strong communication skills should have the best job opportunities. Employers will particularly seek those who have the computer skills to conduct advertising, marketing, promotions, public relations, and sales activities on the Internet.

Employment of advertising, marketing, promotions, public relations, and sales managers is expected to increase faster than the average for all occupations through 2012, spurred by intense domestic and global competition in products and services offered to consumers. However, projected employment growth varies by industry. For example, employment is projected to grow much faster than average in scientific, professional, and related services such as computer systems design and related services and advertising and related services, as businesses increasingly hire contractors for these services instead of additional full-time staff. On the other hand, little or no change in employment is expected in many manufacturing industries.

Earnings

Median annual earnings in 2002 were $57,130 for advertising and promotions managers, $78,250 for marketing managers, $75,040 for sales managers, and $60,640 for public relations managers. Earnings ranged from less than $30,310 for the lowest 10 percent of advertising and promotions managers, to more than $145,600 for the highest 10 percent of marketing and sales managers.

Median annual earnings advertising and promotions managers in 2002 in the advertising and related services industry were $72,630.

Median annual earnings in the industries employing the largest numbers of marketing managers in 2002 were as follows:

Computer systems design and related services	$96,440
Management of companies and enterprises	90,750
Depository credit intermediation	65,960

Median annual earnings in the industries employing the largest numbers of sales managers in 2002 were as follows:

Computer systems design and related services	$102,520
Automobile dealers	91,350
Management of companies and enterprises	87,800
Insurance carriers	80,540
Traveler accommodation	44,560

Median annual earnings of public relations managers in 2002 in colleges, universities, and professional schools were $55,510.

According to a National Association of Colleges and Employers survey, starting salaries for marketing majors graduating in 2003 averaged $34,038; starting salaries for advertising majors averaged $29,495.

Salary levels vary substantially, depending upon the level of managerial responsibility, length of service, education, firm size, location, and industry. For example, manufacturing firms usually pay these managers higher salaries than do nonmanufacturing firms. For sales managers, the size of their sales territory is another important determinant of salary. Many managers earn bonuses equal to 10 percent or more of their salaries.

Related Occupations

Advertising, marketing, promotions, public relations, and sales managers direct the sale of products and services offered by their

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firms and the communication of information about their firms' activities. Other workers involved with advertising, marketing, promotions, public relations, and sales include actors, producers, and directors; artists and related workers; demonstrators, product promoters, and models; market and survey researchers; public relations specialists; sales representatives, wholesale and manufacturing; and writers and editors.

Sources of Additional Information

For information about careers in advertising management, contact:

➤ American Association of Advertising Agencies, 405 Lexington Ave., New York, NY 10174-1801. Internet: **http://www.aaaa.org**

Information about careers and professional certification in public relations management is available from:

➤ Public Relations Society of America, 33 Irving Place, New York, NY 10003-2376. Internet: **http://www.prsa.org**

Computer and Information Systems Managers

(0*NET 11-3021.00)

Significant Points

- Projected job growth stems primarily from rapid growth among computer-related occupations.
- Employers prefer managers with formal education and advanced technical knowledge acquired through computer-related work experience.
- Job opportunities should be best for applicants with a master's degree in business administration or management information systems with technology as a core component.

Nature of the Work

The need for organizations to incorporate existing and future technologies in order to remain competitive has become a more pressing issue over the last several yearsg. As electronic commerce becomes more common, how and when companies use technology are critical issues. Computer and information systems managers play a vital role in the technological direction of their organizations. They do everything from constructing the business plan to overseeing network security to directing Internet operations.

Computer and information systems managers plan, coordinate, and direct research and design the computer-related activities of firms. They help determine both technical and business goals in consultation with top management, and make detailed plans for the accomplishment of these goals. For example, working with their staff, they may develop the overall concepts of a new product or service, or may identify how an organization's computing capabilities can effectively aid project management.

Computer and information systems managers direct the work of systems analysts, computer programmers, support specialists, and other computer-related workers. These managers plan and coordinate activities such as installation and upgrading of hardware and software, programming and systems design, development of computer networks, and implementation of Internet and intranet sites. They are increasingly involved with the upkeep and maintenance and security of networks. They analyze the computer and information needs of their organization, from an operational and strategic perspective, and determine immediate and long-range personnel and equipment requirements. They assign and review the work of their subordinates, and stay abreast of the latest technology in order to assure the organization does not lag behind competitors.

The duties of computer and information systems managers vary with their specific titles. *Chief technology officers*, for example, evaluate the newest and most innovative technologies and determine how these can help their organization. The chief technology officer, who often reports to the organization's chief information officer, manages and plans technical standards and tends to the daily information technology issues of the firm. (Chief information officers are covered in a separate *Handbook* statement on top executives.) Because of the rapid pace of technological change, chief technology officers must constantly be on the lookout for developments that could benefit their organization. They are responsible for demonstrating to a company how information technology can be used as a competitive tool that not only cuts costs, but also increases revenue and maintains or increases competitive advantage.

Management information systems (MIS) directors manage information systems and computing resources for their entire organization. They may also work under the chief information officer and plan and direct the work of subordinate information technology employees. These managers oversee a variety of user services such as an organization's help desk, which employees can call with questions or problems. MIS directors also may make hardware and software upgrade recommendations based on their experience with an organization's technology. Helping to assure the availability, continuity, and security of data and information technology services are key responsibilities for these workers.

Project managers develop requirements, budgets, and schedules for their firm's information technology projects. They coordinate such projects from development through implementation, working with internal and external clients, vendors, consultants, and computer specialists. These managers are increasingly involved in projects that upgrade the information security of an organization.

LAN/WAN (Local Area Network/Wide Area Network) *managers* provide a variety of services, from design to administration, of an organization's local area network, which connects staff within an organization. These managers direct the network, and its related computing environment, including hardware, systems software, applications software, and all other computer-related configurations.

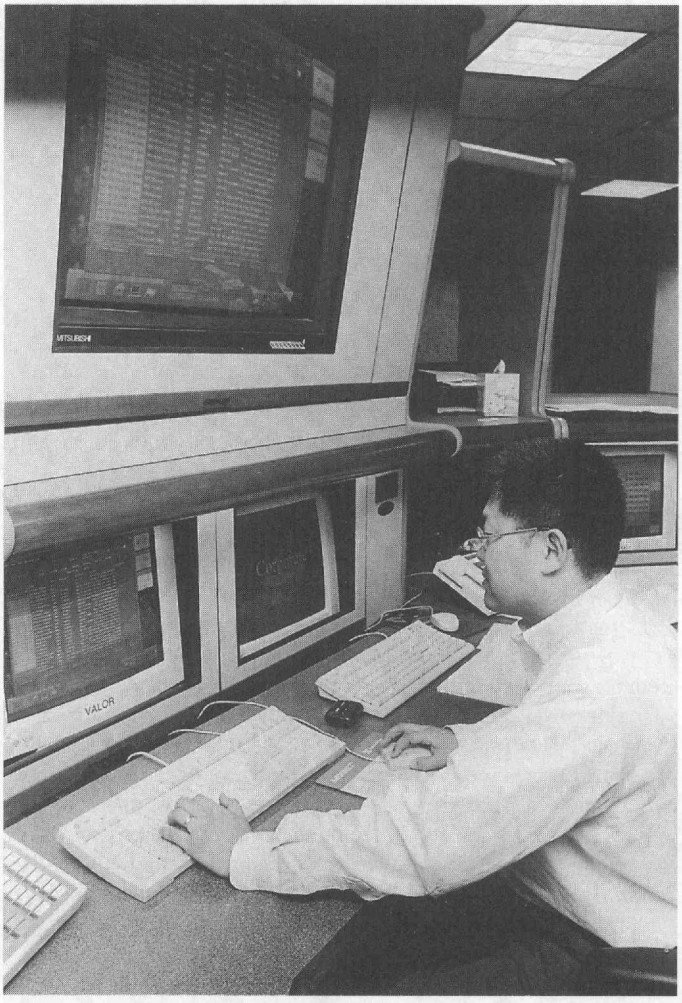
Computer and information system managers need strong communication skills. They coordinate the activities of their unit with those of other units or organizations. They confer with top executives; financial, production, marketing, and other managers; and contractors and equipment and materials suppliers.

Working Conditions

Computer and information systems managers spend most of their time in an office. Most work at least 40 hours a week and may have to work evenings and weekends to meet deadlines or solve unexpected problems. Some computer and information systems managers may experience considerable pressure in meeting technical goals within short timeframes or tight budgets. As networks continue to expand and more work is done remotely, computer and information system managers have to communicate with and oversee offsite employees using modems, laptops, e-mail, and the Internet.

Like other workers who sit continuously in front of a keyboard, computer and information system managers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

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Computer and information systems managers supervise information systems and computing resources for their entire organization.

Employment

Computer and information systems managers held about 284,000 jobs in 2002. About 2 in 5 works in service-providing industries, mainly in computer systems design and related services. This industry provides services related to the commercial use of computers on a contract basis, including custom computer programming services; computer systems integration design services; computer facilities management services, including computer systems or data-processing facilities support services for clients; and other computer-related services, such as disaster recovery services and software installation. Other large employers include insurance and financial services firms, government agencies, and manufacturers.

Training, Other Qualifications, and Advancement

Strong technical knowledge is essential for computer and information systems managers, who must understand and guide the work of their subordinates, yet also explain the work in nontechnical terms to senior management and potential customers. Therefore, these management positions usually require work experience and formal education similar to that of other computer occupations.

Many computer and information systems managers have experience as systems analysts; others may have experience as computer support specialists, programmers, or other information technology professionals. A bachelor's degree usually is required for management positions, although employers often prefer a graduate degree, especially a master's degree in business administration (MBA) with technology as a core component. This degree differs from a traditional MBA in that there is a heavy emphasis on information technology in addition to the standard business curriculum. This is becoming important because more computer and information systems managers are making important technology decisions as well as business decisions for their organizations. Some universities specialize in offering degrees in management information systems, which blend technical core subjects with business, accounting, and communications courses. A few computer and information systems managers may have only an associate degree if they have sufficient experience and were able to learn additional skills on the job. To aid their professional advancement, though, many managers with an associate degree eventually earn a bachelor's or master's degree while working.

Computer and information systems managers need a broad range of skills. In addition to technical skills, employers also seek managers with strong business skills. Employers want managers who have experience with the specific software or technology to be used on the job, as well as a background in either consulting or business management. The expansion of electronic commerce has elevated the importance of business insight, because many managers are called upon to make important business decisions. Managers need a keen understanding of people, management processes, and customers' needs.

Computer and information systems managers must possess strong interpersonal, communication, and leadership skills because they are required to interact not only with their staff, but also with other people inside and outside their organization. They also must possess team skills to work on group projects and other collaborative efforts. Computer and information systems managers increasingly interact with persons outside their organization, reflecting their emerging role as vital parts of their firm's executive team.

Computer and information systems managers may advance to progressively higher leadership positions in their field. Some may become managers in non-technical areas such as marketing, human resources, or sales. In high technology firms, managers in non-technical areas often must possess the same specialized knowledge as do managers in technical areas.

Job Outlook

Employment of computer and information systems managers is expected to grow much faster than the average for all occupations through the year 2012. Technological advancements will boost the employment of computer-related workers; as a result, the demand for managers to direct these workers also will increase. In addition, job openings will result from the need to replace managers who retire or move into other occupations. Opportunities for obtaining a management position will be best for workers possessing an MBA with technology as a core component, or a management information systems degree, advanced technical knowledge, and strong communication and administrative skills.

Despite the recent downturn in the economy, especially in technology-related sectors, the outlook for computer and information systems managers remains strong. In order to remain competitive, firms will continue to install sophisticated computer networks and set up more complex Internet and intranet sites. Keeping a computer network running smoothly is essential to almost every organization. Firms will be more willing to hire managers who can accomplish that.

The security of computer networks will continue to increase in importance as more business is conducted over the Internet. The security of the Nation's entire electronic infrastructure has come under renewed focus in light of recent threats. Organizations need

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to understand how their systems are vulnerable and how to protect their infrastructure and Internet sites from hackers, viruses, and other acts of cyber-terrorism. The emergence of "cyber-security" as a key issue facing most organizations should lead to strong growth for computer managers. Firms will increasingly hire cyber-security experts to fill key leadership roles in their information technology departments, because the integrity of their computing environment is of the utmost concern. As a result, there will be a high demand for managers proficient in computer security issues.

Due to the explosive growth of electronic commerce and the capacity of the Internet to create new relationships with customers, the role of computer and information systems managers will continue to evolve in the future. Persons in these jobs will continue to become more vital to their companies. The expansion of the wireless Internet will spur the need for computer and information systems managers with both business savvy and technical proficiency.

Opportunities for those who wish to become computer and information systems managers should be closely related to the growth of the occupations they supervise and the industries in which they are found. (See the statements on computer programmers; computer software engineers; computer support specialists and systems administrators; and computer systems analysts, database administrators, and computer scientists elsewhere in the *Handbook*.)

Earnings

Earnings for computer and information systems managers vary by specialty and level of responsibility. Median annual earnings of these managers in 2002 were $85,240. The middle 50 percent earned between $64,150 and $109,950. The lowest 10 percent earned less than $47,440, and the highest 10 percent earned more than $140,440. Median annual earnings in the industries employing the largest numbers of computer and information systems managers in 2002 were:

Computer systems design and related services	$94,240
Management of companies and enterprises	91,710
Insurance carriers	89,920
Depository credit intermediation	75,160
Colleges, universities, and professional schools	68,100

According to Robert Half International, average starting salaries in 2003 for high-level information technology managers ranged from $82,750 to $151,500. According to a 2003 survey by the National Association of Colleges and Employers, starting salary offers for those with an MBA, a technical undergraduate degree, and 1 year or less of experience averaged $54,643; for those with a master's degree in management information systems/business data processing, the starting salary averaged $43,750.

In addition, computer and information systems managers, especially those at higher levels, often receive more employment-related benefits—such as expense accounts, stock option plans, and bonuses—than do non-managerial workers in their organizations.

Related Occupations

The work of computer and information systems managers is closely related to that of computer programmers; computer software engineers; computer systems analysts, database administrators, and computer scientists; and computer support specialists and systems administrators. Computer and information systems managers also have some high-level responsibilities similar to those of top executives.

Sources of Additional Information

For information about a career as a computer and information systems manager, contact the sources of additional information for the various computer occupations discussed elsewhere in the *Handbook*.

Construction Managers

(0*NET 11-9021.00)

Significant Points

- Construction managers must be available—often 24 hours a day—to deal with delays, bad weather, or emergencies at the jobsite.
- Employers prefer individuals who combine construction industry work experience with a bachelor's degree in construction science, construction management, or civil engineering.
- Good employment opportunities are expected; however, employment can be sensitive to the short-term nature of many construction projects and to cyclical fluctuations in construction activity.

Nature of the Work

Construction managers plan and coordinate construction projects. They may have job titles such as constructor, construction superintendent, general superintendent, project engineer, project manager, general construction manager, or executive construction manager. Construction managers may be owners or salaried employees of a construction management or contracting firm, or may work under contract or as a salaried employee of the owner, developer, contractor, or management firm overseeing the construction project. They may plan and direct a whole project or just a part of a project. The *Handbook* uses the term "construction manager" to describe salaried or self-employed managers who oversee construction supervisors and workers.

In contrast with the *Handbook* definition, "construction manager" is defined more narrowly within the construction industry to denote a management firm, or an individual employed by such a firm, involved in managerial oversight of a construction project. Under this definition, construction managers usually represent the owner or developer along with other workers throughout the project. Although they usually play no direct role in the actual construction of a structure, they typically schedule and coordinate all design and construction processes, including the selection, hiring, and oversight of specialty trade contractors.

Managers who work in the construction industry, such as general managers, project engineers, and others, increasingly are called *constructors*. Constructors manage, coordinate, and supervise the construction process from the conceptual development stage through final construction on a timely and economical basis. Given designs for buildings, roads, bridges, or other projects, constructors oversee the organization, scheduling, and implementation of the project to execute those designs. They are responsible for coordinating and managing people, materials, and equipment; budgets, schedules, and contracts; and safety of employees and the general public.

On large projects, several different management systems may be used. In the general contractor system, the owner hires a general contractor to manage all activities. Working for the general contractor, construction managers oversee the completion of all construction in accordance with the engineer's and architect's drawings and specifications and prevailing building codes. They arrange for trade contractors to perform specialized craftwork or other specified construction work. On small projects, such as remodeling a home, a self-employed construction manager or skilled trades worker who directs and oversees employees often is referred to as the con-

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struction "contractor." In the construction management system, the owner hires a firm to oversee all aspects of the project. The management firm will then hire a general contractor to run the construction process and oversee construction of the structure. The major difference from the general contractor system is that the hired management firm, rather than the owner, works with the individual construction manager. In the design-build system, the owners, architects, general contractors, and major subcontractors are brought together to cooperatively plan and design the project. The design-build group may be from an individual firm or a conglomeration of separate entities. The construction manager participates during the design process and may be in charge of the construction project once the design is agreed upon.

Large construction projects, such as an office building or industrial complex, are too complicated for one person to manage. These projects are divided into many segments: Site preparation, including land clearing and earth moving; sewage systems; landscaping and road construction; building construction, including excavation and laying of foundations, as well as erection of structural framework, floors, walls, and roofs; and building systems, including fire-protection, electrical, plumbing, air-conditioning, and heating. Construction managers may be in charge of one or more of these activities. Construction managers often work with engineers, architects, and others who are involved in the construction process.

Construction managers evaluate and determine appropriate construction methods and the most cost-effective plan and schedule. They divide all required construction site activities into logical steps, budgeting the time required to meet established deadlines. This may require sophisticated estimating and scheduling techniques and use of computers with specialized software. (See the statement on cost estimators elsewhere in the *Handbook*.) They oversee the selection of trade contractors to complete specific pieces of the project—which could include everything from structural metalworking and plumbing to painting and carpet installation. Construction managers determine the labor requirements and, in some cases, supervise or monitor the hiring and dismissal of workers. They oversee the performance of all trade contractors and are responsible for ensuring that all work is completed on schedule.

Construction managers direct and monitor the progress of construction activities, sometimes through construction supervisors or other construction managers. They oversee the delivery and use of materials, tools, and equipment; and the quality of construction, worker productivity, and safety. They are responsible for obtaining all necessary permits and licenses and, depending upon the contractual arrangements, direct or monitor compliance with building and safety codes and other regulations. They may have several subordinates, such as assistant managers or superintendents, field engineers, or crew supervisors, reporting to them.

Construction managers regularly review engineering and architectural drawings and specifications to monitor progress and ensure compliance with plans and schedules. They track and control construction costs against the project budget to avoid cost overruns. Based upon direct observation and reports by subordinate supervisors, managers may prepare daily reports of progress and requirements for labor, material, machinery, and equipment at the construction site. They meet regularly with owners, other constructors, trade contractors, vendors, architects, engineers, and others to monitor and coordinate all phases of the construction project.

Working Conditions

Construction managers work out of a main office from which the overall construction project is monitored, or out of a field office at the construction site. Advances in telecommunications and Internet access allow construction managers to be onsite without being out of contact of the office. Management decisions regarding daily construction activities generally are made at the jobsite. Managers usually travel when the construction site is in another State or when they are responsible for activities at two or more sites. Management of overseas construction projects usually entails temporary residence in another country.



Construction managers are responsible for coordinating and managing people, materials, and equipment; budgets, schedules, and contracts; and the safety of employees and the general public.

Construction managers may be "on call"—often 24 hours a day—to deal with delays, bad weather, or emergencies at the site. Most work more than a standard 40-hour week because construction may proceed around-the-clock. They may have to work this type of schedule for days, even weeks, to meet special project deadlines, especially if there are delays.

Although the work usually is not considered inherently dangerous, construction managers must be careful while performing onsite services.

Employment

Construction managers held 389,000 jobs in 2002. Almost half were self-employed. Most of the rest were employed in the construction industry, 15 percent by specialty trade contractors—for example, plumbing, heating and air-conditioning, and electrical contractors—and 21 percent by general building contractors. Architectural, engineering and related services firms, as well as local governments, employed others.

Training, Other Qualifications, and Advancement

Persons interested in becoming a construction manager need a solid background in building science, business, and management, as well as related work experience within the construction industry. They need to understand contracts, plans, and specifications, and to be knowledgeable about construction methods, materials, and regulations. Familiarity with computers and software programs for job costing, online collaboration, scheduling, and estimating also is important.

Traditionally, persons advance to construction management positions after having substantial experience as construction craftworkers—carpenters, masons, plumbers, or electricians, for example—or after having worked as construction supervisors or as owners of independent specialty contracting firms overseeing

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workers in one or more construction trades. However, employers—particularly large construction firms—increasingly prefer individuals who combine industry work experience with a bachelor's degree in construction science, construction management, or civil engineering. Practical industry experience also is very important, whether it is acquired through internships, cooperative education programs, or work experience in the industry.

Construction managers should be flexible and work effectively in a fast-paced environment. They should be decisive and work well under pressure, particularly when faced with unexpected occurrences or delays. The ability to coordinate several major activities at once, while analyzing and resolving specific problems, is essential, as is an understanding of engineering, architectural, and other construction drawings. Good oral and written communication skills also are important, as are leadership skills. Managers must be able to establish a good working relationship with many different people, including owners, other managers, designers, supervisors, and craftworkers.

Advancement opportunities for construction managers vary depending upon an individual's performance and the size and type of company for which they work. Within large firms, managers may eventually become top-level managers or executives. Highly experienced individuals may become independent consultants; some serve as expert witnesses in court or as arbitrators in disputes. Those with the required capital may establish their own construction management services, specialty contracting, or general contracting firm.

Many colleges and universities offer 4-year degree programs in construction management, construction science, and construction engineering. These programs include courses in project control and development, site planning, design, construction methods, construction materials, value analysis, cost estimating, scheduling, contract administration, accounting, business and financial management, safety, building codes and standards, inspection procedures, engineering and architectural sciences, mathematics, statistics, and information technology. Graduates from 4-year degree programs usually are hired as assistants to project managers, field engineers, schedulers, or cost estimators. An increasing number of graduates in related fields—engineering or architecture, for example—also enter construction management, often after acquiring substantial experience on construction projects or after completing graduate studies in construction management or building science.

Several colleges and universities offer a master's degree program in construction management or construction science. Master's degree recipients, especially those with work experience in construction, typically become construction managers in very large construction or construction management companies. Often, individuals who hold a bachelor's degree in an unrelated field seek a master's degree in order to work in the construction industry. Some construction managers obtain a master's degree in business administration or finance to further their career prospects. Doctoral degree recipients usually become college professors or conduct research.

Many individuals also attend training and educational programs sponsored by industry associations, often in collaboration with postsecondary institutions. A number of 2-year colleges throughout the country offer construction management or construction technology programs.

There is a growing movement towards certification of construction managers to ensure that a construction manager has a certain body of knowledge, abilities, and experience. Both the American Institute of Constructors (AIC) and the Construction Management Association of America (CMAA) have established voluntary certification programs for construction managers. Requirements combine written examinations with verification of education and professional experience. AIC awards the Associate Constructor (AC) and Certified Professional Constructor (CPC) designations to candidates who meet its requirements and pass appropriate construction examinations. CMAA awards the Certified Construction Manager (CCM) designation to practitioners who meet its requirements through work performed in a construction management firm and by passing a technical examination. Applicants for the CMAA certification also must complete a self-study course that covers a broad range of topics central to construction management, including the professional role of a construction manager, legal issues, and allocation of risk. Although certification is not required to work in the construction industry, voluntary certification can be valuable because it provides evidence of competence and experience.

Job Outlook

Good employment opportunities for construction managers are expected through 2012 because the number of job openings should be sufficient to accommodate the number of qualified managers seeking to enter the occupation. Because the construction industry often is seen as having dirty, strenuous, and hazardous working conditions, even for managers, many potential managers choose other types of careers.

Employment of construction managers is projected to increase about as fast as the average for all occupations through 2012, as the level and complexity of construction activity continues to grow. Prospects in construction management, architectural and engineering services, and construction contracting firms should be best for persons who have a bachelor's or higher degree in construction science, construction management, or civil engineering, as well as practical experience working in construction. Employers prefer applicants with previous construction work experience who can combine a strong background in building technology with proven supervisory or managerial skills. In addition to those arising from job growth, many openings should result annually from the need to replace workers who transfer to other occupations or leave the labor force.

The increasing complexity of construction projects should boost demand for management-level personnel within the construction industry, as sophisticated technology and the proliferation of laws setting standards for buildings and construction materials, worker safety, energy efficiency, and environmental protection have further complicated the construction process. Advances in building materials and construction methods; the need to replace much of the Nation's infrastructure; and the growing number of multipurpose buildings, electronically operated "smart" buildings, and energy-efficient structures will further add to the demand for more construction managers. However, employment of construction managers can be sensitive to the short-term nature of many projects and to cyclical fluctuations in construction activity.

Earnings

Earnings of salaried construction managers and self-employed independent construction contractors vary depending upon the size and nature of the construction project, its geographic location, and economic conditions. In addition to typical benefits, many salaried construction managers receive benefits such as bonuses and use of company motor vehicles.

Median annual earnings of construction managers in 2002 were $63,500. The middle 50 percent earned between $48,720 and $84,080. The lowest 10 percent earned less than $38,130, and the

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highest 10 percent earned more than $112,810. Median annual earnings in the industries employing the largest numbers of construction managers in 2002 were:

Nonresidential building construction	$66,280
Foundation, structure, and building exterior contractors	60,020
Building finishing contractors	59,950
Residential building construction	59,900
Other specialty trade contractors	58,860

According to a 2003 salary survey by the National Association of Colleges and Employers, candidates with a bachelor's degree in construction science/management received job offers averaging $42,229 a year.

Related Occupations

Construction managers participate in the conceptual development of a construction project and oversee its organization, scheduling, and implementation. Other workers who perform similar functions include architects, except landscape and naval; civil engineers; cost estimators; landscape architects; and engineering and natural sciences managers.

Sources of Information

For information about constructor certification, contact:

➤ American Institute of Constructors, 466 94th Ave. North, St. Petersburg, FL 33702. Internet: **http://www.constructorcertification.org or http://www.aicnet.org**

For information about construction management and construction manager certification, contact:

➤ Construction Management Association of America, 7918 Jones Branch Dr., Suite 540, McLean, VA 22102-3307. Internet: **http://www.cmaanet.org**

Information on accredited construction science and management educational programs and accreditation requirements is available from:

➤ American Council for Construction Education, 1300 Hudson Lane, Suite 3, Monroe, LA 71201. Internet: **http://www.acce-hq.org**

Education Administrators

(0*NET 11-9031.00, 11-9032.00, 11-9033.00, 11-9039.99)

Significant Points

- Many jobs require a master's or doctoral degree and experience in a related occupation, such as a teacher or admissions counselor.
- Strong interpersonal and communication skills are essential because much of an administrator's job involves working and collaborating with others.
- Job outlook is expected to be excellent because a large proportion of education administrators are expected to retire over the next 10 years.

Nature of the Work

Smooth operation of an educational institution requires competent administrators. *Education administrators* provide instructional leadership as well as manage the day-to-day activities in schools, preschools, daycare centers, and colleges and universities. They also direct the educational programs of businesses, correctional institutions, museums, and job training and community service organizations. (College presidents and school superintendents are covered in the *Handbook* statement on general managers and top executives.) Education administrators set educational standards and goals and establish the policies and procedures to carry them out. They also supervise managers, support staff, teachers, counselors, librarians, coaches, and others. They develop academic programs; monitor students' educational progress; train and motivate teachers and other staff; manage guidance and other student services; administer recordkeeping; prepare budgets; handle relations with parents, prospective and current students, employers, and the community; and perform many other duties. In an organization such as a small daycare center, one administrator may handle all these functions. In universities or large school systems, responsibilities are divided among many administrators, each with a specific function.

Those who manage elementary, middle, and secondary schools are called *principals*. They set the academic tone and hire, evaluate, and help improve the skills of teachers and other staff. Principals confer with staff to advise, explain, or answer procedural questions. They visit classrooms, observe teaching methods, review instructional objectives, and examine learning materials. They actively work with teachers to develop and maintain high curriculum standards, develop mission statements, and set performance goals and objectives. Principals must use clear, objective guidelines for teacher appraisals, because pay often is based on performance ratings.

Principals also meet and interact with other administrators, students, parents, and representatives of community organizations. Decisionmaking authority has increasingly shifted from school district central offices to individual schools. Thus, parents, teachers, and other members of the community play an important role in setting school policies and goals. Principals must pay attention to the concerns of these groups when making administrative decisions.

Principals prepare budgets and reports on various subjects, including finances and attendance, and oversee the requisition and allocation of supplies. As school budgets become tighter, many principals have become more involved in public relations and fundraising to secure financial support for their schools from local businesses and the community.

Principals must take an active role to ensure that students meet national, State, and local academic standards. Many principals develop school/business partnerships and school-to-work transition programs for students. Increasingly, principals must be sensitive to the needs of the rising number of non-English speaking and culturally diverse students. Growing enrollments, which are leading to overcrowding at many existing schools, also are a cause for concern. When addressing problems of inadequate resources, administrators serve as advocates for the building of new schools or the repair of existing ones. During summer months, principals are responsible for planning for the upcoming year, overseeing summer school, participating in workshops for teachers and administrators, supervising building repairs and improvements, and working to be sure the school has adequate staff for the school year.

Schools continue to be involved with students' emotional welfare as well as their academic achievement. As a result, principals face responsibilities outside the academic realm. For example, in response to the growing numbers of dual-income and single-parent families and teenage parents, schools have established before- and after-school childcare programs or family resource centers, which also may offer parenting classes and social service referrals. With the help of community organizations, some principals have established programs to combat increases in crime, drug and alcohol abuse, and sexually transmitted diseases among students.

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Assistant principals aid the principal in the overall administration of the school. Some assistant principals hold this position for several years to prepare for advancement to principal jobs; others are career assistant principals. They are primarily responsible for scheduling student classes, ordering textbooks and supplies, and coordinating transportation, custodial, cafeteria, and other support services. They usually handle student discipline and attendance problems, social and recreational programs, and health and safety matters. They also may counsel students on personal, educational, or vocational matters. With the advent of site-based management, assistant principals are playing a greater role in ensuring the academic success of students by helping to develop new curriculums, evaluating teachers, and dealing with school-community relations—responsibilities previously assumed solely by the principal. The number of assistant principals that a school employs may vary, depending on the number of students.

In preschools and childcare centers, education administrators are the director or supervisor of the school or center. Their job is similar to that of other school administrators in that they oversee daily activities and operation of the schools, hire and develop staff, and make sure that the school meets required regulations.

Administrators in school district central offices oversee public schools under their jurisdiction. This group includes those who direct subject-area programs such as English, music, vocational education, special education, and mathematics. They supervise instructional coordinators and curriculum specialists, and work with them to evaluate curriculums and teaching techniques and improve them. (Instructional coordinators are covered elsewhere in the *Handbook*.) Administrators also may oversee career counseling programs and testing that measures students' abilities and helps to place them in appropriate classes. Others may also direct programs such as school psychology, athletics, curriculum and instruction, and professional development. With site-based management, administrators have transferred primary responsibility for many of these programs to the principals, assistant principals, teachers, instructional coordinators, and other staff in the schools.

In colleges and universities, *academic deans, deans of faculty, provosts,* and *university deans* assist presidents, make faculty appointments, develop budgets, and establish academic policies and programs. They also direct and coordinate the activities of deans of individual colleges and chairpersons of academic departments. Fundraising also is becoming an essential part of their job.

College or university department heads or *chairpersons* are in charge of departments that specialize in particular fields of study, such as English, biological science, or mathematics. In addition to teaching, they coordinate schedules of classes and teaching assignments; propose budgets; recruit, interview, and hire applicants for teaching positions; evaluate faculty members; encourage faculty development; serve on committees; and perform other administrative duties. In overseeing their departments, chairpersons must consider and balance the concerns of faculty, administrators, and students.

Higher education administrators also direct and coordinate the provision of student services. *Vice presidents of student affairs or student life, deans of students, and directors of student services* may direct and coordinate admissions, foreign student services, health and counseling services, career services, financial aid, and housing and residential life, as well as social, recreational, and related programs. In small colleges, they may counsel students. In larger colleges and universities, separate administrators may handle each of these services. *Registrars* are custodians of students' records. They register students, record grades, prepare student transcripts, evaluate academic records, assess and collect tuition and fees, plan and implement commencement, oversee the preparation of college catalogs and schedules of classes, and analyze enrollment and demographic statistics. *Directors of admissions* manage the process of recruiting, evaluating, and admitting students, and work closely with *financial aid directors*, who oversee scholarship, fellowship, and loan programs. Registrars and admissions officers at most institutions need computer skills because they use electronic student information systems. For example, for those whose institutions present information—such as college catalogs and schedules—on the Internet, knowledge of online resources, imaging, and other computer skills is important. *Athletic directors* plan and direct intramural and intercollegiate athletic activities, seeing to publicity for athletic events, preparation of budgets, and supervision of coaches. Other increasingly important administrators direct fundraising, public relations, distance learning, and technology.

Working Conditions

Education administrators hold leadership positions with significant responsibility. Most find working with students extremely rewarding, but as the responsibilities of administrators have increased in recent years, so has the stress. Coordinating and interacting with faculty, parents, students, community members, business leaders, and State and local policymakers can be fast-paced and stimulating, but also stressful and demanding. Principals and assistant principals, whose varied duties include discipline, may find working with difficult students challenging. The pressures associated with education administrator jobs have multiplied in recent years, as workers in these positions are increasingly being held accountable for ensuring that their schools meet recently imposed State and Federal guidelines for student performance and teacher qualifications, and as they must cope with the additional challenges presented by current budget shortfalls,.

Many education administrators work more than 40 hours a week, often including school activities at night and on weekends. Most administrators work 11 or 12 months out of the year. Some jobs include travel.

Employment

Education administrators held about 427,000 jobs in 2002. About 2 in 10 worked for private education institutions, and 6 in 10 worked for State and local governments, mainly in schools, colleges and universities, and departments of education. Less than 5 percent were self-employed. The rest worked in child daycare centers, religious



Strong interpersonal and communication skills are essential for education administrators.

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organizations, job training centers, and businesses and other organizations that provided training for their employees.

Training, Other Qualifications, and Advancement

Most education administrators begin their careers in related occupations, and prepare for a job in education administration by completing a master's or doctoral degree. Because of the diversity of duties and levels of responsibility, their educational backgrounds and experience vary considerably. Principals, assistant principals, central office administrators, academic deans, and preschool directors usually have held teaching positions before moving into administration. Some teachers move directly into principal positions; others first become assistant principals, or gain experience in other central office administrative jobs at either the school or district level in positions such as department head, curriculum specialist, or subject matter advisor. In some cases, administrators move up from related staff jobs such as recruiter, guidance counselor, librarian, residence hall director, or financial aid or admissions counselor.

To be considered for education administrator positions, workers must first prove themselves in their current jobs. In evaluating candidates, supervisors look for leadership, determination, confidence, innovativeness, and motivation. The ability to make sound decisions and to organize and coordinate work efficiently is essential. Because much of an administrator's job involves interacting with others—such as students, parents, teachers, and the community—a person in such a position must have strong interpersonal skills and be an effective communicator and motivator. Knowledge of leadership principles and practices, gained through work experience and formal education, is important. A familiarity with computer technology is a necessity for principals, who are required to gather information and coordinate technical resources for their students, teachers, and classrooms.

In most public schools, principals, assistant principals, and school administrators in central offices need a master's degree in education administration or educational supervision. Some principals and central office administrators have a doctorate or specialized degree in education administration. In private schools, which are not subject to State licensure requirements, some principals and assistant principals hold only a bachelor's degree; however, the majority have a master's or doctoral degree. Most States require principals to be licensed as school administrators. License requirements vary by State. National standards for school leaders, including principals and supervisors, have been developed by the Interstate School Leaders Licensure Consortium. Many States use these national standards as guidelines to assess beginning principals for licensure. Increasingly, on-the-job training, often with a mentor, is required for new school leaders. Some States require administrators to take continuing education courses to keep their license, thus ensuring that administrators have the most up-to-date skills. The number and types of courses required to maintain licensure vary by State.

Educational requirements for administrators of preschools and childcare centers vary depending on the setting of the program and the State of employment. Administrators who oversee school-based preschool programs are often required to have at least a bachelor's degree. Child care directors are generally not required to have a degree; however, most States require a credential such as the Child Development Associate credential (CDA) sponsored by the Council for Professional Recognition or other credential specifically designed for administrators. The National Child Care Association, offers a National Administration Credential, which some recent college graduates voluntarily earn to better qualify for positions as childcare center directors.

Academic deans and chairpersons usually have a doctorate in their specialty. Most have held a professorship in their department before advancing. Admissions, student affairs, and financial aid directors and registrars sometimes start in related staff jobs with bachelor's degrees—any field usually is acceptable—and obtain advanced degrees in college student affairs, counseling, or higher education administration. A Ph.D. or Ed.D. usually is necessary for top student affairs positions. Computer literacy and a background in accounting or statistics may be assets in admissions, records, and financial work.

Advanced degrees in higher education administration, educational supervision, and college student affairs are offered in many colleges and universities. The National Council for Accreditation of Teacher Education and the Educational Leadership Constituent Council accredit these programs. Education administration degree programs include courses in school leadership, school law, school finance and budgeting, curriculum development and evaluation, research design and data analysis, community relations, politics in education, and counseling. Educational supervision degree programs include courses in supervision of instruction and curriculum, human relations, curriculum development, research, and advanced teaching courses.

Education administrators advance through promotion to more responsible administrative positions or by transferring to more responsible positions at larger schools or systems. They also may become superintendents of school systems or presidents of educational institutions.

Job Outlook

Employment of education administrators is projected to grow faster than the average for all occupations through 2012. As education and training take on greater importance in everyone's lives, the need for people to administer education programs will grow. Job opportunities for many of these positions should also be excellent because a large proportion of education administrators are expected to retire over the next 10 years.

A significant portion of growth will stem from growth in the private and for-profit segments of education. Many of these schools cater to working adults, many of whom might not ordinarily participate in postsecondary education. These schools allow students to earn a degree, receive job-specific training or update their skills, in a convenient manner, such as through part-time programs or distance learning. As the number of these schools continues to grow, more administrators will be needed to oversee them.

Enrollments of school-age children will also have an impact on the demand for education administrators. The U.S. Department of Education projects enrollment of elementary and secondary school students to grow between 5 and 7 percent over the next decade. Preschool and childcare center administrators are expected to experience substantially more growth as enrollments in formal child care programs continues to expand as fewer private households care for young children. Additionally, if mandatory preschool becomes more widespread more preschool directors will be needed. The number of postsecondary school students is projected to grow more rapidly than other student populations, creating significant demand for administrators at that level. In addition, enrollments are expected to increase the fastest in the West and South, where the population is growing, and to decline or remain stable in the Northeast and the Midwest. School administrators also are in greater demand in rural and urban areas, where pay is generally lower than in the suburbs.

Principals and assistant principals should have favorable job prospects. A sharp increase in responsibilities in recent years has made the job more stressful, and has discouraged teachers from taking

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positions in administration. Principals are now being held more accountable for the performance of students and teachers, while at the same time they are required to adhere to a growing number of government regulations. In addition, overcrowded classrooms, safety issues, budgetary concerns, and teacher shortages in some areas all are creating additional stress for administrators. The increase in pay is often not high enough to entice people into the field.

Job prospects also are expected to be favorable for college and university administrators, particularly those seeking nonacademic positions. Colleges and universities may be subject to funding shortfalls during economic downturns, but increasing enrollments over the projection period will require that institutions replace the large numbers of administrators who retire, and even hire additional administrators. While competition among faculty for prestigious positions as academic deans and department heads is likely to remain keen, fewer applicants are expected for nonacademic administrative jobs, such as director of admissions or student affairs. Furthermore, many people are discouraged from seeking administrator jobs by the requirement that they have a master's or doctoral degree in education administration—as well as by the opportunity to earn higher salaries in other occupations.

Earnings

In 2002, elementary and secondary school administrators had median annual earnings of $71,490; postsecondary school administrators had median annual earnings of $64,640, while preschool and childcare center administrators earned a median of $33,340 per year. Salaries of education administrators depend on several factors, including the location and enrollment level in the school or school district. According to a survey of public schools, conducted by the Educational Research Service, average salaries for principals and assistant principals in the 2002-03 school year were as follows:

Directors, managers, coordinators, and supervisors, finance and business	$81,451
Principals:	
Elementary school	75,291
Jr. high/middle school	80,708
Senior high school	86,452
Assistant principals:	
Elementary school	$62,230
Jr. high/middle school	67,288
Senior high school	70,874

According to the College and University Professional Association for Human Resources, median annual salaries for selected administrators in higher education in 2001-02 were as follows:

Academic deans:	
Business	$107,414
Graduate programs	100,391
Education	100,227
Arts and sciences	98,780
Health-related professions	89,234
Nursing	88,386
Continuing education	84,457
Occupational or vocational education	73,595
Other administrators:	
Dean of students	$70,012
Director, admissions and registrar	61,519
Director, student financial aid	57,036
Director, annual giving	49,121
Director, student activities	41,050

Benefits for education administrators are generally very good. Many get 4 or 5 weeks vacation every year and have generous health and pension packages. Many colleges and universities offer free tuition to employees and their families.

Related Occupations

Education administrators apply organizational and leadership skills to provide services to individuals. Workers in related occupations include administrative services managers; office and administrative support worker supervisors and managers; human resource, training, and labor relations managers and specialists; and archivists, curators, and museum technicians. Education administrators also work with students and have backgrounds similar to those of counselors; librarians; instructional coordinators; teachers—preschool, kindergarten, elementary, middle, and secondary; and teachers—postsecondary.

Sources of Additional Information

For information on principals and other management staff in public schools, contact:

➤ Educational Research Service, 2000 Clarendon Boulevard, Arlington, VA 22201-2908. Internet: **http://www.ers.org**

For information on principals, contact:

➤ The National Association of Elementary School Principals, 1615 Duke St., Alexandria, VA 22314-3483. Internet: **http://www.naesp.org**

➤ The National Association of Secondary School Principals, 1904 Association Drive, Reston, VA 20191-1537. Internet: **http://www.nassp.org**

For information on collegiate registrars and admissions officers, contact:

➤ American Association of Collegiate Registrars and Admissions Officers, One Dupont Circle NW., Suite 520, Washington, DC 20036-1171. Internet: **http://www.aacrao.org**

For information on professional development and graduate programs for college student affairs administrators, contact:

➤ NASPA, Student Affairs Administrators in Higher Education, 1875 Connecticut Ave. NW., Suite 418, Washington, DC 20009. Internet: **http://www.naspa.org**

Engineering and Natural Sciences Managers

(0*NET 11-9041.00, 11-9121.00)

Significant Points

- Most engineering and natural sciences managers have previous experience as engineers, scientists, or mathematicians.
- Projected employment growth for engineering and natural sciences managers should be closely related to those for the engineers and scientists they supervise and the industries in which they are found.
- Opportunities will be best for workers with advanced technical knowledge and strong communication and business management skills.

Nature of the Work

Engineering and natural sciences managers plan, coordinate, and direct research, design, and production activities. They may supervise engineers, scientists, and technicians, along with support personnel. These managers use advanced technical knowledge of engineering and science to oversee a variety of activities. They

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determine scientific and technical goals within broad outlines provided by top executives, who are discussed elsewhere in the *Handbook*. These goals may include improving manufacturing processes, advancing scientific research, or developing new products. Managers make detailed plans to accomplish these goals—for example, they may develop the overall concepts of a new product or identify technical problems preventing the completion of a project.

To perform effectively, they also must possess knowledge of administrative procedures, such as budgeting, hiring, and supervision. These managers propose budgets for projects and programs and determine staff, training, and equipment needs. They hire and assign scientists, engineers, and support personnel to carry out specific parts of each project. They also supervise the work of these employees, review their output, and establish administrative procedures and policies—including environmental standards, for example.

In addition, these managers use communication skills extensively. They spend a great deal of time coordinating the activities of their unit with those of other units or organizations. They confer with higher levels of management; with financial, production, marketing, and other managers; and with contractors and equipment and materials suppliers.

Engineering managers supervise people who design and develop machinery, products, systems, and processes; or direct and coordinate production, operations, quality assurance, testing, or maintenance in industrial plants. Many are plant engineers, who direct and coordinate the design, installation, operation, and maintenance of equipment and machinery in industrial plants. Others manage research and development teams that produce new products and processes or improve existing ones.

Natural sciences managers oversee the work of life and physical scientists, including agricultural scientists, chemists, biologists, geologists, medical scientists, and physicists. These managers direct research and development projects and coordinate activities such as testing, quality control, and production. They may work on basic research projects or on commercial activities. Science managers sometimes conduct their own research in addition to managing the work of others.

Working Conditions

Engineering and natural sciences managers spend most of their time in an office. Some managers, however, also may work in laboratories, where they may be exposed to the same conditions as research scientists, or in industrial plants, where they may be exposed to the same conditions as production workers. Most managers work at least 40 hours a week and may work much longer on occasion to meet project deadlines. Some may experience considerable pressure to meet technical or scientific goals on a short deadline or within a tight budget.

Employment

Engineering and natural sciences managers held about 257,000 jobs in 2002. About 26 percent worked in professional, scientific, and technical services industries, primarily for firms providing architectural, engineering, and related services; computer systems design and related services; and scientific research and development services. Manufacturing industries employed 35 percent of engineering and natural sciences managers. Manufacturing industries with the largest employment include those producing computer and electronic equipment, machinery, transportation equipment, including aerospace products and parts, and chemicals, including pharmaceuticals. Other large employers include government agencies and telecommunications and utilities companies.



Engineering and natural sciences managers provide guidance to employees and oversee day-to-day operations of the organization.

Training, Other Qualifications, and Advancement

Strong technical knowledge is essential for engineering and natural sciences managers, who must understand and guide the work of their subordinates and explain the work in nontechnical terms to senior management and potential customers. Therefore, these management positions usually require work experience and formal education similar to those of engineers, scientists, or mathematicians.

Most engineering managers begin their careers as engineers, after completing a bachelor's degree in the field. To advance to higher level positions, engineers generally must assume management responsibility. To fill management positions, employers seek engineers who possess administrative and communications skills in addition to technical knowledge in their specialty. Many engineers gain these skills by obtaining a master's degree in engineering management or a master's degree in business administration (MBA). Employers often pay for such training. In large firms, some courses required in these degree programs may be offered on site. Engineers who prefer to manage in technical areas should get a master's degree in engineering management, while those interested in nontechnical management should get an MBA.

Many science managers begin their careers as scientists, such as chemists, biologists, geologists, or mathematicians. Most scientists or mathematicians engaged in basic research have a Ph.D.; some in applied research and other activities may have a bachelor's or master's degree. Science managers must be specialists in the work they supervise. In addition, employers prefer managers with good communication and administrative skills. Graduate programs allow scientists to augment their undergraduate training with instruction in other fields, such as management or computer technology. Given the rapid pace of scientific developments, science managers must continuously upgrade their knowledge.

Engineering and natural sciences managers may advance to progressively higher leadership positions within their discipline. Some may become managers in nontechnical areas such as marketing, human resources, or sales. In high technology firms, managers in nontechnical areas often must possess the same specialized knowledge as do managers in technical areas. For example, employers in an engineering firm may prefer to hire experienced engineers as sales workers because the complex services offered by the firm can be marketed only by someone with specialized engineering knowledge. Such sales workers could eventually advance to jobs as sales managers.

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Job Outlook

Employment of engineering and natural sciences managers is expected to have average growth through the year 2012—in line with projected employment growth in engineering and most sciences. However, many additional jobs will result from the need to replace managers who retire or move into other occupations. Opportunities for obtaining a management position will be best for workers with advanced technical knowledge and strong communication skills. In addition, business management skills are important because engineering and natural sciences managers are involved in their firm's financial, production, and marketing activities.

Projected employment growth for engineering and natural sciences managers should be closely related to the growth of the occupations they supervise and the industries in which they are found. For example, opportunities for managers should be better in rapidly growing areas of engineering—such as electrical, computer, and biomedical engineering—than in more slowly growing areas of engineering or physical science, such as aerospace and petroleum engineering. (See the statements on engineers and on life and physical scientists, elsewhere in the *Handbook*.) In addition, many employers are finding it more efficient to contract engineering and science management services to outside companies and consultants, creating good opportunities for managers in management services and management, scientific, and technical consulting firms.

Earnings

Earnings for engineering and natural sciences managers vary by specialty and level of responsibility. Median annual earnings of engineering managers were $90,930 in 2002. The middle 50 percent earned between $72,480 and $114,050. The lowest 10 percent earned less than $57,840, and the highest 10 percent earned more than $141,380. Median annual earnings in the industries employing the largest numbers of engineering managers in 2002 were:

Navigational, measuring, electromedical, and control instruments manufacturing	$101,290
Management of companies and enterprises	98,000
Aerospace product and parts manufacturing	97,420
Federal Government	90,030
Architectural, engineering, and related services	89,520

Median annual earnings of natural sciences managers were $82,250 in 2002. The middle 50 percent earned between $60,000 and $111,070. The lowest 10 percent earned less than $45,640, and the highest 10 percent earned more than $144,590. Median annual earnings in the industries employing the largest numbers of natural sciences managers in 2002 were:

Scientific research and development services	$101,690
Federal Government	77,020

A survey of manufacturing firms, conducted by Abbot, Langer & Associates, found that engineering department managers and superintendents earned a median annual income of $89,271 in 2003, while research and development managers earned $86,412.

In addition, engineering and natural sciences managers, especially those at higher levels, often receive more benefits—such as expense accounts, stock option plans, and bonuses—than do nonmanagerial workers in their organizations.

Related Occupations

The work of engineering and natural sciences managers is closely related to that of engineers; mathematicians; and physical and life scientists, including agricultural and food scientists, biological and medical scientists, conservation scientists and foresters, atmospheric scientists, chemists and materials scientists, environmental scientists and geoscientists, and physicists and astronomers. It also is related to the work of other managers, especially top executives.

Sources of Additional Information

For information about a career as an engineering and natural sciences manager, contact the sources of additional information for engineers, life scientists, and physical scientists that are listed at the end of statements on these occupations elsewhere in the *Handbook*.

Farmers, Ranchers, and Agricultural Managers

(0*NET 11-9011.01, 11-9011.02, 11-9011.03, 11-9012.00)

Significant Points

- Modern farming requires knowledge of new developments in agriculture, and work experience acquired through growing up on a farm or through a small number of internships now available.
- Overall employment is projected to decline because of increasing productivity and consolidation of farms.
- Aquaculture and horticulture should provide better employment opportunities.
- Developments in value-added marketing and organic farming are making small-scale farming economically viable again.

Nature of the Work

American farmers, ranchers, and agricultural managers direct the activities of one of the world's largest and most productive agricultural sectors. They produce enough food and fiber to meet the needs of the United States and produce a surplus for export.

Farmers and ranchers own and operate mainly family-owned farms. They may also lease land from a landowner and operate it as a working farm. The type of farm they operate determines their specific tasks. On crop farms—farms growing grain, cotton, and other fibers, fruit, and vegetables—farmers are responsible for preparing, tilling, planting, fertilizing, cultivating, spraying, and harvesting. After the harvest, they make sure the crops are properly packaged, stored, or marketed. Livestock, dairy, and poultry farmers must feed, and care for the animals and keep barns, pens, coops, and other farm buildings clean and in good condition. They also plan and oversee breeding and marketing activities. Horticultural specialty farmers oversee the production of ornamental plants, nursery products—such as flowers, bulbs, shrubbery, and sod—and fruits and vegetables grown in greenhouses. Aquaculture farmers raise fish and shellfish in marine, brackish, or fresh water, usually in ponds, floating net pens, raceways, or recirculating systems. They stock, feed, protect, and otherwise manage aquatic life sold for consumption or used for recreational fishing.

Responsibilities of farmers and ranchers range from caring for livestock, to operating machinery, to maintaining equipment and facilities. The size of the farm or ranch often determines which of these tasks farmers and ranchers will handle themselves. Operators of small farms usually perform all tasks, physical and administrative. They keep records for management and tax purposes, service machinery, maintain buildings, and grow vegetables and raise animals. Operators of large farms, on the other hand, have employees who help with the physical work that small-farm operators do them-

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selves. Although employment on most farms is limited to the farmer and one or two family workers or hired employees, some large farms have 100 or more full-time and seasonal workers. Some of these employees are in nonfarm occupations, working as truck drivers, sales representatives, bookkeepers, and computer specialists.

Agricultural managers manage the day-to-day activities of one or more farms, ranches, nurseries, timber tracts, greenhouses, and other agricultural establishments for farmers, absentee landowners, or corporations. Their duties and responsibilities vary widely, but are concentrated on the business aspects of running a farm. On small farms, they may oversee the entire operation, while on large farms they may oversee a single activity, such as marketing. Agricultural managers usually do not perform production activities; instead they hire and supervise farm and livestock workers, who perform most of the daily production tasks. In these cases, managers may establish output goals; determine financial constraints; monitor production and marketing; hire, assign, and supervise workers; determine crop transportation and storage requirements; and oversee maintenance of the property and equipment.

Farmers, ranchers, and agricultural managers make many managerial decisions. Farm output is strongly influenced by the weather, disease, fluctuations in prices of domestic and foreign farm products, and Federal farm programs. In crop production operations, farmers and managers usually determine the best time to plant seed, apply fertilizer and chemicals, harvest, and market. They use different strategies to protect themselves from unpredictable changes in the markets for agricultural products. Many farmers and managers carefully plan the combination of crops they grow so that if the price of one crop drops, they will have sufficient income from another to make up for the loss. While most farm output is sold to middlemen—primarily food processing companies—some farmers, particularly operators of smaller farms, may choose to sell their goods directly through farmers' markets, or use cooperatives to reduce their financial risk and to gain a larger share of consumers' expenditures on food. For example, in Community Supported Agriculture (CSA), cooperatives sell to consumers shares of a harvest prior to the planting season, thus freeing the farmer from having to bear all the financial risks and ensuring the farmer a market for the produce of the coming season.

Farmers, ranchers, and agricultural managers also negotiate with banks and other credit lenders to get the best financing deals for their equipment as well as their livestock and seed. They must also keep abreast of constantly changing prices for their products and be able to manage the risk of fluctuating prices. Those who plan ahead may be able to store their crops or keep their livestock to take advantage of better prices later in the year. Those who participate in the risky futures market, where contracts on agricultural goods are bought and sold at specified prices in the future, can minimize the risk of sudden price changes by buying futures contracts that guarantee they will get at least a certain price for their agricultural goods when they are ready to sell.

Like other businesses, farming operations have become more complex in recent years, so many farmers use computers to keep financial and inventory records. They also use computer databases and spreadsheets to manage breeding, dairy, and other farm operations.

Working Conditions

The work of farmers, ranchers, and agricultural managers is often strenuous; work hours are frequently long; and they rarely have days off during the planting, growing, and harvesting seasons. Nevertheless, for those who enter farming or ranching, the disadvantages are outweighed by the quality of life in a rural area, working outdoors, being self-employed, and making a living working the land. Farmers and farm managers on crop farms usually work from sunrise to sunset during the planting and harvesting seasons. During the rest of the year they plan next season's crops, market their output, and repair machinery; some may earn additional income by working a second job off the farm.

On livestock producing farms and ranches, work goes on throughout the year. Animals, unless they are grazing, must be fed and watered every day, and dairy cows must be milked two or three times a day. Many livestock and dairy farmers monitor and attend to the health of their herds, which may include assisting in the birthing of animals. Such farmers rarely get the chance to get away unless they hire an assistant or arrange for a temporary substitute.

Farmers who grow produce and perishables have different demands on their time. For example, organic farmers must maintain cover crops during the cold months, which keep them occupied with farming beyond the typical growing season.

Farm work also can be hazardous. Tractors and other farm machinery can cause serious injury, and workers must be constantly alert on the job. The proper operation of equipment and handling of chemicals is necessary to avoid accidents and protect the environment.

On very large farms, farmers spend substantial time meeting with farm managers or farm supervisors in charge of various activities. Professional farm managers overseeing several farms may divide their time between traveling to meet farmers or landowners and planning the farm operations in their offices. As farming practices and agricultural technology become more sophisticated, farmers and farm managers are spending more time in offices and at computers, where they electronically manage many aspects of their businesses. Some farmers also spend time at conferences, particularly during the winter months, exchanging information.

Employment

Farmers, ranchers, and agricultural managers held nearly 1.4 million jobs in 2002. About 84 percent were self-employed. Most farmers, ranchers, and agricultural managers oversee crop production activities, while others manage livestock and dairy production. A smaller number are involved in agricultural services, such as contract harvesting and farm labor contracting.

The soil, topography of the land, and climate determine the type of farming and ranching done in a particular area. For example, California, Wisconsin, New York, and Pennsylvania lead the country in milk production, while Iowa, Ohio, Pennsylvania, and California



Getting a crop to market is a prime responsibility of farmers and agricultural managers.

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lead in egg production. Texas, California, Mississippi, Georgia, and Arizona are the biggest cotton producers; and Kansas, North Dakota, Washington, and Montana are the biggest wheat producers.

Training, Other Qualifications, and Advancement

Growing up on a family farm and participating in agricultural programs for young people (sponsored by the National FFA Organization, formerly known as the Future Farmers of America, or the 4-H youth educational programs, or other educational opportunities offered by the Extension Service) are important sources of training for those interested in pursuing agriculture as a career. However, modern farming requires increasingly complex scientific, business, and financial decisions. Therefore, even people who were raised on farms must acquire the appropriate education.

Not all agricultural managers grew up on farms or ranches. For these people, a bachelor's degree in business with a concentration in agriculture is important. In addition to formal education, they need several years of work experience in the different aspects of farm and ranch operations in order to qualify for an agricultural manager position.

Students should select the college most appropriate to their specific interests and location. In the United States, all State university systems have one land-grant university with a school of agriculture. Common programs of study include agronomy, dairy science, agricultural economics and business, horticulture, crop and fruit science, and animal science. For students interested in aquaculture, formal programs are available, and include coursework in fisheries biology, fish culture, hatchery management and maintenance, and hydrology. Whatever one's interest, the college curriculum should include courses in agricultural production, marketing, and economics.

Professional status can be enhanced through voluntary certification as an Accredited Farm Manager (AFM) by the American Society of Farm Managers and Rural Appraisers. Certification requires several years of farm management experience, the appropriate academic background—a bachelor's degree or, preferably, a master's degree in a field of agricultural science—and the passing of courses and examinations relating to business, financial, and legal aspects of farm and ranch management.

Farmers, ranchers, and agricultural managers need to keep abreast of continuing advances in agricultural methods both in the United States and abroad, as well as changes in governmental regulations that may impact methods or markets for particular crops. Besides print journals that inform the agricultural community, the spread of the Internet allows quick access to the latest developments in areas such as agricultural marketing, legal arrangements, or growing crops, vegetables, and livestock. Electronic mail, on-line journals, and newsletters from agricultural organizations also speed the exchange of information directly between farming associations and individual farmers.

Farmers, ranchers, and agricultural managers also must have enough technical knowledge of crops, growing conditions, and plant diseases to make decisions ensuring the successful operation of their farms. A rudimentary knowledge of veterinary science, as well as animal husbandry, is important for livestock and dairy farmers. Knowledge of the relationship between farm operations—for example, the use of pesticides—and environmental conditions is essential. Mechanical aptitude and the ability to work with tools of all kinds are also valuable skills for the operator of a small farm, who often maintains and repairs machinery or farm structures.

Farmers, ranchers, and agricultural managers need the managerial skills necessary to organize and operate a business. A basic knowledge of accounting and bookkeeping is essential in keeping financial records, while knowledge of credit sources is vital for buying seed, fertilizer, and other inputs necessary for planting. It is also necessary to be familiar with complex safety regulations and requirements of governmental agricultural support programs. Computer skills are increasingly important, especially on large farms, where computers are widely used for recordkeeping and business analysis. For example, some farmers, ranchers, and agricultural managers use personal computers to access the Internet to get the latest information on prices of farm products and other agricultural news. Additionally, skills in personnel management, communication, and conflict resolution are equally important in the operation of a farm or ranch business.

High school training should include courses in mathematics and in biology and other life sciences. Completion of a 2-year degree, and preferably a 4-year bachelor's degree program in a college of agriculture, is becoming increasingly important. But even after obtaining formal education, novices may need to spend time working under an experienced farmer to learn how to put into practice the skills learned through academic training. A small number of farms offer, on a formal basis, apprenticeships to help young people acquire such practical skills.

Job Outlook

Market pressures and low prices for many agricultural goods, will cause more farms to go out of business over the 2002-2012 period. The complexity of modern farming and keen competition among farmers leaves little room for the marginally successful farmer. Therefore, the long-term trend toward consolidation of farms into fewer and larger farms is expected to continue over the 2002-12 period, and result in the continued decline in employment of self-employed farmers and ranchers and slower than average growth in employment of salaried agricultural managers. As land, machinery, seed, and chemicals become more expensive, only well capitalized farmers and corporations are able to acquire many of the farms that become available. It is the larger, more productive farms that are better able to withstand the adverse effects of climate and price fluctuations upon farm output and income and to cover operating costs for livestock, feed, seed, and fuel, for example. Larger farms also have advantages in competing for government subsidies and payments.

In addition, the agriculture sector continues to produce more with fewer workers. Increasing productivity in the U.S. agricultural production industry is expected to allow greater domestic consumption needs and export requirements to be met with fewer farmers, ranchers, and agricultural managers overall. The overwhelming majority of job openings for self-employed farmers and ranchers will result from the need to replace farmers who retire or leave the occupation for economic or other reasons.

Despite the expected continued consolidation of farm land and the projected decline in overall employment of farmers, ranchers, and agricultural managers, an increasing number of small-scale farmers have developed successful market niches that involve personalized, direct contact with their customers. Many are finding opportunities in organic food production, as more consumers demand food grown without pesticides or chemicals. Others use farmers' markets that cater directly to urban and suburban consumers, allowing the farmers to capture a greater share of consumers' food dollars. Some small-scale farmers, such as some dairy farmers, belong to collectively owned marketing cooperatives that process and sell their product. Other farmers participate in community-supported agriculture cooperatives that allow consumers to directly buy a share of the farmer's harvest.

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Aquaculture also should continue to provide some new employment opportunities over the 2002-12 period. Overfishing has resulted in declining ocean catches even as public demand for the consumption of seafood continues to grow. This has spurred the growth of aquaculture farms that raise selected aquatic species—such as shrimp, salmon, trout and catfish—in pens or ponds. Aquaculture's presence in even landlocked States has increased as farmers attempt to diversify and cater to the growing demand for fish by consumers. Additionally, growing consumer demand for horticulture products, such as flowers and ornamentals, trees, shrubs, and other non-edibles, is expected to produce better employment opportunities for greenhouse and nursery farmers and managers.

Earnings

Incomes of farmers and ranchers vary greatly from year to year because prices of farm products fluctuate depending upon weather conditions and other factors that influence the quantity and quality of farm output and the demand for those products. A farm that shows a large profit in one year may show a loss in the following year. Farmers, however, often receive government subsidies or other payments that supplement their incomes and reduce some of the risk of farming. Price supports for dairy farmers, though, are being phased out and may result in lower incomes for these farmers. Many farmers—primarily operators of small farms—have income from off-farm business activities or careers, often greater than that of their farm income.

Full-time, salaried farm managers had median annual earnings of $43,740 in 2002. The middle half earned between $32,620 and $59,330. The highest paid 10 percent earned more than $81,100, and the lowest paid 10 percent earned less than $24,410.

Farmers and self-employed farm managers make their own provisions for benefits. As members of farm organizations, they may derive benefits such as group discounts on health and life insurance premiums.

Related Occupations

Farmers, ranchers, and agricultural managers strive to improve the quality of agricultural products and the efficiency of farms. Others whose work is related to agricultural products include agricultural engineers, agricultural and food scientists, agricultural workers, and purchasing agents and buyers of farm products.

Sources of Additional Information

For general information about farming and agricultural occupations, contact:

➤ Center for Rural Affairs, P.O. Box 406, Walthill, NE 68067. Internet: **http://www.cfra.org**

➤ National FFA Organization, The National FFA Center, Attention Career Information Requests, P.O. Box 68690, Indianapolis, IN 46268-0960. Internet: **http://www.ffa.org**

For information about certification as an accredited farm manager, contact:

➤ American Society of Farm Managers and Rural Appraisers, 950 Cherry St., Suite 508, Denver, CO 80222. Internet: **http://www.asfmra.org**

For information on the USDA's program to help small farmers get started, contact:

➤ Small Farm Program, U.S. Department of Agriculture, Cooperative State, Research, Education, and Extension Service, Stop 2220, Washington, DC 20250-2220. Internet: **http://www.reeusda.gov/smallfarm/**

For information on aquaculture, education, training, or Community Supported Agriculture, contact:

➤ Alternative Farming System Information Center (AFSIC), National Agricultural Library USDA, 10301 Baltimore Ave., Room 132, Beltsville, MD 20705-2351. Internet: **http://www.nal.usda.gov/afsic**

➤ Appropriate Technology Transfer for Rural Areas, P.O. Box 3657, Fayetteville, AR 72702. Internet: **http://www.attra.org**

Financial Managers

(0*NET 11-3031.01, 11-3031.02)

Significant Points

- A bachelor's degree in finance, accounting, or a related field is the minimum academic preparation, but many employers increasingly seek graduates with a master's degree.
- Employment will grow as the economy expands and increases the need for workers with financial expertise.

Nature of the Work

Almost every firm, government agency, and organization has one or more financial managers who oversee the preparation of financial reports, direct investment activities, and implement cash management strategies. As computers are increasingly used to record and organize data, many financial managers are spending more time developing strategies and implementing the long-term goals of their organization.

The duties of financial managers vary with their specific titles, which include controller, treasurer or finance officer, credit manager, cash manager, and risk and insurance manager. *Controllers* direct the preparation of financial reports that summarize and forecast the organization's financial position, such as income statements, balance sheets, and analyses of future earnings or expenses. Controllers also are in charge of preparing special reports required by regulatory authorities. Often, controllers oversee the accounting, audit, and budget departments. *Treasurers* and *finance officers* direct the organization's financial goals, objectives, and budgets. They oversee the investment of funds and manage associated risks, supervise cash management activities, execute capital-raising strategies to support a firm's expansion, and deal with mergers and acquisitions. *Credit managers* oversee the firm's issuance of credit. They establish credit-rating criteria, determine credit ceilings, and monitor the collections of past-due accounts. Managers specializing in international finance develop financial and accounting systems for the banking transactions of multinational organizations.

Cash managers monitor and control the flow of cash receipts and disbursements to meet the business and investment needs of the firm. For example, cashflow projections are needed to determine whether loans must be obtained to meet cash requirements or whether surplus cash should be invested in interest-bearing instruments. *Risk* and *insurance managers* oversee programs to minimize risks and losses that might arise from financial transactions and business operations undertaken by the institution. They also manage the organization's insurance budget.

Financial institutions, such as commercial banks, savings and loan associations, credit unions, and mortgage and finance companies, employ additional financial managers who oversee various functions, such as lending, trusts, mortgages, and investments, or programs, including sales, operations, or electronic financial services. These managers may be required to solicit business, authorize loans, and direct the investment of funds, always adhering to Federal and State laws and regulations. (Chief financial officers and other executives are included with top executives elsewhere in the *Handbook*.)

Branch managers of financial institutions administer and manage all of the functions of a branch office, which may include hir-

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ing personnel, approving loans and lines of credit, establishing a rapport with the community to attract business, and assisting customers with account problems. Financial managers who work for financial institutions must keep abreast of the rapidly growing array of financial services and products.

In addition to the general duties described above, all financial managers perform tasks unique to their organization or industry. For example, government financial managers must be experts on the government appropriations and budgeting processes, whereas healthcare financial managers must be knowledgeable about issues surrounding healthcare financing. Moreover, financial managers must be aware of special tax laws and regulations that affect their industry.

Financial managers play an increasingly important role in mergers and consolidations, and in global expansion and related financing. These areas require extensive, specialized knowledge on the part of the financial manager to reduce risks and maximize profit. Financial managers increasingly are hired on a temporary basis to advise senior managers on these and other matters. In fact, some small firms contract out all accounting and financial functions to companies that provide these services.

The role of the financial manager, particularly in business, is changing in response to technological advances that have significantly reduced the amount of time it takes to produce financial reports. Financial managers now perform more data analysis and use it to offer senior managers ideas on how to maximize profits. They often work on teams, acting as business advisors to top management. Financial managers need to keep abreast of the latest computer technology in order to increase the efficiency of their firm's financial operations.

Working Conditions

Financial managers work in comfortable offices, often close to top managers and to departments that develop the financial data these managers need. They typically have direct access to state-of-the-art computer systems and information services. Financial managers commonly work long hours, often up to 50 or 60 per week. They generally are required to attend meetings of financial and economic associations and may travel to visit subsidiary firms or to meet customers.

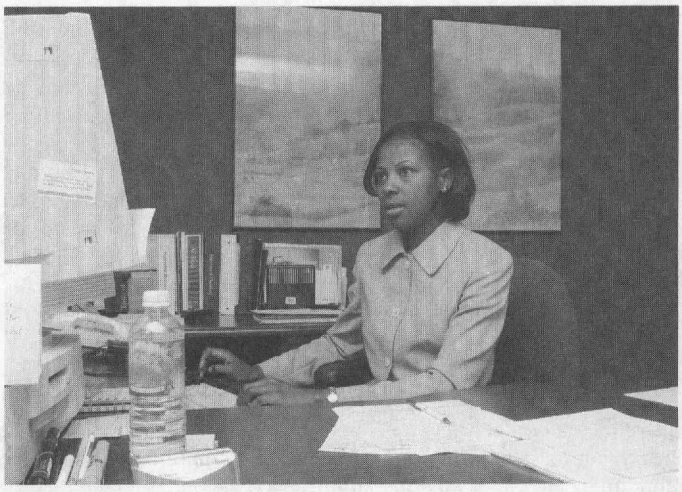
Employment

Financial managers held about 599,000 jobs in 2002. While the vast majority is employed in private industry, nearly 1 in 10 work for the different branches of government. In addition, although they can be found in every industry, approximately 1 out of 4 are employed by insurance and finance establishments, such as banks, savings institutions, finance companies, credit unions, and securities dealers.

Training, Other Qualifications, and Advancement

A bachelor's degree in finance, accounting, economics, or business administration is the minimum academic preparation for financial managers. However, many employers now seek graduates with a master's degree, preferably in business administration, economics, finance, or risk management. These academic programs develop analytical skills and provide knowledge of the latest financial analysis methods and technology.

Experience may be more important than formal education for some financial manager positions—notably, branch managers in banks. Banks typically fill branch manager positions by promoting



Financial managers develop strategies and implement the long-term goals of an organization.

experienced loan officers and other professionals who excel at their jobs. Other financial managers may enter the profession through formal management training programs offered by the company.

Continuing education is vital for financial managers, who must cope with the growing complexity of global trade, changes in Federal and State laws and regulations, and the proliferation of new and complex financial instruments. Firms often provide opportunities for workers to broaden their knowledge and skills by encouraging employees to take graduate courses at colleges and universities or attend conferences related to their specialty. Financial management, banking, and credit union associations, often in cooperation with colleges and universities, sponsor numerous national and local training programs. Persons enrolled prepare extensively at home and then attend sessions on subjects such as accounting management, budget management, corporate cash management, financial analysis, international banking, and information systems. Many firms pay all or part of the costs for employees who successfully complete courses. Although experience, ability, and leadership are emphasized for promotion, advancement may be accelerated by this type of special study.

In some cases, financial managers also may broaden their skills and exhibit their competency by attaining professional certification. There are many different associations that offer professional certification programs. For example, the Association for Investment Management and Research confers the Chartered Financial Analyst designation on investment professionals who have a bachelor's degree, pass three sequential examinations, and meet work experience requirements. The Association for Financial Professionals (AFP) confers the Certified Cash Manager credential to those who pass a computer-based exam and have a minimum of 2 years of relevant experience. The Institute of Management Accountants offers a Certified in Financial Management designation to members with a BA and at least 2 years of work experience who pass the institute's four-part examination and fulfill continuing education requirements. Also, financial managers who specialize in accounting may earn the Certified Public Accountant (CPA) or Certified Management Accountant (CMA) designations. (See accountants and auditors elsewhere in the *Handbook*.)

Candidates for financial management positions need a broad range of skills. Interpersonal skills are important because these jobs involve managing people and working as part of a team to solve problems. Financial managers must have excellent communication

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skills to explain complex financial data. Because financial managers work extensively with various departments in their firm, a broad overview of the business is essential.

Financial managers should be creative thinkers and problem-solvers, applying their analytical skills to business. They must be comfortable with the latest computer technology. As financial operations increasingly are affected by the global economy, financial managers must have knowledge of international finance. Proficiency in a foreign language also may be important.

Because financial management is critical for efficient business operations, well-trained, experienced financial managers who display a strong grasp of the operations of various departments within their organization are prime candidates for promotion to top management positions. Some financial managers transfer to closely related positions in other industries. Those with extensive experience and access to sufficient capital may start their own consulting firms.

Job Outlook

Employment of financial managers is expected to grow about as fast as the average for all occupations through 2012. Growth is expected to be steady and will increase in line with the growth of the economy as a whole. However, jobseekers are likely to face keen competition for jobs, as the number of job openings is expected to be less than the number of applicants. Candidates with expertise in accounting and finance, particularly those with a master's degree, should enjoy the best job prospects. Strong computer skills and knowledge of international finance are important; so are excellent communication skills, because financial management jobs involve working on strategic planning teams.

As the economy expands, job growth for financial managers will stem from both the expansion of established companies and from the creation of new businesses. Over the short term, employment in this occupation is negatively impacted by economic downturns, during which companies are more likely to close departments, or even go out of business—decreasing the need for financial managers. Mergers, acquisitions, and corporate downsizing also are likely to adversely affect employment of financial managers. However, the growing need for financial expertise as the economy expands will ensure job growth over the next decade.

The banking industry, which employs more than 1 out of 10 financial managers, will continue to consolidate, although at a slower rate than in previous years. In spite of this trend, employment of bank branch managers is expected to increase as banks begin to refocus on the importance of their existing branches and as new branches are created to service a growing population. As banks expand the range of products and services they offer to include insurance and investment products, branch managers with knowledge in these areas will be needed. As a result, candidates who are licensed to sell insurance or securities will have the most favorable prospects.

Despite the current downturn in the securities and commodities industry, the long-run prospects for financial managers in that industry should be favorable, as more will be needed to handle increasingly complex financial transactions and manage a growing amount of investments. Financial managers also will be needed to handle mergers and acquisitions, raise capital, and assess global financial transactions. Risk managers, who assess risks for insurance and investment purposes, also will be in demand.

Some companies may hire financial managers on a temporary basis, to see the organization through a short-term crisis or to offer suggestions for boosting profits. Other companies may contract out all accounting and financial operations. Even in these cases, however, financial managers may be needed to oversee the contracts.

Computer technology has reduced the time and staff required to produce financial reports. As a result, forecasting earnings, profits, and costs, and generating ideas and creative ways to increase profitability will become a major role of corporate financial managers over the next decade. Financial managers who are familiar with computer software that can assist them in this role will be needed.

Earnings

Median annual earnings of financial managers were $73,340 in 2002. The middle 50 percent earned between $52,490 and $100,660. The lowest 10 percent had earnings of less than $39,120, while the top 10 percent earned over $142,260. Median annual earnings in the industries employing the largest numbers of financial managers in 2002 were as follows:

Securities and commodity contracts intermediation and brokerage	$125,220
Management of companies and enterprises	88,310
Nondepository credit intermediation	78,400
Local government	63,090
Depository credit intermediation	58,790

According to a 2002 survey by Robert Half International, a staffing services firm specializing in accounting and finance professionals, directors of finance earned between $75,000 and $204,500, and corporate controllers earned between $54,000 and $138,750.

The Association for Financial Professionals' 14th annual compensation survey showed that financial officers' average total compensation in 2002, including bonuses and deferred compensation, was $130,900. Selected financial manager positions had average total compensation as follows:

Vice president of finance	$183,500
Treasurer	150,600
Assistant vice president–finance	141,300
Controller/comptroller	134,300
Director	113,600
Assistant treasurer	111,900
Assistant controller/comptroller	115,500
Manager	84,500
Cash manager	64,700

Large organizations often pay more than small ones, and salary levels also can depend on the type of industry and location. Many financial managers in both public and private industry receive additional compensation in the form of bonuses, which also vary substantially by size of firm. Deferred compensation in the form of stock options is becoming more common, especially for senior level executives.

Related Occupations

Financial managers combine formal education with experience in one or more areas of finance, such as asset management, lending, credit operations, securities investment, or insurance risk and loss control. Workers in other occupations requiring similar training and skills include accountants and auditors; budget analysts; financial analysts and personal financial advisors; insurance underwriters; loan counselors and officers; securities, commodities, and financial services sales agents; and real estate brokers and sales agents.

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Sources of Additional Information

For information about careers and certification in financial management, contact:

➤ Financial Management Association International, College of Business Administration, University of South Florida, Tampa, FL 33620-5500. Internet: **http://www.fma.org**

For information about careers in financial and treasury management and the Certified Cash Manager program, contact:

➤ Association for Financial Professionals, 7315 Wisconsin Ave., Suite 600 West, Bethesda, MD 20814. Internet: **http://www.afponline.org**

For information about the Chartered Financial Analyst program, contact:

➤ Association for Investment Management and Research, P.O. Box 3668, 560 Ray Hunt Dr., Charlottesville, VA 22903-0668. Internet: **http://www.aimr.org**

For information about the Certified in Financial Management designation, contact:

➤ Institute of Management Accountants, 10 Paragon Drive, Montvale, NJ, 07645-1759. Internet: **http://www.imanet.org/**

Food Service Managers

(0*NET 11-9051.00)

Significant Points

- Many experienced food and beverage preparation and service workers are promoted into managerial positions; however, applicants with a bachelor's or an associate degree in restaurant and institutional food service management should have the best job opportunities.
- Most new jobs will arise in food services and drinking places as the number of establishments increases along with the population.
- Job opportunities for salaried food service managers should be better than for self-employed managers, because more restaurant managers will be employed by larger companies to run multi-outlet establishments.

Nature of the Work

Food service managers are responsible for the daily operations of restaurants and other establishments that prepare and serve meals and beverages to customers. Besides coordinating activities among various departments, such as kitchen, dining room, and banquet operations, food service managers ensure that customers are satisfied with their dining experience. In addition, they oversee the inventory and ordering of food, equipment, and supplies and arrange for the routine maintenance and upkeep of the restaurant, its equipment, and facilities. Managers generally are responsible for all of the administrative and human-resource functions of running the business, including recruiting new employees and monitoring employee performance and training.

In most full-service restaurants and institutional food service facilities, the management team consists of a *general manager*, one or more *assistant managers*, and *an executive chef*. The executive chef is responsible for all food preparation activities, including running kitchen operations, planning menus, and maintaining quality standards for food service. In limited-service eating places, such as sandwich shops, coffee bars, or fast-food establishments, managers, not executive chefs, are responsible for supervising routine food preparation operations. Assistant managers in full-service facilities generally oversee service in the dining rooms and banquet areas. In larger restaurants and fast-food or other food service facilities that serve meals daily and maintain longer hours, individual assistant managers may supervise different shifts of workers. In smaller restaurants, formal titles may be less important, and one person may undertake the work of one or more food service positions. For example, the executive chef also may be the general manager or even sometimes an owner. (For additional information on these other workers, see the *Handbook* statements on top executives and chefs, cooks, and food preparation workers.)

One of the most important tasks of food service managers is assisting executive chefs as they select successful menu items. This task varies by establishment depending on the seasonality of menu items, the frequency with which restaurants change their menus, and the introduction of daily or weekly specials. Many restaurants rarely change their menus while others make frequent alterations. Managers or executive chefs select menu items, taking into account the likely number of customers and the past popularity of dishes. Other issues considered when planning a menu include whether there was any unserved food left over from prior meals that should not be wasted, the need for variety, and the seasonal availability of foods. Managers or executive chefs analyze the recipes of the dishes to determine food, labor, and overhead costs and to assign prices to various dishes. Menus must be developed far enough in advance that supplies can be ordered and received in time.

Managers or executive chefs estimate food needs, place orders with distributors, and schedule the delivery of fresh food and supplies. They plan for routine services or deliveries, such as linen services or the heavy cleaning of dining rooms or kitchen equipment, to occur during slow times or when the dining room is closed. Managers also arrange for equipment maintenance and repairs, and coordinate a variety of services such as waste removal and pest control. Managers or executive chefs receive deliveries and check the contents against order records. They inspect the quality of fresh meats, poultry, fish, fruits, vegetables, and baked goods to ensure that expectations are met. They meet with representatives from restaurant supply companies and place orders to replenish stocks of tableware, linens, paper products, cleaning supplies, cooking utensils, and furniture and fixtures.

Managers must be good communicators. They need to speak well, often in several languages, with a diverse clientele and staff. They must motivate employees to work as a team, to ensure that food and service meet appropriate standards. Managers also must ensure that written supply orders are clear and unambiguous.

Managers interview, hire, train, and, when necessary, fire employees. Retaining good employees is a major challenge facing food service managers. Managers recruit employees at career fairs, contact schools that offer academic programs in hospitality or culinary arts, and arrange for newspaper advertising to attract additional applicants. Managers oversee the training of new employees and explain the establishment's policies and practices. They schedule work hours, making sure that enough workers are present to cover each shift. If employees are unable to work, managers may have to call in alternates to cover for them or fill in themselves when needed. Some managers may help with cooking, clearing tables, or other tasks when the restaurant becomes extremely busy.

Food service managers ensure that diners are served properly and in a timely manner. They investigate and resolve customers' complaints about food quality or service. They monitor orders in the kitchen to determine where backups may occur, and they work with the chef to remedy any delays in service. Managers direct the

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cleaning of the dining areas and the washing of tableware, kitchen utensils, and equipment to comply with company and government sanitation standards. Managers also monitor the actions of their employees and patrons on a continual basis to ensure the personal safety of everyone. They make sure that health and safety standards and local liquor regulations are obeyed.

In addition to their regular duties, food service managers perform a variety of administrative assignments, such as keeping employee work records, preparing the payroll, and completing paperwork to comply with licensing laws and reporting requirements of tax, wage and hour, unemployment compensation, and Social Security laws. Some of this work may be delegated to an assistant manager or bookkeeper, or it may be contracted out, but most general managers retain responsibility for the accuracy of business records. Managers also maintain records of supply and equipment purchases and ensure that accounts with suppliers are paid.

Technology influences the jobs of food service managers in many ways, enhancing efficiency and productivity. Many restaurants use computers to track orders, inventory, and the seating of patrons. Point-of-service (POS) systems allow servers to key in a customer's order, either at the table, using a hand-held device, or from a computer terminal in the dining room, and send the order to the kitchen instantaneously so preparation can begin. The same system totals and prints checks, functions as a cash register, connects to credit card authorizers, and tracks sales. To minimize food costs and spoilage, many managers use inventory-tracking software to compare the record of sales from the POS with a record of the current inventory. Some establishments enter an inventory of standard ingredients and suppliers into their POS system. When supplies of particular ingredients run low, they can be ordered directly from the supplier using preprogrammed information. Computers also allow restaurant and food service managers to keep track of employee schedules and paychecks more efficiently.

Food service managers use the Internet to track industry news, find recipes, conduct market research, purchase supplies or equipment, recruit employees, and train staff. Internet access also makes service to customers more efficient. Many restaurants maintain Web sites that include menus and online promotions, provide information about the restaurant's location, and offer patrons the option to make a reservation.

Managers tally the cash and charge receipts received and balance them against the record of sales. They are responsible for depositing the day's receipts at the bank or securing them in a safe place. Finally, managers are responsible for locking up the establishment, checking that ovens, grills, and lights are off, and switching on alarm systems.

Working Conditions

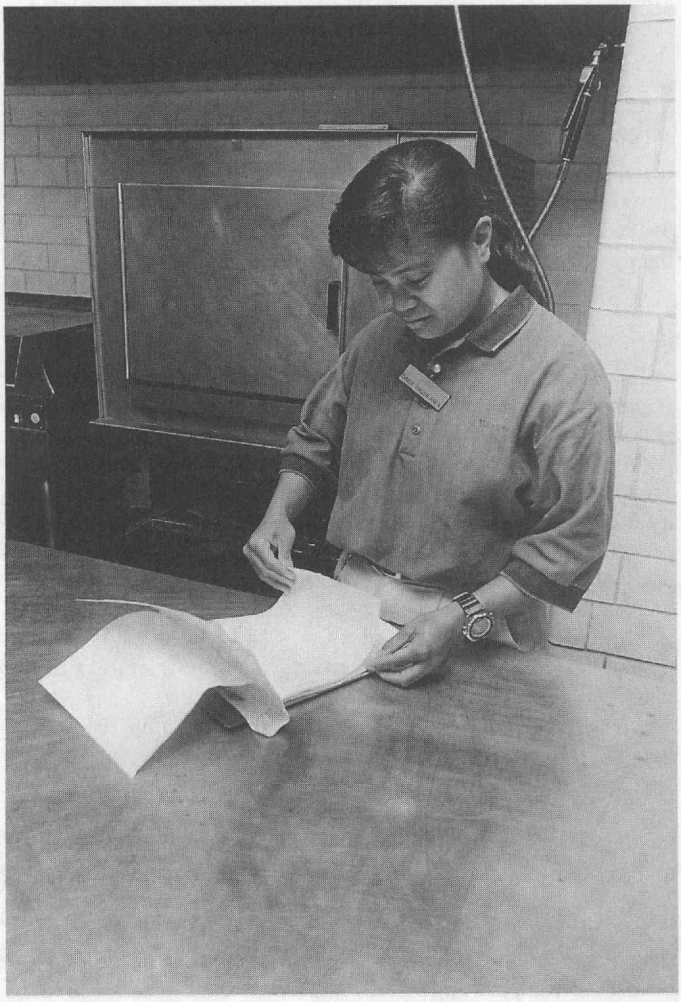
Food service managers are among the first to arrive in the morning and the last to leave at night. Long hours—12 to 15 per day, 50 or more per week, and sometimes 7 days a week—are common. Managers of institutional food service facilities, such as school, factory, or office cafeterias, work more regular hours because the operating hours of these establishments usually conform to the operating hours of the business or facility they serve. However, hours for many managers are unpredictable.

Managers should be calm, flexible, and able to work through emergencies, such as a fire or flood, in order to ensure everyone's safety. Managers also should be able to fill in for absent workers on short notice. Managers often experience the pressures of simultaneously coordinating a wide range of activities. When problems occur, it is the manager's responsibility to resolve them with minimal disruption to customers. The job can be hectic, and dealing with irate customers or uncooperative employees can be stressful.

Managers also may experience the typical minor injuries of other restaurant workers, such as muscle aches, cuts, or burns. They might endure physical discomfort from moving tables or chairs to accommodate large parties, receiving and storing daily supplies from vendors, or making minor repairs to furniture or equipment.

Employment

Food service managers held about 386,000 jobs in 2002. Most managers were salaried, but about one-third were self-employed in independent restaurants or other small food service establishments. Almost three-fourths of all salaried jobs for food service managers were in full-service restaurants or limited-service eating places, such as fast-food restaurants and cafeterias. Other salaried jobs were in drinking places (alcoholic beverages) and in special food services—an industry that includes food service contractors who supply food services at institutional, governmental, commercial, or industrial locations. A small number of salaried jobs were in traveler accommodation (hotels); educational services; amusement, gambling, and recreation industries; nursing care facilities; and hospitals. Jobs are located throughout the country, with large cities and tourist areas providing more opportunities for full-service dining positions.



Food service managers check orders to ensure adequate inventories of food and other supplies.

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Training, Other Qualifications, and Advancement

Most food service management companies and national or regional restaurant chains recruit management trainees from 2- and 4-year college hospitality management programs. Restaurant chains prefer to hire people with degrees in restaurant and institutional food service management, but they often hire graduates with degrees in other fields who have demonstrated interest and aptitude. Some restaurant and food service manager positions—particularly self-service and fast-food—are filled by promoting experienced food and beverage preparation and service workers. Waiters, waitresses, chefs, and fast-food workers demonstrating potential for handling increased responsibility sometimes advance to assistant manager or management trainee jobs. Executive chefs need extensive experience working as chefs, and general managers need prior restaurant experience, usually as assistant managers.

A bachelor's degree in restaurant and food service management provides particularly strong preparation for a career in this occupation. A number of colleges and universities offer 4-year programs in restaurant and hotel management or institutional food service management. For those not interested in pursuing a 4-year degree, community and junior colleges, technical institutes, and other institutions offer programs in the field leading to an associate degree or other formal certification. Both 2- and 4-year programs provide instruction in subjects such as nutrition, sanitation, and food planning and preparation, as well as accounting, business law and management, and computer science. Some programs combine classroom and laboratory study with internships providing on-the-job experience. In addition, many educational institutions offer culinary programs in food preparation. Such training can lead to a career as a cook or chef and provide a foundation for advancement to an executive chef position.

Most restaurant chains and food service management companies have rigorous training programs for management positions. Through a combination of classroom and on-the-job training, trainees receive instruction and gain work experience in all aspects of the operation of a restaurant or institutional food service facility. Areas include food preparation, nutrition, sanitation, security, company policies and procedures, personnel management, record-keeping, and preparation of reports. Training on use of the restaurant's computer system is increasingly important as well. Usually, after 6 months or a year, trainees receive their first permanent assignment as an assistant manager.

Most employers emphasize personal qualities when hiring managers. For example, self-discipline, initiative, and leadership ability are essential. Managers must be able to solve problems and concentrate on details. They need good communication skills to deal with customers and suppliers, as well as to motivate and direct their staff. A neat and clean appearance is important, because managers must convey self-confidence and show respect in dealing with the public. Food service management can be physically demanding, so good health and stamina also are important.

The certified Foodservice Management Professional (FMP) designation is a measure of professional achievement for food service managers. Although not a requirement for employment or advancement in the occupation, voluntary certification provides recognition of professional competence, particularly for managers who acquired their skills largely on the job. The National Restaurant Association Educational Foundation awards the FMP designation to managers who achieve a qualifying score on a written examination, complete a series of courses that cover a range of food service management topics, and meet standards of work experience in the field.

Willingness to relocate often is essential for advancement to positions with greater responsibility. Managers typically advance to larger establishments or regional management positions within restaurant chains. Some eventually open their own food service establishments.

Job Outlook

Employment of food service managers is expected to grow about as fast as the average for all occupations through 2012. In addition to job openings arising out of employment growth, the need to replace managers who transfer to other occupations or stop working will create many job opportunities. Applicants with a bachelor's or an associate degree in restaurant and institutional food service management should have the best job opportunities.

Projected employment growth varies by industry. Most new jobs will arise in full-service restaurants and limited-service eating places as the number of these establishments increases along with the population. Manager jobs in special food services, an industry that includes food service contractors, will increase as hotels, schools, healthcare facilities, and other businesses contract out their food services to firms in this industry. Food service manager jobs still are expected to increase in hotels, schools, and health-care facilities, but growth will be slowed as contracting out becomes more common.

Job opportunities should be better for salaried managers than for self-employed managers. More new restaurants are affiliated with national chains than are independently owned and operated. As this trend continues, fewer owners will manage restaurants themselves, and more restaurant managers will be employed by larger companies to run individual establishments.

Earnings

Median annual earnings of salaried food service managers were $35,790 in 2002. The middle 50 percent earned between $27,910 and $47,120. The lowest 10 percent earned less than $21,760, and the highest 10 percent earned more than $67,490. Median annual earnings in the industries employing the largest numbers of food service managers in 2002 were as follows:

Special food services	$40,720
Traveler accommodation	39,210
Full-service restaurants	37,280
Nursing care facilities	33,910
Limited-service eating places	33,590
Elementary and secondary schools	31,210

In addition to receiving typical benefits, most salaried food service managers are provided free meals and the opportunity for additional training, depending on their length of service.

Related Occupations

Food service managers direct the activities of a hospitality-industry business and provide a service to customers. Other managers and supervisors in hospitality-oriented businesses include gaming managers, lodging managers, sales worker supervisors, and first-line supervisors or managers of food preparation and serving workers.

Sources of Additional Information

Information about a career as a food service manager, 2- and 4-year college programs in restaurant and food service management, and certification as a Foodservice Management Professional is available from:

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➤ National Restaurant Association Educational Foundation, 175 West Jackson Blvd., Suite 1500, Chicago, IL 60604-2702. Internet: **http://www.nraef.org**

General information on hospitality careers may be obtained from:
➤ The International Council on Hotel, Restaurant, and Institutional Education, 2613 North Parham Rd., 2nd Floor, Richmond, VA 23294. Internet: **http://www.chrie.org**

Additional information about job opportunities in food service management may be obtained from local employers and from local offices of State employment services agencies.

Funeral Directors

(0*NET 11-9061.00)

Significant Points

- Funeral directors must be licensed by their State.
- Job opportunities should be good, particularly for those who also embalm; however, mortuary science graduates may have to relocate to find jobs.

Nature of the Work

Funeral practices and rites vary greatly among cultures and religions. Among the many diverse groups in the United States, funeral practices usually share some common elements—removing the deceased to a mortuary, preparing the remains, performing a ceremony that honors the deceased and addresses the spiritual needs of the family, and final disposition of the remains. Funeral directors arrange and direct these tasks for grieving families.

Funeral directors also are called morticians or undertakers. This career may not appeal to everyone, but those who work as funeral directors take great pride in their ability to provide efficient and appropriate services. They also comfort the family and friends of the deceased.

Funeral directors arrange the details and handle the logistics of funerals. They interview the family to learn what family members desire with regard to the nature of the funeral, the clergy members or other persons who will officiate, and the final disposition of the remains. Sometimes, the deceased leaves detailed instructions for his or her own funeral. Together with the family, funeral directors establish the location, dates, and times of wakes, memorial services, and burials. They arrange for a hearse to carry the body to the funeral home or mortuary.

Funeral directors also prepare obituary notices and have them placed in newspapers, arrange for pallbearers and clergy, schedule the opening and closing of a grave with a representative of the cemetery, decorate and prepare the sites of all services, and provide transportation for the remains, mourners, and flowers between sites. They also direct preparation and shipment of remains for out-of-State burial.

Most funeral directors also are trained, licensed, and practicing embalmers. Embalming is a sanitary, cosmetic, and preservative process through which the body is prepared for interment. If more than 24 hours elapses between death and interment, State laws usually require that the remains be refrigerated or embalmed.

When embalming a body, funeral directors wash the body with germicidal soap and replace the blood with embalming fluid to preserve the tissues. They may reshape and reconstruct disfigured or maimed bodies using materials, such as clay, cotton, plaster of paris, and wax. They also may apply cosmetics to provide a natural appearance, and then dress the body and place it in a casket. Funeral directors maintain records such as embalming reports, and itemized lists of clothing or valuables delivered with the body. In large funeral homes, an embalming staff of two or more, plus several apprentices may be employed.

Funeral services may take place in a home, house of worship, or funeral home, or at the gravesite or crematory. Services may be nonreligious, but often they reflect the religion of the family, so funeral directors must be familiar with the funeral and burial customs of many faiths, ethnic groups, and fraternal organizations. For example, members of some religions seldom have the bodies of the deceased embalmed or cremated.

Burial in a casket is the most common method of disposing of remains in this country, although entombment also occurs. Cremation, which is the burning of the body in a special furnace, is increasingly selected because it can be less expensive, and is becoming more appealing. Memorial services can be held anywhere, and at any time, sometimes months later when all relatives and friends can get together. Even when the remains are cremated, many people still want a funeral service.

A funeral service followed by cremation need not be any different from a funeral service followed by a burial. Usually cremated remains are placed in some type of permanent receptacle, or urn, before being committed to a final resting place. The urn may be buried, placed in an indoor or outdoor mausoleum or columbarium, or interred in a special urn garden that many cemeteries provide for cremated remains.

Funeral directors handle the paperwork involved with the person's death, such as submitting papers to State authorities so that a formal certificate of death may be issued and copies distributed to the heirs. They may help family members apply for veterans' burial benefits, and notify the Social Security Administration of the death. Also, funeral directors may apply for the transfer of any pensions, insurance policies, or annuities on behalf of survivors.

Funeral directors also prearrange funerals. Increasingly, they arrange funerals in advance of need to provide peace of mind by ensuring that the client's wishes will be taken care of in a way that is satisfying to the person and to those who will survive.

Most funeral homes are small, family-run businesses, and the funeral directors are either owner-operators or employees of the operation. Funeral directors, therefore, are responsible for the success and the profitability of their businesses. Directors keep records of expenses, purchases, and services rendered; prepare and send invoices for services; prepare and submit reports for unemployment insurance; prepare Federal, State, and local tax forms; and prepare itemized bills for customers. Funeral directors increasingly are using computers for billing, bookkeeping, and marketing. Some are beginning to use the Internet to communicate with clients who are preplanning their funerals, or to assist clients by developing electronic obituaries and guestbooks. Directors strive to foster a cooperative spirit and friendly attitude among employees and a compassionate demeanor towards the families. A growing number of funeral directors also are involved in helping individuals adapt to changes in their lives following a death through aftercare services or support group activities.

Most funeral homes have a chapel, one or more viewing rooms, a casket-selection room, and a preparation room. An increasing number also have a crematory on the premises. Equipment may include a hearse, a flower car, limousines, and, sometimes, an ambulance. Funeral homes usually stock a selection of caskets and urns for families to purchase or rent.

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Working Conditions

Funeral directors often work long, irregular hours, and the occupation can be highly stressful. Many work on an on-call basis, because they may be needed to remove remains in the middle of the night. Shiftwork sometimes is necessary because funeral home hours include evenings and weekends. In smaller funeral homes, working hours vary, but in larger homes employees usually work 8 hours a day, 5 or 6 days a week.

Funeral directors occasionally come into contact with the remains of persons who had contagious diseases, but the possibility of infection is remote if strict health regulations are followed.

To show proper respect and consideration for the families and the dead, funeral directors must dress appropriately. The profession usually requires short, neat haircuts and trim beards, if any, for men. Suits, ties, and dresses are customary for a conservative look.

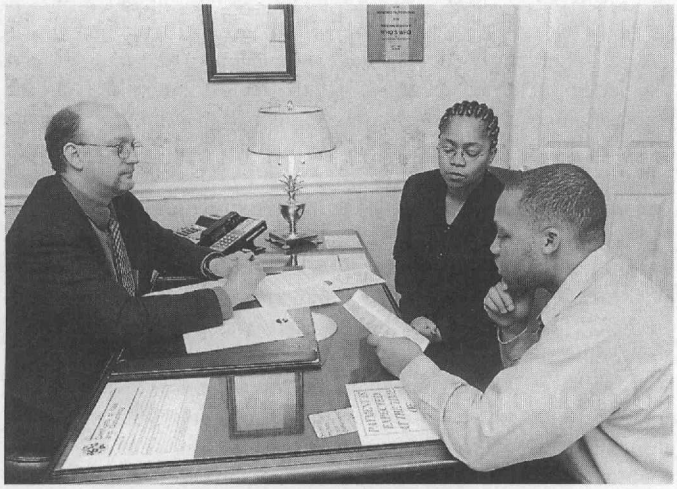
Employment

Funeral directors held about 24,000 jobs in 2002. Eleven percent were self-employed. Nearly all worked in the death care services industry.

Training, Other Qualifications, and Advancement

Funeral directors must be licensed in all States. Licensing laws vary from State to State, but most require applicants to be 21 years old, have 2 years of formal education that includes studies in mortuary science, serve a 1-year apprenticeship, and pass a qualifying examination. After becoming licensed, new funeral directors may join the staff of a funeral home. Funeral directors who embalm must be licensed in all States, and some States issue a single license for funeral directors who embalm. In States that have separate licensing requirements, most people in the field obtain both licenses. Persons interested in a career as a funeral director should contact their State licensing board for specific requirements.

College programs in mortuary science usually last from 2 to 4 years; the American Board of Funeral Service Education accredits about 50 mortuary science programs. A small number of community and junior colleges offer 2-year programs, and a few colleges and universities offer both 2-year and 4-year programs. Mortuary science programs include courses in anatomy, physiology, pathology, embalming techniques, restorative art, business management, accounting and use of computers in funeral home management, and client services. They also include courses in the social sciences and legal, ethical, and regulatory subjects, such as psychology, grief counseling, oral and written communication, funeral service law, business law, and ethics.



Funeral directors explain, arrange, and handle the details of funerals with clients.

Many State and national associations offer continuing education programs designed for licensed funeral directors. These programs address issues in communications, counseling, and management. More than 30 States have requirements that funeral directors receive continuing education credits in order to maintain their licenses.

Apprenticeships must be completed under the direction of an experienced and licensed funeral director. Depending on State regulations, apprenticeships last from 1 to 3 years and may be served before, during, or after mortuary school. Apprenticeships provide practical experience in all facets of the funeral service, from embalming to transporting remains.

State board licensing examinations vary, but they usually consist of written and oral parts and include a demonstration of practical skills. Persons who want to work in another State may have to pass the examination for that State; however, some States have reciprocity arrangements and will grant licenses to funeral directors from another State without further examination.

High school students can start preparing for a career as a funeral director by taking courses in biology and chemistry and participating in public speaking or debate clubs. Part-time or summer jobs in funeral homes consist mostly of maintenance and cleanup tasks, such as washing and polishing limousines and hearses, but these tasks can help students to become familiar with the operation of funeral homes.

Important personal traits for funeral directors are composure, tact, and the ability to communicate easily with the public. They also should have the desire and ability to comfort people in a time of sorrow.

Advancement opportunities are best in larger funeral homes—funeral directors may earn promotions to higher paying positions such as branch manager or general manager. Some directors eventually acquire enough money and experience to establish their own funeral home businesses.

Job Outlook

Employment opportunities for funeral directors are expected to be good, particularly for those who also embalm. However, mortuary science graduates may have to relocate to find jobs.

Employment of funeral directors is projected to increase more slowly than the average for all occupations through the year 2012, as the population and the number of deaths increase. The need to replace funeral directors who retire or leave the occupation for other reasons will account for more job openings than will employment growth. Typically, a number of mortuary science graduates leave the profession shortly after becoming licensed funeral directors to pursue other career interests, and this trend is expected to continue. Also, funeral directors are older, on average, than workers in most other occupations, and should be retiring in greater numbers between 2002 and 2012.

Earnings

Median annual earnings for funeral directors were $43,380 in 2002. The middle 50 percent earned between $33,540 and $58,140. The lowest 10 percent earned less than $24,950, and the top 10 percent more than $84,060.

Salaries of funeral directors depend on the number of years of experience in funeral service, the number of services performed, the number of facilities operated, the area of the country, the size of the community, and the level of formal education. Funeral directors in large cities earn more than their counterparts in small towns and rural areas.

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Related Occupations
The job of a funeral director requires tact, discretion, and compassion when dealing with grieving people. Others who need these qualities include members of the clergy, social workers, psychologists, physicians and surgeons, and other health-diagnosing and -treating practitioners.

Sources of Additional Information
For a list of accredited mortuary science programs and information on the funeral service profession, write to:

➤ The National Funeral Directors Association, 13625 Bishop's Dr., Brookfield, WI 53005. Internet: **http://www.nfda.org**

For information about college programs in mortuary science, scholarships, and funeral service as a career, contact:

➤ The American Board of Funeral Service Education, 38 Florida Ave., Portland, ME 04103. Internet: **http://www.abfse.org/index.html**

Human Resources, Training, and Labor Relations Managers and Specialists

(0*NET 11-3040.00, 11-3041.00, 11-3042.00, 11-3049.99, 13-1071.01, 13-1071.02, 13-1072.00, 13-1073.00, 13-1079.99)

Significant Points

- Entry-level jobs are filled by college graduates who have majored in a wide range of fields.
- For many specialized jobs, previous experience is an asset; for more advanced positions, including those of managers, arbitrators, and mediators, it is essential.
- Keen competition for jobs is expected due to the abundant supply of qualified college graduates and experienced workers.

Nature of the Work
Attracting the most qualified employees and matching them to the jobs for which they are best suited is important for the success of any organization. However, many enterprises are too large to permit close contact between top management and employees. Human resources, training, and labor relations managers and specialists provide this link. In the past, these workers have been associated with performing the administrative function of an organization, such as handling employee benefits questions or recruiting, interviewing, and hiring new personnel in accordance with policies and requirements that have been established in conjunction with top management. Today's human resources workers juggle these tasks and, increasingly, consult top executives regarding strategic planning. They have moved from behind-the-scenes staff work to leading the company in suggesting and changing policies. Senior management is recognizing the importance of the human resources department to their financial success.

In an effort to improve morale and productivity and to limit job turnover, they also help their firms effectively use employee skills, provide training opportunities to enhance those skills, and boost employees' satisfaction with their jobs and working conditions. Although some jobs in the human resources field require only limited contact with people outside the office, dealing with people is an essential part of the job.

In a small organization, a *human resources generalist* may handle all aspects of human resources work, and thus require a broad range of knowledge. The responsibilities of human resources generalists can vary widely, depending on their employer's needs. In a large corporation, the top human resources executive usually develops and coordinates personnel programs and policies. (Executives are included in the *Handbook* statement on top executives.) These policies usually are implemented by a director or manager of human resources and, in some cases, a director of industrial relations.

The *director of human resources* may oversee several departments, each headed by an experienced manager who most likely specializes in one personnel activity, such as employment, compensation, benefits, training and development, or employee relations.

Employment and placement managers oversee the hiring and separation of employees and supervise various workers, including equal employment opportunity specialists and recruitment specialists. *Employment, recruitment,* and *placement specialists* recruit and place workers.

Recruiters maintain contacts within the community and may travel extensively, often to college campuses, to search for promising job applicants. Recruiters screen, interview, and sometimes test applicants. They also may check references and extend job offers. These workers must be thoroughly familiar with the organization and its personnel policies in order to discuss wages, working conditions, and promotional opportunities with prospective employees. They also must keep informed about equal employment opportunity (EEO) and affirmative action guidelines and laws, such as the Americans with Disabilities Act.

EEO officers, representatives, or *affirmative action coordinators* handle EEO matters in large organizations. They investigate and resolve EEO grievances, examine corporate practices for possible violations, and compile and submit EEO statistical reports.

Employer relations representatives, who usually work in government agencies, maintain working relationships with local employers and promote the use of public employment programs and services. Similarly, *employment interviewers*—whose many job titles include *personnel consultants*, *personnel development specialists*, and *human resources coordinators*—help to match employers with qualified jobseekers.

Compensation, benefits, and job analysis specialists conduct programs for employers and may specialize in specific areas such as position classifications or pensions. *Job analysts*, sometimes called *position classifiers*, collect and examine detailed information about job duties in order to prepare job descriptions. These descriptions explain the duties, training, and skills that each job requires. Whenever a large organization introduces a new job or reviews existing jobs, it calls upon the expert knowledge of the job analyst.

Occupational analysts conduct research, usually in large firms. They are concerned with occupational classification systems and study the effects of industry and occupational trends upon worker relationships. They may serve as technical liaison between the firm and other firms, government, and labor unions.

Establishing and maintaining a firm's pay system is the principal job of the *compensation manager*. Assisted by staff specialists, compensation managers devise ways to ensure fair and equitable pay rates. They may conduct surveys to see how their firm's rates compare with others and to see that the firm's pay scale complies with changing laws and regulations. In addition, compensation managers often oversee their firm's performance evaluation system, and they may design reward systems such as pay-for-performance plans.

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Employee benefits managers and specialists handle the company's employee benefits program, notably its health insurance and pension plans. Expertise in designing and administering benefits programs continues to take on importance as employer-provided benefits account for a growing proportion of overall compensation costs, and as benefit plans increase in number and complexity. For example, pension benefits might include savings and thrift, profit-sharing, and stock ownership plans; health benefits might include long-term catastrophic illness insurance and dental insurance. Familiarity with health benefits is a top priority for employee benefits managers and specialists, as more firms struggle to cope with the rising cost of healthcare for employees and retirees. In addition to health insurance and pension coverage, some firms offer employees life and accidental death and dismemberment insurance, disability insurance, and relatively new benefits designed to meet the needs of a changing workforce, such as parental leave, child and elder care, long-term nursing home care insurance, employee assistance and wellness programs, and flexible benefits plans. Benefits managers must keep abreast of changing Federal and State regulations and legislation that may affect employee benefits.

Employee assistance plan managers, also called *employee welfare managers*, are responsible for a wide array of programs covering occupational safety and health standards and practices; health promotion and physical fitness, medical examinations, and minor health treatment, such as first aid; plant security; publications; food service and recreation activities; carpooling and transportation programs, such as transit subsidies; employee suggestion systems; childcare and elder care; and counseling services. Childcare and elder care are increasingly important due to growth in the number of dual-income households and the elderly population. Counseling may help employees deal with emotional disorders, alcoholism, or marital, family, consumer, legal, and financial problems. Some employers offer career counseling as well. In large firms, certain programs, such as those dealing with security and safety, may be in separate departments headed by other managers.

Training and development managers and specialists conduct and supervise training and development programs for employees. Increasingly, management recognizes that training offers a way of developing skills, enhancing productivity and quality of work, and building worker loyalty to the firm. Training is widely accepted as a method of improving employee morale, but this is only one of the reasons for its growing importance. Other factors include the complexity of the work environment, the rapid pace of organizational and technological change, and the growing number of jobs in fields that constantly generate new knowledge. In addition, advances in learning theory have provided insights into how adults learn, and how training can be organized most effectively for them.

Training managers provide worker training either in the classroom or onsite. This includes setting up teaching materials prior to the class, involving the class, and issuing completion certificates at the end of the class.

Training specialists plan, organize, and direct a wide range of training activities. Trainers respond to corporate and worker service requests. They consult with onsite supervisors regarding available performance improvement services and conduct orientation sessions and arrange on-the-job training for new employees. They help rank-and-file workers maintain and improve their job skills, and possibly prepare for jobs requiring greater skill. They help supervisors improve their interpersonal skills in order to deal effectively with employees. They may set up individualized training plans to strengthen an employee's existing skills or teach new ones. Training specialists in some companies set up leadership or executive development programs among employees in lower level positions. These programs are designed to develop potential executives to replace those leaving the organization. Trainers also lead programs to assist employees with transitions due to mergers and acquisitions, as well as technological changes. In government-supported training programs, training specialists function as case managers. They first assess the training needs of clients, then guide them through the most appropriate training method. After training, clients may either be referred to employer relations representatives or receive job placement assistance.

Planning and program development is an important part of the training specialist's job. In order to identify and assess training needs within the firm, trainers may confer with managers and supervisors or conduct surveys. They also periodically evaluate training effectiveness.

Depending on the size, goals, and nature of the organization, trainers may differ considerably in their responsibilities and in the methods they use. Training methods include on-the-job training; operating schools that duplicate shop conditions for trainees prior to putting them on the shop floor; apprenticeship training; classroom training; and electronic learning, which may involve interactive Internet-based training, multimedia programs, distance learning, satellite training, other computer-aided instructional technologies, videos, simulators, conferences, and workshops.

An organization's *director of industrial relations* forms labor policy, oversees industrial labor relations, negotiates collective bargaining agreements, and coordinates grievance procedures to handle complaints resulting from management disputes with unionized employees. The director of industrial relations also advises and collaborates with the director of human resources, other managers, and members of their staff, because all aspects of personnel policy—such as wages, benefits, pensions, and work practices—may be involved in drawing up a new or revised union contract.

Labor relations managers and their staffs implement industrial labor relations programs. When a collective bargaining agreement is up for negotiation, labor relations specialists prepare information for management to use during negotiation, a process that requires the specialist to be familiar with economic and wage data and to have extensive knowledge of labor law and collective bargaining trends. The labor relations staff interprets and administers the contract with respect to grievances, wages and salaries, employee welfare, healthcare, pensions, union and management practices, and other contractual stipulations. As union membership continues to decline in most industries, industrial relations personnel are working more often with employees who are not members of a labor union.

Dispute resolution—attaining tacit or contractual agreements—has become increasingly important as parties to a dispute attempt to avoid costly litigation, strikes, or other disruptions. Dispute resolution also has become more complex, involving employees, management, unions, other firms, and government agencies. Specialists involved in dispute resolution must be highly knowledgeable and experienced, and often report to the director of industrial relations. *Conciliators*, or *mediators*, advise and counsel labor and management to prevent and, when necessary, resolve disputes over labor agreements or other labor relations issues. *Arbitrators*, sometimes called umpires or referees, decide disputes that bind both labor and management to specific terms and conditions of labor contracts. Labor relations specialists who work for unions perform many of the same functions on behalf of the union and its members.

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Other emerging specialties include those of *international human resources managers*, who handle human resources issues related to a company's foreign operations, and *human resources information system specialists*, who develop and apply computer programs to process personnel information, match jobseekers with job openings, and handle other personnel matters.

Working Conditions

Personnel work usually takes place in clean, pleasant, and comfortable office settings. Arbitrators and mediators may work out of their homes. Many human resources, training, and labor relations managers and specialists work a standard 35- to 40-hour week. However, longer hours might be necessary for some workers—for example, labor relations managers and specialists, arbitrators, and mediators—when contract agreements are being prepared and negotiated.

Although most human resources, training, and labor relations managers and specialists work in the office, some travel extensively. For example, recruiters regularly attend professional meetings and visit college campuses to interview prospective employees; arbitrators and mediators often must travel to the site chosen for negotiations.

Employment

Human resources, training, and labor relations managers and specialists held about 677,000 jobs in 2002. The following tabulation shows the distribution of jobs by occupational specialty:

Training and development specialists	209,000
Human resources managers	202,000
Employment, recruitment, and placement specialists	175,000
Compensation, benefits, and job analysis specialists	91,000

Human resources, training, and labor relations managers and specialists were employed in virtually every industry. About 3,800 specialists were self-employed, working as consultants to public and private employers.

The private sector accounted for almost 8 out of 10 salaried jobs, including 11 percent in professional, scientific, and technical services and 10 percent each in manufacturing industries; health care and social assistance; finance and insurance firms; and administrative and support services.



Keen competition for jobs as human resources workers is expected due to the abundant supply of qualified college graduates and experienced workers.

Government employed about 18 percent of human resources managers and specialists. They handled the recruitment, interviewing, job classification, training, salary administration, benefits, employee relations, and other matters related to the Nation's public employees.

Training, Other Qualifications, and Advancement

Because of the diversity of duties and levels of responsibility, the educational backgrounds of human resources, training, and labor relations managers and specialists vary considerably. In filling entry-level jobs, many employers seek college graduates who have majored in human resources, personnel administration, or industrial and labor relations. Other employers look for college graduates with a technical or business background or a well-rounded liberal arts education.

Many colleges and universities have programs leading to a degree in personnel, human resources, or labor relations. Some offer degree programs in personnel administration or human resources management, training and development, or compensation and benefits. Depending on the school, courses leading to a career in human resources management may be found in departments of business administration, education, instructional technology, organizational development, human services, communication, or public administration, or within a separate human resources institution or department.

Because an interdisciplinary background is appropriate in this field, a combination of courses in the social sciences, business, and behavioral sciences is useful. Some jobs may require a more technical or specialized background in engineering, science, finance, or law, for example. Most prospective human resources specialists should take courses in compensation, recruitment, training and development, and performance appraisal, as well as courses in principles of management, organizational structure, and industrial psychology. Other relevant courses include business administration, public administration, psychology, sociology, political science, economics, and statistics. Courses in labor law, collective bargaining, labor economics, labor history, and industrial psychology also provide a valuable background for the prospective labor relations specialist. As in many other fields, knowledge of computers and information systems also is useful.

An advanced degree is increasingly important for some jobs. Many labor relations jobs require graduate study in industrial or labor relations. A strong background in industrial relations and law is highly desirable for contract negotiators, mediators, and arbitrators; in fact, many people in these specialties are lawyers. A background in law also is desirable for employee benefits managers and others who must interpret the growing number of laws and regulations. A master's degree in human resources, labor relations, or in business administration with a concentration in human resources management is highly recommended for those seeking general and top management positions.

For many specialized jobs in the human resources field, previous experience is an asset; for more advanced positions, including those of managers as well as arbitrators and mediators, it is essential. Many employers prefer entry-level workers who have gained some experience through an internship or work-study program while in school. Personnel administration and human resources development require the ability to work with individuals as well as a commitment to organizational goals. This field also demands other skills that people may develop elsewhere—using computers, selling, teaching, supervising, and volunteering, among others. The field offers clerical workers opportunities for advancement to professional po-

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sitions. Responsible positions sometimes are filled by experienced individuals from other fields, including business, government, education, social services administration, and the military.

The human resources field demands a range of personal qualities and skills. Human resources, training, and labor relations managers and specialists must speak and write effectively. The growing diversity of the workforce requires that they work with or supervise people with various cultural backgrounds, levels of education, and experience. They must be able to cope with conflicting points of view, function under pressure, and demonstrate discretion, integrity, fair-mindedness, and a persuasive, congenial personality.

The duties given to entry-level workers will vary, depending on whether the new workers have a degree in human resource management, have completed an internship, or have some other type of human resources-related experience. Entry-level employees commonly learn the profession by performing administrative duties—helping to enter data into computer systems, compiling employee handbooks, researching information for a supervisor, or answering the phone and handling routine questions. Entry-level workers often enter formal or on-the-job training programs in which they learn how to classify jobs, interview applicants, or administer employee benefits. They then are assigned to specific areas in the personnel department to gain experience. Later, they may advance to a managerial position, overseeing a major element of the personnel program—compensation or training, for example.

Exceptional human resources workers may be promoted to director of personnel or industrial relations, which can eventually lead to a top managerial or executive position. Others may join a consulting firm or open their own business. A Ph.D. is an asset for teaching, writing, or consulting work.

Most organizations specializing in human resources offer classes intended to enhance the marketable skills of their members. Some organizations offer certification programs, which are signs of competence and can enhance one's advancement opportunities. For example, the International Foundation of Employee Benefit Plans confers a designation to persons who complete a series of college-level courses and pass exams covering employee benefit plans. The Society for Human Resources Management has two levels of certification; both require experience and a passing score on a comprehensive exam.

Job Outlook

The abundant supply of qualified college graduates and experienced workers should create keen competition for jobs. Overall employment of human resources, training, and labor relations managers and specialists is expected to grow faster than the average for all occupations through 2012. In addition to openings due to growth, many job openings will arise from the need to replace workers who transfer to other occupations or leave the labor force.

Legislation and court rulings setting standards in various areas—occupational safety and health, equal employment opportunity, wages, health, pensions, and family leave, among others—will increase demand for human resources, training, and labor relations experts. Rising healthcare costs should continue to spur demand for specialists to develop creative compensation and benefits packages that firms can offer prospective employees. Employment of labor relations staff, including arbitrators and mediators, should grow as firms become more involved in labor relations, and attempt to resolve potentially costly labor-management disputes out of court. Additional job growth may stem from increasing demand for specialists in international human resources management and human resources information systems.

Demand may be particularly strong for certain specialists. For example, employers are expected to devote greater resources to job-specific training programs in response to the increasing complexity of many jobs, the aging of the workforce, and technological advances that can leave employees with obsolete skills. This should result in particularly strong demand for training and development specialists. In addition, increasing efforts throughout industry to recruit and retain quality employees should create many jobs for employment, recruitment, and placement specialists.

Among industries, firms involved in management, consulting, and employment services should offer many job opportunities, as businesses increasingly contract out personnel functions or hire personnel specialists on a temporary basis in order to deal with the increasing cost and complexity of training and development programs. Demand also should increase in firms that develop and administer complex employee benefits and compensation packages for other organizations.

Demand for human resources, training, and labor relations managers and specialists also are governed by the staffing needs of the firms for which they work. A rapidly expanding business is likely to hire additional human resources workers—either as permanent employees or consultants—while a business that has experienced a merger or a reduction in its workforce will require fewer human resources workers. Also, as human resources management becomes increasingly important to the success of an organization, some small and medium-size businesses that do not have a human resources department may assign employees various human resources duties together with other unrelated responsibilities. In any particular firm, the size and the job duties of the human resources staff are determined by the firm's organizational philosophy and goals, skills of its workforce, pace of technological change, government regulations, collective bargaining agreements, standards of professional practice, and labor market conditions.

Job growth could be limited by the widespread use of computerized human resources information systems that make workers more productive. Like that of other workers, employment of human resources, training, and labor relations managers and specialists, particularly in larger firms, may be adversely affected by corporate downsizing, restructuring, and mergers.

Earnings

Annual salary rates for human resources workers vary according to occupation, level of experience, training, location, and size of the firm, and whether they are union members. Median annual earnings of human resources managers were $64,710 in 2002. The middle 50 percent earned between $47,420 and $88,100. The lowest 10 percent earned less than $36,280, and the highest 10 percent earned more than $114,300. Median annual earnings in the industries employing the largest numbers of human resources managers in 2002 were:

Management of companies and enterprises	$77,690
Local government	65,590
General medical and surgical hospitals	61,720
Depository credit intermediation	60,030

Median annual earnings of training and development specialists were $42,800 in 2002. The middle 50 percent earned between $32,050 and $56,890. The lowest 10 percent earned less than $24,760, and the highest 10 percent earned more than $72,530. Median annual earnings in the industries employing the largest numbers of training and development specialists in 2002 were:

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Management of companies and enterprises	$49,660
Insurance carriers	45,830
Local government	43,740
State government	40,960
Federal Government	37,560

Median annual earnings of employment, recruitment, and placement specialists were $39,410 in 2002. The middle 50 percent earned between $30,390 and $54,130. The lowest 10 percent earned less than $24,440, and the highest 10 percent earned more than $73,940. Median annual earnings in 2002 were $34,850 in employment services, the industry employing the largest numbers of these specialists.

Median annual earnings of compensation, benefits, and job analysis specialists were $45,100 in 2002. The middle 50 percent earned between $35,000 and $57,230. The lowest 10 percent earned less than $28,160, and the highest 10 percent earned more than $72,250. Median annual earnings in 2002 were $48,870 in local government, the industry employing the largest numbers of these specialists.

According to a 2003 salary survey conducted by the National Association of Colleges and Employers, bachelor's degree candidates majoring in human resources, including labor relations, received starting offers averaging $35,400 a year.

The average salary for human resources managers employed by the Federal Government was $66,886 in 2003; for employee relations specialists, $63,345; for labor relations specialists, $72,915; and for employee development specialists, $68,735. Salaries were slightly higher in areas where the prevailing local pay level was higher. There are no formal entry-level requirements for managerial positions. Applicants must possess a suitable combination of educational attainment, experience, and record of accomplishment.

Related Occupations

All human resources occupations are closely related. Other workers with skills and expertise in interpersonal relations include counselors, education administrators, public relations specialists, lawyers, psychologists, social and human service assistants, and social workers.

Sources of Additional Information

For information about human resource management careers and certification, contact:

➤ Society for Human Resource Management, 1800 Duke St., Alexandria, VA 22314. Internet: **http://www.shrm.org**

For information about careers in employee training and development and certification, contact:

➤ American Society for Training and Development, 1640 King St., Box 1443, Alexandria, VA 22313. Internet: **http://www.astd.org**

For information about careers and certification in employee compensation and benefits, contact:

➤ International Foundation of Employee Benefit Plans, 18700 W. Bluemound Rd., P.O. Box 69, Brookfield, WI 53008-0069. Internet: **http://www.ifebp.org**

For information about academic programs in industrial relations, write to:

➤ Industrial Relations Research Association, 121 Labor and Industrial Relations, University of Illinois, 504 E. Armory, Champaign, IL 61820. Internet: **http://www.irra.uiuc.edu**

Information about personnel careers in the healthcare industry is available from:

➤ American Society for Healthcare Human Resources Administration, One North Franklin, 31st Floor, Chicago, IL 60606. Internet: **http://www.ashhra.org**

Industrial Production Managers

(0*NET 11-3051.00)

Significant Points

- While there is no standard preparation, a college degree is required.
- Applicants with a college degree in industrial engineering, management, or business administration, and particularly those with an undergraduate engineering degree and a master's degree in business administration or industrial management, enjoy the best job prospects.
- Projected slower-than-average growth in employment reflects increasing productivity.

Nature of the Work

Industrial production managers coordinate the resources and activities required to produce millions of goods every year in the United States. Although their duties vary from plant to plant, industrial production managers share many of the same major responsibilities. These responsibilities include production scheduling, staffing, procurement and maintenance of equipment, quality control, inventory control, and the coordination of production activities with those of other departments.

The primary mission of industrial production managers is planning the production schedule within budgetary limitations and time constraints. They do this by analyzing the plant's personnel and capital resources to select the best way of meeting the production quota. Industrial production managers determine, often using mathematical formulas, which machines will be used, whether new machines need to be purchased, whether overtime or extra shifts are necessary, and what the sequence of production will be. They monitor the production run to make sure that it stays on schedule and correct any problems that may arise.

As production techniques have evolved beyond traditional mass assembly lines, industrial production managers have adapted to "lean" production techniques. Many manufacturers have adopted lean production techniques, while some others use a combination of lean and mass production techniques. In a traditional assembly line, each worker is responsible for only a small portion of the assembly, repeating that task on every product. Lean production employs teams to build and assemble products in stations or cells. When companies use stations, one worker may work alone with handtools and various parts to complete a large portion of the assembly process. Rather than specializing in a specific task, workers are capable of performing all jobs within a team. Without the constraints of the traditional assembly line, companies can be more flexible in their production process, more easily changing production levels on different product lines.

The increased flexibility of lean manufacturing enables industrial production managers to experiment with ways of improving the assembly and manufacturing process. As companies strive to minimize inventory, they want to maintain only a limited stock of finished products. Employing manufacturing cells and stations, companies can more quickly react to changes in customer demand so that limited inventories will not get too low.

Industrial production managers also must monitor product standards. Inspecting samples of finished goods and recording defects enables managers to statistically analyze quality control problems.

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While traditional quality control programs reacted only to problems that reached a certain significant level, newer management techniques and programs, such as ISO 9000, Total Quality Management (TQM), or Six Sigma, emphasize continuous quality improvement. If the problem relates to the quality of work performed in the plant, the manager may implement better training programs or reorganize the manufacturing process, often based upon the suggestions of employee teams. If the cause is substandard materials or parts from outside suppliers, companies may work with their suppliers to improve their quality.

Because the work of many departments is related, managers work closely with heads of other departments such as sales, procurement, and logistics to plan and implement company goals, policies, and procedures. For example, the production manager works with the procurement department to ensure that plant inventories are maintained at their optimal level. This is vital to a firm's operation because maintaining the inventory of materials necessary for production ties up the firm's financial resources, yet insufficient quantities cause delays in production. A breakdown in communications between the production manager and the purchasing department can cause slowdowns and a failure to meet production schedules. Just-in-time production techniques have reduced inventory levels, making constant communication among the manager, suppliers, and purchasing departments even more important. Computers play an integral part in this coordination. They also are used to provide up-to-date information on inventory, the status of work in progress, and quality standards.

Production managers usually report to the plant manager or the vice president for manufacturing, and may act as liaison between executives and first-line supervisors. (Information about top executives may be found elsewhere in the *Handbook.*) In many plants, one production manager is responsible for all aspects of production. In large plants with several operations—aircraft assembly, for example—there are managers in charge of each operation, such as machining, assembly, or finishing.

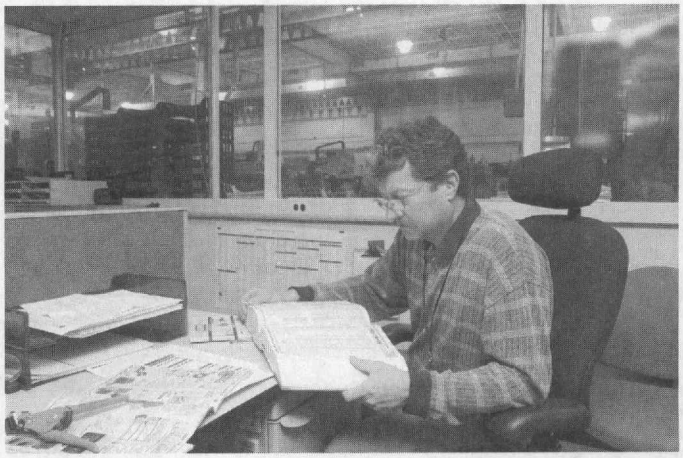
Working Conditions

Most industrial production managers divide their time between production areas and their offices. While in the production area, they must follow established health and safety practices and wear the required protective clothing and equipment. The time in the office, which often is located near production areas, usually is spent meeting with subordinates or other department managers, analyzing production data, and writing and reviewing reports.

Most industrial production managers work more than 40 hours a week, especially when production deadlines must be met. In facilities that operate around-the-clock, managers often work late shifts and may be called at any hour to deal with emergencies. This could mean going to the plant to resolve the problem, regardless of the hour, and staying until the situation is under control. Dealing with production workers as well as superiors when working under the pressure of production deadlines or emergency situations can be stressful. Corporate restructuring has eliminated levels of management and support staff, thus shifting more responsibilities to production managers and compounding this stress.

Employment

Industrial production managers held about 182,000 jobs in 2002. Almost all are employed in manufacturing industries, including the plastics product manufacturing, printing and related support activities, motor vehicle parts manufacturing, and semiconductor and other electronic component manufacturing industries. Production managers work in all parts of the country, but jobs are most plentiful in areas where manufacturing is concentrated.



Industrial production managers often work near the factory floor.

Training, Other Qualifications, and Advancement

Because of the diversity of manufacturing operations and job requirements, there is no standard preparation for this occupation. However, a college degree is required, even for those who have worked their way up through the ranks. Many industrial production managers have a college degree in business administration, management, industrial technology, or industrial engineering. Others have a master's degree in industrial management or business administration (MBA). Some are former production-line supervisors who have been promoted. Although many employers prefer candidates with a business or engineering background, some companies hire well-rounded liberal arts graduates.

As production operations become more sophisticated, increasing numbers of employers are looking for candidates with graduate degrees in industrial management or business administration. Combined with an undergraduate degree in engineering, either of these graduate degrees is considered particularly good preparation. Managers who do not have graduate degrees often take courses in decision sciences, which provide them with techniques and mathematical formulas that can be used to maximize efficiency and improve quality. Companies also are placing greater importance on a candidate's interpersonal skills. Because the job requires the ability to compromise, persuade, and negotiate, successful production managers must be well-rounded and have excellent communication skills.

Those who enter the field directly from college or graduate school often are unfamiliar with the firm's production process. As a result, they may spend their first few months in the company's training program. These programs familiarize trainees with the production process, company policies, and the requirements of the job. In larger companies, they also may include assignments to other departments, such as purchasing and accounting. A number of companies hire college graduates as first-line supervisors and later promote them.

Some industrial production managers have worked their way up through the ranks, perhaps after having worked as first-line supervisors. These workers already have an intimate knowledge of the production process and the firm's organization. To be selected for promotion, however, they must obtain a college degree, must demonstrate leadership qualities, and usually must take company-sponsored courses in management skills and communication techniques.

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In addition to formal training, industrial production managers must keep informed of new production technologies and management practices. Many belong to professional organizations and attend trade shows at which new equipment is displayed; they also attend industry conferences and conventions at which changes in production methods and technological advances are discussed. Some take courses to become certified in various quality and management systems.

Industrial production managers with a proven record of superior performance may advance to plant manager or vice president for manufacturing. Others transfer to jobs with more responsibilities at larger firms. Opportunities also exist for consultants. (For more information, see the statement on management analysts elsewhere in the *Handbook*.)

Job Outlook

Employment of industrial production managers is expected to grow more slowly than the average for all occupations through 2012. However, a number of job openings will stem from the need to replace workers who transfer to other occupations or leave the labor force. Applicants with a college degree in industrial engineering, management, or business administration, and particularly those with an undergraduate engineering degree and a master's degree in business administration or industrial management, enjoy the best job prospects. Employers also are likely to seek candidates who have excellent communication skills and who are personable, flexible, and eager to enhance their knowledge and skills through ongoing training.

Although manufacturing output is projected to rise, increases in productivity among industrial production managers and the workers they supervise will limit growth in employment of these managers. Productivity gains among managers will stem from the increasing use of computers for scheduling, planning, and coordination. Productivity gains among workers will limit both the number of employees in factories and the need for supervision. In addition, more emphasis on quality in the production process has redistributed some of the production manager's oversight responsibilities to supervisors and workers on the production line. Because production managers are so essential to the efficient operation of a plant, they have not been greatly affected by recent efforts to flatten management structures. Nevertheless, this trend has led production managers to assume more responsibilities and has limited the creation of more employment opportunities.

Earnings

Median annual earnings for industrial production managers were $67,320 in 2002. The middle 50 percent earned between $50,710 and $88,880. The lowest 10 percent earned less than $38,980, and the highest 10 percent earned more than $114,750. Median annual earnings in the manufacturing industries employing the largest numbers of industrial production managers in 2002 were:

Management of companies and enterprises	$89,570
Semiconductor and other electronic component manufacturing	78,070
Motor vehicle parts manufacturing	73,570
Plastics products manufacturing	60,720
Printing and related support activities	59,270

Related Occupations

Industrial production managers oversee production staff and equipment, ensure that production goals and quality standards are being met, and implement company policies. Occupations requiring similar training and skills are engineers, management analysts, operations research analysts, top executives, and industrial engineers, including health and safety.

Sources of Additional Information

For more information on industrial production management, contact local manufacturers or schools with programs in industrial management.

Lodging Managers

(0*NET 11-9081.00)

Significant Points

- As in other hotel occupations, night and weekend work is common.
- Employment is projected to grow more slowly than average.
- College graduates with degrees in hotel or restaurant management should have the best job opportunities.

Nature of the Work

A comfortable room, good food, and a helpful staff can make being away from home an enjoyable experience for both vacationing families and business travelers. While most lodging managers work in traditional hotels and motels, some work in other lodging establishments, such as camps, inns, boardinghouses, dude ranches, and recreational resorts. In full-service hotels, lodging managers help their guests have a pleasant stay by providing many of the comforts of home, including cable television, fitness equipment, and voice mail, as well as specialized services such as health spas. For business travelers, lodging managers often schedule available meeting rooms and electronic equipment, including slide projectors and fax machines.

Lodging managers are responsible for keeping their establishments efficient and profitable. In a small establishment with a limited staff, the manager may oversee all aspects of operations. However, large hotels may employ hundreds of workers, and the general manager usually is aided by a number of assistant managers assigned to the various departments of the operation. In hotels of every size, managerial duties vary significantly by job title.

General managers, for example, have overall responsibility for the operation of the hotel. Within guidelines established by the owners of the hotel or executives of the hotel chain, the general manager sets room rates, allocates funds to departments, approves expenditures, and establishes expected standards for guest service, decor, housekeeping, food quality, and banquet operations. Managers who work for chains also may organize and staff a newly built hotel, refurbish an older hotel, or reorganize a hotel or motel that is not operating successfully. In order to fill entry-level service and clerical jobs in hotels, some managers attend career fairs.

Resident managers live in hotels and are on call 24 hours a day to resolve problems or emergencies. In general, though, they typically work an 8- to 10 hour day and oversee the day-to-day operations of the hotel. In many hotels, the general manager also is the resident manager.

Executive housekeepers ensure that guest rooms, meeting and banquet rooms, and public areas are clean, orderly, and well maintained. They also train, schedule, and supervise the work of housekeepers, inspect rooms, and order cleaning supplies.

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Front office managers coordinate reservations and room assignments, as well as train and direct the hotel's front desk staff. They ensure that guests are treated courteously, complaints and problems are resolved, and requests for special services are carried out. Front office managers may adjust charges posted on a customer's bill.

Convention services managers coordinate the activities of various departments in larger hotels to accommodate meetings, conventions, and special events. They meet with representatives of groups or organizations to plan the number of rooms to reserve, the desired configuration of the meeting space, and the banquet services. During the meeting or event, they resolve unexpected problems and monitor activities to ensure that hotel operations conform to the expectations of the group.

Assistant managers help run the day-to-day operations of the hotel. In large hotels, they may be responsible for activities such as personnel, accounting, office administration, marketing and sales, purchasing, security, maintenance, and pool, spa, or recreational facilities. In smaller hotels, these duties may be combined into one position. Assistant managers may adjust charges on a hotel guest's bill when a manager is unavailable.

Computers are used extensively by lodging managers and their assistants to keep track of guests' bills, reservations, room assignments, meetings, and special events. In addition, computers are used to order food, beverages, and supplies, as well as to prepare reports for hotel owners and top-level managers. Managers work with computer specialists to ensure that the hotel's computer system functions properly. Should the hotel's computer system fail, managers must continue to meet the needs of hotel guests and staff.

Working Conditions

Because hotels are open around the clock, night and weekend work is common. Many lodging managers work more than 40 hours per week. Managers who live in the hotel usually have regular work schedules, but they may be called to work at any time. Some employees of resort hotels are managers during the busy season and have other duties during the rest of the year.

Lodging managers sometimes experience the pressures of coordinating a wide range of functions. Conventions and large groups of tourists may present unusual problems. Moreover, dealing with irate guests can be stressful. The job can be particularly hectic for front office managers during check-in and check-out time. Computer failures can further complicate an already busy time.

Employment

Lodging managers held about 69,000 jobs in 2002. Self-employed managers—primarily owners of small hotels and motels—held about 50 percent of these jobs. Companies that manage hotels and motels under contract employed some managers.

Training, Other Qualifications, and Advancement

Hotels increasingly emphasize specialized training. Postsecondary training in hotel or restaurant management is preferred for most hotel management positions, although a college liberal arts degree may be sufficient when coupled with related hotel experience. Internships or part-time or summer work are an asset to students seeking a career in hotel management. The experience gained and the contacts made with employers can greatly benefit students after graduation. Most bachelor's degree programs include work-study opportunities.

Community colleges, junior colleges, and some universities offer associate's, bachelor's, and graduate degree programs in hotel or restaurant management. Combined with technical institutes, vocational and trade schools, and other academic institutions, over 800 educational facilities have programs leading to formal recognition in hotel or restaurant management. Hotel management programs include instruction in hotel administration, accounting, economics, marketing, housekeeping, food service management and catering, and hotel maintenance engineering. Computer training also is an integral part of hotel management training, due to the widespread use of computers in reservations, billing, and housekeeping management.



Lodging managers establish standards for guest services.

Additionally, over 450 high schools in 45 States offer the Lodging Management Program created by the Educational Institute of the American Hotel and Lodging Association. This is a two-year program offered to high school juniors and seniors, which teaches management principles and leads to a professional certification called the "Certified Rooms Division Specialist". Many colleges and universities grant participants credit towards a post-secondary degree in hotel management.

Lodging managers must be able to get along with many different people, even in stressful situations. They must be able to solve problems and concentrate on details. Initiative, self-discipline, effective communication skills, and the ability to organize and direct the work of others also are essential for managers at all levels.

In the past, many managers were promoted from the ranks of front desk clerks, housekeepers, waiters, chefs, and hotel sales workers. Although some employees still advance to hotel management positions without education beyond high school, postsecondary education is preferred. Restaurant management training or experience also is a good background for entering hotel management, because the success of a hotel's food service and beverage operations often is important to the profitability of the entire establishment.

Graduates of hotel or restaurant management programs usually start as trainee assistant managers. Some large hotels sponsor specialized on-the-job management training programs that allow trainees to rotate among various departments and gain a thorough knowledge of the hotel's operation. Other hotels may help finance formal training in hotel management for outstanding employees. Newly built hotels, particularly those without established on-the-job training programs, often prefer to hire applicants who have hotel management experience.

Large hotel and motel chains may offer better opportunities for advancement than small, independently owned establishments, but relocation every several years often is necessary for advancement.

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The large chains have more extensive career ladder programs and offer managers the opportunity to transfer to another hotel or motel in the chain or to the central office. Career advancement can be accelerated by the completion of certification programs offered by various associations. These programs usually require a combination of course work, examinations, and experience. For example, outstanding lodging managers may advance to higher level manager positions. (For more information, see the statement on top executives elsewhere in the *Handbook.*)

Job Outlook

Employment of lodging managers is expected to grow more slowly than the average for all occupations through 2012. Additional job openings are expected to occur as experienced managers transfer to other occupations or leave the labor force, in part because of the long hours and stressful working conditions. Job opportunities are expected to be best for persons with college degrees in hotel or restaurant management.

Increasing business travel and domestic and foreign tourism will drive employment growth of lodging managers. Managerial jobs are not expected to grow as rapidly as the hotel industry overall, however. As the industry consolidates, many chains and franchises will acquire independently owned establishments and increase the numbers of economy-class rooms to accommodate bargain-conscious guests. Economy hotels offer clean, comfortable rooms and front desk services without costly extras such as restaurants and room service. Because there are not as many departments in these hotels, fewer managers will be needed. Similarly, the increasing number of extended-stay hotels will temper demand for managers because, in these establishments, management is not required to be available 24 hours a day. In addition, front desk clerks increasingly are assuming some responsibilities previously reserved for managers, further limiting the employment growth of managers and their assistants.

Additional demand for managers is expected in suite hotels, because some guests—especially business customers—are willing to pay higher prices for rooms with kitchens and suites that provide the space needed to conduct meetings. In addition, large full-service hotels—offering restaurants, fitness centers, large meeting rooms, and play areas for children, among other amenities—will continue to provide many trainee and managerial opportunities.

Earnings

Median annual earnings of lodging managers were $33,970 in 2002. The middle 50 percent earned between $26,110 and $44,670. The lowest 10 percent earned less than $20,400, while the highest 10 percent earned more than $59,420.

Salaries of lodging managers vary greatly according to their responsibilities and the segment of the hotel industry in which they are employed, as well as the location and region where the hotel is located. Managers may earn bonuses of up to 25 percent of their basic salary in some hotels and also may be furnished with lodging, meals, parking, laundry, and other services. In addition to providing typical benefits, some hotels offer profit-sharing plans and educational assistance to their employees.

Related Occupations

Other occupations concerned with organizing and directing a business in which customer service is the cornerstone of their success include food service managers, gaming managers, sales worker supervisors, and property, real estate, and community association managers.

Sources of Additional Information

For information on careers and scholarships in hotel management, contact

➤ American Hotel and Lodging Association, 1201 New York Ave. NW., #600, Washington, DC 20005-3931.

Information on careers in the lodging industry and on professional development and training programs may be obtained from:

➤ Educational Institute of the American Hotel and Lodging Association, 800 N. Magnolia Ave., Suite 1800, Orlando, FL 32853-1126. Internet: **http://www.ei-ahla.org**

For information on educational programs, including correspondence courses, in hotel and restaurant management, write to:

➤ International Council on Hotel, Restaurant, and Institutional Education, 2613 North Parham Rd., 2nd Floor, Richmond, VA 23294-4442. Internet: **http://www.chrie.org**

Information on careers in housekeeping management may be obtained from:

➤ International Executive Housekeepers Association, Inc., 1001 Eastwind Dr., Suite 301, Westerville, OH 43081. **Internet: http://www.ieha.org**

Medical and Health Services Managers

(0*NET 11-9111.00)

Significant Points

- Earnings of medical and health services managers are high, but long work hours are common.
- A master's degree is the standard credential for most positions, although a bachelor's degree is adequate for some entry-level positions in smaller facilities.
- Employment will grow fastest in practitioners' offices and in home healthcare services.
- Applicants with work experience in healthcare and strong business and management skills should have the best opportunities.

Nature of the Work

Healthcare is a business and, like every other business, it needs good management to keep it running smoothly. The occupation, medical and health services manager, encompasses all individuals who plan, direct, coordinate, and supervise the delivery of healthcare. Medical and health services managers include specialists and generalists. Specialists are in charge of specific clinical departments or services, while generalists manage or help to manage an entire facility or system.

The structure and financing of healthcare is changing rapidly. Future medical and health services managers must be prepared to deal with evolving integrated healthcare delivery systems, technological innovations, an increasingly complex regulatory environment, restructuring of work, and an increased focus on preventive care. They will be called upon to improve efficiency in healthcare facilities and the quality of the healthcare provided. Increasingly, medical and health services managers will work in organizations in which they must optimize efficiency of a variety of interrelated services—for example, those ranging from inpatient care to outpatient followup care.

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Large facilities usually have several assistant administrators to aid the top administrator and to handle daily decisions. Assistant administrators may direct activities in clinical areas such as nursing, surgery, therapy, medical records, or health information. (Managers in nonhealth areas, such as administrative services, computer and information systems, finance, and human resources, are not included in this statement. For information about them, see the statements on management occupations elsewhere in the *Handbook.*)

In smaller facilities, top administrators handle more of the details of daily operations. For example, many nursing home administrators manage personnel, finance, facility operations, and admissions, and have a larger role in resident care.

Clinical managers have more specific responsibilities than do generalists, and have training or experience in a specific clinical area. For example, directors of physical therapy are experienced physical therapists, and most health information and medical record administrators have a bachelor's degree in health information or medical record administration. Clinical managers establish and implement policies, objectives, and procedures for their departments; evaluate personnel and work; develop reports and budgets; and coordinate activities with other managers.

In group medical practices, managers work closely with physicians. Whereas an office manager may handle business affairs in small medical groups, leaving policy decisions to the physicians themselves, larger groups usually employ a full-time administrator to help formulate business strategies and coordinate day-to-day business.

A small group of 10 to 15 physicians might employ 1 administrator to oversee personnel matters, billing and collection, budgeting, planning, equipment outlays, and patient flow. A large practice of 40 to 50 physicians may have a chief administrator and several assistants, each responsible for different areas.

Medical and health services managers in managed care settings perform functions similar to those of their counterparts in large group practices, except that they may have larger staffs to manage. In addition, they may do more work in the areas of community outreach and preventive care than do managers of a group practice.

Some medical and health services managers oversee the activities of a number of facilities in health systems. Such systems may contain both inpatient and outpatient facilities and offer a wide range of patient services.

Working Conditions

Most medical and health services managers work long hours. Facilities such as nursing care facilities and hospitals operate around the clock, and administrators and managers may be called at all hours to deal with problems. They also may travel to attend meetings or inspect satellite facilities.

Some managers work in comfortable, private offices; others share space with other managers or staff. They may spend considerable time walking, to consult with coworkers.

Employment

Medical and health services managers held about 244,000 jobs in 2002. About 37 percent worked in hospitals, and another 17 percent worked in offices of physicians or nursing care facilities. The remainder worked mostly in home healthcare services, Federal government healthcare facilities, ambulatory facilities run by State and local governments, outpatient care centers, insurance carriers, and community care facilities for the elderly.



Medical and health services managers plan, direct, coordinate, and supervise the delivery of healthcare.

Training, Other Qualifications, and Advancement

Medical and health services managers must be familiar with management principles and practices. A master's degree in health services administration, long-term care administration, health sciences, public health, public administration, or business administration is the standard credential for most generalist positions in this field. However, a bachelor's degree is adequate for some entry-level positions in smaller facilities and at the departmental level within healthcare organizations. Physicians' offices and some other facilities may substitute on-the-job experience for formal education.

For clinical department heads, a degree in the appropriate field and work experience may be sufficient for entry. However, a master's degree in health services administration or a related field may be required to advance. For example, nursing service administrators usually are chosen from among supervisory registered nurses with administrative abilities and a graduate degree in nursing or health services administration.

Bachelor's, master's, and doctoral degree programs in health administration are offered by colleges, universities, and schools of public health, medicine, allied health, public administration, and business administration. In 2003, 67 schools had accredited programs leading to the master's degree in health services administration, according to the Accrediting Commission on Education for Health Services Administration.

Some graduate programs seek students with undergraduate degrees in business or health administration; however, many graduate programs prefer students with a liberal arts or health profession background. Candidates with previous work experience in healthcare also may have an advantage. Competition for entry to these programs is keen, and applicants need above-average grades to gain admission. Graduate programs usually last between 2 and 3 years. They may include up to 1 year of supervised administrative experience, and course work in areas such as hospital organization and management, marketing, accounting and budgeting, human resources administration, strategic planning, health economics, and health information systems. Some programs allow students to specialize in one type of facility—hospitals, nursing care facilities, mental health facilities, or medical groups. Other programs encourage a generalist approach to health administration education.

New graduates with master's degrees in health services administration may start as department managers or as staff employees. The level of the starting position varies with the experience of the

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applicant and the size of the organization. Hospitals and other health facilities offer postgraduate residencies and fellowships, which usually are staff positions. Graduates from master's degree programs also take jobs in large group medical practices, clinics, mental health facilities, nursing care corporations, and consulting firms.

Graduates with bachelor's degrees in health administration usually begin as administrative assistants or assistant department heads in larger hospitals. They also may begin as department heads or assistant administrators in small hospitals or nursing care facilities.

All States and the District of Columbia require nursing care facility administrators to have a bachelor's degree, pass a licensing examination, complete a State-approved training program, and pursue continuing education. A license is not required in other areas of medical and health services management.

Medical and health services managers often are responsible for millions of dollars' worth of facilities and equipment and hundreds of employees. To make effective decisions, they need to be open to different opinions and good at analyzing contradictory information. They must understand finance and information systems, and be able to interpret data. Motivating others to implement their decisions requires strong leadership abilities. Tact, diplomacy, flexibility, and communication skills are essential because medical and health services managers spend most of their time interacting with others.

Medical and health services managers advance by moving into more responsible and higher paying positions, such as assistant or associate administrator, or by moving to larger facilities.

Job Outlook

Employment of medical and health services managers is expected to grow faster than the average for all occupations through 2012, as the health services industry continues to expand and diversify. Opportunities will be especially good in offices of physicians and other health practitioners, home healthcare services, and outpatient care centers. Applicants with work experience in the healthcare field and strong business and management skills should have the best opportunities.

Hospitals will continue to employ the most medical and health services managers over the projection period. However, the number of new jobs created in hospitals is expected to increase at a slower rate than in many other industries, as hospitals focus on controlling costs and increasing the utilization of clinics and other alternate care sites. Medical and health services managers with experience in large facilities will enjoy the best job opportunities, as hospitals become larger and more complex.

Employment will grow the fastest in practitioners' offices and in home healthcare agencies. Many services previously provided in hospitals will continue to shift to these sectors, especially as medical technologies improve. Demand in medical group practice management will grow as medical group practices become larger and more complex. Medical and health services managers will need to deal with the pressures of cost containment and financial accountability, as well as with the increased focus on preventive care. They also will become more involved in trying to improve the health of their communities. Managers with specialized experience in a particular field, such as reimbursement, should have good opportunities.

Medical and health services managers also will be employed by healthcare management companies who provide management services to hospitals and other organizations, as well as to specific departments such as emergency, information management systems, managed care contract negotiations, and physician recruiting.

Earnings

Median annual earnings of medical and health services managers were $61,370 in 2002. The middle 50 percent earned between $47,910 and $80,150.The lowest 10 percent earned less than $37,460, and the highest 10 percent earned more than $109,080. Median annual earnings in the industries employing the largest numbers of medical and health services managers in 2002 were as follows:

General medical and surgical hospitals	$65,950
Home health care services	56,320
Outpatient care centers	55,650
Offices of physicians	55,600
Nursing care facilities	55,320

Earnings of medical and health services managers vary by type and size of the facility, as well as by level of responsibility. For example, the Medical Group Management Association reported that, in 2002, median salaries for administrators were $78,258 in practices with fewer than 7 physicians; $92,727 in practices with 7 to 25 physicians; and $125,988 in practices with more than 26 physicians.

According to a survey by *Modern Healthcare* magazine, median annual compensation in 2003 for managers of selected clinical departments was $71,800 in respiratory care, $79,000 in physical therapy, $84,500 in home healthcare, $85,100 in laboratory services, $89,100 in rehabilitation services, $89,500 in medical imaging/diagnostic radiology, and $98,400 in nursing services. Salaries also varied according to size of facility and geographic region.

Related Occupations

Medical and health services managers have training or experience in both health and management. Other occupations requiring knowledge of both fields are insurance underwriters and social and community service managers.

Sources of Additional Information

Information about undergraduate and graduate academic programs in this field is available from:

➤ Association of University Programs in Health Administration, 730 11th St. NW., Washington, DC 20001-4510. Internet: **http://www.aupha.org**

For a list of accredited graduate programs in medical and health services administration, contact:

➤ Accrediting Commission on Education for Health Services Administration, 730 11th St. NW., Washington, DC 20001-4510. Internet: **http://www.acehsa.org**

For information about career opportunities in long-term care administration, contact:

➤ American College of Health Care Administrators, 300 N. Lee St., Suite 301, Alexandria, VA 22314. Internet: **http://www.achca.org**

For information about career opportunities in medical group practices and ambulatory care management, contact:

➤ Medical Group Management Association, 104 Inverness Terrace East, Englewood, CO 80112-5306.

For information about medical and healthcare office managers, contact:

➤ Professional Association of Health Care Office Management, 461 East Ten Mile Rd., Pensacola, FL 32534-9712.

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Property, Real Estate, and Community Association Managers

(0*NET 11-9141.00)

Significant Points

- Many enter the occupation as onsite managers of apartment buildings, office complexes, or community associations, or as employees of property management firms or community association management companies.
- Forty-six percent of property, real estate, and community association managers are self-employed.
- Opportunities should be best for those with college degrees in business administration or related fields, as well as professional designations.

Nature of the Work

Buildings can be homes, stores, or offices to those who use them. To businesses and investors, properly managed real estate is a potential source of income and profits, and, to homeowners, it is a way to preserve and enhance resale values. Property, real estate, and community association managers maintain and increase the value of real estate investments. *Property and real estate managers* oversee the performance of income-producing commercial or residential properties, and ensure that real estate investments achieve their expected revenues. *Community association managers* manage the common property and services of condominiums, cooperatives, and planned communities through their homeowners' or community associations.

When owners of apartments, office buildings, or retail or industrial properties lack the time or expertise needed for day-to-day management of their real estate investments or homeowners' associations, they often hire a property or real estate manager, or community association manager. The manager is employed either directly by the owner or indirectly through a contract with a property management firm.

Generally, property and real estate managers handle the financial operations of the property, ensuring that rent is collected and that mortgages, taxes, insurance premiums, payroll, and maintenance bills are paid on time. In community associations, although homeowners pay no rent and pay their own real estate taxes and mortgages, community association managers must collect association dues. Some property managers, called *asset property managers*, supervise the preparation of financial statements and periodically report to the owners on the status of the property, occupancy rates, dates of lease expirations, and other matters.

Often, property managers negotiate contracts for janitorial, security, groundskeeping, trash removal, and other services. When contracts are awarded competitively, managers solicit bids from several contractors and recommend to the owners which bid to accept. They monitor the performance of contractors and investigate and resolve complaints from residents and tenants when services are not properly provided. Managers also purchase supplies and equipment for the property and make arrangements with specialists for repairs that cannot be handled by regular property maintenance staff.

In addition to these duties, property managers must understand and comply with provisions of legislation, such as the Americans with Disabilities Act and the Federal Fair Housing Amendment Act, as well as local fair housing laws. They must ensure that their renting and advertising practices are not discriminatory and that the property itself complies with all of the local, State, and Federal regulations and building codes.

Onsite property managers are responsible for day-to-day operations for one piece of property, such as an office building, shopping center, community association, or apartment complex. To ensure that the property is safe and properly maintained, onsite managers routinely inspect the grounds, facilities, and equipment to determine if repairs or maintenance are needed. They meet not only with current residents when handling requests for repairs or trying to resolve complaints, but also with prospective residents or tenants to show vacant apartments or office space. Onsite managers also are responsible for enforcing the terms of rental or lease agreements, such as rent collection, parking and pet restrictions, and termination-of-lease procedures. Other important duties of onsite managers include keeping accurate, up-to-date records of income and expenditures from property operations and submitting regular expense reports to the asset property manager or owners.

Property managers who do not work onsite act as a liaison between the onsite manager and the owner. They also market vacant space to prospective tenants through the use of a leasing agent or by advertising or other means, and establish rental rates in accordance with prevailing local economic conditions.

Some property and real estate managers, often called *real estate asset managers*, act as the property owners' agent and adviser for the property. They plan and direct the purchase, development, and disposition of real estate on behalf of the business and investors. These managers focus on long-term strategic financial planning rather than on day-to-day operations of the property.

When deciding to acquire property, real estate asset managers take several factors into consideration, such as property values, taxes, zoning, population growth, transportation, and traffic volume and patterns. Once a site is selected, they negotiate contracts for the purchase or lease of the property, securing the most beneficial terms. Real estate asset managers periodically review their company's real estate holdings and identify properties that are no longer financially profitable. They then negotiate the sale of or terminate the lease on such properties.

Property and real estate managers who work for homebuilders, real estate developers, and land development companies acquire land and plan construction of shopping centers, houses, apartments, office buildings, or industrial parks. They negotiate with representatives of local governments, other businesses, community and public interest groups, and public utilities to eliminate obstacles to the development of land and to gain support for a planned project. It sometimes takes years to win approval for a project and, in the process, managers may have to modify plans for the project many times. Once cleared to proceed with a project, managers may help to negotiate short-term loans to finance the construction of the project, and later negotiate long-term permanent mortgage loans. They then help to choose, assist, and advise the architectural firms that draw up detailed plans and the construction companies that build the project.

In many respects, the work of community association managers parallels that of property managers. They collect monthly assessments, prepare financial statements and budgets, negotiate with contractors, and help to resolve complaints. In other respects, however, the work of these managers differs from that of other residential property and real estate managers. Community association managers interact on a daily basis with homeowners and other residents,

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rather than with renters. Hired by the volunteer board of directors of the association, they administer the daily affairs, and oversee the maintenance of property and facilities that the homeowners own and use jointly through the association. They also assist the board and owners in complying with association and government rules and regulations.

Some associations encompass thousands of homes and employ their own onsite staff and managers. In addition to administering the associations' financial records and budget, managers may be responsible for the operation of community pools, golf courses, and community centers, and for the maintenance of landscaping and parking areas. Community association managers also may meet with the elected boards of directors to discuss and resolve legal issues or disputes that may affect the owners, as well as to review any proposed changes or improvements by homeowners to their properties, to make sure that they comply with community guidelines.

Working Conditions

Offices of most property, real estate, and community association managers are clean, modern, and well lighted. However, many managers spend a major portion of their time away from their desks. Onsite managers, in particular, may spend a large portion of their workday away from their office, visiting the building engineer, showing apartments, checking on the janitorial and maintenance staff, or investigating problems reported by tenants. Property and real estate managers frequently visit the properties they oversee, sometimes on a daily basis when contractors are doing major repair or renovation work. Real estate asset managers may spend time away from home while traveling to company real estate holdings or searching for properties to acquire.



Property, real estate, and community association managers manage, maintain, and increase the value of real estate investments.

Property, real estate, and community association managers often must attend evening meetings with residents, property owners, community association boards of directors, or civic groups. Not surprisingly, many managers put in long workweeks, especially before financial and tax reports are due. Some apartment managers are required to live in the apartment complexes where they work so that they are available to handle any emergency that occurs, even when they are off duty. They usually receive compensatory time off for working nights or weekends. Many apartment managers receive time off during the week so that they are available on weekends to show apartments to prospective residents.

Employment

Property, real estate, and community association managers held about 293,000 jobs in 2002. Forty percent worked for real estate agents and brokers, lessors of real estate, or property management firms. Others worked for real estate development companies, government agencies that manage public buildings, and corporations with extensive holdings of commercial properties. Forty-six percent of property, real estate, and community association managers were self-employed.

Training, Other Qualifications, and Advancement

Most employers prefer to hire college graduates for property management positions. Entrants with degrees in business administration, accounting, finance, real estate, public administration, or related fields are preferred, but those with degrees in the liberal arts also may qualify. Good speaking, writing, computer, and financial skills, as well as an ability to tactfully deal with people, are essential in all areas of property management.

Many people enter property management as onsite managers of apartment buildings, office complexes, or community associations, or as employees of property management firms or community association management companies. As they acquire experience working under the direction of a property manager, they may advance to positions with greater responsibility at larger properties. Those who excel as onsite managers often transfer to assistant property manager positions in which they can acquire experience handling a broad range of property management responsibilities.

Previous employment as a real estate sales agent may be an asset to onsite managers because it provides experience useful in showing apartments or office space. In the past, those with backgrounds in building maintenance have advanced to onsite manager positions on the strength of their knowledge of building mechanical systems, but this is becoming less common as employers place greater emphasis on administrative, financial, and communication abilities for managerial jobs.

Although many people entering jobs such as assistant property manager do so by having previously gained onsite management experience, employers increasingly hire inexperienced college graduates with bachelor's or master's degrees in business administration, accounting, finance, or real estate for these positions. Assistants work closely with a property manager and learn how to prepare budgets, analyze insurance coverage and risk options, market property to prospective tenants, and collect overdue rent

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payments. In time, many assistants advance to property manager positions.

The responsibilities and compensation of property, real estate, and community association managers increase as they manage more and larger properties. Most property managers are responsible for several properties at a time. As their careers advance, they gradually are entrusted with larger properties that are more complex to manage. Many specialize in the management of one type of property, such as apartments, office buildings, condominiums, cooperatives, homeowner associations, or retail properties. Managers who excel at marketing properties to tenants may specialize in managing new properties, while those who are particularly knowledgeable about buildings and their mechanical systems might specialize in the management of older properties requiring renovation or more frequent repairs. Some experienced managers open their own property management firms.

Persons most commonly enter real estate asset manager jobs by transferring from positions as property managers or real estate brokers. Real estate asset managers must be good negotiators, adept at persuading and handling people, and good at analyzing data in order to assess the fair market value of property or its development potential. Resourcefulness and creativity in arranging financing are essential for managers who specialize in land development.

Many employers encourage attendance at short-term formal training programs conducted by various professional and trade associations active in the real estate field. Employers send managers to these programs to improve their management skills and expand their knowledge of specialized subjects, such as the operation and maintenance of building mechanical systems, enhancement of property values, insurance and risk management, personnel management, business and real estate law, community association risks and liabilities, tenant relations, communications, and accounting and financial concepts. Managers also participate in these programs to prepare themselves for positions of greater responsibility in property management. Completion of these programs, related job experience, and a satisfactory score on a written examination lead to certification, or the formal award of a professional designation, by the sponsoring association. (Some organizations offering such programs are listed as sources of additional information at the end of this statement.) In addition to these qualifications, some associations require their members to adhere to a specific code of ethics. In some States, community association managers must be licensed.

Managers of public housing subsidized by the Federal Government are required to be certified, but many property, real estate, and community association managers, who work with all types of property, choose to earn a professional designation voluntarily because it represents formal recognition of their achievements and status in the occupation. Real estate asset managers who buy or sell property are required to be licensed by the State in which they practice.

Job Outlook

Employment of property, real estate, and community association managers is projected to increase about as fast as the average for all occupations through the year 2012. Additional job openings are expected to occur as managers transfer to other occupations or leave the labor force. Opportunities should be best for those with a college degree in business administration, real estate, or a related field, and for those who attain a professional designation.

Job growth among onsite property managers in commercial real estate is expected to accompany the projected expansion of the real estate and rental and leasing industry. An increase in the Nation's stock of apartments, houses, and offices also should require more property managers. Developments of new homes increasingly are being organized with community or homeowner associations that provide community services and oversee jointly owned common areas, requiring professional management. To help properties become more profitable or to enhance the resale values of homes, more commercial and residential property owners are expected to place their investments in the hands of professional managers.

The changing demographic composition of the population also should create more jobs for property, real estate, and community association managers. The number of older people will grow during the 2000-12 projection period, increasing the need for various types of suitable housing, such as assisted-living facilities and retirement communities. Accordingly, there will be demand for property and real estate managers to operate these facilities, and especially for those who have a background in the operation and administrative aspects of running a health unit.

Earnings

Median annual earnings of salaried property, real estate, and community association managers were $36,880 in 2002. The middle 50 percent earned between $25,470 and $56,000 a year. The lowest 10 percent earned less than $17,450, and the highest 10 percent earned more than $86,650 a year. Median annual earnings of salaried property, real estate, and community association managers in the largest employing industries in 2002 were as follows:

Local government	$50,340
Offices of real estate agents and brokers	37,820
Activities related to real estate	35,750
Lessors of real estate	31,190

Many resident apartment managers and onsite association managers receive the use of an apartment as part of their compensation package. Managers often are reimbursed for the use of their personal vehicles, and managers employed in land development often receive a small percentage of ownership in the projects that they develop.

Related Occupations

Property, real estate, and community association managers plan, organize, staff, and manage the real estate operations of businesses. Workers who perform similar functions in other fields include administrative services managers, education administrators, food service managers, lodging managers, medical and health services managers, real estate brokers and sales agents, and urban and regional planners.

Sources of Additional Information

General information about education and careers in property management is available from:

➤ Institute of Real Estate Management, 430 N. Michigan Ave., Chicago, IL 60611. Internet: **http://www.irem.org**

For information on careers and certification programs in commercial property management, contact:

➤ Building Owners and Managers Institute, 1521 Ritchie Hwy., Arnold, MD 21012.

For information on careers and professional designation and certification programs in residential property management and community association management, contact:

➤ Community Associations Institute, 225 Reinekers Ln., Suite 300, Alexandria, VA 22314. Internet: **http://www.caionline.org**

➤ National Board of Certification for Community Association Managers, P.O. Box 25037, Alexandria, VA 22313. Internet: **http://www.nbccam.org**

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Purchasing Managers, Buyers, and Purchasing Agents

(0*NET 11-3061.00, 13-1021.00, 13-1022.00, 13-1023.00)

Significant Points

- Forty-two percent are employed in wholesale trade or manufacturing establishments.
- Some firms promote qualified employees to these positions, while other employers recruit college graduates; regardless of academic preparation, new employees need 1 to 5 years to learn the specifics of their employer's business.
- Overall employment is expected to be slower than the average, but the projected change in employment varies significantly by occupational specialty.
- Opportunities should be best for those with a college degree.

Nature of the Work

Purchasing managers, buyers, and purchasing agents seek to obtain the highest quality merchandise at the lowest possible purchase cost for their employers. In general, *purchasers* buy goods and services for use by their company or organization, whereas *buyers* typically buy items for resale. Purchasers and buyers determine which commodities or services are best, choose the suppliers of the product or service, negotiate the lowest price, and award contracts that ensure that the correct amount of the product or service is received at the appropriate time. In order to accomplish these tasks successfully, purchasing managers, buyers, and purchasing agents study sales records and inventory levels of current stock, identify foreign and domestic suppliers, and keep abreast of changes affecting both the supply of, and demand for, needed products and materials.

Purchasing managers, buyers, and purchasing agents evaluate suppliers on the basis of price, quality, service support, availability, reliability, and selection. To assist them in their search for the right suppliers, they review catalogs, industry and company publications, directories, and trade journals. Much of this information is now available on the Internet. They research the reputation and history of the suppliers and may advertise anticipated purchase actions in order to solicit bids. At meetings, trade shows, conferences, and suppliers' plants and distribution centers, they examine products and services, assess a supplier's production and distribution capabilities, and discuss other technical and business considerations that influence the purchasing decision. Once all of the necessary information on suppliers is gathered, orders are placed and contracts are awarded to those suppliers who meet the purchaser's needs. Contracts often are for several years and may stipulate the price or a narrow range of prices, allowing purchasers to reorder as necessary. Other specific job duties and responsibilities of purchasing managers, buyers, and purchasing agents vary by employer and by the type of commodities or services to be purchased.

Purchasing specialists employed by government agencies or manufacturing firms usually are called purchasing directors, managers, or agents; buyers or industrial buyers; or contract specialists. These workers acquire materials, parts, machines, supplies, services, and other inputs to the production of a final product. Some purchasing managers specialize in negotiating and supervising supply contracts, and are called contract or supply managers. Purchasing agents and managers obtain items ranging from raw materials, fabricated parts, machinery, and office supplies to construction services and airline tickets. The flow of work—or even the entire production process—can be slowed or halted if the right materials, supplies, or equipment are not on hand when needed. To be effective, purchasing specialists must have a working technical knowledge of the goods or services to be purchased.

In large industrial organizations, a distinction often is drawn between the work of a buyer or purchasing agent and that of a purchasing manager. Purchasing agents and buyers commonly focus on routine purchasing tasks, often specializing in a commodity or group of related commodities, such as steel, lumber, cotton, grains, fabricated metal products, or petroleum products. Purchasing agents usually track market conditions, price trends, or futures markets. Purchasing managers usually handle the more complex or critical purchases and may supervise a group of purchasing agents handling other goods and services. Whether a person is titled purchasing manager, buyer, or purchasing agent depends more on specific industry and employer practices than on specific job duties.

Changing business practices have altered the traditional roles of purchasing or supply management specialists in many industries. For example, manufacturing companies increasingly involve workers in this occupation at most stages of product development because of their ability to forecast a part's or material's cost, availability, and suitability for its intended purpose. Furthermore, potential problems with the supply of materials may be avoided by consulting the purchasing department in the early stages of product design.

Businesses also might enter into integrated supply contracts. These contracts increase the importance of selecting the right supplier, because agreements are larger in scope and longer in duration. Integrated supply incorporates all members of the supply chain, including the supplier, transportation companies, and the retailer. A major responsibility of most purchasers is to work out problems that may occur with a supplier, because the success of the relationship affects the buying firm's performance.

Purchasing specialists often work closely with other employees in their own organization when deciding on purchases, an arrangement sometimes called team buying. For example, before submitting an order, they may discuss the design of custom-made products with company design engineers, talk about problems involving the quality of purchased goods with quality assurance engineers and production supervisors, or mention shipment problems to managers in the receiving department.

Contract specialists and managers at various levels of government award contracts for an array of items, including office and building supplies, services for the public, and construction projects. For example, they may oversee the contract for cleaning services of a government office building to verify that the work is being done on schedule and on budget, even though the cleaners are not government employees. They may use sealed bids to award contracts, but usually establish negotiated agreements for complex items. Often, purchasing specialists in government place solicitations for services and accept bids and offers through the Internet. Government purchasing agents and managers must follow strict laws and regulations in their work, in order to avoid any appearance of impropriety. These legal requirements are occasionally changed, so agents and contract specialists must keep abreast of the latest regulations.

Purchasing specialists who buy finished goods for resale are employed by wholesale and retail establishments, where they commonly are known as buyers or merchandise managers. Wholesale and retail buyers are an integral part of a complex system of distribution and merchandising that caters to the vast array of consumer needs and desires. Wholesale buyers purchase goods directly from

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manufacturers or from other wholesale firms for resale to retail firms, commercial establishments, institutions, and other organizations. In retail firms, buyers purchase goods from wholesale firms or directly from manufacturers for resale to the public. Buyers largely determine which products their establishment will sell. Therefore, it is essential that they have the ability to predict what will appeal to consumers. They must constantly stay informed of the latest trends, because failure to do so could jeopardize profits and the reputation of their company. Buyers also follow ads in newspapers and other media to check competitors' sales activities, and they watch general economic conditions to anticipate consumer buying patterns. Buyers working for large and medium-sized firms usually specialize in acquiring one or two lines of merchandise, whereas buyers working for small stores may purchase the establishment's complete inventory.

The use of private-label merchandise and the consolidation of buying departments have increased the responsibilities of retail buyers. Private-label merchandise, produced for a particular retailer, requires buyers to work closely with vendors to develop and obtain the desired product. The downsizing and consolidation of buying departments increases the demands placed on buyers because, although the amount of work remains unchanged, there are fewer people to accomplish it. The result is an increase in the workloads and levels of responsibility for all.

Many merchandise managers assist in the planning and implementation of sales promotion programs. Working with merchandise executives, they determine the nature of the sale and purchase items accordingly. Merchandise managers may work with advertising personnel to create an ad campaign. For example, they may determine in which media the advertisement will be placed—newspapers, direct mail, television, or some combination of all three. In addition, merchandise managers often visit the selling floor to ensure that goods are properly displayed. Often, assistant buyers are responsible for placing orders and checking shipments.

Computers continue to have a major effect on the jobs of purchasing managers, buyers, and purchasing agents. In manufacturing and service industries, computers handle most of the routine tasks, enabling purchasing workers to concentrate mainly on the analytical and qualitative aspects of the job. Computers are used to obtain instant and accurate product and price listings, to track inventory levels, to process orders, and to help determine when to make purchases. Computers also maintain lists of bids and offers, record the history of supplier performance, and issue purchase orders.

Computerized systems have dramatically simplified many of the acquisition functions and improved the efficiency of determining which products are selling. For example, cash registers connected to computers, known as point-of-sale terminals, allow organizations to maintain instant access to current sales and inventory records. The information contained therein can then be used to produce sales reports that reflect customer buying habits. The ability to find out quickly which products or combinations of products are selling well enables buyers and supply managers to increase sales and reduce costs. Buyers can gain instant access to the specifications for thousands of commodities, inventory records, and their customers' purchase records to avoid overpaying for goods and to avoid shortages of popular goods or surpluses of goods that do not sell as well. Firms are linked with manufacturers and wholesalers by electronic purchasing systems, the Internet, or Extranets. These systems permit faster selection, customization, and ordering of products, and they allow buyers to concentrate better on selecting goods and suppliers.

Working Conditions

Most purchasing managers, buyers, and purchasing agents work in comfortable offices. They frequently work more than the standard 40-hour week, because of special sales, conferences, or production deadlines. Evening and weekend work also is common, before holiday and back-to-school seasons for those working in retail trade. Consequently, many retail firms discourage the use of vacation time during peak periods.

Buyers and merchandise managers often work under great pressure. Because wholesale and retail stores are so competitive, buyers need physical stamina to keep up with the fast-paced nature of their work.

Many purchasing managers, buyers, and purchasing agents travel at least several days a month. Purchasers for worldwide manufacturing companies and large retailers, as well as buyers of high fashion, may travel outside the United States.

Employment

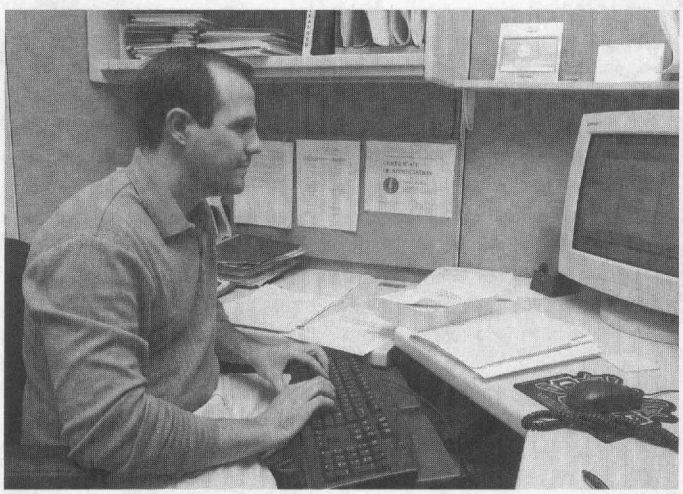
Purchasing managers, buyers, and purchasing agents held about 527,000 jobs in 2002. Forty-two percent worked in the wholesale trade and manufacturing industries, and another 15 percent worked in retail trade. The remainder worked mostly in service establishments, such as hospitals, or different levels of government. A small number were self-employed.

The following tabulation shows the distribution of employment by occupational specialty:

Purchasing agents, except wholesale, retail, and farm products	245,000
Wholesale and retail buyers, except farm products	155,000
Purchasing managers	108,000
Purchasing agents and buyers, farm products	19,000

Training, Other Qualifications, and Advancement

Qualified persons may begin as trainees, purchasing clerks, expediters, junior buyers, or assistant buyers. Retail and wholesale firms prefer to hire applicants who have a college degree and who are familiar with the merchandise they sell and with wholesaling and retailing practices. Some retail firms promote qualified employees to assistant buyer positions; others recruit and train college graduates as assistant buyers. Most employers use a combination of methods.



Purchasing managers, buyers, and purchasing agents work to get the best merchandise at the lowest cost.

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Educational requirements tend to vary with the size of the organization. Large stores and distributors, especially those in wholesale and retail trade, prefer applicants who have completed a bachelor's degree program with a business emphasis. Many manufacturing firms put yet a greater emphasis on formal training, preferring applicants with a bachelor's or master's degree in engineering, business, economics, or one of the applied sciences. A master's degree is essential for advancement to many top-level purchasing manager jobs.

Regardless of academic preparation, new employees must learn the specifics of their employers' business. Training periods vary in length, with most lasting 1 to 5 years. In wholesale and retail establishments, most trainees begin by selling merchandise, supervising sales workers, checking invoices on material received, and keeping track of stock. As they progress, retail trainees are given increased buying-related responsibilities.

In manufacturing, new purchasing employees often are enrolled in company training programs and spend a considerable amount of time learning about their firm's operations and purchasing practices. They work with experienced purchasers to learn about commodities, prices, suppliers, and markets. In addition, they may be assigned to the production planning department to learn about the material requirements system and the inventory system the company uses to keep production and replenishment functions working smoothly.

Purchasing managers, buyers, and purchasing agents must know how to use both word processing and spreadsheet software, as well as the Internet. Other important qualities include the ability to analyze technical data in suppliers' proposals; good communication, negotiation, and mathematical skills; knowledge of supply-chain management; and the ability to perform financial analyses.

Persons who wish to become wholesale or retail buyers should be good at planning and decisionmaking and have an interest in merchandising. Anticipating consumer preferences and ensuring that goods are in stock when they are needed requires resourcefulness, good judgment, and self-confidence. Buyers must be able to make decisions quickly and to take risks. Marketing skills and the ability to identify products that will sell also are very important. Employers often look for leadership ability, too, because buyers spend a large portion of their time supervising assistant buyers and dealing with manufacturers' representatives and store executives.

Experienced buyers may advance by moving to a department that manages a larger volume or by becoming a merchandise manager. Others may go to work in sales for a manufacturer or wholesaler.

An experienced purchasing agent or buyer may become an assistant purchasing manager in charge of a group of purchasing professionals before advancing to purchasing manager, supply manager, or director of materials management. At the top levels, duties may overlap with other management functions, such as production, planning, logistics, and marketing.

Regardless of industry, continuing education is essential for advancement. Many purchasers participate in seminars offered by professional societies and take college courses in supply management. Professional certification is becoming increasingly important, especially for those just entering the occupation.

In private industry, recognized marks of experience and professional competence are the Accredited Purchasing Practitioner (APP) and Certified Purchasing Manager (CPM) designations, conferred by the Institute for Supply Management, and the Certified Purchasing Professional (CPP) and Certified Professional Purchasing Manager (CPPM) designations, conferred by the American Purchasing Society. In Federal, State, and local government, the indications of professional competence are Certified Professional Public Buyer (CPPB) and Certified Public Purchasing Officer, (CPPO), conferred by the National Institute of Governmental Purchasing. Most of these certifications are awarded only after work-related experience and education requirements are met, and written or oral exams are successfully completed.

Job Outlook

Overall employment of purchasing managers, buyers, and purchasing agents is expected to be slower than the average through the year 2012. Offsetting some declines for purchasing workers in the manufacturing sector will be increases in the services sector. Companies in the services sector, which have typically made purchases on an ad hoc basis, are beginning to realize that centralized purchasing offices may be more efficient. Demand for purchasing workers will be limited by improving software, which has eliminated much of the paperwork involved in ordering and procuring supplies, the increased use of credit cards by some employees to purchase supplies without using the services of the procurement or purchasing office, and the growing number of purchases being made electronically. Despite slower-than-average growth, some job openings will result from the need to replace workers who transfer to other occupations or leave the labor force.

The projected change in employment varies significantly by occupational specialty. Employment of purchasing managers is expected to grow more slowly than the average through 2012. The use of the Internet to conduct electronic commerce has made information easier to obtain, thus increasing the productivity of purchasing managers. The Internet also allows both large and small companies to bid on contracts. Exclusive supply contracts and long-term contracting have allowed companies to negotiate with fewer suppliers less frequently.

Employment of wholesale and retail buyers, except farm products, also is projected to grow more slowly than the average. In the retail industry, mergers and acquisitions have forced buying departments to consolidate. In addition, larger retail stores are removing their buying departments from regional markets and centralizing them at their headquarters

In contrast, employment of purchasing agents, except wholesale, retail, and farm products, is expected to increase about as fast as the average for all occupations through 2012. Despite the greater use of electronic transactions, purchases of complex equipment are more difficult both to automate and to transact electronically. Employment of purchasing agents and buyers, farm products, also is projected to increase about as fast as the average for all occupations, as the need to evaluate the quality and freshness of farm products limits the ease of making purchases electronically.

Persons who have a bachelor's degree in business should have the best chance of obtaining a buyer position in wholesale or retail trade or within government. A bachelor's degree, combined with industry experience and knowledge of a technical field, will be an advantage for those interested in working for a manufacturing or industrial company. Government agencies and larger companies usually require a master's degree in business or public administration for top-level purchasing positions.

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Earnings

Median annual earnings of purchasing managers were $59,890 in 2002. The middle 50 percent earned between $43,670 and $81,950 a year. The lowest 10 percent earned less than $32,330, and the highest 10 percent earned more than $108,140 a year.

Median annual earnings for purchasing agents and buyers, farm products were $40,900 in 2002. The middle 50 percent earned between $31,390 and $55,440 a year. The lowest 10 percent earned less than $23,850, and the highest 10 percent earned more than $76,740 a year.

Median annual earnings for wholesale and retail buyers, except farm products, were $40,780 in 2002. The middle 50 percent earned between $30,040 and $55,670 a year. The lowest 10 percent earned less than $23,270, and the highest 10 percent earned more than $76,070 a year. Median annual earnings in the industries employing the largest numbers of wholesale and retail buyers, except farm products, in 2002 were as follows:

Management of companies and enterprises	$49,150
Grocery and related product wholesalers	42,850
Machinery, equipment, and supplies merchant wholesalers	37,920
Building material and supplies dealers	35,910

Median annual earnings for purchasing agents, except wholesale, retail, and farm products, were $45,090 in 2002. The middle 50 percent earned between $34,820 and $58,780 a year. The lowest 10 percent earned less than $27,950, and the highest 10 percent earned more than $73,990 a year. Median annual earnings in the industries employing the largest numbers of purchasing agents, except of wholesale, retail, and farm products, in 2002 were as follows:

Federal Government	$58,410
Aerospace product and parts manufacturing	52,900
Management of companies and enterprises	50,790
Local government	42,450
General medical and surgical hospitals	34,420

Purchasing managers, buyers, and purchasing agents receive the same benefits package as other workers, including vacations, sick leave, life and health insurance, and pension plans. In addition to receiving standard benefits, retail buyers often earn cash bonuses based on their performance and may receive discounts on merchandise bought from their employer.

Related Occupations

Workers in other occupations who need a knowledge of marketing and the ability to assess consumer demand include those in advertising, marketing, promotions, and public relations, as well as sales managers; food service managers: insurance sales agents; lodging managers; sales engineers; and sales representatives, wholesale and manufacturing.

Sources of Additional Information

Further information about education, training, employment, and certification for purchasing careers is available from any of the following sources:

➤ American Purchasing Society, North Island Center, Suite 203, 8 East Galena Blvd., Aurora, IL 60506. Internet: **http://www.american-purchasing.com**

➤ Institute for Supply Management, P.O. Box 22160, Tempe, AZ 85285-2160. Internet: **http://www.ism.ws**

➤ National Institute of Governmental Purchasing, Inc., 151 Spring St., Suite 300, Herndon, VA 20170-5223. Internet: **http://www.nigp.org**

Top Executives

(0*NET 11-1011.01, 11-1011.02, 11-1021.00, 11-1031.00)

Significant Points

- Top executives are among the highest paid workers; however, long hours, considerable travel, and intense pressure to succeed are common.
- The formal education and experience of top executives varies as widely as the nature of their responsibilities.
- Keen competition is expected because the prestige and high pay attract a large number of qualified applicants.
- Most government chief executives and legislators are elected; local government managers are appointed.

Nature of the Work

All organizations have specific goals and objectives that they strive to meet. Top executives devise strategies and formulate policies to ensure that these objectives are met. Although they have a wide range of titles—such as chief executive officer, chief operating officer, board chair, president, vice president, school superintendent, county administrator, or tax commissioner—all formulate policies and direct the operations of businesses and corporations, nonprofit institutions, governments, and other organizations.

A corporation's goals and policies are established by the *chief executive officer* in collaboration with other top executives, who are overseen by a board of directors. In a large corporation, the chief executive officer meets frequently with subordinate executives to ensure that operations are conducted in accordance with these policies. The chief executive officer of a corporation retains overall accountability; however, a chief operating officer may be delegated several responsibilities, including the authority to oversee executives who direct the activities of various departments and implement the organization's policies on a day-to-day basis. In publicly held and nonprofit corporations, the board of directors ultimately is accountable for the success or failure of the enterprise, and the chief executive officer reports to the board.

The nature of other high-level executives' responsibilities depends upon the size of the organization. In large organizations, the duties of such executives are highly specialized. Some managers, for instance, are responsible for the overall performance of one aspect of the organization, such as manufacturing, marketing, sales, purchasing, finance, personnel, training, administrative services, computer and information systems, property management, transportation, or the legal services department. (Some of these and other management occupations are discussed elsewhere in this section of the *Handbook*.)

In smaller organizations, such as independent retail stores or small manufacturers, a partner, owner, or general manager often is responsible for purchasing, hiring, training, quality control, and day-to-day supervisory duties.

Chief financial officers direct the organization's financial goals, objectives, and budgets. They oversee the investment of funds and manage associated risks, supervise cash management activities, execute capital-raising strategies to support a firm's expansion, and deal with mergers and acquisitions.

Chief information officers are responsible for the overall technological direction of their organizations. They are increasingly involved in the strategic business plan of a firm as part of the executive team. To perform effectively, they also need knowledge of

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administrative procedures, such as budgeting, hiring, and supervision. These managers propose budgets for projects and programs, and make decisions on staff training and equipment purchases. They hire and assign computer specialists, information technology workers, and support personnel to carry out specific parts of the projects. They supervise the work of these employees, review their output, and establish administrative procedures and policies. Chief information officers also provide organizations with the vision to master information technology as a competitive tool.

Chief executives and legislators at the Federal, State, and local levels direct government activities and pass laws that affect us daily. These officials consist of the President and Vice President of the United States; members of Congress; State governors and lieutenant governors; members of the State legislators; county chief executives and commissioners; city, town, and township council members; mayors; and city, county, town, and township managers. (Many small communities have top government officials who are volunteers and receive no salary. These individuals are not included in the employment or salary data cited in this *Handbook* statement.)

Most chief executives are elected by their constituents, but many managers are hired by a local government executive, council, or commission, to whom they are directly responsible. These officials formulate and establish government policy and develop Federal, State, or local laws and regulations.

Chief executives, government—like their counterparts in the private sector—have overall responsibility for the operation of their organizations. Working with legislators, they set goals and arrange programs to attain them. These executives also appoint department heads, who oversee the civil servants who carry out programs enacted by legislative bodies. As in the private sector, government chief executives oversee budgets and ensure that resources are used properly and that programs are carried out as planned.

Chief executive officers carry out a number of other important functions, such as meeting with legislators and constituents to determine the level of support for proposed programs. In addition, they often nominate citizens to boards and commissions, encourage business investment, and promote economic development in their communities. To do all of these varied tasks effectively, chief executives of large governments rely on a staff of highly skilled aides to research issues that concern the public. Executives who control small governmental bodies, however, often do this work by themselves.

Legislators are elected officials who develop, enact, or amend laws. They include U.S. Senators and Representatives, State senators and representatives, and county, city, and town commissioners and council members. Legislators introduce, examine, and vote on bills to pass official legislation. In preparing such legislation, they study staff reports and hear testimony from constituents, representatives of interest groups, board and commission members, and others with an interest in the issue under consideration. They usually must approve budgets and the appointments of nominees for leadership posts whose names are submitted by the chief executive. In some bodies, the legislative council appoints the city, town, or county manager.

General and operations managers plan, direct, or coordinate the operations of companies or public and private sector organizations. Their duties include formulating policies, managing daily operations, and planning the use of materials and human resources, but are too diverse and general in nature to be classified in any one area of management or administration, such as personnel, purchasing, or administrative services. In some organizations, the duties of general and operations managers may overlap the duties of chief executive officers.

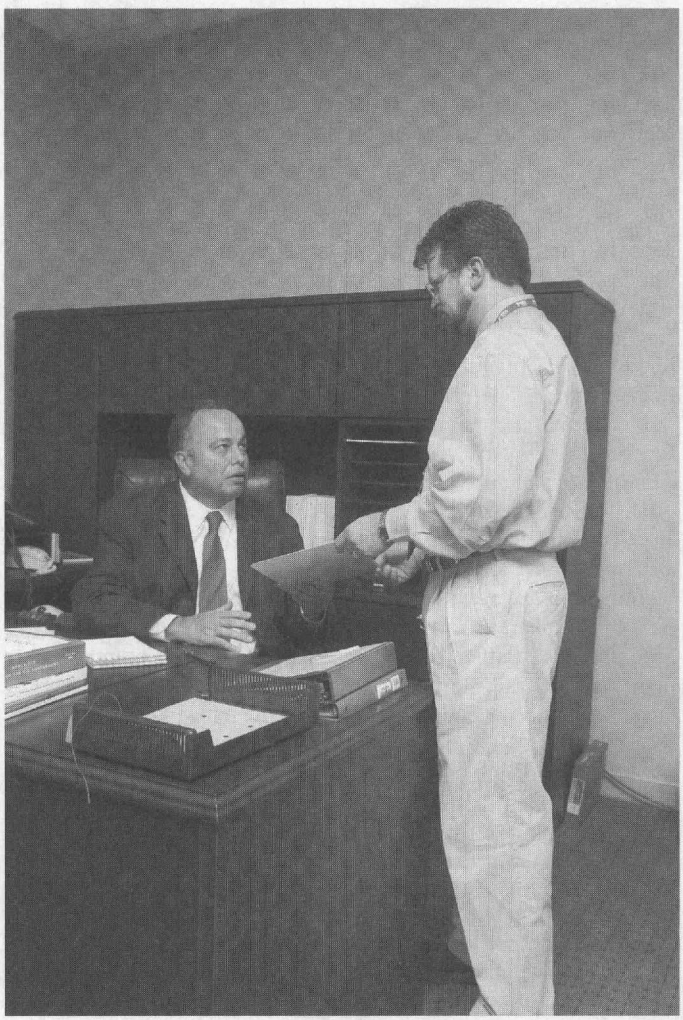
Working Conditions

Top executives typically have spacious offices and numerous support staff. General managers in large firms or nonprofit organizations usually have comfortable offices close to those of the top executives to whom they report. Long hours, including evenings and weekends, are standard for most top executives and general managers, although their schedules may be flexible.

Substantial travel between international, national, regional, and local offices to monitor operations and meet with customers, staff, and other executives often is required of managers and executives. Many managers and executives also attend meetings and conferences sponsored by various associations. The conferences provide an opportunity to meet with prospective donors, customers, contractors, or government officials and allow managers and executives to keep abreast of technological and managerial innovations.

In large organizations, job transfers between local offices or subsidiaries are common for persons on the executive career track. Top executives are under intense pressure to succeed; depending on the organization, this may mean earning higher profits, providing better service, or attaining fundraising and charitable goals. Executives in charge of poorly performing organizations or departments usually find their jobs in jeopardy.

The working conditions of legislators and government chief executives vary with the size and budget of the governmental unit. Time spent at work ranges from a few hours a week for some local



Top executives devise strategies, formulate policies, and direct operations to ensure that an organization's objectives are met.

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leaders to stressful weeks of 60 or more hours for members of the U.S. Congress. Similarly, some jobs require only occasional out-of-town travel, while others involve long periods away from home, such as when attending sessions of the legislature.

U.S. Senators and Representatives, governors and lieutenant governors, and chief executives and legislators in municipalities work full time, year-round, as do most county and city managers. Many State legislators work full time on government business while the legislature is in session (usually for 2 to 6 months a year or every other year) and work only part time when the legislature is not in session. Some local elected officials work a schedule that is officially designated as part time, but actually is the equivalent of a full-time schedule when unpaid duties are taken into account. In addition to their regular schedules, most chief executives are on call to handle emergencies.

Employment

Top executives held about 2.7 million jobs in 2002. Employment by detailed occupation was distributed as follows:

General and operations managers	2,049,000
Chief executives	553,000
Legislators	67,000

Top executives are found in every industry, but service-providing industries, including government, employ almost 8 out of 10.

Chief executives and legislators in the Federal Government consist of the 100 Senators, 435 Representatives, and the President and Vice President. State governors, lieutenant governors, legislators, chief executives, professional managers, and council and commission members of local governments make up the remainder.

Government chief executives and legislators who do not hold full-time, year-round positions often continue to work in the occupation that they held before being elected.

Training, Other Qualifications, and Advancement

The formal education and experience of top executives varies as widely as the nature of their responsibilities. Many top executives have a bachelor's or higher degree in business administration or liberal arts. College presidents typically have a doctorate in the field in which they originally taught, and school superintendents often have a master's degree in education administration. (For information on lower level managers in educational services, see the *Handbook* statement on education administrators.) A brokerage office manager needs a strong background in securities and finance, and department store executives generally have extensive experience in retail trade.

Some top executives in the public sector have a background in public administration or liberal arts. Others might have a background related to their jobs. For example, a health commissioner might have a graduate degree in health services administration or business administration. (For information on lower level managers in health services, see the *Handbook* statement on medical and health services managers.)

Because many top executive positions are filled by promoting experienced, lower level managers when an opening occurs, many top managers have been promoted from within the organization. In industries such as retail trade or transportation, for instance, it is possible for individuals without a college degree to work their way up within the company and become managers. However, many companies prefer that their top executives have specialized backgrounds and, therefore, hire individuals who have been managers in other organizations.

Top executives must have highly developed personal skills. An analytical mind able to quickly assess large amounts of information and data is very important, as is the ability to consider and evaluate the interrelationships of numerous factors. Top executives also must be able to communicate clearly and persuasively. Other qualities critical for managerial success include leadership, self-confidence, motivation, decisiveness, flexibility, sound business judgment, and determination.

Advancement may be accelerated by participation in company training programs that impart a broader knowledge of company policy and operations. Managers also can help their careers by becoming familiar with the latest developments in management techniques at national or local training programs sponsored by various industry and trade associations. Managers who have experience in a particular field, such as accounting or engineering, may attend executive development programs to facilitate their promotion to an even higher level. Participation in conferences and seminars can expand knowledge of national and international issues influencing the organization and can help the participants to develop a network of useful contacts.

General managers may advance to top executive positions, such as executive vice president, in their own firm or they may take a corresponding position in another firm. They may even advance to peak corporate positions such as chief operating officer or chief executive officer. Chief executive officers often become members of the board of directors of one or more firms, typically as a director of their own firm and often as chair of its board of directors. Some top executives establish their own firms or become independent consultants.

Apart from meeting minimum age, residency, and citizenship requirements, candidates for a legislative position have no established training or qualifications. Candidates come from a wide variety of occupations—such as lawyer, private sector manager or executive, or business owner—but many do have some political experience as staffers or members of government bureaus, boards, or commissions. Successful candidates usually become well known through their political campaigns and some have built voter name recognition through their work with community religious, fraternal, or social organizations.

Increasingly, candidates target information to voters through advertising paid for by their respective campaigns, so fundraising skills are essential for candidates. Management-level work experience and public service help to develop the fundraising, budgeting, public speaking, and problem-solving skills that are needed to run an effective political campaign. Candidates must make decisions quickly, sometimes on the basis of limited or contradictory information. They also should be able to inspire and motivate their constituents and staff. Additionally, they must know how to reach compromises and satisfy conflicting demands of constituents. National, State, and some local campaigns require massive amounts of energy and stamina, traits vital to successful candidates.

Virtually all town, city, and county managers have at least a bachelor's degree, and many hold a higher degree. A master's degree in public administration is recommended, including courses in public financial management and legal issues in public administration. Working in management support positions in government is a prime source of the experience and personal contacts required to eventually secure a manager position. For example, applicants often gain experience as management analysts or assistants in government departments, working for committees, councils, or chief executives. In this capacity, they learn about planning, budgeting, civil engineering, and other aspects of running a government. With

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sufficient experience, they may be hired to manage a small government.

Generally, a town, city, or county manager is first hired by a smaller community. Advancement often takes the form of securing positions with progressively larger towns, cities, or counties. A broad knowledge of local issues, combined with communication skills and the ability to compromise, are essential for advancement in this field.

Advancement opportunities for elected officials are not clearly defined. Because elected positions normally require a period of residency and because local public support is critical, officials usually advance to other offices only in the jurisdictions where they live. For example, council members may run for mayor or for a position in the State government, and State legislators may run for governor or for the U.S. Congress. Many officials are not politically ambitious, however, and do not seek advancement. Others lose their bids for reelection or voluntarily leave the occupation. A lifetime career as a government chief executive or legislator is rare.

Job Outlook

Keen competition is expected for top executive positions, with the prestige and high pay attracting a large number of qualified applicants. Because this is a large occupation, numerous openings will occur each year as executives transfer to other positions, start their own businesses, or retire. However, many executives who leave their jobs transfer to other executive positions, which tend to limit the number of job openings for new entrants.

Experienced managers whose accomplishments reflect strong leadership qualities and the ability to improve the efficiency or competitive position of an organization will have the best opportunities. In an increasingly global economy, experience in international economics, marketing, information systems, and knowledge of several languages also may be beneficial.

Employment of top executives—including chief executives, general and operations managers, and legislators—is expected to grow about as fast as the average for all occupations through 2012. Because top managers are essential to the success of any organization, they should be more immune to automation and corporate restructuring—factors that are expected to adversely affect employment of lower level managers. Projected employment growth of top executives varies by industry, reflecting the projected change in industry employment over the 2002-12 period. For example, employment growth is expected to be faster than average in professional, scientific, and technical services and administrative and support services. However, employment is projected to decline in some manufacturing industries.

Few new governments at any level are likely to be formed, and the number of chief executives and legislators in existing governments rarely changes. However, some increase will occur at the local level as counties, cities, and towns take on professional managers or move from volunteer to paid career executives to deal with population growth, Federal regulations, and long-range planning.

Elections give newcomers the chance to unseat incumbents or to fill vacated positions. The level of competition in elections varies from place to place. There tends to be less competition in small communities that offer part-time positions with low or no salaries and little or no staff, compared with large municipalities with prestigious full-time positions offering high salaries, staff, and greater exposure.

Earnings

Top executives are among the highest paid workers in the U.S. economy. However, salary levels vary substantially depending upon the level of managerial responsibility, length of service, and type, size, and location of the firm. For example, a top manager in a very large corporation can earn significantly more than a counterpart in a small firm.

Median annual earnings of general and operations managers in 2002 were $68,210. The middle 50 percent earned between $45,720 and $104,970. Because the specific responsibilities of general and operations managers vary significantly within industries, earnings also tend to vary considerably. Median annual earnings in the industries employing the largest numbers of general and operations managers in 2002 were:

Management of companies and enterprises	$94,600
Building equipment contractors	74,550
Depository credit intermediation	68,110
Local government	60,470
Grocery stores	44,980

Median annual earnings of chief executives in 2002 were $126,260. Median annual earnings in the industries employing the largest numbers of chief executives in 2002 were:

Management of companies and enterprises	$145,600
Architectural, engineering, and related services	133,880
Depository credit intermediation	123,220
Colleges, universities, and professional schools	103,120
Local government	73,990

Salaries vary substantially by type and level of responsibilities and by industry. According to a survey by Abbott, Langer & Associates, the median income of chief executive officers in the nonprofit sector was $81,000 in 2003, but some of the highest paid made $600,000.

In addition to salaries, total compensation often includes stock options, dividends, and other performance bonuses. The use of executive dining rooms and company aircraft and cars, expense allowances, and company-paid insurance premiums and physical examinations also are among benefits commonly enjoyed by top executives in private industry. A number of chief executive officers also are provided with company-paid club memberships, a limousine with chauffeur, and other amenities.

Median annual earnings of legislators were $15,220 in 2002. The middle 50 percent earned between $13,180 and $38,540. The lowest 10 percent earned less than $12,130, and the highest 10 percent earned more than $69,380.

Earnings of public administrators vary widely, depending on the size of the governmental unit and on whether the job is part time, full time and year round, or full time for only a few months a year. Salaries range from little or nothing for a small-town council member to $400,000 a year for the President of the United States.

The National Conference of State Legislatures reports that the annual salary for rank-and-file legislators in the 40 States that paid an annual salary ranged from $10,000 to more than $99,000 in 2003. In eight States, legislators received a daily salary plus an additional allowance for living expenses while legislatures were in session.

The Council of State Governments reports in its *Book of the States, 2002-2003* that gubernatorial annual salaries ranged from $50,000 in American Samoa to $179,000 in New York. In addition to a salary, most governors received benefits such as transportation and an official residence. In 2003, U.S. Senators and Representatives earned $154,700, the Senate and House Majority and Minority leaders earned $171,900, and the Vice President was paid $198,600.

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Related Occupations
Top executives plan, organize, direct, control, and coordinate the operations of an organization and its major departments or programs. The members of the board of directors and lower-level managers also are involved in these activities. Many other management occupations have similar responsibilities; however, they are concentrated in specific industries or are responsible for a specific department within an organization. A few examples are administrative services managers, education administrators, financial managers, food service managers, and advertising, marketing, promotions, public relations, and sales managers.

Sources of Additional Information
For a variety of information on top executives, including educational programs and job listings, contact:
➤ American Management Association, 1601 Broadway, 6th Floor, New York, NY 10019. Internet: **http://www.amanet.org**
➤ Institute of Certified Professional Managers, James Madison University, MSC 5504, Harrisonburg, VA 22807. Internet: **http://cob.jmu.edu/icpm/**
➤ International Public Management Association for Human Resources, 1617 Duke St., Alexandria, VA 22314. Internet: **http://www.ipma-hr.org**
➤ National Management Association, 2210 Arbor Blvd., Dayton, OH 45439. Internet: **http://www.nma1.org**

Information on appointed officials in local government can be obtained from:
➤ Council of State Governments, P.O. Box 11910, 2760 Research Park Dr., Lexington, KY 40578-1910. Internet: **http://www.statesnews.org**
➤ National Association of Counties, 440 First St. NW., 8th Floor, Washington, DC 20001. Internet: **http://www.naco.org**
➤ National Conference of State Legislatures, 7700 East First Place, Denver, CO 80230. Internet: **http://www.ncsl.org**
➤ National League of Cities, 1301 Pennsylvania Ave. NW., Washington, DC 20004. Internet: **http://www.nlc.org**

For information on executive financial management careers and certification, contact:
➤ Financial Executives International, 200 Campus Dr., P.O. Box 674, Florham Park, NJ 07932-0674. Internet: **http://www.fei.org**
➤ Financial Management Association International, College of Business Administration, University of South Florida, 4202 East Fowler Ave., BSN 3331, Tampa, FL 33620-5500. Internet: **http://www.fma.org**

Business and Financial Operations Occupations

Accountants and Auditors

(0*NET 13-2011.01, 13-2011.02)

Significant Points

- Most jobs require at least a bachelor's degree in accounting or a related field.
- Overall job opportunities should be favorable, although jobseekers who obtain professional recognition through certification or licensure, a master's degree, proficiency in accounting and auditing computer software, or specialized expertise will have an advantage.
- An increase in the number of businesses, changing financial laws and regulations, and increased scrutiny of company finances will drive growth of accountants and auditors.

Nature of the Work
Accountants and auditors help to ensure that the Nation's firms are run efficiently, its public records kept accurately, and its taxes paid properly and on time. They perform these vital functions by offering an increasingly wide array of business and accounting services to their clients. These services include public, management, and government accounting, as well as internal auditing. Beyond the fundamental tasks of the occupation—preparing, analyzing, and verifying financial documents in order to provide information to clients—many accountants now are required to possess a wide range of knowledge and skills. Accountants and auditors are broadening the services they offer to include budget analysis, financial and investment planning, information technology consulting, and limited legal services.

Specific job duties vary widely among the four major fields of accounting: *public, management, government, and internal.*

Public accountants perform a broad range of accounting, auditing, tax, and consulting activities for their clients, who may be corporations, governments, nonprofit organizations, or individuals. For example, some public accountants concentrate on tax matters, such as advising companies of the tax advantages and disadvantages of certain business decisions and preparing individual income tax returns. Others offer advice in areas such as compensation or employee healthcare benefits, the design of accounting and data-processing systems, and the selection of controls to safeguard assets. Still others audit clients' financial statements and report to investors and authorities that the statements have been correctly prepared and reported. Public accountants, many of whom are Certified Public Accountants (CPAs), generally have their own businesses or work for public accounting firms.

Some public accountants specialize in forensic accounting—investigating and interpreting white collar crimes such as securities fraud and embezzlement, bankruptcies and contract disputes, and other complex and possibly criminal financial transactions, such as money laundering by organized criminals. Forensic accountants combine their knowledge of accounting and finance with law and investigative techniques in order to determine if illegal activity is going on. Many forensic accountants work closely with law enforcement personnel and lawyers during investigations and often appear as expert witnesses during trials.

In response to the recent accounting scandals, new Federal legislation restricts the nonauditing services that public accountants can provide to clients. If an accounting firm audits a client's financial statements, that same firm cannot provide advice in the areas of human resources, technology, investment banking, or legal matters, although accountants may still advise on tax issues, such as establishing a tax shelter. Accountants may still advise other clients in these areas, or may provide advice within their own firm.

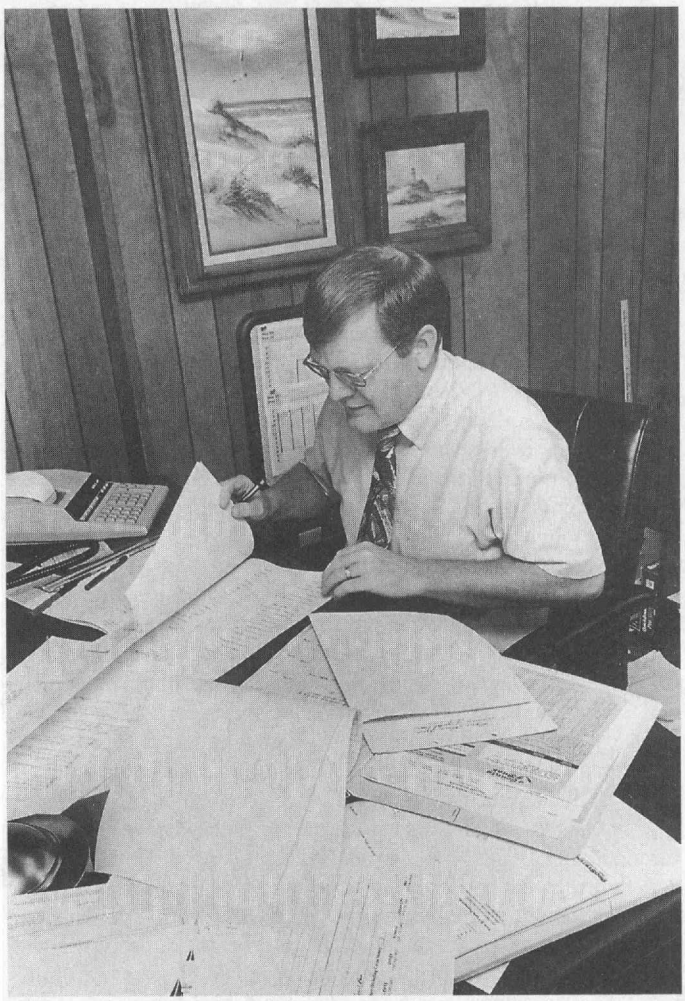
Management accountants—also called cost, managerial, industrial, corporate, or private accountants—record and analyze the financial information of the companies for which they work. Other responsibilities include budgeting, performance evaluation, cost management, and asset management. Usually, management accoun-

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tants are part of executive teams involved in strategic planning or new-product development. They analyze and interpret the financial information that corporate executives need to make sound business decisions. They also prepare financial reports for nonmanagement groups, including stockholders, creditors, regulatory agencies, and tax authorities. Within accounting departments, they may work in various areas, including financial analysis, planning and budgeting, and cost accounting.

Government accountants and auditors work in the public sector, maintaining and examining the records of government agencies and auditing private businesses and individuals whose activities are subject to government regulations or taxation. Accountants employed by Federal, State, and local governments guarantee that revenues are received and expenditures are made in accordance with laws and regulations. Those who are employed by the Federal Government may work as Internal Revenue Service agents or in financial management, financial institution examination, or budget analysis and administration.

Internal auditors verify the accuracy of their organization's internal records and check for mismanagement, waste, or fraud. Internal auditing is an increasingly important area of accounting and auditing. Internal auditors examine and evaluate their firms' financial and information systems, management procedures, and internal controls to ensure that records are accurate and controls are adequate to protect against fraud and waste. They also review company operations—evaluating their efficiency, effectiveness, and compliance with corporate policies and procedures, laws, and government regulations. There are many types of highly specialized auditors, such as electronic data-processing, environmental, engineering, legal, insurance premium, bank, and healthcare auditors. As computer systems make information timelier, internal auditors help managers to base their decisions on actual data, rather than personal observation. Internal auditors also may recommend controls for their organization's computer system to ensure the reliability of the system and the integrity of the data.



Accountants and auditors carefully analyze financial data and prepare financial reports and tax returns for clients.

Computers are rapidly changing the nature of the work for most accountants and auditors. With the aid of special software packages, accountants summarize transactions in standard formats for financial records and organize data in special formats for financial analysis. These accounting packages greatly reduce the amount of tedious manual work associated with data management and recordkeeping. Computers enable accountants and auditors to be more mobile and to use their clients' computer systems to extract information from databases and the Internet. As a result, a growing number of accountants and auditors with extensive computer skills specialize in correcting problems with software or in developing software to meet unique data management and analytical needs. Accountants also are beginning to perform more technical duties, such as implementing, controlling, and auditing systems and networks, and developing technology plans and budgets.

Increasingly, accountants also are assuming the role of a personal financial advisor. They not only provide clients with accounting and tax help, but also help them develop personal budgets, manage assets and investments, plan for retirement, and recognize and reduce exposure to risks. This role is a response to client demands for a single trustworthy individual or firm to meet all of their financial needs. However, accountants are restricted from providing these services to clients whose financial statements they also prepare. (See financial analysts and personal financial advisors elsewhere in the *Handbook.*)

Working Conditions

Most accountants and auditors work in a typical office setting. Self-employed accountants may be able to do part of their work at home. Accountants and auditors employed by public accounting firms and government agencies may travel frequently to perform audits at branches of their firm, clients' places of business, or government facilities.

Most accountants and auditors generally work a standard 40-hour week, but many work longer hours, particularly if they are self-employed and have numerous clients. Tax specialists often work long hours during the tax season.

Employment

Accountants and auditors held about 1.1 million jobs in 2002. They worked throughout private industry and government, but 1 out of 5 wage and salary accountants worked for accounting, tax preparation, bookkeeping, and payroll services firms. Approximately 1 out of 10 accountants or auditors were self-employed.

Many accountants and auditors are unlicensed management accountants, internal auditors, or government accountants and auditors; however, a large number are licensed Certified Public Accountants. Most accountants and auditors work in urban areas, where public accounting firms and central or regional offices of businesses are concentrated.

Some individuals with backgrounds in accounting and auditing are full-time college and university faculty; others teach part time while working as self-employed accountants or employed as accountants for private industry or government. (Elsewhere in the *Handbook* see teachers—postsecondary.)

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Training, Other Qualifications, and Advancement

Most accountant and auditor positions require at least a bachelor's degree in accounting or a related field. Beginning accounting and auditing positions in the Federal Government, for example, usually require 4 years of college (including 24 semester hours in accounting or auditing) or an equivalent combination of education and experience. Some employers prefer applicants with a master's degree in accounting, or with a master's degree in business administration with a concentration in accounting.

Previous experience in accounting or auditing can help an applicant get a job. Many colleges offer students an opportunity to gain experience through summer or part-time internship programs conducted by public accounting or business firms. In addition, practical knowledge of computers and their applications in accounting and internal auditing is a great asset for jobseekers in the accounting field.

Professional recognition through certification or licensure provides a distinct advantage in the job market. CPAs are licensed by a State Board of Accountancy. The vast majority of States require CPA candidates to be college graduates, but a few States substitute a number of years of public accounting experience for a college degree. As of early 2003, based on recommendations made by the American Institute of Certified Public Accountants (AICPA), 42 States and the District of Columbia required CPA candidates to complete 150 semester hours of college coursework—an additional 30 hours beyond the usual 4-year bachelor's degree. Another five States—Arizona, Minnesota, New Mexico, New York, and Virginia—have adopted similar legislation that will become effective between 2004 and 2009. Colorado, Delaware, New Hampshire, and Vermont are the only States that do not require 150 semester hours. Many schools have altered their curricula accordingly with most programs offering masters degrees as part of the 150 hours, and prospective accounting majors should carefully research accounting curricula and the requirements of any States in which they hope to become licensed.

All States use the four-part Uniform CPA Examination prepared by the AICPA. The 2-day CPA examination is rigorous, and only about one-quarter of those who take it each year passes every part they attempt. Candidates are not required to pass all four parts at once, but most States require candidates to pass at least two parts for partial credit and to complete all four sections within a certain period. Most States also require applicants for a CPA certificate to have some accounting experience. In May 2004, the CPA exam will become computerized and offered quarterly at various testing centers throughout the United States.

The AICPA also offers members with valid CPA certificates the option to receive the Accredited in Business Valuation (ABV), Certified Information Technology Professional (CITP), or Personal Financial Specialist (PFS) designations. The addition of these designations to the CPA distinguishes those accountants with a certain level of expertise in the nontraditional areas in which accountants are practicing more frequently. The ABV designation requires a written exam, as well as completion of a minimum of 10 business valuation projects that demonstrate a candidate's experience and competence. The CITP requires payment of a fee, a written statement of intent, and the achievement of a set number of points awarded for business experience and education. Those who do not meet the required number of points may substitute a written exam. Candidates for the PFS designation also must achieve a certain level of points, based on experience and education, and must pass a written exam and submit references.

Nearly all States require CPAs and other public accountants to complete a certain number of hours of continuing professional education before their licenses can be renewed. The professional associations representing accountants sponsor numerous courses, seminars, group study programs, and other forms of continuing education.

Accountants and auditors also can seek to obtain other forms of credentials from professional societies on a voluntary basis. Voluntary certification can attest to professional competence in a specialized field of accounting and auditing. It also can certify that a recognized level of professional competence has been achieved by accountants and auditors who have acquired some skills on the job, without the formal education or public accounting work experience needed to meet the rigorous standards required to take the CPA examination.

The Institute of Management Accountants (IMA) confers the Certified Management Accountant (CMA) designation upon applicants who complete a bachelor's degree or attain a minimum score on specified graduate school entrance exams. Applicants, who must have worked at least 2 years in management accounting, also must pass a four-part examination, agree to meet continuing education requirements, and comply with standards of professional conduct. The CMA program is administered by the Institute of Certified Management Accountants, an affiliate of the IMA.

Graduates from accredited colleges and universities who have worked for 2 years as internal auditors and have passed a four-part examination may earn the Certified Internal Auditor (CIA) designation from the Institute of Internal Auditors (IIA). The IIA recently implemented three new specialty designations—Certification in Control Self—Assessment (CCSA), Certified Government Auditing Professional (CGAP), and Certified Financial Services Auditor (CFSA). Requirements are similar to those of the CIA. The Information Systems Audit and Control Association confers the Certified Information Systems Auditor (CISA) designation upon candidates who pass an examination and have 5 years of experience in auditing information systems. Auditing or data-processing experience and a college education may be substituted for up to 2 years of work experience in this program. For instance, an internal auditor might be a CPA, CIA, and CISA.

The Accreditation Council for Accountancy and Taxation, a satellite organization of the National Society of Public Accountants, confers three designations—Accredited Business Accountant (ABA), Accredited Tax Advisor (ATA), and Accredited Tax Preparer (ATP)—on accountants specializing in tax preparation for small- and medium-sized businesses. Candidates for the ABA must pass an exam, while candidates for the ATA and ATP must complete the required coursework and pass an exam. Often, a practitioner will hold multiple licenses and designations.

The Association of Government Accountants grants the Certified Government Financial Manager (CGFM) designation for accountants, auditors, and other government financial personnel at the Federal, State, and local levels. Candidates must have a minimum of a bachelor's degree, 24 hours of study in financial management, and 2 years' experience in government, and must pass a series of three exams. The exams cover topics in governmental environment; governmental accounting, financial reporting, and budgeting; and financial management and control.

Persons planning a career in accounting should have an aptitude for mathematics and be able to analyze, compare, and interpret facts and figures quickly. They must be able to clearly communicate both written and verbally the results of their work to clients and managers. Accountants and auditors must be good at working with people, as well as with business systems and computers. At a minimum, accountants should be familiar with basic accounting software packages. Because financial decisions are made based on their

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statements and services, accountants and auditors should have high standards of integrity.

Capable accountants and auditors may advance rapidly; those having inadequate academic preparation may be assigned routine jobs and find promotion difficult. Many graduates of junior colleges and business and correspondence schools, as well as bookkeepers and accounting clerks who meet the education and experience requirements set by their employers, can obtain junior accounting positions and advance to positions with more responsibilities by demonstrating their accounting skills on the job.

Beginning public accountants usually start by assisting with work for several clients. They may advance to positions with more responsibility in 1 or 2 years, and to senior positions within another few years. Those who excel may become supervisors, managers, or partners; open their own public accounting firm; or transfer to executive positions in management accounting or internal auditing in private firms.

Management accountants often start as cost accountants, junior internal auditors, or trainees for other accounting positions. As they rise through the organization, they may advance to accounting manager, chief cost accountant, budget director, or manager of internal auditing. Some become controllers, treasurers, financial vice presidents, chief financial officers, or corporation presidents. Many senior corporation executives have a background in accounting, internal auditing, or finance.

In general, public accountants, management accountants, and internal auditors have much occupational mobility. Practitioners often shift into management accounting or internal auditing from public accounting, or between internal auditing and management accounting. However, it is less common for accountants and auditors to move from either management accounting or internal auditing into public accounting.

Job Outlook

Employment of accountants and auditors is expected to grow about as fast as the average for all occupations through the year 2012. An increase in the number of businesses, changing financial laws and regulations, and increased scrutiny of company finances will drive growth. In addition to openings resulting from growth, the need to replace accountants and auditors who retire or transfer to other occupations will produce numerous job openings in this large occupation.

As the economy grows, the number of business establishments will increase, requiring more accountants and auditors to set up books, prepare taxes, and provide management advice. As these businesses grow, the volume and complexity of information developed by accountants and auditors regarding costs, expenditures, and taxes will increase as well. Increased need for accountants and auditors will arise from changes in legislation related to taxes, financial reporting standards, business investments, mergers, and other financial matters. The growth of international business also has led to more demand for accounting expertise and services related to international trade and accounting rules, as well as to international mergers and acquisitions. These trends should create more jobs for accountants and auditors.

As a result of the recent accounting scandals, Federal legislation was enacted to increase penalties, and make company executives personally responsible for falsely reporting financial information. These changes should lead to increased scrutiny of company finances and accounting procedures, and should create opportunities for accountants and auditors, particularly Certified Public Accountants, to more thoroughly audit financial records. In order to ensure finances comply with the law before public accountants conduct audits, management accountants and internal auditors will increasingly be needed to discover and eliminate fraud. And, in an effort to make government agencies more efficient and accountable, demand for government accountants should increase.

Increased awareness of financial crimes such as embezzlement, bribery, and securities fraud will also increase the demand for forensic accountants to detect illegal financial activity by individuals, companies, and organized crime rings. Computer technology has made these crimes easier to commit, and it is on the rise. But, development of new computer software and electronic surveillance technology has also made tracking down financial criminals easier, thus increasing the ease and likelihood that forensic accountants will discover their crimes. As success rates of investigations grow, demand will also grow for forensic accountants.

The changing role of accountants and auditors also will spur job growth, although this growth will be limited as a result of financial scandals. In response to demand, some accountants were offering more financial management and consulting services as they assumed a greater advisory role and developed more sophisticated accounting systems. Since Federal legislation now prohibits accountants from providing nontraditional services to clients whose books they audit, opportunities for accountants to do non-audit work could be limited. However, accountants will still be able to advise on other financial matters for clients that are not publicly traded companies, and for nonaudit clients, but growth in these areas will be slower than in the past. Also, due to the increasing popularity of tax preparation firms and computer software, accountants will shift away from tax preparation. As computer programs continue to simplify some accounting-related tasks, clerical staff will increasingly handle many routine calculations.

Overall, job opportunities for accountants and auditors should be favorable. After most States instituted the 150-hour rule for CPAs, enrollment in accounting programs declined; however, enrollment is slowly beginning to grow again as more students are attracted to the profession because of the attention from the accounting scandals. Those who pursue a CPA should have excellent job prospects. However, many accounting graduates are instead pursuing other certifications such as the CMA and CIA, so competition could be greater in management accounting and internal auditing than in public accounting. Regardless of specialty, accountants and auditors who have earned professional recognition through certification or licensure should have the best job prospects. Applicants with a master's degree in accounting, or a master's degree in business administration with a concentration in accounting, also will have an advantage. In the aftermath of the accounting scandals, professional certification is even more important in order to ensure that accountants' credentials and ethics are sound.

Proficiency in accounting and auditing computer software, or expertise in specialized areas such as international business, specific industries, or current legislation, may be helpful in landing certain accounting and auditing jobs. In addition, employers increasingly seek applicants with strong interpersonal and communication skills. Because many accountants work on teams with others from different backgrounds, they must be able to communicate accounting and financial information clearly and concisely. Regardless of one's qualifications, however, competition will remain keen for the most prestigious jobs in major accounting and business firms.

Earnings

In 2002, the median wage and salary annual earnings of accountants and auditors were $47,000. The middle half of the occupation earned between $37,210 and $61,630. The top 10 percent of accountants and auditors earned more than $82,730, and the bottom

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10 percent earned less than $30,320. In 2002, median annual earnings in the industries employing the largest numbers of accountants and auditors were:

Federal Government	$51,070
Accounting, tax preparation, bookkeeping, and payroll services	49,520
Management of companies and enterprises	49,110
Local government	44,690
State government	42,680

According to a salary survey conducted by the National Association of Colleges and Employers, bachelor's degree candidates in accounting received starting offers averaging $40,647 a year in 2003; master's degree candidates in accounting were initially offered $42,241.

According to a 2003 salary survey conducted by Robert Half International, a staffing services firm specializing in accounting and finance, accountants and auditors with up to 1 year of experience earned between $29,500 and $40,500. Those with 1 to 3 years of experience earned between $34,000 and $49,500. Senior accountants and auditors earned between $41,000 and $61,500; managers earned between $47,500 and $78,750; and directors of accounting and auditing earned between $66,750 and $197,500 a year. The variation in salaries reflects differences in size of firm, location, level of education, and professional credentials.

In the Federal Government, the starting annual salary for junior accountants and auditors was $23,442 in 2003. Candidates who had a superior academic record might start at $29,037, while applicants with a master's degree or 2 years of professional experience usually began at $35,519. Beginning salaries were slightly higher in selected areas where the prevailing local pay level was higher. Accountants employed by the Federal Government in nonsupervisory, supervisory, and managerial positions averaged $69,370 a year in 2003; auditors averaged $73,247.

Related Occupations

Accountants and auditors design internal control systems and analyze financial data. Others for whom training in accounting is valuable include budget analysts; cost estimators; loan officers; financial analysts and personal financial advisors; tax examiners, collectors, and revenue agents; bill and account collectors; and bookkeeping, accounting, and auditing clerks. Recently, accountants have assumed the role of management analysts and are involved in the design, implementation, and maintenance of accounting software systems. Others who perform similar work include computer programmers, computer software engineers, and computer support specialists and systems administrators.

Sources of Additional Information

Information on accredited accounting programs can be obtained from:

➤ AACSB International—Association to Advance Collegiate Schools of Business, 600 Emerson Rd., Suite 300, St. Louis, MO 63141. Internet: **http://www.aacsb.edu/accreditation/AccreditedMembers.asp**

Information about careers in certified public accounting and CPA standards and examinations may be obtained from:

➤ American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, NY 10036. Internet: **http://www.aicpa.org**

Information on CPA licensure requirements by State may be obtained from:

➤ National Association of State Boards of Accountancy, 150 Fourth Ave. North, Suite 700, Nashville, TN 37219-2417. Internet: **http://www.nasba.org**

Information on careers in management accounting and the CMA designation may be obtained from:

➤ Institute of Management Accountants, 10 Paragon Dr., Montvale, NJ 07645-1760. Internet: **http://www.imanet.org**

Information on the Accredited in Accountancy, Accredited Business Accountant, Accredited Tax Advisor, or Accredited Tax Preparer designations may be obtained from:

➤ Accreditation Council for Accountancy and Taxation, 1010 North Fairfax St., Alexandria, VA 22314. Internet: **http://www.acatcredentials.org**

Information on careers in internal auditing and the CIA designation may be obtained from:

➤ The Institute of Internal Auditors, 247 Maitland Ave., Altamonte Springs, FL 32701-4201. Internet: **http://www.theiia.org**

Information on careers in information systems auditing and the CISA designation may be obtained from:

➤ Information Systems Audit and Control Association, 3701 Algonquin Rd., Suite 1010, Rolling Meadows, IL 60008. Internet: **http://www.isaca.org**

Information on careers in government accounting and the CGFM designation may be obtained from:

➤ Association of Government Accountants, 2208 Mount Vernon Ave., Alexandria, VA 22301. Internet: **http://www.agacgfm.org**

Information on obtaining an accounting or auditing position with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Budget Analysts

(0*NET 13-2031.00)

Significant Points

- Almost half of all budget analysts work in Federal, State, and local governments.
- While a bachelor's degree generally is the minimum educational requirement, many employers prefer or require a master's degree.
- Competition for jobs is expected.

Nature of the Work

Deciding how to efficiently distribute limited financial resources is an important challenge in all organizations. In most large and complex organizations, this task would be nearly impossible without budget analysts. These workers play the primary role in the development, analysis, and execution of budgets, which are used to allocate current resources and estimate future financial requirements. Without effective budget analysis and feedback about budgetary problems, many private and public organizations could become bankrupt.

Budget analysts can be found in private industry, nonprofit organizations, and the public sector. In private sector firms, a budget analyst examines, analyzes, and seeks new ways to improve efficiency and increase profits. Although analysts working in nonprofit and governmental organizations usually are not concerned with profits, they still try to find the most efficient distribution of funds and other resources among various departments and programs.

Budget analysts have many responsibilities in these organizations, but their primary task is providing advice and technical assistance in the preparation of annual budgets. At the beginning of each budget cycle, managers and department heads submit proposed op-

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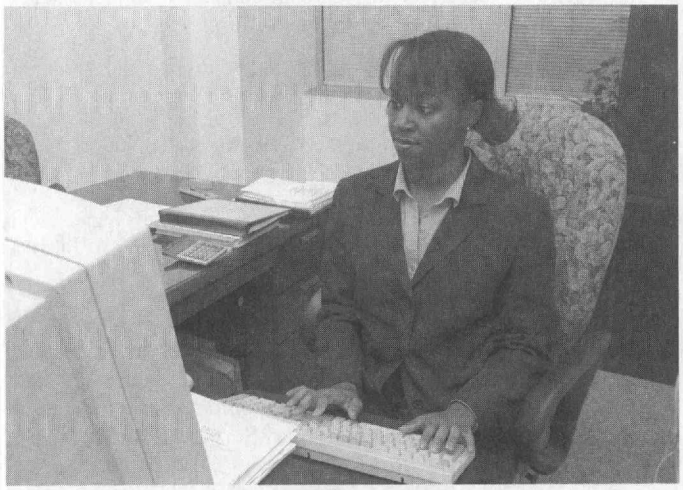
erational and financial plans to budget analysts for review. These plans outline prospective programs, including proposed funding increases and new initiatives, estimated costs and expenses, and capital expenditures needed to finance these programs.

Analysts examine the budget estimates or proposals for completeness, accuracy, and conformance with established procedures, regulations, and organizational objectives. Sometimes, they employ cost-benefit analysis to review financial requests, assess program tradeoffs, and explore alternative funding methods. They also examine past and current budgets and research economic and financial developments that affect the organization's spending. This process enables analysts to evaluate proposals in terms of the organization's priorities and financial resources.

After this initial review process, budget analysts consolidate the individual departmental budgets into operating and capital budget summaries. These summaries contain comments and statements that support or argue against funding requests. Budget summaries then are submitted to senior management or, as is often the case in local and State governments, to appointed or elected officials. Budget analysts then help the chief operating officer, agency head, or other top managers analyze the proposed plan and devise possible alternatives if the projected results are unsatisfactory. The final decision to approve the budget, however, usually is made by the organization head in a private firm or by elected officials, such as the State legislative body, in government.

Throughout the remainder of the year, analysts periodically monitor the budget by reviewing reports and accounting records to determine if allocated funds have been spent as specified. If deviations appear between the approved budget and actual performance, budget analysts may write a report providing reasons for the variations, along with recommendations for new or revised budget procedures. In order to avoid or alleviate deficits, they may recommend program cuts or reallocation of excess funds. They also inform program managers and others within their organization of the status and availability of funds in different budget accounts. Before any changes are made to an existing program or a new one is implemented, a budget analyst assesses the program's efficiency and effectiveness. Analysts also may be involved in long-range planning activities such as projecting future budget needs.

The amount of data and information that budget analysts are able to analyze has greatly increased through the use of computerized financial software programs. The analysts also make extensive use of spreadsheet, database, and word processing software.



Almost half of all budget analysts work in Federal, State, and local governments.

Budget analysts have seen their role broadened as limited funding has led to downsizing and restructuring throughout private industry and government. Not only do they develop guidelines and policies governing the formulation and maintenance of the budget, but they also measure organizational performance, assess the effects of various programs and policies on the budget, and help to draft budget-related legislation. In addition, budget analysts sometimes conduct training sessions for company or government agency personnel regarding new budget procedures.

Working Conditions

Budget analysts usually work in a comfortable office setting. Long hours are common among these workers, especially during the initial development and midyear and final reviews of budgets. The pressure of deadlines and tight work schedules during these periods can be stressful, and analysts usually are required to work more than the routine 40 hours a week.

Budget analysts spend the majority of their time working independently, compiling and analyzing data, and preparing budget proposals. Nevertheless, their schedule sometimes is interrupted by special budget requests, meetings, and training sessions. Some budget analysts travel to obtain budget details and explanations of various programs from coworkers, or to personally observe funding allocation.

Employment

Budget analysts held 62,000 jobs throughout private industry and government in 2002. Federal, State, and local governments are major employers, accounting for 46 percent of budget analyst jobs. About 1 in 5 worked for the Federal government. Many other budget analysts worked in manufacturing, financial services, or management services. Other major employers include schools and hospitals.

Training, Other Qualifications, and Advancement

Private firms and government agencies generally require candidates for budget analyst positions to have at least a bachelor's degree, but many prefer or require a master's degree. Within the Federal Government, a bachelor's degree in any field is sufficient for an entry-level budget analyst position, but, again, those with master's degrees are preferred. State and local governments have varying requirements, but a bachelor's degree in one of many areas—accounting, finance, business or public administration, economics, political science, statistics, or a social science such as sociology—may qualify one for entry into the occupation. Many States, especially larger, more urban States, require a master's degree. Sometimes, a degree in a field closely related to that of the employing industry or organization, such as engineering, may be preferred. Some firms prefer candidates with a degree in business because business courses emphasize quantitative and analytical skills. Many government employers prefer candidates with strong analytic and policy analysis backgrounds that may be obtained through such majors as political science, economics, public administration, or public finance. Occasionally, budget-related or finance-related work experience can be substituted for formal education.

Because developing a budget involves manipulating numbers and requires strong analytical skills, courses in statistics or accounting are helpful, regardless of the prospective budget analyst's major field of study. Financial analysis is automated in almost every organization and, therefore, familiarity with word processing and the financial software packages used in budget analysis often is required. Software packages commonly used by budget analysts include electronic spreadsheet, database, and graphics software.

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Employers usually prefer job candidates who already possess these computer skills.

In addition to analytical and computer skills, those seeking a career as a budget analyst must be able to work under strict time constraints. Strong oral and written communication skills are essential for analysts because they must prepare, present, and defend budget proposals to decision makers.

Entry-level budget analysts may receive some formal training when they begin their jobs, but most employers feel that the best training is obtained by working through one complete budget cycle. During the cycle, which typically is 1 year, analysts become familiar with the various steps involved in the budgeting process. The Federal Government, on the other hand, offers extensive on-the-job and classroom training for entry-level trainees. In addition to on-the-job training, budget analysts are encouraged to participate in the various classes offered throughout their careers.

Some government budget analysts employed at the Federal, State, or local level may earn the Certified Government Financial Manager (CGFM) designation granted by the Association of Government Accountants. Other government financial officers also may earn this designation. Candidates must have a minimum of a bachelor's degree, 24 hours of study in financial management, and 2 years of experience in government, and must pass a series of three exams. The exams cover topics on the organization and structure of government; governmental accounting, financial reporting and budgeting; and financial management and control.

Budget analysts start their careers with limited responsibilities. In the Federal Government, for example, beginning budget analysts compare projected costs with prior expenditures, consolidate and enter data prepared by others, and assist higher grade analysts by doing research. As analysts progress in their careers, they begin to develop and formulate budget estimates and justification statements, perform indepth analyses of budget requests, write statements supporting funding requests, advise program managers and others on the status and availability of funds for different budget activities, and present and defend budget proposals to senior managers.

Beginning analysts usually work under close supervision. Capable entry-level analysts can be promoted into intermediate-level positions within 1 to 2 years, and then into senior positions within a few more years. Progressing to a higher level means added budgetary responsibility and can lead to a supervisory role. Because of the importance and high visibility of their jobs, senior budget analysts are prime candidates for promotion to management positions in various parts of the organization.

Job Outlook

Competition for budget analyst jobs is expected over the 2002-12 projection period. Candidates with a master's degree should have the best job opportunities. Familiarity with computer financial software packages also should enhance a jobseeker's employment prospects.

Employment of budget analysts is expected to grow about as fast as the average for all occupations through 2012. Employment growth will be driven by the continuing demand for sound financial analysis in both public and private sector organizations. In addition to employment growth, many job openings will result from the need to replace experienced budget analysts who transfer to other occupations or leave the labor force.

The expanding use of computer applications in budget analysis increases worker productivity by enabling analysts to process more data in less time. However, because budget analysts now have much more data available to them, their jobs are becoming more complicated. In addition, as businesses and other organizations become more complex and specialized, budget planning and financial control will demand greater attention. These factors should offset any adverse effects of computer applications on employment of budget analysts.

In coming years, all types of organizations will continue to rely heavily on budget analysts to examine, analyze, and develop budgets. Because of the importance of financial analysis performed by budget analysts, employment of these workers has remained relatively unaffected by downsizing in the Nation's workplaces. In addition, because financial and budget reports must be completed during both periods of economic growth and slowdowns, budget analysts usually are less subject to layoffs than are many other workers during economic downturns.

Earnings

Salaries of budget analysts vary widely by experience, education, and employer. Median annual earnings of budget analysts in 2002 were $52,480. The middle 50 percent earned between $42,000 and $66,180. The lowest 10 percent earned less than $34,580, and the highest 10 percent earned more than $82,720.

According to a 2002 survey conducted by Robert Half International—a staffing services firm specializing in accounting and finance—starting salaries of financial, budget, treasury, and cost analysts in small companies ranged from $29,750 to $36,250. In large companies, starting salaries ranged from $33,500 to $41,250.

In the Federal Government, budget analysts usually started as trainees earning $23,442 or $29,037 a year in 2003. Candidates with a master's degree might begin at $35,519. Beginning salaries were slightly higher in selected areas where the prevailing local pay level was higher. The average annual salary in 2003 for budget analysts employed by the Federal Government in nonsupervisory, supervisory, and managerial positions was $62,400.

Related Occupations

Budget analysts review, analyze, and interpret financial data; make recommendations for the future; and assist in the implementation of new ideas and financial strategies. Other workers who have similar duties include accountants and auditors, cost estimators, economists, financial analysts and personal financial advisors, financial managers, loan counselors and officers, and management analysts.

Sources of Additional Information

Information about career opportunities as a budget analyst may be available from your State or local employment service.

Information on careers in government financial management and the CGFM designation may be obtained from:

➤ Association of Government Accountants, 2208 Mount Vernon Ave., Alexandria, VA 22301. Internet: **http://www.agacgfm.org**

Information on careers in budget analysis at the State government level may be obtained from:

➤ National Association of State Budget Officers, Hall of the States Building, Suite 642, 444 North Capitol St. NW., Washington, DC 20001. Internet: **http://www.nasbo.org**

Information on obtaining a budget analyst position with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

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Claims Adjusters, Appraisers, Examiners, and Investigators

(0*NET 13-1031.01, 13-1031.02, 13-1032.00)

Significant Points

- Adjusters and examiners investigate insurance claims, negotiate settlements, and authorize payments; investigators deal with claims where there is a question of liability and where fraud or criminal activity is suspected.
- Most employers prefer to hire college graduates.
- Competition will be keen for jobs as investigators, because this occupation attracts many qualified people.

Nature of the Work

Individuals and businesses purchase insurance policies to protect against monetary losses. In the event of a loss, policyholders submit claims, or requests for payment, as compensation for their loss. Adjusters, examiners, and investigators work primarily for property and casualty insurance companies, for whom they handle a wide variety of claims for property damage, liability, and bodily injury. Their main role is to investigate the claims, negotiate settlements, and authorize payments to claimants, but they must always be mindful not to violate the claimant's rights under Federal and State privacy laws. They must determine whether the customer's insurance policy covers the loss and how much of the loss should be paid to the claimant. Although many adjusters, appraisers, examiners, and investigators have overlapping functions and may even perform the same job, the insurance industry generally assigns specific roles to each of these claims workers.

Adjusters plan and schedule the work required to process a claim that would follow, for example, an automobile accident or damage to one's home caused by a storm. They investigate claims by interviewing the claimant and witnesses, consulting police and hospital records, and inspecting property damage to determine the extent of the company's liability. Adjusters may also consult with other professionals, such as accountants, architects, construction workers, engineers, lawyers, and physicians, who can offer a more expert evaluation of a claim. The information gathered, including photographs and written or taped statements, is set down in a report that is then used to evaluate a claim. When the policyholder's claim is legitimate, the claims adjuster negotiates with the claimant and settles the claim. When claims are contested, adjusters will work with attorneys and expert witnesses to defend the insurer's position.

Many companies centralize the claims-adjusting operation in a claims center, where the cost of repair is determined and a check is issued immediately. More complex cases, usually involving bodily injury, are referred to senior adjusters. Some adjusters work with multiple types of insurance; however, most specialize in homeowner claims, business losses, automotive damage, or workers' compensation.

Claimants can opt not to rely on the services of their insurance company's adjuster and may instead choose to hire a public adjuster. Public adjusters assist clients in preparing and presenting claims to insurance companies and try to negotiate a fair settlement. They perform the same services as adjusters who work directly for companies; however, they work in the best interests of the client, rather than the insurance company.

Claims examiners within property and casualty insurance firms may have duties similar to those of an adjuster, but often their primary job is to review the claims submitted to ensure that proper guidelines have been followed. They may assist adjusters with complex and complicated claims or when a disaster suddenly greatly increases the volume of claims. Most claims examiners work for life or health insurance companies. In health insurance companies, examiners review health-related claims to see whether costs are reasonable based on the diagnosis. The examiners are provided with guides that supply information on the average period of disability, the expected treatments, and the average hospital stay, for patients with the various ailments for which a claim may be submitted. Examiners check claim applications for completeness and accuracy, interview medical specialists, and consult policy files to verify the information reported in a claim. Examiners will then either authorize the appropriate payment or refer the claim to an investigator for a more thorough review. Claims examiners usually specialize in group or individual insurance plans and in hospital, dental, or prescription drug claims.

In life insurance, claims examiners review the causes of death, particularly in the case of an accident, because most life insurance policies pay additional benefits if a death is accidental. Claims examiners also may review new applications for life insurance to make sure that applicants have no serious illnesses that would make them a high risk to insure and thus disqualify them from obtaining insurance.

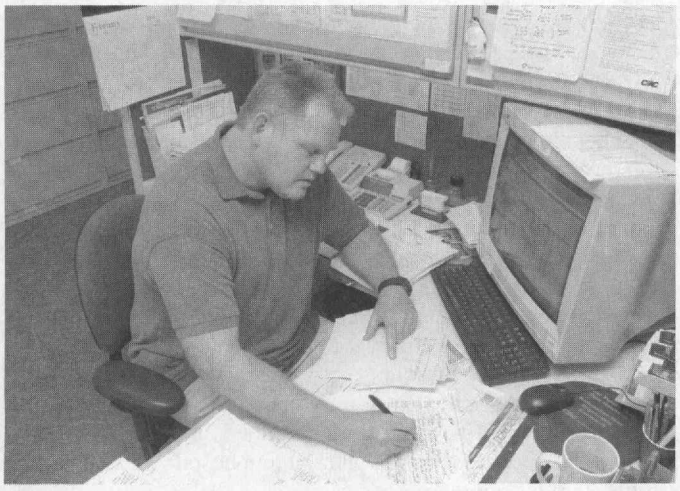
Another occupation that plays an important role in the accurate settlement of claims is that of the *appraiser*, whose role is to assess the cost or value of an insured item. The majority of appraisers employed by insurance companies and independent adjusting firms are *auto damage appraisers.* These appraisers inspect damaged vehicles after an accident and estimate the cost of repairs. This information is then relayed to the adjuster, who incorporates the appraisal into the settlement. Auto damage appraisers are valued by insurance companies because they can provide an unbiased judgment of repair costs. Otherwise, the companies would have to rely on auto mechanics' estimates, which might be unreasonably high.

Many claims adjusters and auto damage appraisers are equipped with laptop computers from which they can download the necessary forms and files from insurance company databases. Many adjusters and appraisers use digital cameras, which allow photographs of the damage to be sent to the company via the Internet. Many also input information about the damage directly into their computers, where software programs produce estimates of damage on standard forms. These new technologies allow for faster and more efficient processing of claims.

When adjusters or examiners suspect fraud, they refer the claim to an investigator. *Insurance investigators* in an insurance company's Special Investigative Unit handle claims in which a company suspects fraudulent or criminal activity, such as arson cases, false workers' disability claims, staged accidents, or unnecessary medical treatments. The severity of insurance fraud cases can vary greatly, from claimants simply overstating the damage to a vehicle to complicated fraud rings responsible for many claimants supported by dishonest doctors, lawyers, and even insurance personnel.

Investigators usually start with a database search to obtain background information on claimants and witnesses. Investigators can access certain personal information and identify Social Security numbers, aliases, driver's license numbers, addresses, phone numbers, criminal records, and past claims histories to establish whether a claimant has ever attempted insurance fraud. Then, investigators may visit claimants and witnesses to obtain a recorded statement, take photographs, and inspect facilities, such as a doctor's office, to determine whether they have a proper license. Investigators often consult with legal counsel and can be expert witnesses in court cases.

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Claims adjusters, appraisers, examiners, and investigators gather facts related to insurance claims.

Often, investigators also perform surveillance work. For example, in a case involving fraudulent workers' compensation claims, an investigator may covertly observe the claimant for several days or even weeks. If the investigator observes the subject performing an activity that is ruled out by injuries stated in a workers' compensation claim, the investigator would take video or still photographs to document the activity and report it to the insurance company.

Working Conditions

Working environments of claims adjusters, appraisers, examiners, and investigators vary greatly. Most claims examiners employed by life and health insurance companies work a standard 5-day, 40-hour week in a typical office environment. Many claims adjusters and auto damage appraisers, however, often work outside the office, inspecting damaged buildings and automobiles. Adjusters who inspect damaged buildings must be wary of potential hazards such as collapsed roofs and floors, as well as weakened structures.

In general, adjusters are able to arrange their work schedules to accommodate evening and weekend appointments with clients. This accommodation sometimes results in adjusters working irregular schedules or more than 40 hours a week, especially when there are a lot of claims. Some report to the office every morning to get their assignments, while others simply call in from home and spend their days traveling to claim sites. New technology, such as laptop computers and cellular telephones, is making telecommuting easier for claims adjusters and auto damage appraisers. Many adjusters work inside their office only a few hours a week, while others conduct their business entirely out of their home and automobile. Occasionally, experienced adjusters must be away from home for days—for example, when they travel to the scene of a disaster such as a tornado, hurricane, or flood—to work with local adjusters and government officials. Adjusters often are called to work in the event of such emergencies and may have to work 50 or 60 hours a week until all claims are resolved.

Insurance investigators often work irregular hours because of the need to conduct surveillance and contact people who are not available during normal working hours. Early morning, evening, and weekend work is common. Some days, investigators will spend all day in the office doing database searches, making telephone calls, and writing reports. Other times, they may be away performing surveillance activities or interviewing witnesses. Some of the work can involve confrontation with claimants and others involved in a case, so the job can be stressful and dangerous.

Employment

Adjusters, appraisers, examiners, and investigators held about 241,000 jobs in 2002. Of these, more than 14,000 were jobs held by auto damage insurance appraisers. Insurance carriers employed nearly 60 percent of claims adjusters, appraisers, examiners, and investigators; more than 20 percent were employed by insurance agencies and brokerages, and private claims adjusting companies. Around 2 percent of adjusters, appraisers, examiners, and investigators were self-employed.

Training, Other Qualifications, and Advancement

Training and entry requirements vary widely for claims adjusters, appraisers, examiners, and investigators. Although many in these occupations do not have a college degree, most companies prefer to hire college graduates. No specific college major is recommended, but a variety of backgrounds can be an asset. A claims adjuster, for example, who has a business or an accounting background might specialize in claims of financial loss due to strikes, equipment breakdowns, or damage to merchandise. College training in architecture or engineering is helpful in adjusting industrial claims, such as those involving damage from fires or other accidents. Some claims adjusters and examiners apply expertise acquired through specialized professional training to adjust claims. A legal background can be beneficial to someone handling workers' compensation and product liability cases. A medical background is useful for those examiners working on medical and life insurance claims.

Because they often work closely with claimants, witnesses, and other insurance professionals, claims adjusters and examiners must be able to communicate effectively with others. Knowledge of computer applications also is extremely important. In addition, a valid driver's license and a good driving record are required for workers for whom travel is an important aspect of their job. Some companies require applicants to pass a series of written aptitude tests designed to measure communication, analytical, and general mathematical skills.

Licensing requirements for these workers vary by State. Some States have very few requirements, while others require the completion of prelicensing education or a satisfactory score on a licensing exam. Completion of the requirements to earn a voluntary professional designation may in some cases be substituted for the exam requirement. In some States, claims adjusters employed by insurance companies can work under the company license and need not become licensed themselves. Separate or additional requirements may apply for public adjusters. For example, some States require public adjusters to file a surety bond.

Continuing education (CE) in claims is very important for claims adjusters, appraisers, examiners, and investigators because new Federal and State laws and court decisions frequently affect how claims are handled or who is covered by insurance policies. Also, examiners working on life and health claims must be familiar with new medical procedures and prescription drugs. Some States that require licensing also require a certain number of CE credits per year in order to renew the license. These credits can be obtained from a number of sources. Many companies offer training sessions to inform their employees of industry changes. Many schools and associations give courses and seminars on various topics having to with claims. Correspondence courses via the Internet are making long-distance learning possible. Workers also can earn CE credits by writing articles for claims publications or by giving lectures and presentations. In addition, many adjusters and examiners choose to earn professional certifications and designations for independent recognition of their professional expertise. Although requirements for these designations vary, many entail at least 5 to 10 years' expe-

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rience in the claims field and passing examinations; in addition, a certain number of CE credits must be earned each year to retain the designation.

For auto damage appraiser jobs, insurance companies and independent adjusting firms typically prefer to hire persons with experience as an estimator or manager of an auto-body repair shop. An appraiser must know how to repair vehicles in order to identify and estimate damage, and technical skills are essential. While auto damage appraisers do not require a college education, most companies prefer to hire persons with formal training. Many vocational colleges offer 2-year programs in auto-body repair on how to estimate and repair damaged vehicles. Some States require auto damage appraisers to be licensed, and certification also may be required or preferred. Basic computer skills are an important qualification for many auto damage appraiser positions. As with adjusters and examiners, continuing education is important because of the continual introduction of new car models and repair techniques.

Most insurance companies prefer to hire former law enforcement officers or private investigators as insurance investigators. Many experienced claims adjusters or examiners also become investigators. Licensing requirements vary among States. Most employers look for individuals with ingenuity who are persistent and assertive. Investigators should not be afraid of confrontation, should communicate well, and should be able to think on their feet. Good interviewing and interrogation skills also are important and usually are acquired in earlier careers in law enforcement.

Beginning claims adjusters, appraisers, examiners, and investigators work on small claims under the supervision of an experienced worker. As they learn more about claims investigation and settlement, they are assigned larger, more complex claims. Trainees are promoted as they demonstrate competence in handling assignments and progress in their coursework. Employees who demonstrate competence in claims work or administrative skills may be promoted to more responsible managerial or administrative jobs. Similarly, claims investigators may rise to supervisor or manager of the investigations department. Once they achieve a certain level of expertise, many choose to start their own independent adjusting or auto damage appraising firms.

Job Outlook

Employment of claims adjusters, appraisers, examiners, and investigators is expected to grow about as fast as the average for all occupations over the 2002-12 period. Opportunities will be best for those with a college degree. Numerous job openings also will result from the need to replace workers who transfer to other occupations or leave the labor force.

Many insurance carriers are downsizing their claims staff in an effort to contain costs. Larger companies are relying more on customer service representatives in call centers to handle the recording of the necessary details of the claim, allowing adjusters to spend more of their time investigating claims. New technology also is reducing the amount of time it takes for an adjuster to complete a claim, thereby increasing the number of claims that one adjuster can handle. However, as long as more insurance policies are being sold to accommodate a growing population, there will be a need for adjusters, appraisers, examiners, and investigators. Further, as the elderly population increases, there will be a greater need for healthcare, resulting in more claims.

Despite recent gains in productivity resulting from technological advances, these jobs are not easily automated. Adjusters still are needed to contact policyholders, inspect damaged property, and consult with experts. Although the number of claims in litigation and the number and complexity of insurance fraud cases are expected to increase over the next decade, demand for insurance investigators is not expected to grow significantly, because technology such as the Internet, which reduces the amount of time it takes to perform background checks, will allow investigators to handle more cases. Competition for investigator jobs will remain keen because the occupation attracts many qualified people, including retirees from law enforcement and military careers, as well as experienced claims adjusters and examiners who choose to get their investigator license.

As with claims adjusters, examiners, and investigators, employment of auto damage appraisers should grow about as fast as the average for all occupations. Insurance companies and agents continue to sell growing numbers of auto insurance policies, leading to more claims being filed that require the attention of an auto damage appraiser. The work of this occupation is not easily automated, because most appraisals require an on-site inspection. However, employment growth will be limited by industry downsizing and the implementation of new technology that is making auto damage appraisers more efficient. In addition, some insurance companies are opening their own repair facilities, which may reduce the need for auto damage appraisers.

Earnings

Earnings of claims adjusters, examiners, and investigators vary significantly. Median annual earnings were $43,020 in 2002. The middle 50 percent earned between $ 33,120 and $ 56,170. The lowest 10 percent earned less than $ 26,680, and the highest 10 percent earned more than $ 71,350.

Many claims adjusters, especially those who work for insurance companies, receive additional bonuses or benefits as part of their job. Adjusters often are furnished a laptop computer, a cellular telephone, and a company car or are reimbursed for the use of their own vehicle for business purposes.

Median annual earnings of auto damage insurance appraisers were $42,630 in 2002. The middle 50 percent earned between $34,570 and $52,360. The lowest 10 percent earned less than $27,410, and the highest 10 percent earned more than $60,470.

Related Occupations

Property-casualty insurance adjusters and life and health insurance examiners must determine the validity of a claim and negotiate a settlement. They also are responsible for determining how much to reimburse the client. Occupations similar to those of claims adjusters, appraisers, examiners, and investigators include cost estimators; bill and account collectors; medical records and health information technicians; billing and posting clerks; and credit authorizers, checkers, and clerks, as well as bookkeeping, accounting, and auditing clerks.

In determining the validity of a claim, insurance adjusters must inspect the damage in order to assess the magnitude of the loss. Workers who perform similar duties include fire inspectors and investigators and construction and building inspectors.

To ensure that company practices and procedures are followed, property and casualty examiners review insurance claims to which a claims adjuster has already proposed a settlement. Others in occupations that review documents for accuracy and compliance with a given set of rules and regulations are tax examiners and revenue agents, as well as accountants and auditors.

Insurance investigators detect and investigate fraudulent claims and criminal activity. Their work is similar to that of private detectives and investigators.

Like automotive body and related repairers and automotive service technicians and mechanics, auto damage appraisers must be

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familiar with the structure and functions of various automobiles and their parts.

Sources of Additional Information

General information about a career as a claims adjuster, an appraiser, an examiner, or an investigator is available from the home offices of many life, health, and property and casualty insurance companies.

Information about licensing requirements for claims adjusters may be obtained from the department of insurance in each State.

For information about professional designation and training programs, contact:

➤ Insurance Institute of America, 720 Providence Rd., P.O. Box 3016, Malvern, PA 19355-0716. Internet: **http://www.aicpcu.org**

➤ The American College, 270 South Bryn Mawr Ave., Bryn Mawr, PA 19010-2196. Internet: **http://www.amercoll.edu**

➤ International Claim Association, 1255 23rd St., NW., Washington, DC 20037. Internet: **http://www.claim.org**

Information on careers in auto damage appraising can be obtained from

➤ Independent Automotive Damage Appraisers Association, P.O. Box 12291 Columbus, GA 31917-2291. Internet: **http://www.iada.org**

Cost Estimators

(0*NET 13-1051.00)

Significant Points

- Over half work in the construction industry and another 20 percent are employed in manufacturing industries.
- Growth of the construction industry will be the driving force behind the demand for cost estimators.
- In construction and manufacturing, job prospects should be best for those with industry work experience and a bachelor's degree in a related field.

Nature of the Work

Accurately forecasting the cost of future projects is vital to the survival of any business. Cost estimators develop the cost information that business owners or managers need to make a bid for a contract or to determine if a proposed new product will be profitable. They also determine which endeavors are making a profit.

Regardless of the industry in which they work, estimators compile and analyze data on all of the factors that can influence costs—such as materials, labor, location, and special machinery requirements, including computer hardware and software. Job duties vary widely depending on the type and size of the project.

The methods of and motivations for estimating costs can differ greatly by industry. On a construction project, for example, the estimating process begins with the decision to submit a bid. After reviewing various preliminary drawings and specifications, the estimator visits the site of the proposed project. The estimator needs to gather information on access to the site and availability of electricity, water, and other services, as well as on surface topography and drainage. The information developed during the site visit usually is recorded in a signed report that is included in the final project estimate.

After the site visit is completed, the estimator determines the quantity of materials and labor the firm will need to furnish. This process, called the quantity survey or "takeoff," involves completing standard estimating forms, filling in dimensions, number of units, and other information. A cost estimator working for a general contractor, for example, will estimate the costs of all items the contractor must provide. Although subcontractors will estimate their costs as part of their own bidding process, the general contractor's cost estimator often analyzes bids made by subcontractors as well. Also during the takeoff process, the estimator must make decisions concerning equipment needs, sequence of operations, crew size, and physical constraints at the site. Allowances for the waste of materials, inclement weather, shipping delays, and other factors that may increase costs also must be incorporated in the estimate.

On completion of the quantity surveys, the estimator prepares a cost summary for the entire project, including the costs of labor, equipment, materials, subcontracts, overhead, taxes, insurance, markup, and any other costs that may affect the project. The chief estimator then prepares the bid proposal for submission to the owner.

Construction cost estimators also may be employed by the project's architect or owner to estimate costs or to track actual costs relative to bid specifications as the project develops. In large construction companies employing more than one estimator, it is common practice for estimators to specialize. For example, one may estimate only electrical work and another may concentrate on excavation, concrete, and forms.

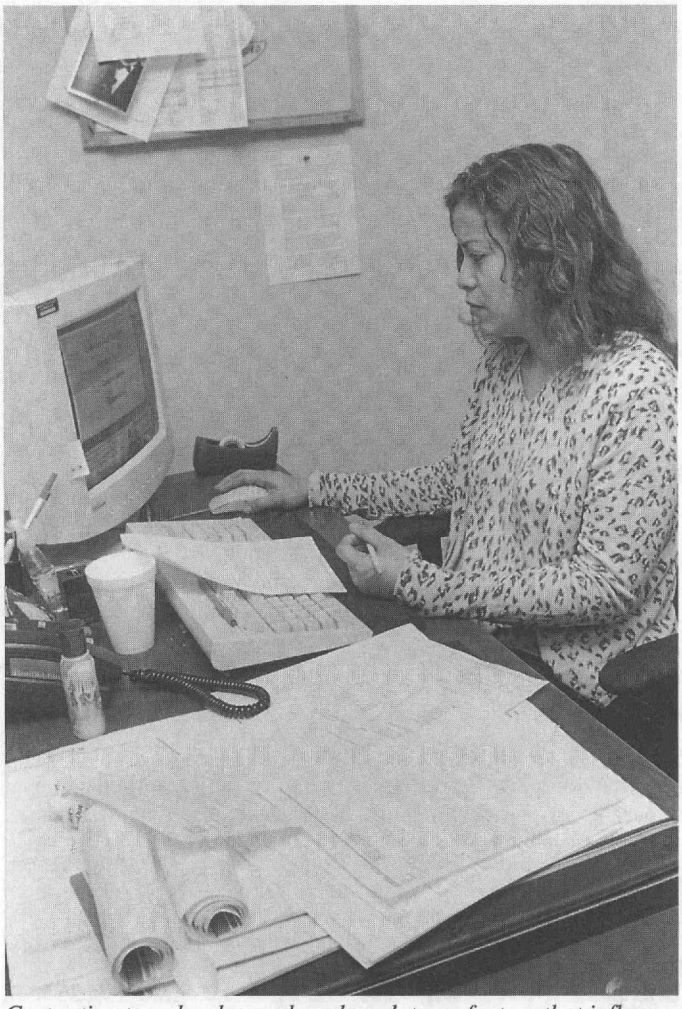
In manufacturing and other firms, cost estimators usually are assigned to the engineering, cost, or pricing departments. The estimators' goal in manufacturing is to accurately estimate the costs associated with making products. The job may begin when management requests an estimate of the costs associated with a major redesign of an existing product or the development of a new product or production process. When estimating the cost of developing a new product, for example, the estimator works with engineers, first reviewing blueprints or conceptual drawings to determine the machining operations, tools, gauges, and materials that would be required for the job. The estimator then prepares a parts list and determines whether it is more efficient to produce or to purchase the parts. To do this, the estimator must initiate inquiries for price information from potential suppliers. The next step is to determine the cost of manufacturing each component of the product. Some high-technology products require a tremendous amount of computer programming during the design phase. The cost of software development is one of the fastest growing and most difficult activities to estimate. Some cost estimators now specialize in estimating only computer software development and related costs.

The cost estimator then prepares time-phase charts and learning curves. Time-phase charts indicate the time required for tool design and fabrication, tool "debugging"—finding and correcting all problems—manufacturing of parts, assembly, and testing. Learning curves graphically represent the rate at which performance improves with practice. These curves are commonly called "cost reduction" curves because many problems—such as engineering changes, rework, parts shortages, and lack of operator skills—diminish as the number of parts produced increases, resulting in lower unit costs.

Using all of this information, the estimator then calculates the standard labor hours necessary to produce a predetermined number of units. Standard labor hours are then converted to dollar values, to which are added factors for waste, overhead, and profit to yield the unit cost in dollars. The estimator then compares the cost of purchasing parts with the firm's cost of manufacturing them to determine which is cheaper.

Computers play an integral role in cost estimation because estimating often involves complex mathematical calculations and requires advanced mathematical techniques. For example, to undertake a parametric analysis (a process used to estimate project costs

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Cost estimators develop and analyze data on factors that influence costs in order to determine whether a proposed new product or contract will be profitable.

on a per unit basis, subject to the specific requirements of a project), cost estimators use a computer database containing information on costs and conditions of many other similar projects. Although computers cannot be used for the entire estimating process, they can relieve estimators of much of the drudgery associated with routine, repetitive, and time-consuming calculations. Computers also are used to produce all of the necessary documentation with the help of word-processing and spreadsheet software, leaving estimators more time to study and analyze projects.

Operations research, production control, cost, and price analysts who work for government agencies may do significant amounts of cost estimating in the course of their regular duties. In addition, the duties of construction managers also may include estimating costs. (For more information, see the statements on operations research analysts and construction managers elsewhere in the *Handbook.*)

Working Conditions

Although estimators spend most of their time in an office, construction estimators must make visits to project worksites that can be dusty, dirty, and occasionally hazardous. Likewise, estimators in manufacturing must spend time on the factory floor where it also can be noisy and dirty. In some industries, frequent travel between a firm's headquarters and its subsidiaries or subcontractors may be required.

Although estimators normally work a 40-hour week, overtime is common. Cost estimators often work under pressure and stress, especially when facing bid deadlines. Inaccurate estimating can cause a firm to lose out on a bid or to lose money on a job that was not accurately estimated.

Employment

Cost estimators held about 188,000 jobs in 2002. About 53 percent were in the construction industry, and another 20 percent were in manufacturing industries. The remainder worked in a wide range of other industries.

Cost estimators work throughout the country, usually in or near major industrial, commercial, and government centers, and in cities and suburban areas undergoing rapid change or development.

Training, Other Qualifications, and Advancement

Job entry requirements for cost estimators vary by industry. In the construction industry, employers increasingly prefer individuals with a degree in building construction, construction management, construction science, engineering, or architecture. However, most construction estimators also have considerable construction experience, gained through work in the industry, internships, or cooperative education programs. Applicants with a thorough knowledge of construction materials, costs, and procedures in areas ranging from heavy construction to electrical work, plumbing systems, or masonry work have a competitive edge.

In manufacturing industries, employers prefer to hire individuals with a degree in engineering, physical science, operations research, mathematics, or statistics; or in accounting, finance, business, economics, or a related subject. In most industries, great emphasis is placed on experience involving quantitative techniques.

Cost estimators should have an aptitude for mathematics, be able to quickly analyze, compare, and interpret detailed and sometimes poorly defined information, and be able to make sound and accurate judgments based on this knowledge. Assertiveness and self-confidence in presenting and supporting their conclusions are important, as are strong communications and interpersonal skills, because estimators may work as part of a project team alongside managers, owners, engineers, and design professionals. Cost estimators also need knowledge of computers, including word-processing and spreadsheet packages. In some instances, familiarity with special estimation software or programming skills also may be required.

Regardless of their background, estimators receive much training on the job because every company has its own way of handling estimates. Working with an experienced estimator, they become familiar with each step in the process. Those with no experience reading construction specifications or blueprints first learn that aspect of the work. They then may accompany an experienced estimator to the construction site or shop floor, where they observe the work being done, take measurements, or perform other routine tasks. As they become more knowledgeable, estimators learn how to tabulate quantities and dimensions from drawings and how to select the appropriate material prices.

For most estimators, advancement takes the form of higher pay and prestige. Some move into management positions, such as project manager for a construction firm or manager of the industrial engineering department for a manufacturer. Others may go into business for themselves as consultants, providing estimating services for a fee to government or to construction or manufacturing firms.

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Many colleges and universities include cost estimating as part of bachelor's and associate degree curriculums in civil engineering, industrial engineering, and construction management or construction engineering technology. In addition, cost estimating is a significant part of many master's degree programs in construction science or construction management. Organizations representing cost estimators, such as the Association for the Advancement of Cost Engineering (AACE International) and the Society of Cost Estimating and Analysis (SCEA), also sponsor educational and professional development programs. These programs help students, estimators-in-training, and experienced estimators stay abreast of changes affecting the profession. Specialized courses and programs in cost estimating techniques and procedures also are offered by many technical schools, community colleges, and universities.

Voluntary certification can be valuable to cost estimators because it provides professional recognition of the estimator's competence and experience. In some instances, individual employers may even require professional certification for employment. Both AACE International and SCEA administer certification programs. To become certified, estimators usually must have between 2 and 8 years of estimating experience and must pass an examination. In addition, certification requirements may include publication of at least one article or paper in the field.

Job Outlook

Overall employment of cost estimators is expected to grow about as fast as the average for all occupations through the year 2012. In addition to openings created by growth, some job openings will arise from the need to replace workers who transfer to other occupations or leave the labor force. In construction and manufacturing—the primary employers of cost estimators—job prospects should be best for those with industry work experience and a bachelor's degree in a related field.

Growth of the construction industry, in which 53 percent of all cost estimators are employed, will be the driving force behind the demand for these workers. Construction and repair of highways, streets, and bridges, as well as construction of more subway systems, airports, water and sewage systems, and electric power plants and transmission lines, will stimulate demand for many more cost estimators. The increasing population and its changing demographics that will boost the demand for residential construction and remodeling also will spur demand for cost estimators. As the population ages, the demand for nursing and extended care facilities will increase. School construction and repair also will add to the demand for cost estimators. Job prospects in construction should be best for cost estimators with a degree in construction management or construction science, engineering, or architecture, and who have practical experience in various phases of construction or in a specialty craft area.

Employment of cost estimators in manufacturing will also grow, but not as fast as in construction as firms continue to use their services to identify and control operating costs. Experienced estimators with degrees in engineering, science, mathematics, business administration, or economics should have the best job prospects in manufacturing.

Earnings

Salaries of cost estimators vary widely by experience, education, size of firm, and industry. Median annual earnings of cost estimators in 2002 were $47,550. The middle 50 percent earned between $36,440 and $62,040. The lowest 10 percent earned less than $28,670, and the highest 10 percent earned more than $79,240. Median annual earnings in the industries employing the largest numbers of cost estimators in 2002 were:

Nonresidential building construction	$53,820
Building equipment contractors	50,240
Foundation, structure, and building exterior contractors	47,630
Residential building construction	47,180
Building finishing contractors	45,630

College graduates with degrees in fields that provide a strong background in cost estimating, such as engineering or construction management, could start at a higher level. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates with degrees in construction science/management received job offers averaging $42,229 a year.

Related Occupations

Other workers who quantitatively analyze information include accountants and auditors; budget analysts; claims adjusters, appraisers, examiners, and investigators; economists; financial analysts and personal financial advisors; insurance underwriters; loan counselors and officers; market and survey researchers; and operations research analysts. In addition, the duties of industrial production managers and construction managers also may involve analyzing costs.

Sources of Additional Information

Information about career opportunities, certification, educational programs, and cost estimating techniques may be obtained from:

➤ Association for the Advancement of Cost Engineering (AACE International), 209 Prairie Ave., Suite 100, Morgantown, WV 26501. Internet: **http://www.aacei.org**

➤ Society of Cost Estimating and Analysis, 101 S. Whiting St., Suite 201, Alexandria, VA 22304. Internet: **http://www.sceaonline.net**

Financial Analysts and Personal Financial Advisors

(0*NET 13-2051.00, 13-2052.00)

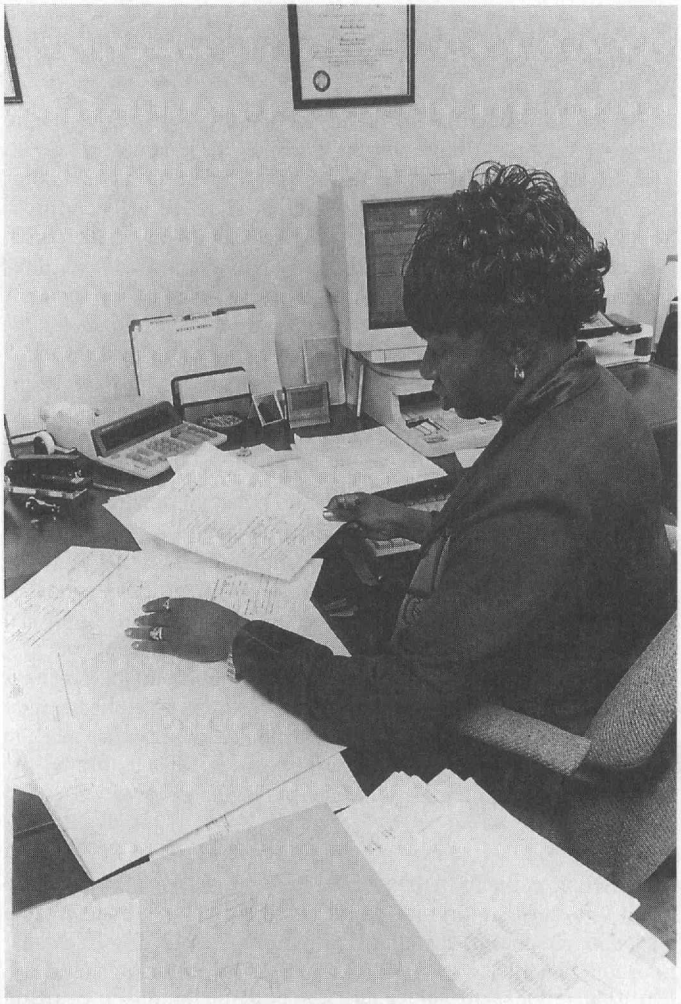
Significant Points

- A college degree and good interpersonal skills are among the most important qualifications for these workers.
- Although both occupations will benefit from an increase in investing by individuals, personal financial advisors will benefit more.
- Financial analysts will face keen competition for jobs, especially at top securities firms, where pay can be lucrative.

Nature of the Work

Financial analysts and personal financial advisors provide analysis and guidance to businesses and individuals to help them with their investment decisions. Both types of specialist gather financial information, analyze it, and make recommendations to their clients. However, their job duties differ because of the type of investment information they provide and the clients they work for. *Financial analysts* assess the economic performance of companies and industries for firms and institutions with money to invest. *Personal financial advisors* generally assess the financial needs of individuals, providing them a wide range of options.

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Financial analysts and personal financial advisors gather and analyze information, and then make recommendations to businesses or individuals with money to invest.

Financial analysts, also called *securities analysts* and *investment analysts*, work for banks, insurance companies, mutual and pension funds, securities firms, and other businesses, helping these companies or their clients make investment decisions. Financial analysts read company financial statements and analyze commodity prices, sales, costs, expenses, and tax rates in order to determine a company's value and project future earnings. They often meet with company officials to gain a better insight into a company's prospects and to determine the company's managerial effectiveness. Usually, financial analysts study an entire industry, assessing current trends in business practices, products, and industry competition. They must keep abreast of new regulations or policies that may affect the industry, as well as monitor the economy to determine its effect on earnings.

Financial analysts use spreadsheet and statistical software packages to analyze financial data, spot trends, and develop forecasts. On the basis of their results, they write reports and make presentations, usually making recommendations to buy or sell a particular investment or security. Senior analysts may actually make the decision to buy or sell for the company or client if they are the ones responsible for managing the assets. Other analysts use the data to measure the financial risks associated with making a particular investment decision.

Financial analysts in investment banking departments of securities or banking firms often work in teams, analyzing the future prospects of companies that want to sell shares to the public for the first time. They also ensure that the forms and written materials necessary for compliance with Securities and Exchange Commission regulations are accurate and complete. They may make presentations to prospective investors about the merits of investing in the new company. Financial analysts also work in mergers and acquisitions departments, preparing analyses on the costs and benefits of a proposed merger or takeover.

Some financial analysts, called *ratings analysts*, evaluate the ability of companies or governments that issue bonds to repay their debt. On the basis of their evaluation, a management team assigns a rating to a company's or government's bonds. Other financial analysts perform budget, cost, and credit analysis as part of their responsibilities.

Personal financial advisors, also called *financial planners* or *financial consultants*, use their knowledge of investments, tax laws, and insurance to recommend financial options to individuals in accordance with their short-term and long-term goals. Some of the issues that planners address are retirement and estate planning, funding for college, and general investment options. While most planners offer advice on a wide range of topics, some specialize in areas such as retirement and estate planning or risk management.

An advisor's work begins with a consultation with the client, from whom the advisor obtains information on the client's finances and financial goals. The advisor then develops a comprehensive financial plan that identifies problem areas, makes recommendations for improvement, and selects appropriate investments compatible with the client's goals, attitude toward risk, and expectation or need for a return on the investment. Sometimes this plan is written, but, more often, it is in the form of verbal advice. Financial advisors usually meet with established clients at least once a year to update them on potential investments and to determine whether the clients have been through any life changes—such as marriage, disability, or retirement—that might affect their financial goals. Financial advisors also answer questions from clients regarding changes in benefit plans or the consequences of a change in their job or career.

Some advisors buy and sell financial products, such as mutual funds or insurance, or refer clients to other companies for products and services—for example, the preparation of taxes or wills. A number of advisors take on the responsibility of managing the clients' investments for them.

Finding clients and building a customer base is one of the most important parts of a financial advisor's job. Referrals from satisfied clients are an important source of new business. Many advisors also contact potential clients by giving seminars or lectures or meet clients through business and social contacts.

Working Conditions

Financial analysts and personal financial advisors usually work indoors in safe, comfortable offices or their own homes. Many of these workers enjoy the challenge of helping firms or people make financial decisions. However, financial analysts may face long hours, frequent travel to visit companies and talk to potential investors, and the pressure of deadlines. Much of their research must be done after office hours, because their day is filled with telephone calls and meetings. Personal financial advisors usually work standard business hours, but they also schedule meetings with clients in the evenings or on weekends. Many teach evening classes or hold seminars in order to bring in more clients.

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Employment

Financial analysts and personal financial advisors held 298,000 jobs in 2002; financial analysts accounted for almost 6 in 10 of the total. Many financial analysts work at the headquarters of large financial companies, several of which are based in New York City. Nineteen percent of financial analysts work for securities and commodity brokers, exchanges, and investment services firms; and 17 percent work for depository and nondepository institutions, including banks, savings institutions, and mortgage bankers and brokers. The remainder work primarily for insurance carriers; accounting, tax preparation, bookkeeping, and payroll services; management, scientific, and technical consulting services; and State and local government agencies.

Approximately 38 percent of personal financial advisors are self-employed, operating small investment advisory firms, usually in urban areas. About 31 percent of personal financial advisors are employed by securities and commodity brokers, exchanges, and investment services firms. Another 14 percent are employed by depository and nondepository institutions, including banks, savings institutions, and credit unions. A small number work for insurance carriers and insurance agents, brokers, and services.

Training, Other Qualifications, and Advancement

A college education is required for financial analysts and is strongly preferred for personal financial advisors. Most companies require financial analysts to have at least a bachelor's degree in business administration, accounting, statistics, or finance. Coursework in statistics, economics, and business is required, and knowledge of accounting policies and procedures, corporate budgeting, and financial analysis methods is recommended. A master of business administration is desirable. Advanced courses in options pricing or bond valuation and knowledge of risk management also are suggested.

Employers usually do not require a specific field of study for personal financial advisors, but a bachelor's degree in accounting, finance, economics, business, mathematics, or law provides good preparation for the occupation. Courses in investments, taxes, estate planning, and risk management also are helpful. Programs in financial planning are becoming more widely available in colleges and universities. However, many financial planners enter the field after working in a related occupation, such as accountant, auditor, insurance sales agent, lawyer, or securities, commodities, and financial services sales agent.

Mathematical, computer, analytical, and problem-solving skills are essential qualifications for financial analysts and personal financial advisors. Good communication skills also are necessary, because these workers must present complex financial concepts and strategies in easy-to-understand language to clients and other professionals. Self-confidence, maturity, and the ability to work independently are important as well.

Financial analysts must be detail oriented, motivated to seek out obscure information, and familiar with the workings of the economy, tax laws, and money markets. Strong interpersonal skills and sales ability are crucial to the success of both financial analysts and personal financial advisors.

Although not required for financial analysts or personal financial advisors to practice, certification can enhance one's professional standing and is strongly recommended by many financial companies. Financial analysts may receive the title Chartered Financial Analyst (CFA), sponsored by the Association of Investment Management and Research. To qualify for CFA designation, applicants must hold a bachelor's degree, must have 3 years of work experience in a related field, and must pass a series of three examinations. The essay exams, administered once a year for 3 years, cover subjects such as accounting, economics, securities analysis, asset valuation, and portfolio management.

Personal financial advisors may obtain the Certified Financial Planner credential, often referred to as CFP (R), demonstrating to potential customers that a planner has extensive training and competency in the area of financial planning. The CFP (R) certification, issued by the Certified Financial Planner Board of Standards, Inc., requires relevant experience, the completion of education requirements, the passage of a comprehensive examination, and adherence to an enforceable code of ethics. Personal financial advisors may also obtain the Chartered Financial Consultant (ChFC) designation, issued by the American College in Bryn Mawr, Pennsylvania, which requires experience and the completion of an eight-course program of study. Both designations have a continuing education requirement.

A license is not required to work as a personal financial advisor, but advisors who sell stocks, bonds, mutual funds, insurance, or real estate may need licenses to perform these additional services. Also, if legal advice is provided, a license to practice law may be required. Financial advisors who do not provide these additional services often refer clients to those qualified to provide them.

Financial analysts may advance by becoming portfolio managers or financial managers, directing the investment portfolios of their companies or of clients. Personal financial advisors who work in firms also may move into managerial positions, but most advisors advance by accumulating clients and managing more assets.

Job Outlook

Increased investment by businesses and individuals is expected to result in faster-than-average employment growth of financial analysts and personal financial advisors through 2012. Both occupations will benefit as baby boomers save for retirement and as a generally better educated and wealthier population requires investment advice. In addition, people are living longer and must plan to finance more years of retirement. The globalization of the securities markets will increase the need for analysts and advisors to help investors make financial choices.

Deregulation of the financial services industry is also expected to spur demand for financial analysts and personal financial advisors. Since 1999, banks, insurance companies, and brokerage firms have been allowed to broaden their financial services. Many firms are adding investment advice to their list of services and are expected to increase their hiring of personal financial advisors. Numerous banks are now entering the securities brokerage and investment banking fields and will increasingly need the skills of financial analysts in these areas.

Employment of personal financial advisors is expected to grow faster than the average for all occupations through the year 2012. The rapid expansion of self-directed retirement plans, such as 401(k) plans, is expected to continue. As the number and complexity of investments rises, more individuals will look to financial advisors to help manage their money. Financial advisors who have either the CFP (R) certification or ChFC designation are expected to have the best opportunities.

Employment of financial analysts is expected to grow about as fast as the average for all occupations through the year 2012. As the number of mutual funds and the amount of assets invested in the funds increase, mutual-fund companies will need increased numbers of financial analysts to recommend which financial products the funds should buy or sell.

Financial analysts also will be needed in the investment banking field, where they help companies raise money and work on corpo-

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rate mergers and acquisitions. However, growth in demand for financial analysts to do company research will be constrained by the implementation of reform proposals calling for investment firms to subsidize independent research boutiques and separate research from investment banking. Firms may try to contain the costs of reform by eliminating research jobs.

Demand for financial analysts in investment banking fluctuates because investment banking is sensitive to changes in the stock market. In addition, further consolidation in the financial services industry may eliminate some financial analyst positions, dampening overall employment growth somewhat. Competition is expected to be keen for these highly lucrative positions, with many more applicants than jobs.

Earnings

Median annual earnings of financial analysts were $57,100 in 2002. The middle 50 percent earned between $43,660 and $76,620. The lowest 10 percent earned less than $34,570, and the highest 10 percent earned more than $108,060. Median annual earnings in the industries employing the largest numbers of financial analysts in 2002 were as follows:

Other financial investment activities	$74,860
Management of companies and enterprises	60,670
Securities and commodity contracts intermediation and brokerage	58,540
Nondepository credit intermediation	51,700
Depository credit intermediation	51,570

Median annual earnings of personal financial advisors were $56,680 in 2002. The middle 50 percent earned between $36,180 and $100,540. Median annual earnings in the industries employing the largest number of personal financial advisors in 2002 were as follows:

Other financial investment activities	$74,260
Securities and commodity contracts intermediation and brokerage	68,110
Depository credit intermediation	51,030

Many financial analysts receive a bonus in addition to their salary, and the bonus can add substantially to their earnings. Usually, the bonus is based on how well their predictions compare to the actual performance of a benchmark investment. Personal financial advisors who work for financial services firms are generally paid a salary plus bonus. Advisors who work for financial-planning firms or who are self-employed either charge hourly fees for their services or charge one set fee for a comprehensive plan, based on its complexity. Advisors who manage a client's assets usually charge a percentage of those assets. A majority of advisors receive commissions for financial products they sell, in addition to charging a fee.

Related Occupations

Other jobs requiring expertise in finance and investment or in the sales of financial products include accountants and auditors; financial managers; insurance sales agents; real estate brokers and sales agents; and securities, commodities, and financial services sales representatives.

Sources of Additional Information

For information on a career in financial planning, contact:

➤ The Financial Planning Association, 4100 E. Mississippi Ave., Denver, CO 80246-3053. Internet: **http://www.fpanet.org**

For information about the Certified Financial Planner, CFP (R), certification, contact:

➤ Certified Financial Planner Board of Standards, Inc., 1670 Broadway, Suite 600, Denver, CO 80202-4809. Internet: **http://www.cfp.net/become**

For information about the Chartered Financial Consultant (ChFC) designation, contact:

➤ The American College, 270 South Bryn Mawr Ave., Bryn Mawr, PA 19010. Internet: **http://www.amercoll.edu**

For information on a career as a financial analyst, contact:

➤ American Academy of Financial Management, 102 Beverly Dr., Metairie, LA 70001. Internet: **http://www.financialanalyst.org**

➤ Association of Investment Management and Research, P.O. Box 3668, 560 Ray C. Hunt Dr., Charlottesville, VA 22903. Internet: **http://www.aimr.org**

Insurance Underwriters

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Significant Points

- Because insurance is considered a necessity for people and businesses, there will always be a need for underwriters.
- Most large insurance companies prefer college graduates who have a degree in business administration or finance with courses in accounting; however, a bachelor's degree in any field—plus courses in business law and accounting—may be sufficient to qualify.

Nature of the Work

Insurance companies protect individuals and organizations from financial loss by assuming billions of dollars in risks each year. Underwriters are needed to identify and calculate the risk of loss from policyholders, establish appropriate premium rates, and write policies that cover these risks. An insurance company may lose business to competitors if the underwriter appraises risks too conservatively, or it may have to pay excessive claims if the underwriting actions are too liberal.

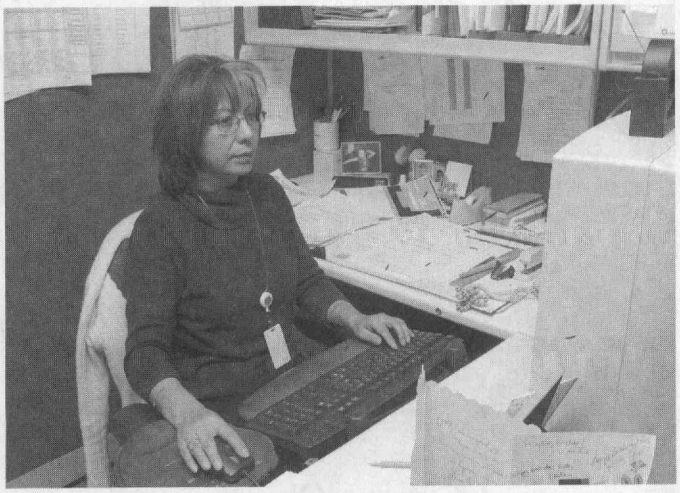
With the aid of computers, underwriters analyze information in insurance applications to determine if a risk is acceptable and will not result in a loss. Applications are often supplemented with reports from loss-control consultants, medical reports, data vendors, and actuarial studies. Underwriters then must decide whether to issue the policy and the appropriate premium to charge. In making this determination, underwriters serve as the main link between the insurance carrier and the insurance agent. On occasion, they accompany sales agents to make presentations to prospective clients.

Technology plays an important role in an underwriter's job. Underwriters use computer applications called "smart systems" to manage risks more efficiently and accurately. These systems automatically analyze and rate insurance applications, recommend acceptance or denial of the risk, and adjust the premium rate in accordance with the risk. With these systems, underwriters are better equipped to make sound decisions and avoid excessive losses.

The Internet also has affected the work of underwriters. Many insurance carriers' computer systems are now linked to different databases on the Internet that allow immediate access to information—such as driving records—necessary in determining a potential client's risk. This reduces the amount of time and paperwork necessary for an underwriter to complete a risk assessment.

Most underwriters specialize in one of three major categories of insurance—life, health, or property and casualty. Life and health insurance underwriters may further specialize in group or individual policies.

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Insurance underwriters review insurance applications and decide whether to issue a policy.

Property and casualty underwriters usually specialize in either commercial or personal insurance, and then by type of risk insured, such as fire, homeowners, automobile, marine, liability, or workers' compensation. In cases where casualty companies provide insurance through a single "package" policy, covering various types of risks, the underwriter must be familiar with different lines of insurance. For business insurance, the underwriter often must be able to evaluate the firm's entire operation in appraising its application for insurance.

An increasing proportion of insurance sales, particularly in life and health insurance, is being made through group contracts. A standard group policy insures everyone in a specified group through a single contract at a standard premium rate. The group underwriter analyzes the overall composition of the group to assure that the total risk is not excessive. Another type of group policy provides members of a group—a labor union, for example—with individual policies reflecting their needs. These usually are casualty policies, such as those covering automobiles. The casualty underwriter analyzes the application of each group member and makes individual appraisals. Some group underwriters meet with union or employer representatives to discuss the types of policies available to their group.

Working Conditions

Underwriters have desk jobs that require no unusual physical activity. Their offices usually are comfortable and pleasant. Although underwriters typically work a standard 40-hour week, more are working longer hours due to the downsizing of many insurance companies. Most underwriters are based in a home or regional branch office, but they occasionally attend meetings away from home for several days. Construction and marine underwriters frequently travel to inspect worksites and assess risks.

Employment

Insurance underwriters held about 102,000 jobs in 2002. The majority of underwriters—about 64 percent—work for insurance companies called "carriers." Most of the remaining underwriters work in insurance agencies or for organizations that offer insurance services to insurance companies and policyholders. A small number of underwriters work in agencies owned and operated by banks, mortgage companies, and real estate firms.

Most underwriters are based in the insurance company's home office, but some, mostly in the property and casualty area, work out of regional branch offices of the insurance company. These underwriters usually have the authority to underwrite most risks and determine an appropriate rating without consulting the home office.

Training, Other Qualifications, and Advancement

For entry-level underwriting jobs, most large insurance companies prefer college graduates who have a degree in business administration or finance, with courses or experience in accounting. However, a bachelor's degree in almost any field—plus courses in business law and accounting—provides a good general background and may be sufficient to qualify. Because computers are an integral part of most underwriters' jobs, computer skills are essential.

New employees usually start as underwriter trainees or assistant underwriters. They may help collect information on applicants and evaluate routine applications under the supervision of an experienced risk analyst. Property and casualty trainees study claims files to become familiar with factors associated with certain types of losses. Many larger insurers offer work-study training programs, lasting from a few months to a year. As trainees gain experience, they are assigned policy applications that are more complex and cover greater risks. These require the use of computers for more efficient analysis and processing.

Underwriting can be a satisfying career for people who enjoy analyzing information and paying attention to detail. In addition, underwriters must possess good judgment in order to make sound decisions. Excellent communication and interpersonal skills also are essential, as much of the underwriter's work involves dealing with agents and other insurance professionals.

Continuing education is necessary for advancement. Insurance companies usually pay tuition for underwriting courses that their trainees successfully complete; some also offer salary incentives. Independent study programs for experienced property and casualty underwriters also are available. The Insurance Institute of America offers a program called "Introduction to Underwriting" for beginning underwriters, and the specialty designation, Associate in Commercial Underwriting (AU), the second formal step in developing a career in underwriting business insurance policies. Those interested in developing a career underwriting personal insurance policies may earn the Associate in Personal Insurance (API) designation. To earn either the AU or API designation, underwriters complete a series of courses and examinations that generally lasts 1 to 2 years.

The American Institute for Chartered Property Casualty Underwriters awards the designation Chartered Property and Casualty Underwriter, or CPCU, the third and final stage of development for an underwriter. Earning the more advanced CPCU designation takes about four years, and requires passing eight examinations covering risk management; insurance operations and regulations; business and insurance law; financial management; financial institutions; and a three course concentration in either personal or commercial insurance coverage. Although the CPCU may be mainly for underwriters, it is also meant for everyone working in all aspects of property and casualty insurance. The American College offers the Chartered Life Underwriter (CLU) designation and the Registered Health Underwriter (RHU) designation for all life and health insurance professionals.

Experienced underwriters who complete courses of study may advance to senior underwriter or underwriting manager positions. Some underwriting managers are promoted to senior managerial jobs. Some employers require a master's degree to achieve this level. Other underwriters are attracted to the earnings potential of sales and therefore obtain State licenses to sell insurance and related financial products as agents or brokers.

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Job Outlook

Employment of underwriters is expected to grow as fast as the average for all occupations through 2012. Underwriting software will continue to make workers more productive; however, because computer software does not do away with the need for human skills, underwriter employment will increase as economic and population growth result in increased insurance needs by businesses and individuals. In addition, job openings will be generated to replace underwriters who transfer or leave the occupation.

Insurance carriers are always assessing new risks and offering policies to meet changing circumstances. Underwriters are particularly needed in the area of product development, where underwriters assess risks and set the premiums for new lines of insurance. One new line of insurance being offered by life insurance carriers that may provide job opportunities for underwriters is long term care insurance.

Demand for underwriters is also expected to improve as insurance carriers try to restore profitability to make up for an unusually large number of underwriting losses in recent years. As the carriers' returns on their investments have declined, insurers are placing more emphasis on underwriting to generate revenues. This renewed interest in underwriting will result in favorable job opportunities for underwriters in the near term.

Employment of underwriters has historically been relatively steady. Overall, the best prospects for underwriter jobs will be for persons with the right skills and credentials, such as excellent computer and communication skills coupled with a background in finance. Because insurance is considered a necessity for people and businesses, there will always be a need for underwriters. It is a profession that is less subject to recession and layoffs than other fields.

Earnings

Median annual earnings of insurance underwriters were $45,590 in 2002. The middle 50 percent earned between $35,190 and $60,890 a year. The lowest 10 percent earned less than $28,840, while the highest 10 percent earned over $79,400. Median annual earnings in insurance carriers were $46,690, while earnings in agencies, brokerages, and other insurance related activities were $43,560.

Insurance companies usually provide better than average benefits, including employer-financed group life and health insurance, and retirement plans.

Related Occupations

Underwriters make decisions on the basis of financial and statistical data. Other workers with the same type of responsibility include accountants and auditors, actuaries, budget analysts, cost estimators, financial analysts and personal financial advisors, financial managers, loan counselors and officers, and credit analysts. Other related jobs in the insurance industry include insurance sales agents and claims adjusters, appraisers, examiners, and investigators.

Sources of Additional Information

Information about a career as an insurance underwriter is available from the home offices of many life, health, and property-casualty insurance companies.

Information about the property-casualty insurance field can be obtained by contacting:

➤ The Insurance Information Institute, 110 William St., New York, NY 10038. Internet: **http://www.iii.org**

Information on careers in the life insurance field can be obtained from:

➤ LIMRA International, P.O. Box 203, Hartford, CT 06141.

Information on the underwriting function and the CPCU and AU designations can be obtained from:

➤ The American Institute for Chartered Property and Casualty Underwriters/Insurance Institute of America, 720 Providence Rd., P.O. Box 3016, Malvern, PA 19355-0716. Internet: **http://www.aicpcu.org**

Information on the CLU and RHU designations can be obtained from:

➤ The American College, 270 South Bryn Mawr Ave., Bryn Mawr, PA, 19010-2196. Internet: **http://www.amercoll.edu**

Loan Counselors and Officers

(0*NET 13-2071.00, 13-2072.00)

Significant Points

- Loan officer positions generally require a bachelor's degree in finance, economics, or a related field; training or experience in banking, lending, or sales is advantageous.
- Average employment growth is expected for loan officers despite rising demand for loans, because technology is making loan processing and approval simpler and faster.
- Earnings often fluctuate with the number of loans generated, rising substantially when the economy is good and interest rates are low.

Nature of the Work

For many individuals, taking out a loan may be the only way to afford a house, car, or college education. For businesses, loans likewise are essential to start many companies, purchase inventory, or invest in capital equipment. *Loan officers* facilitate this lending by finding potential clients and assisting them in applying for loans. Loan officers also gather personal information about clients and businesses to ensure that an informed decision is made regarding the creditworthiness of the borrower and the probability of repayment. *Loan counselors* provide guidance to prospective loan applicants who have problems qualifying for traditional loans. The guidance they provide may include determining the most appropriate type of loan for a particular customer, and explaining specific requirements and restrictions associated with the loan. Some of the functions of a loan counselor also may be performed by a loan officer. Within some institutions, such as credit unions, loan counselor is an alternate title for loan officer.

Loan officers usually specialize in commercial, consumer, or mortgage loans. Commercial or business loans help companies pay for new equipment or expand operations; consumer loans include home equity, automobile, and personal loans; mortgage loans are made to purchase real estate or to refinance an existing mortgage. As banks and other financial institutions begin to offer new types of loans and a growing variety of financial services, loan officers will have to keep abreast of these new product lines so that they can meet their customers' needs.

In many instances, loan officers act as salespeople. Commercial loan officers, for example, contact firms to determine their needs for loans. If a firm is seeking new funds, the loan officer will try to persuade the company to obtain the loan from his or her institution. Similarly, mortgage loan officers develop relationships with commercial and residential real estate agencies so that, when an individual or firm buys a property, the real estate agent might recommend contacting a specific loan officer for financing.

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Once this initial contact has been made, loan officers guide clients through the process of applying for a loan. This process begins with a formal meeting or telephone call with a prospective client, during which the loan officer obtains basic information about the purpose of the loan and explains the different types of loans and credit terms that are available to the applicant. Loan officers answer questions about the process and sometimes assist clients in filling out the application.

After a client completes the application, the loan officer begins the process of analyzing and verifying the information on the application to determine the client's creditworthiness. Often, loan officers can quickly access the client's credit history by computer and obtain a credit "score." This score represents the creditworthiness of a person or business as assigned by a software program that makes the evaluation. In cases in which a credit history is not available or in which unusual financial circumstances are present, the loan officer may request additional financial information from the client or, in the case of commercial loans, copies of the company's financial statements. With this information, loan officers who specialize in evaluating a client's creditworthiness—often called loan underwriters—may conduct a financial analysis or other risk assessment. Loan officers include this information and their written comments in a loan file, which is used to analyze whether the prospective loan meets the lending institution's requirements. Loan officers then decide, in consultation with their managers, whether to grant the loan. If the loan is approved, a repayment schedule is arranged with the client.

A loan may be approved that would otherwise be denied if the customer can provide the lender with appropriate collateral—property pledged as security for the repayment of a loan. For example, when lending money for a college education, a bank may insist that borrowers offer their home as collateral. If the borrowers were ever unable to repay the loan, the home would be seized under court order and sold to raise the necessary money.

Some loan officers, referred to as *loan collection officers*, contact borrowers with delinquent loan accounts to help them find a method of repayment in order to avoid their defaulting on the loan. If a repayment plan cannot be developed, the loan collection officer initiates collateral liquidation, in which the lender seizes the collateral used to secure the loan—a home or car, for example—and sells it to repay the loan.



Loan officers meet with prospective clients to discuss different types of loans and credit terms that are available.

Working Conditions

Working as a loan officer usually involves considerable travel. For example, commercial and mortgage loan officers frequently work away from their offices and rely on laptop computers, cellular telephones, and pagers to keep in contact with their offices and clients. Mortgage loan officers often work out of their home or car, visiting offices or homes of clients while completing loan applications. Commercial loan officers sometimes travel to other cities to prepare complex loan agreements. Consumer loan officers and loan counselors, however, are likely to spend most of their time in an office.

Most loan officers and counselors work a standard 40-hour week, but many work longer, depending on the number of clients and the demand for loans. Mortgage loan officers can work especially long hours because they are free to take on as many customers as they choose. Loan officers usually carry a heavy caseload and sometimes cannot accept new clients until they complete current cases. They are especially busy when interest rates are low, a condition that triggers a surge in loan applications.

Employment

Loan counselors and officers together held about 255,000 jobs in 2002. The majority of this employment consisted of loan officers—nearly 88 percent—with the remaining 31,000 jobs being held by loan counselors. Approximately 40 percent of loan officers and counselors were employed by commercial banks, savings institutions, and credit unions. Mortgage and consumer finance companies employed an additional 33 percent. Loan officers are employed throughout the Nation, but most work in urban and suburban areas. At some banks, particularly in rural areas, the branch or assistant manager often handles the loan application process.

Training, Other Qualifications, and Advancement

Loan officer positions generally require a bachelor's degree in finance, economics, or a related field. Most employers prefer applicants who are familiar with computers and their applications in banking. For commercial or mortgage loan officer jobs, training or experience in sales is highly valued by potential employers. Loan officers without college degrees usually advance to these positions from other jobs in an organization after acquiring several years of work experience in various other occupations, such as teller or customer service representative.

There are currently no specific licensing requirements for loan counselors and officers working in banks or credit unions. Training and licensing requirements for loan counselors and officers who work in mortgage banks or brokerages vary by State. These criteria also may vary depending on whether workers are employed by a mortgage bank or mortgage brokerage.

Various banking-related associations and private schools offer courses and programs for students interested in lending, as well as for experienced loan officers who want to keep their skills current. Completion of these courses and programs generally enhances one's employment and advancement opportunities.

Persons planning a career as a loan officer or counselor should be capable of developing effective working relationships with others, confident in their abilities, and highly motivated. For public relations purposes, loan officers must be willing to attend community events as representatives of their employer.

Capable loan officers and counselors may advance to larger branches of the firm or to managerial positions, while less capable workers—and those having weak academic preparation—could be assigned to smaller branches and might find promotion difficult without obtaining training to upgrade their skills. Advancement

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beyond a loan officer position usually includes supervising other loan officers and clerical staff.

Job Outlook

Employment of loan counselors and officers is projected to increase as fast as the average for all occupations through 2012. College graduates and those with banking, lending, or sales experience should have the best job prospects. Employment growth stemming from economic expansion and population increases—factors that generate demand for loans—will be partially offset by increased automation that speeds lending processes and by the spread of alternative methods of applying for and obtaining loans. Job opportunities for workers in these occupations are influenced by the volume of loan applications, which is determined largely by interest rates and by the overall level of economic activity. However, besides those resulting from growth, additional job openings will result from the need to replace workers who retire or otherwise leave the occupation permanently.

The use of credit scoring has made the loan evaluation process much simpler than in the past, and even unnecessary in some cases. Credit scoring allows loan officers, particularly loan underwriters, to evaluate many more loans in much less time, thus increasing loan officers' efficiency. In addition, the mortgage application process has become highly automated and standardized. This simplification has enabled online mortgage loan vendors to offer loan shopping services over the Internet. Online vendors accept loan applications from customers over the Internet and determine which lenders have the best interest rates for particular loans. With this knowledge, customers can go directly to the lending institution, thereby bypassing mortgage loan brokers. Shopping for loans on the Internet—though currently not a widespread practice—is expected to become more common over the next 10 years, particularly for mortgages, thus reducing demand for loan officers.

Although loans remain a major source of revenue for banks, demand for new loans fluctuates and affects the income and employment opportunities of loan officers. When the economy is on the upswing or when interest rates decline dramatically, there is a surge in real estate buying and mortgage refinancing that requires loan officers to work long hours processing applications and induces lenders to hire additional loan officers. Loan officers often are paid by commission on the value of the loans they place, and some have high earnings when demand for mortgages is high. When the real estate market slows, loan officers often suffer a decline in earnings and may even be subject to layoffs. The same applies to commercial loan officers, whose workloads increase during good economic times as companies seek to invest more in their businesses. In difficult economic conditions, loan collection officers are likely to see an increase in the number of delinquent loans.

Earnings

Median annual earnings of loan counselors were $32,010 in 2002. The middle 50 percent earned between $26,330 and $41,660. The lowest 10 percent earned less than $22,800, while the top 10 percent earned more than $57,400.

Median annual earnings of loan officers were $43,980 in 2002. The middle 50 percent earned between $32,360 and $62,160. The lowest 10 percent earned less than $25,790, while the top 10 percent earned more than $88,450. Median annual earnings in the industries employing the largest numbers of loan officers in 2002 were:

Activities related to credit intermediation	$47,240
Management of companies and enterprises	46,420
Nondepository credit intermediation	44,770
Depository credit intermediation	41,450

The form of compensation for loan officers varies. Most loan officers are paid a commission that is based on the number of loans they originate. In this way, commissions are used to motivate loan officers to bring in more loans. Some institutions pay only salaries, while others pay their loan officers a salary plus a commission or bonus based on the number of loans originated. Banks and other lenders sometimes offer their loan officers free checking privileges and somewhat lower interest rates on personal loans.

According to a salary survey conducted by Robert Half International, a staffing services firm specializing in accounting and finance, mortgage loan officers earned between $36,000 and $45,750 in 2002; consumer loan officers with 1 to 3 years of experience earned between $42,250 and $56,750; and commercial loan officers with 1 to 3 years of experience made between $48,000 and $64,500. With over 3 years of experience, commercial loan officers made between $66,000 and $92,000, and consumer loan officers earned between $55,500 and $75,750. Earnings of loan officers with graduate degrees or professional certifications were approximately 10 to 15 percent higher than these figures. Loan officers who are paid on a commission basis usually earn more than those on salary only, and those who work for smaller banks generally earn less than those employed by larger institutions.

Related Occupations

Loan officers help the public manage financial assets and secure loans. Occupations that involve similar functions include those of securities and financial services sales representatives, personal financial advisors, real estate brokers and sales agents, and insurance sales agents.

Sources of Additional Information

Information about a career as a mortgage loan officer can be obtained from:

➤ Mortgage Bankers Association of America, 1919 Pennsylvania Ave., NW., Washington, DC 20006-3438. Internet: **http://www.mbaa.org**

State bankers' associations can furnish specific information about job opportunities in their State. Also, individual banks can supply information about job openings and the activities, responsibilities, and preferred qualifications of their loan officers.

Management Analysts

(0*NET 13-1111.00)

Significant Points

- Thirty percent are self-employed, about one and a half times the average for other management, business, and financial occupations.
- Most positions in private industry require a master's degree and additional years of specialized experience; a bachelor's degree is sufficient for entry-level government jobs.
- Despite projected faster-than-average employment growth, intense competition is expected for jobs.

Nature of the Work

As business becomes more complex, the Nation's firms are continually faced with new challenges. Firms increasingly rely on management analysts to help them remain competitive amidst these changes. Management analysts, often referred to as *management*

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consultants in private industry, analyze and propose ways to improve an organization's structure, efficiency, or profits. For example, a small but rapidly growing company that needs help improving the system of control over inventories and expenses may decide to employ a consultant who is an expert in just-in-time inventory management. In another case, a large company that has recently acquired a new division may hire management analysts to help reorganize the corporate structure and eliminate duplicate or nonessential jobs. In recent years, information technology and electronic commerce have provided new opportunities for management analysts. Companies hire consultants to develop strategies for entering and remaining competitive in the new electronic marketplace. (For information on computer specialists working in consulting, see the following statements elsewhere in the *Handbook*: Computer software engineers; systems analysts, computer scientists, and database administrators; and computer programmers.)

Firms providing management analysis range in size from a single practitioner to large international organizations employing thousands of consultants. Some analysts and consultants specialize in a specific industry, such as healthcare or telecommunications, while others specialize by type of business function, such as human resources, marketing, logistics, or information systems. In government, management analysts tend to specialize by type of agency. The work of management analysts and consultants varies with each client or employer, and from project to project. Some projects require a team of consultants, each specializing in one area. In other projects, consultants work independently with the organization's managers. In all cases, analysts and consultants collect, review, and analyze information in order to make recommendations to managers.

Both public and private organizations use consultants for a variety of reasons. Some lack the internal resources needed to handle a project, while others need a consultant's expertise to determine what resources will be required and what problems may be encountered if they pursue a particular opportunity. To retain a consultant, a company first solicits proposals from a number of consulting firms specializing in the area in which it needs assistance. These proposals include the estimated cost and scope of the project, staffing requirements, references from a number of previous clients, and a completion deadline. The company then selects the proposal that best suits its needs.

After obtaining an assignment or contract, management analysts first define the nature and extent of the problem. During this phase, they analyze relevant data, which may include annual revenues, employment, or expenditures, and interview managers and employees while observing their operations. The analyst or consultant then develops solutions to the problem. In the course of preparing their recommendations, they take into account the nature of the organization, the relationship it has with others in the industry, and its internal organization and culture. Insight into the problem often is gained by building and solving mathematical models.

Once they have decided on a course of action, consultants report their findings and recommendations to the client. These suggestions usually are submitted in writing, but oral presentations regarding findings also are common. For some projects, management analysts are retained to help implement the suggestions they have made.

Management analysts in government agencies use the same skills as their private-sector colleagues to advise managers on many types of issues, most of which are similar to the problems faced by private firms. For example, if an agency is planning to purchase personal computers, it must first determine which type to buy, given its budget and data processing needs. In this case, management analysts would assess the prices and characteristics of various machines and determine which best meets the agency's needs.



Management analysts frequenty work in teams to complete projects.

Working Conditions

Management analysts usually divide their time between their offices and the client's site. In either situation, much of an analyst's time is spent indoors in clean, well-lit offices. Because they must spend a significant portion of their time with clients, analysts travel frequently.

Analysts and consultants generally work at least 40 hours a week. Uncompensated overtime is common, especially when project deadlines are approaching. Analysts may experience a great deal of stress as a result of trying to meet a client's demands, often on a tight schedule.

Self-employed consultants can set their workload and hours and work at home. On the other hand, their livelihood depends on their ability to maintain and expand their client base. Salaried consultants also must impress potential clients to get and keep clients for their company.

Employment

Management analysts held about 577,000 jobs in 2002. Thirty percent of these workers were self-employed, about one and a half times the average for other management, business, and financial occupations. Management analysts are found throughout the country, but employment is concentrated in large metropolitan areas. Most work in management, scientific, and technical consulting firms, in computer systems design and related services firms, and for Federal, State, and local governments. The majority of those working for the Federal Government are in the U.S. Department of Defense.

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Training, Other Qualifications, and Advancement

Educational requirements for entry-level jobs in this field vary widely between private industry and government. Most employers in private industry generally seek individuals with a master's degree in business administration or a related discipline. Some employers also require additional years of experience in the field in which the worker plans to consult, in addition to a master's degree. Some will hire workers with a bachelor's degree as a research analyst or associate. Research analysts usually need to pursue a master's degree in order to advance to a consulting position. Most government agencies hire people with a bachelor's degree and no pertinent work experience for entry-level management analyst positions.

Few universities or colleges offer formal programs of study in management consulting; however, many fields of study provide a suitable educational background for this occupation because of the wide range of areas addressed by management analysts. These include most academic programs in business and management, such as accounting and marketing, as well as economics, computer and information sciences, and engineering. In addition to the appropriate formal education, most entrants to this occupation have years of experience in management, human resources, information technology, or other specialties. Analysts also routinely attend conferences to keep abreast of current developments in their field.

Management analysts often work with minimal supervision, so they need to be self-motivated and disciplined. Analytical skills, the ability to get along with a wide range of people, strong oral and written communication skills, good judgment, time management skills, and creativity are other desirable qualities. The ability to work in teams also is an important attribute as consulting teams become more common.

As consultants gain experience, they often become solely responsible for a specific project, taking on more responsibility and managing their own hours. At the senior level, consultants may supervise lower level workers and become more involved in seeking out new business. Those with exceptional skills may eventually become a partner in the firm. Others with entrepreneurial ambition may open their own firm.

A high percentage of management consultants are self-employed, partly because business startup costs are low. Self-employed consultants also can share office space, administrative help, and other resources with other self-employed consultants or small consulting firms, thus reducing overhead costs. Because many small consulting firms fail each year for lack of managerial expertise and clients, persons interested in opening their own firm must have good organizational and marketing skills and several years of consulting experience.

The Institute of Management Consultants USA, Inc. (IMC USA) offers a wide range of professional development programs and resources, such as meetings and workshops, which can be helpful for management consultants. The IMC USA also offers the Certified Management Consultant (CMC) designation to those who meet minimum levels of education and experience, submit client reviews, and pass an interview and exam covering the IMC USA's Code of Ethics. Management consultants with a CMC designation must be recertified every 3 years. Certification is not mandatory for management consultants, but it may give a jobseeker a competitive advantage.

Job Outlook

Despite projected rapid employment growth, keen competition is expected for jobs as management analysts. Because analysts can come from such diverse educational backgrounds, the pool of applicants from which employers can draw is quite large. Furthermore, the independent and challenging nature of the work, combined with high earnings potential, makes this occupation attractive to many. Job opportunities are expected to be best for those with a graduate degree, industry expertise, and a talent for salesmanship and public relations.

Employment of management analysts is expected to grow faster than the average for all occupations through 2012, as industry and government increasingly rely on outside expertise to improve the performance of their organizations. Job growth is projected in very large consulting firms with international expertise and in smaller consulting firms that specialize in specific areas, such as biotechnology, healthcare, information technology, human resources, engineering, and marketing. Growth in the number of individual practitioners may be hindered, however, by increasing use of consulting teams, which permits examination of a variety of different issues and problems within an organization.

Employment growth of management analysts and consultants has been driven by a number of changes in the business environment that have forced firms to take a closer look at their operations. These changes include developments in information technology and the growth of electronic commerce. Traditional companies hire analysts to help design intranets or company Web sites, or establish online businesses. New Internet start-up companies hire analysts not only to design Web sites, but also to advise them in more traditional business practices, such as pricing strategies, marketing, and inventory and human resource management. In order to offer clients better quality and a wider variety of services, consulting firms are partnering with traditional computer software and technology firms. Also, many computer firms are developing consulting practices of their own in order to take advantage of this expanding market. Although information technology consulting should remain one of the fastest growing consulting areas, the volatility of the computer services industry necessitates that the most successful management analysts have knowledge of traditional business practices in addition to computer applications, systems integration, and Web design and management skills.

The growth of international business also has contributed to an increase in demand for management analysts. As U.S. firms expand their business abroad, many will hire management analysts to help them form the right strategy for entering the market; advise on legal matters pertaining to specific countries; or help with organizational, administrative, and other issues, especially if the U.S. company is involved in a partnership or merger with a local firm. These trends provide management analysts with more opportunities to travel or work abroad, but also require them to have a more comprehensive knowledge of international business and foreign cultures and languages.

Furthermore, as international and domestic markets have become more competitive, firms have needed to use resources more efficiently. Management analysts increasingly are sought to help reduce costs, streamline operations, and develop marketing strategies. As this process continues and businesses downsize, even more opportunities will be created for analysts to perform duties that previously were handled internally. Finally, management analysts also will be in greater demand in the public sector, as Federal, State, and local government agencies seek ways to become more efficient.

Though management consultants are continually expanding their services, employment growth could be hampered by increasing competition for clients from occupations that do not traditionally perform consulting work, such as accountants, financial analysts, lawyers, and computer systems analysts. Furthermore, economic downturns also can have adverse effects on employment for some management consultants. In these times, businesses look to cut costs

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and consultants can be considered excess expense. On the other hand, some consultants might experience an increase in work during recessions because they advise businesses on how to cut costs and remain profitable.

Earnings

Salaries for management analysts vary widely by years of experience and education, geographic location, sector of expertise, and size of employer. Generally, management analysts employed in large firms or in metropolitan areas have the highest salaries. Median annual wage and salary earnings of management analysts in 2002 were $60,340. The middle 50 percent earned between $46,160 and $83,590. The lowest 10 percent earned less than $35,990, and the highest 10 percent earned more than $115,670. Median annual earnings in the industries employing the largest numbers of management analysts and consultants in 2002 were:

Management, scientific, and technical consulting services	$71,790
Computer systems design and related services	66,120
Federal Government	65,480
Insurance carriers	51,780
State government	47,340

According to a 2002 survey by the Association of Management Consulting Firms, earnings—including bonuses and profit sharing—averaged $47,826 for research associates in member firms; $61,496 for entry-level consultants, $78,932 for management consultants, $112,716 for senior consultants, $168,998 for junior partners, and $254,817 for senior partners.

Salaried management analysts usually receive common benefits such as health and life insurance, a retirement plan, vacation, and sick leave, as well as less common benefits such as profit sharing and bonuses for outstanding work. In addition, all travel expenses usually are reimbursed by the employer. Self-employed consultants have to maintain their own office and provide their own benefits.

Related Occupations

Management analysts collect, review, and analyze data; make recommendations; and implement their ideas. Occupations with similar duties include accountants and auditors; budget analysts; cost estimators; financial analysts and personal financial advisors; operations research analysts; economists; and market and survey researchers. Some management analysts specialize in information technology and work with computers, as do systems analysts, computer scientists, and database administrators. Most management analysts also have managerial experience similar to that of administrative services managers; advertising, marketing, promotions, public relations, and sales managers; financial managers; human resources, training, and labor relations managers and specialists; and top executives.

Sources of Additional Information

Information about career opportunities in management consulting is available from:

➤ Association of Management Consulting Firms, 380 Lexington Ave., Suite 1700, New York, NY 10168. Internet: **http://www.amcf.org**

Information about the Certified Management Consultant designation can be obtained from:

➤ Institute of Management Consultants USA, Inc., 2025 M St. NW., Suite 800, Washington DC 20036. Internet: **http://www.imcusa.org**

Information on obtaining a management analyst position with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Tax Examiners, Collectors, and Revenue Agents

(0*NET 13-2081.00)

Significant Points

- Tax examiners, collectors, and revenue agents work for Federal, State, and local governments.
- A bachelor's degree in accounting is becoming the standard source of training; in State and local government, an associate degree in accounting or related tax and accounting work experience may be sufficient.
- Employment is expected to grow more slowly than average over the 2002-12 projection period.
- Because of the relatively small number of openings, jobseekers can expect to face competition.

Nature of the Work

Taxes are one of the certainties of life. And, as long as governments collect taxes, there will be jobs for tax examiners, collectors, and revenue agents. These workers ensure that governments obtain revenues from businesses and citizens by reviewing tax returns, conducting audits, identifying taxes payable, and collecting overdue tax dollars.

Tax examiners do similar work, whether they are employed at the Federal, State, or local government level. They review filed tax returns for accuracy and determine whether tax credits and deductions are allowed by law. Because many States assess individual income taxes based on the taxpayer's reported Federal adjusted gross income, tax examiners working for the Federal Government report to the States adjustments or corrections they make. State tax examiners then determine whether the adjustments affect the taxpayer's State tax liability. At the local level, tax examiners often have additional duties, but an integral part of the work still includes the need to determine the factual basis for claims for refunds.

Tax examiners usually deal with the simplest tax returns—those filed by individual taxpayers with few deductions or those filed by small businesses. At the entry level, many tax examiners perform clerical duties, such as reviewing tax returns and entering them into a computer system for processing. If there is a problem, tax examiners may contact the taxpayer to resolve it.

Tax examiners also review returns for accuracy, checking taxpayers' math and making sure that the amounts that they report match those reported from other sources, such as employers and banks. In addition, the examiners verify that Social Security numbers match names and that taxpayers have correctly interpreted the instructions on the tax forms.

Much of a tax examiner's job involves making sure that tax credits and deductions claimed by taxpayers are legitimate. Tax examiners contact the taxpayer by mail or telephone to address discrepancies and request supporting documentation. They may notify the

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taxpayer of any overpayment or underpayment and either issue a refund or request further payment. If a taxpayer owes additional taxes, tax examiners adjust the total amount by assessing fees, interest, and penalties and notify the taxpayer of the total liability. Although most tax examiners deal with uncomplicated returns, some may work in more complex tax areas such as pensions or business net-operating losses.

Revenue agents specialize in tax-related accounting work for the U.S. Internal Revenue Service (IRS) and for equivalent agencies at the State and local government levels. Like tax examiners, they audit returns for accuracy. However, revenue agents handle complicated income, sales, and excise tax returns of businesses and large corporations. As a result, their work differs in a number of ways from that of tax examiners.

Entry-level revenue agents at the Federal level usually audit tax returns of small businesses whose market specializations are similar. As they develop expertise in an industry, such as construction, retail sales, or finance, insurance, and real estate, revenue agents work with tax returns of larger corporations.

Many experienced revenue agents specialize; for example, they may focus exclusively on multinational businesses. But all revenue agents working for the Federal Government must keep abreast of the lengthy, complex, and frequently changing tax code. Computer technology has simplified the research process, allowing revenue agents Internet access to relevant legal bulletins, IRS notices, and tax-related court decisions.

At the State level, revenue agents have duties similar to those of their counterparts in the Federal Government. State revenue agents use revenue adjustment reports forwarded by the IRS to determine whether adjustments made by Federal revenue agents affect a taxpayer's taxable income in the eyes of the States. In addition, State agents consider the sales and income taxes for their own States.

At the local level, revenue agents have varying titles and duties, but they still perform field audits or office audits of financial records for business firms. In some cases, local revenue agents also examine financial records of individuals. These local agents, like their State counterparts, rely on the information contained in Federal tax returns. However, local agents also must be knowledgeable enough to apply local tax laws regarding income, utility fees, or school taxes.

Collectors, also called revenue officers in the IRS, deal with delinquent accounts. The process of collecting a delinquent account starts with the revenue agent or tax examiner sending a report to the taxpayer. If the taxpayer makes no effort to resolve the delinquent account, the case is assigned to a collector. When a collector takes a case, he or she first sends the taxpayer a notice. The collector then works with the taxpayer on how to settle the debt.

In cases in which taxpayers fail to file a tax return, Federal collectors may request that the IRS prepare the return on a taxpayer's behalf. In other instances, collectors are responsible for verifying claims that delinquent taxpayers cannot pay their taxes. They investigate these claims by researching court information for the status of liens, mortgages, or financial statements; locating assets through third parties, such as neighbors or local departments of motor vehicles; and requesting legal summonses for other records. Ultimately, collectors must decide whether the IRS should take a lien, or a claim on an asset—such as a bank account, real estate, or an automobile—to settle a debt. Collectors also have the discretion to garnish wages—that is, take a portion of earned wages—to collect owed taxes.

A big part of a collector's job at the Federal level is imposing and following up on delinquent taxpayers' payment deadlines. For each case file, collectors also must maintain records including contacts, telephone numbers, and actions taken.



At the entry level, many tax examiners perform clerical duties, such as reviewing tax returns and entering them into a computer system for processing.

Like tax examiners and revenue agents, collectors use computers to maintain files. Computer technology also gives collectors data access to help them identify high-risk debtors—those who are unlikely to pay or are likely to flee.

Collectors at the IRS usually work independently. However, they call on experts when tax examiners or revenue agents find fraudulent returns, or when a property seizure will involve complex legal steps.

At the State level, collectors decide whether to take action on the basis of their own States' tax returns. Collection work may be handled over the telephone or be turned over to a collector who specializes in obtaining settlements. These collectors contact people directly and have authority to issue subpoenas and request seizures of property. At the local levels, collectors have less power than do their State and Federal counterparts. Although they can start the processes leading to seizure of property and garnishment of wages, they must go through the local court system.

Working Conditions

Tax examiners, collectors, and revenue agents generally work a 40-hour week, although some overtime might be needed during the tax season. State and local tax examiners, who also may review sales, gasoline, and cigarette taxes, may have a steadier workload year-round. Stress can result from the need to work under a deadline

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in checking returns and evaluating taxpayer claims. Collectors also must face the unpleasant task of confronting delinquent taxpayers.

Tax examiners, collectors, and revenue agents work in clean, well-lighted offices, either in cubicles or at desks. Sometimes travel is necessary. Revenue agents at both the Federal and State levels spend a significant portion of their time in the offices of private firms accessing tax-related records. Some agents may be permanently stationed in the offices of large corporations with complicated tax structures. Agents at the local level usually work in city halls or municipal buildings. Collectors travel to local courthouses; county and municipal seats of government; businesses; and taxpayers' homes to look up records, search for assets, and settle delinquent accounts.

Employment

In 2002, tax examiners, revenue agents, and collectors held about 75,000 jobs at all levels of government. About half worked for the Federal Government, one-third for State governments, and the remainder in local governments. Among those employed by the IRS, tax examiners and revenue agents predominate because of the need to examine or audit tax returns. Collectors make up a smaller proportion, because most disputed tax liabilities do not require enforced collection.

Training, Other Qualifications, and Advancement

Tax examiners, collectors, and revenue agents work with confidential financial and personal information; therefore, trustworthiness is crucial for maintaining the confidentiality of individuals and businesses. Applicants for Federal Government jobs must submit to a background investigation.

A degree in accounting is becoming the standard source of training for tax examiners, collectors, and revenue agents. A bachelor's degree generally is required for employment with the Federal Government. In State and local governments, prospective workers may be able to enter the occupation with an associate degree in accounting, or a combination of related tax and accounting work experience with some college-level business classes. For more advanced entry-level positions, applicants must have a bachelor's degree; demonstrate specialized experience working with tax records, tax laws and regulations, documents, financial accounts, or similar records; or have some combination of postsecondary education and specialized experience.

Tax examiners must be able to understand fundamental tax regulations and procedures, pay attention to detail, and cope well with deadlines. After they are hired, tax examiners receive some formal training. Additionally, annual employer-provided updates keep tax examiners current with changes in procedures or regulations.

Revenue agents need strong analytical, organizational, and time management skills. They also must be able to work independently because they spend so much time away from their home office, and must keep current with changes in the tax code and laws. Newly hired revenue agents expand their accounting knowledge and remain up to date by consulting auditing manuals and other sources for detailed information about individual industries. Additionally, employers continually offer training in new auditing techniques and tax-related issues and court decisions.

Collectors need good interpersonal and communication skills because they deal directly with the public and because their reports are scrutinized when the IRS must legally justify attempts to seize assets. They also must be able to act independently and to exercise good judgment in deciding when and how to collect a debt. Applicants for collector jobs need experience demonstrating knowledge and understanding of business and financial practices, or knowledge of credit operations and practices related to the collection of delinquent accounts.

Entry-level collectors receive formal and on-the-job training under an instructor's guidance before working independently. Collectors usually complete initial training by the end of their second year of service but may receive advanced technical instruction as they gain seniority and take on more difficult cases. Also, collectors are encouraged to continue their professional education by attending meetings to exchange information about how changes in tax laws affect collection methods.

Advancement potential within Federal, State, and local agencies varies for tax examiners, revenue agents, and collectors. For related jobs outside government, experienced workers can take a licensing exam administered by the Federal Government to become enrolled agents—nongovernment tax professionals authorized to represent taxpayers before the IRS.

As revenue agents gain experience, they may specialize in an industry, work with larger corporations, and cover increasingly complex tax returns. Some revenue agents also specialize in assisting in criminal investigations, auditing the books of known or suspected criminals such as drug dealers or money launderers; some agents work with grand juries to help secure indictments. Others become international agents, assessing taxes on companies with subsidiaries abroad.

Collectors who demonstrate leadership skills and a thorough knowledge of collection activities may advance to supervisory or managerial collector positions, in which they oversee the activities of other collectors. It is only these higher supervisors and managers who may authorize the more serious actions against individuals and businesses. The more complex collection attempts, which usually are directed at larger businesses, are reserved for collectors at these higher levels.

Job Outlook

Employment of tax examiners, collectors, and revenue agents is projected to grow more slowly than average during the 2002-12 projection period. Job openings will stem primarily from the need to replace those workers who retire or leave the occupation for other reasons. Because of the relatively small number of openings, jobseekers can expect to face competition.

The number of tax returns filed will continue to increase as the labor force grows. Dampening this effect, however, is a decrease in the proportion of tax returns selected for audit and collection. Because much of the work done by tax examiners and revenue agents is now computerized, productivity has increased, limiting the need for more tax examiners, collectors, and revenue agents. Many State and local governments, as well as the Federal Government, may increasingly contract out their tax collection functions to private sector collection agencies in order to reduce costs.

Employment at the State and local levels may fluctuate with the overall state of the economy. When the economy is contracting, State and local governments are likely to freeze hiring and lay off workers in response to budgetary constraints. Employment growth is more likely to occur in Southern and Western States that are experiencing large population increases. Opportunities at the Federal level could arise from the relaxing of budget constraints imposed on the IRS, the primary employer of these workers.

Earnings

In 2002, median annual earnings for all tax examiners, collectors, and revenue agents was $42,250. The middle 50 percent earned

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between $31,250 and $59,670. The bottom 10 percent earned less than $23,950, and the top 10 percent earned more than $74,600.

However, median earnings vary considerably depending on the level of government. At the Federal level, 2002 median annual earnings for tax examiners, collectors, and revenue agents were $50,820; at the State level, they were $41,000; and at the local level, they were $28,710. Earnings also vary by occupational specialty. For example, in the Federal Government in 2003, tax examiners earned an average of $34,002, revenue agents earned $75,816, and tax specialists earned $53,083.

Related Occupations

Tax examiners, collectors, and revenue agents analyze and interpret financial data. Occupations with similar responsibilities include accountants and auditors, budget analysts, cost estimators, financial analysts and personal financial advisors, financial managers, and loan counselors and officers.

Sources of Additional Information

Information on obtaining a position as a tax examiner, collector, or revenue agent with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

State or local government personnel offices can provide information about tax examiner, collector, or revenue agent jobs at those levels of government.

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Professional and Related Occupations

Computer and Mathematical Occupations

Actuaries

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Significant Points

- A strong background in mathematics is essential.
- About 6 out of 10 actuaries are employed in the insurance industry.
- Employment opportunities will be good despite the limited number of openings in this small occupation, as stringent qualifying requirements limit the number of new entrants.

Nature of the Work

One of the main functions of actuaries is to help businesses assess the risk of certain events occurring and formulate policies that minimize the cost of that risk. For this reason, actuaries are essential to the insurance industry. Actuaries assemble and analyze data to estimate the probability and likely cost of the occurrence of an event such as death, sickness, injury, disability, or loss of property. Actuaries also address financial questions, including those involving the level of pension contributions required to produce a certain retirement income level and the way in which a company should invest resources to maximize return on investments in light of potential risk. Using their broad knowledge of statistics, finance, and business, actuaries help design insurance policies, pension plans, and other financial strategies in a manner which will help ensure that the plans are maintained on a sound financial basis.

Most actuaries are employed in the insurance industry, specializing in life and health insurance or property and casualty insurance. They produce probability tables which determine the likelihood that a potential future event will generate a claim. From these tables, they estimate the amount a company can expect to pay in claims. For example, property and casualty actuaries calculate the expected amount of claims resulting from automobile accidents, which varies depending on the insured person's age, sex, driving history, type of car, and other factors. Actuaries ensure that the price, or premium, charged for such insurance will enable the company to cover claims and other expenses. This premium must be profitable, yet competitive with other insurance companies. Within the life and health insurance fields, actuaries are helping to develop long-term-care insurance and annuity policies, the latter a growing investment tool for many individuals.

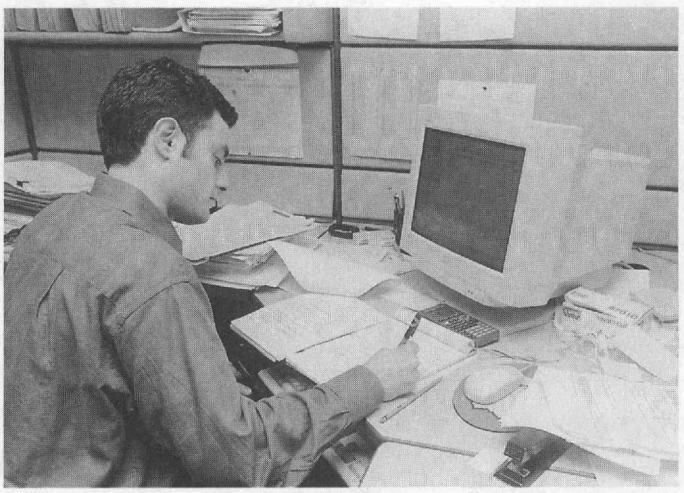
Actuaries in other financial services industries manage credit and help price corporate security offerings. They also devise new investment tools to help their firms compete with other financial services companies. Pension actuaries working under the provisions of the Employee Retirement Income Security Act (ERISA) of 1974 evaluate pension plans covered by that Act and report on the plans' financial soundness to participants, sponsors, and Federal regulators. Actuaries working in government help manage social programs such as Social Security and Medicare.

Actuaries may help determine company policy and may need to explain complex technical matters to company executives, government officials, shareholders, policyholders, or the public in general. They may testify before public agencies on proposed legislation affecting their businesses or explain changes in contract provisions to customers. They also may help companies develop plans to enter new lines of business or new geographic markets with existing lines of business by forecasting demand in competitive settings.

Both staff actuaries employed by businesses and consulting actuaries provide advice to clients on a contract basis. The duties of most consulting actuaries are similar to those of other actuaries. For example, some may evaluate company pension plans by calculating the future value of employee and employer contributions and determining whether the amounts are sufficient to meet the future needs of retirees. Others help companies reduce their insurance costs by lowering the level of risk the companies take on. For instance, they may provide advice on how to lessen the risk of injury on the job, which will lower worker's compensation costs. Consulting actuaries sometimes testify in court regarding the value of the potential lifetime earnings of a person who is disabled or killed in an accident, the current value of future pension benefits (in divorce cases), or other values arrived at by complex calculations. Many consulting actuaries work in reinsurance, a field in which one insurance company arranges to share a large prospective liability policy with another insurance company in exchange for a percentage of the premium.

Working Conditions

Actuaries have desk jobs, and their offices usually are comfortable and pleasant. They often work at least 40 hours a week. Some actuaries, particularly consulting actuaries, may travel to



Actuaries analyze the probability that an adverse event will occur.

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meet with clients. Consulting actuaries also may experience more erratic employment and be expected to work more than 40 hours per week.

Employment

Actuaries held about 15,000 jobs in 2002, with more than 1 in 2 actuaries employed by insurance carriers. Others work for pension funds and insurance agents and brokers. A growing number of actuaries work for firms providing a variety of corporate services, especially management and public relations, or for firms offering consulting services. A relatively small number of actuaries are employed by security and commodity brokers or by government agencies.

Training, Other Qualifications, and Advancement

Actuaries need a strong background in mathematics and general business. Applicants for beginning actuarial jobs usually have a bachelor's degree in mathematics, actuarial science, statistics, or a business-related discipline, such as economics, finance, or accounting. About 100 colleges and universities offer an actuarial science program, and most offer a degree in mathematics, statistics, economics, or finance. Some companies hire applicants without specifying a major, provided that the applicant has a working knowledge of mathematics, including calculus, probability, and statistics, and has demonstrated this knowledge by passing one or two actuarial exams required for professional designation. Courses in economics, accounting, finance, and insurance also are useful. Companies increasingly prefer well-rounded individuals who, in addition to having acquired a strong technical background, have some training in liberal arts and business and possess strong communication skills.

In addition to knowledge of mathematics, computer skills are becoming increasingly important. Actuaries should be able to develop and use spreadsheets and databases, as well as standard statistical analysis software. Knowledge of computer programming languages, such as Visual Basic, also is useful.

Two professional societies sponsor programs leading to full professional status in their specialty. The first, the Society of Actuaries (SOA), administers a series of actuarial examinations in the life insurance, health benefits systems, retirement systems, and finance and investment fields. The Casualty Actuarial Society (CAS), as the name indicates, gives a series of examinations in the property and casualty field, which includes fire, accident, medical malpractice, worker's compensation, and personal injury liability.

The first four exams in the SOA and CAS examination series are jointly sponsored by the two societies and cover the same material. For this reason, students do not need to commit themselves to a specialty until they have taken the initial examinations, which test an individual's competence in probability, calculus, statistics, and other branches of mathematics. The first few examinations help students evaluate their potential as actuaries. Many prospective actuaries begin taking the exams in college with the help of self-study guides and courses. Those who pass one or more examinations have better opportunities for employment at higher starting salaries than those who do not.

After graduating from college, most prospective actuaries gain on-the job experience at an insurance company or consulting firm, while at the same time working to complete the examination process. Actuaries are encouraged to finish the entire series of examinations as soon as possible, advancing first to the Associate level (with an ASA or ACAS designation) and then to the Fellowship level (FSA or FCAS designation). Advanced topics in the casualty field include investment and assets, dynamic financial analysis, and valuation of insurance. Candidates in the SOA examination series must choose a specialty-group and health benefits, individual life and annuities, pensions, investments, or finance. Examinations are given twice a year, in the spring and the fall. Although many companies allot time to their employees for study, home study is required to pass the examinations, and many actuaries study for months to prepare for each examination. It is likewise common for employers to pay the hundreds of dollars for examination fees and study materials. Most actuaries reach the Associate level within 4 to 6 years and the Fellowship level a few years later.

Specific requirements apply to pension actuaries, who verify the financial status of defined benefit pension plans for the Federal Government. These actuaries must be enrolled by the Joint Board for the Enrollment of Actuaries. To qualify for enrollment, applicants must meet certain experience and examination requirements, as stipulated by the Board.

To perform their duties effectively, actuaries must keep up with current economic and social trends and legislation, as well as with developments in health, business, finance, and economics that could affect insurance or investment practices. Good communication and interpersonal skills also are important, particularly for prospective consulting actuaries.

Beginning actuaries often rotate among different jobs in an organization to learn various actuarial operations and phases of insurance work, such as marketing, underwriting, and product development. At first, they prepare data for actuarial projects or perform other simple tasks. As they gain experience, actuaries may supervise clerks, prepare correspondence, draft reports, and conduct research. They may move from one company to another early in their careers as they advance to higher positions.

Advancement depends largely on job performance and the number of actuarial examinations passed. Actuaries with a broad knowledge of the insurance, pension, investment, or employee benefits fields can rise to administrative and executive positions in their companies. Actuaries with supervisory ability may advance to management positions in other areas, such as underwriting, accounting, data processing, marketing, and advertising. Some actuaries assume college and university faculty positions. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Job Outlook

Employment of actuaries is expected to grow as fast as the average for all occupations through 2012. Employment opportunities should remain good for those who qualify, because the stringent qualifying examination system restricts the number of candidates. Employment growth in the insurance industry is expected to continue at a stable pace, while more significant job growth is likely in some other industries. In addition, a small number of jobs will open up each year to replace actuaries who leave the occupation to retire or who find new jobs.

Steady demand by the insurance industry—the largest employer of actuaries—should ensure that actuary jobs in this key industry will not decrease over the projection period. Although relatively few new jobs will be created, actuaries will continue to be needed to develop, price, and evaluate a variety of insurance products and calculate the costs of new risks. Recently, employment of actuaries in life insurance had begun to decline,

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but the growing popularity of annuities, a financial product offered primarily by life insurance companies, has resulted in some job growth in this specialty. Also, new actuarial positions have been created in property-casualty insurance to analyze evolving risks, such as terrorism.

Some new employment opportunities for actuaries should also become available in the health-care field as health-care issues and Medicare reform continue to receive growing attention. Increased regulation of managed health-care companies and the desire to contain health-care costs will continue to provide job opportunities for actuaries, who will also be needed to evaluate the risks associated with new medical issues, such as genetic testing and the impact of new diseases. Others in this field are involved in drafting health-care legislation.

A significant proportion of new actuaries will find employment with consulting firms. Companies that may not find it cost effective to hire their own actuaries are increasingly hiring consulting actuaries to analyze various risks. Other areas with notable growth prospects are information services and accounting services. Also, because actuarial skills are increasingly seen as useful to other industries that deal with risk, such as the airline and the banking industries, additional job openings may be created in these industries.

The best job prospects for entry-level positions will be for those candidates who have passed at least one or two of the initial actuarial exams. Candidates with additional knowledge or experience, such as computer programming skills, will be particularly attractive to employers. Most jobs in this occupation are located in urban areas, but opportunities vary by geographic location. Opportunities should be best in Illinois, New Jersey, New York, and Connecticut—the four States in which about one-third of all actuary jobs are concentrated.

Earnings

Median annual earnings of actuaries were $69,970 in 2002. The middle 50 percent earned between $50,510 and $99,820. The lowest 10 percent had earnings of less than $39,700, while the top 10 percent earned more than $137,650.

According to the National Association of Colleges and Employers, annual starting salaries for graduates with a bachelor's degree in actuarial science averaged $40,396 in 2003.

Insurance companies and consulting firms give merit increases to actuaries as they gain experience and pass examinations. Some companies also offer cash bonuses for each professional designation achieved. A 2003 survey by Life Office Management Association, Inc., of the largest U.S. insurance and financial services companies indicated that the average base salary for an entry-level actuary was $46,991. Associate actuaries, who direct and provide leadership in the design, pricing, and implementation of insurance products, received an average salary of $99,446. Actuaries at the highest technical level without managerial responsibilities reportedly were paid an average of $104,235.

Related Occupations

Actuaries need a strong background in mathematics, statistics, and related fields. Other workers whose jobs involve related skills include accountants and auditors, budget analysts, economists, market and survey researchers, financial analysts and personal financial advisors, insurance underwriters, mathematicians, and statisticians.

Sources of Additional Information

Career information on actuaries specializing in pensions is available from

➤ American Society of Pension Actuaries, 4245 N. Fairfax Dr., Suite 750, Arlington, VA 22203. Internet: **http://www.aspa.org**

For information about actuarial careers in life and health insurance, employee benefits and pensions, and finance and investments, contact

➤ Society of Actuaries (SOA), 475 N. Martingale Rd., Suite 800, Schaumburg, IL 60173-2226. Internet: **http://www.soa.org**

For information about actuarial careers in property and casualty insurance, contact

➤ Casualty Actuarial Society (CAS), 1100 N. Glebe Rd., Suite 600, Arlington, VA 22201. Internet: **http://www.casact.org**

The SOA and CAS jointly sponsor a Web site for those interested in pursuing an actuarial career. Internet: **http://www.BeAnActuary.org**

For general facts about actuarial careers, contact

➤ American Academy of Actuaries, 1100 17th St. NW., 7th Floor, Washington, DC 20036. Internet: **http://www.actuary.org/index.htm**

Computer Programmers

(0*NET 15-1021.00)

Significant Points

- Nearly half of all computer programmers held a bachelor's degree in 2002; about 1 in 5 held a graduate degree.
- Employment is expected to grow much more slowly than that of other computer specialists.
- Prospects should be best for college graduates with knowledge of a variety of programming languages and tools; those with less formal education or its equivalent in work experience should face strong competition for programming jobs.

Nature of the Work

Computer programmers write, test, and maintain the detailed instructions, called programs, that computers must follow to perform their functions. They also conceive, design, and test logical structures for solving problems by computer. Many technical innovations in programming—advanced computing technologies and sophisticated new languages and programming tools—have redefined the role of a programmer and elevated much of the programming work done today. Job titles and descriptions may vary, depending on the organization. In this occupational statement, *computer programmer* refers to individuals whose main job function is programming; this group has a wide range of responsibilities and educational backgrounds.

Computer programs tell the computer what to do—which information to identify and access, how to process it, and what equipment to use. Programs vary widely depending upon the type of information to be accessed or generated. For example, the instructions involved in updating financial records are very different from those required to duplicate conditions on board an aircraft for pilots training in a flight simulator. Although simple programs can be written in a few hours, programs that use complex mathematical formulas, whose solutions can only be approximated, or that draw data from many existing systems

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may require more than a year of work. In most cases, several programmers work together as a team under a senior programmer's supervision.

Programmers write programs according to the specifications determined primarily by computer software engineers and systems analysts. (Separate statements on computer software engineers and on computer systems analysts, database administrators, and computer scientists appear elsewhere in the *Handbook*.) After the design process is complete, it is the job of the programmer to convert that design into a logical series of instructions that the computer can follow. The programmer then codes these instructions in a conventional programming language, such as COBOL; an artificial intelligence language, such as Prolog; or one of the most advanced object-oriented languages such as Java, C++, or Smalltalk. Different programming languages are used depending on the purpose of the program. COBOL, for example, is commonly used for business applications, whereas Fortran (short for "formula translation") is used in science and engineering. C++ is widely used for both scientific and business applications. Many programmers at the enterprise level are also expected to know platform-specific languages used in database programming. Programmers generally know more than one programming language and, because many languages are similar, they often can learn new languages relatively easily. In practice, programmers often are referred to by the language they know, as are Java programmers, or the type of function they perform or environment in which they work, which is the case for database programmers, mainframe programmers, or Web programmers.

Many programmers update, repair, modify, and expand existing programs. When making changes to a section of code, called a *routine*, programmers need to make other users aware of the task that the routine is to perform. They do this by inserting comments in the coded instructions, so that others can understand the program. Many programmers use computer-assisted software engineering (CASE) tools to automate much of the coding process. These tools enable a programmer to concentrate on writing the unique parts of the program, because the tools automate various pieces of the program being built. CASE tools generate whole sections of code automatically, rather than line by line. Programmers also utilize libraries of pre-written code, which can then be modified or customized for a specific application. This also yields more reliable and consistent programs and increases programmers' productivity by eliminating some routine steps.

Programmers test a program by running it to ensure that the instructions are correct and that the program produces the desired outcome. If errors do occur, the programmer must make the appropriate change and recheck the program until it produces the correct results. This process is called testing and debugging. Programmers may continue to fix these problems throughout the life of a program. Programmers working in a mainframe environment, which involves a large centralized computer, may prepare instructions for a computer operator who will run the program. (A separate statement on computer operators appears elsewhere in the *Handbook*.) They also may contribute to a manual for persons who will be using the program.

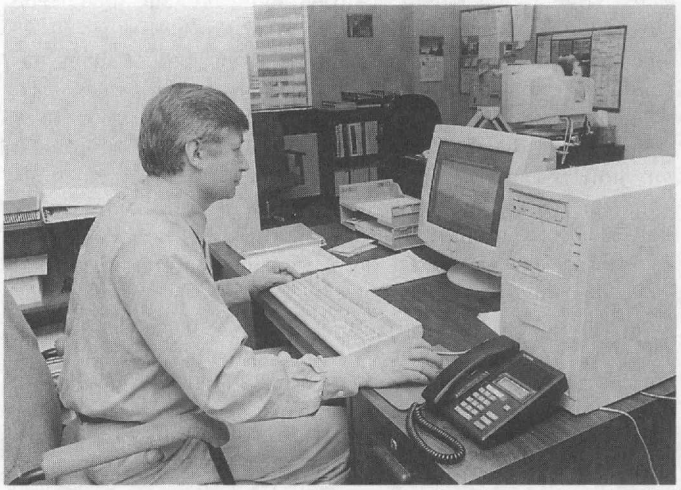
Programmers often are grouped into two broad types—applications programmers and systems programmers. *Applications programmers* write programs to handle a specific job, such as a program to track inventory within an organization. They may also revise existing packaged software or customize generic applications called middleware. *Systems programmers*, on the other hand, write programs to maintain and control computer systems software, such as operating systems, networked systems, and database systems. These workers make changes in the sets of instructions that determine how the network, workstations, and central processing unit of the system handle the various jobs they have been given, and how they communicate with peripheral equipment such as terminals, printers, and disk drives. Because of their knowledge of the entire computer system, systems programmers often help applications programmers to determine the source of problems that may occur with their programs.

Programmers in software development companies may work directly with experts from various fields to create software—either programs designed for specific clients or packaged software for general use—ranging from games and educational software to programs for desktop publishing and financial planning. Much of this type of programming takes place in the preparation of packaged software, which constitutes one of the most rapidly growing segments of the computer services industry.

In some organizations, particularly small ones, workers commonly known as *programmer-analysts* are responsible for both the systems analysis and the actual programming work. (A more detailed description of the work of programmer-analysts is presented in the statement on computer systems analysts, database administrators, and computer scientists elsewhere in the *Handbook*.) Advanced programming languages and new object-oriented programming capabilities are increasing the efficiency and productivity of both programmers and users. The transition from a mainframe environment to one that is based primarily on personal computers (PCs) has blurred the once rigid distinction between the programmer and the user. Increasingly, adept end-users are taking over many of the tasks previously performed by programmers. For example, the growing use of packaged software, such as spreadsheet and database management software packages, allows users to write simple programs to access data and perform calculations.

Working Conditions

Programmers generally work in offices in comfortable surroundings. Many programmers may work long hours or weekends to meet deadlines or fix critical problems that occur during off hours. Given the technology available, telecommuting is becoming common for a wide range of computer professionals,



Computer programmers write, test, and maintain the detailed instructions that computers follow.

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including computer programmers. As computer networks expand, more programmers are able to make corrections or fix problems remotely by using modems, e-mail, and the Internet to connect to a customer's computer.

Like other workers who spend long periods in front of a computer terminal typing at a keyboard, programmers are susceptible to eyestrain, back discomfort, and hand and wrist problems, such as carpal tunnel syndrome.

Employment

Computer programmers held about 499,000 jobs in 2002. Programmers are employed in almost every industry, but the largest concentrations are in computer systems design and related services and in software publishers, which includes firms that write and sell software. Large numbers of programmers also can be found in management of companies and enterprises, telecommunications companies, manufacturers of computer and electronic equipment, financial institutions, insurance carriers, educational institutions, and government agencies.

A large number of computer programmers are employed on a temporary or contract basis or work as independent consultants, as companies demand expertise with new programming languages or specialized areas of application. Rather than hiring programmers as permanent employees and then laying them off after a job is completed, employers can contract with temporary help agencies, consulting firms, or directly with programmers themselves. A marketing firm, for example, may require the services of several programmers only to write and debug the software necessary to get a new customer resource management system running. This practice also enables companies to bring in people with a specific set of skills—usually in one of the latest technologies—as it applies to their business needs. Bringing in an independent contractor or consultant with a certain level of experience in a new or advanced programming language, for example, enables an establishment to complete a particular job without having to retrain existing workers. Such jobs may last anywhere from several weeks to a year or longer. There were 18,000 self-employed computer programmers in 2002.

Training, Other Qualifications, and Advancement

While there are many training paths available for programmers, mainly because employers' needs are so varied, the level of education and experience employers seek has been rising, due to the growing number of qualified applicants and the specialization involved with most programming tasks. Bachelor's degrees are commonly required, although some programmers may qualify for certain jobs with 2-year degrees or certificates. The associate degree is an increasingly attractive entry-level credential for prospective computer programmers. Most community colleges and many independent technical institutes and proprietary schools offer an associate degree in computer science or a related information technology field.

Employers are primarily interested in programming knowledge, and computer programmers can become certified in a programming language such as C++ or Java. College graduates who are interested in changing careers or developing an area of expertise also may return to a 2-year community college or technical school for additional training. In the absence of a degree, substantial specialized experience or expertise may be needed. Even when hiring programmers with a degree, employers appear to be placing more emphasis on previous experience.

Some computer programmers hold a college degree in computer science, mathematics, or information systems, whereas others have taken special courses in computer programming to supplement their degree in a field such as accounting, inventory control, or another area of business. As the level of education and training required by employers continues to rise, the proportion of programmers with a college degree should increase in the future. As indicated by the following tabulation, 65 percent of computer programmers had a bachelor's or higher degree in 2002.

	Percent
High school graduate or equivalent or less	7.7
Some college, no degree	15.2
Associate degree	11.6
Bachelor's degree	48.6
Graduate degree	16.7

Required skills vary from job to job, but the demand for various skills generally is driven by changes in technology. Employers using computers for scientific or engineering applications usually prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences. Graduate degrees in related fields are required for some jobs. Employers who use computers for business applications prefer to hire people who have had college courses in management information systems (MIS) and business and who possess strong programming skills. Although knowledge of traditional languages still is important, employers are placing increasing emphasis on newer, object-oriented programming languages and tools, such as C++ and Java. Additionally, employers are seeking persons familiar with fourth- and fifth-generation languages that involve graphic user interface (GUI) and systems programming. Employers also prefer applicants who have general business skills and experience related to the operations of the firm. Students can improve their employment prospects by participating in a college work-study program or by undertaking an internship.

Most systems programmers hold a 4-year degree in computer science. Extensive knowledge of a variety of operating systems is essential for such workers. This includes being able to configure an operating system to work with different types of hardware and having the skills needed to adapt the operating system to best meet the needs of a particular organization. Systems programmers also must be able to work with database systems, such as DB2, Oracle, or Sybase.

When hiring programmers, employers look for people with the necessary programming skills who can think logically and pay close attention to detail. The job calls for patience, persistence, and the ability to work on exacting analytical work, especially under pressure. Ingenuity, creativity, and imagination also are particularly important when programmers design solutions and test their work for potential failures. The ability to work with abstract concepts and to do technical analysis is especially important for systems programmers, because they work with the software that controls the computer's operation. Because programmers are expected to work in teams and interact directly with users, employers want programmers who are able to communicate with nontechnical personnel.

Entry-level or junior programmers may work alone on simple assignments after some initial instruction, or they may be assigned to work on a team with more experienced programmers. Either way, beginning programmers generally must work under

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close supervision. Because technology changes so rapidly, programmers must continuously update their knowledge and skills by taking courses sponsored by their employer or by software vendors, or offered through local community colleges and universities.

For skilled workers who keep up to date with the latest technology, the prospects for advancement are good. In large organizations, programmers may be promoted to lead programmer and be given supervisory responsibilities. Some applications programmers may move into systems programming after they gain experience and take courses in systems software. With general business experience, programmers may become programmer-analysts or systems analysts or be promoted to a managerial position. Other programmers, with specialized knowledge and experience with a language or operating system, may work in research and development on multimedia or Internet technology, for example. As employers increasingly contract out programming jobs, more opportunities should arise for experienced programmers with expertise in a specific area to work as consultants.

Certification is a way to demonstrate a level of competence, and may provide a jobseeker with a competitive advantage. In addition to language-specific certificates that a programmer can obtain, product vendors or software firms also offer certification and may require professionals who work with their products to be certified. Voluntary certification also is available through other various organizations.

Job Outlook

Employment of programmers is expected to grow about as fast as the average for all occupations through 2012. Jobs for both systems and applications programmers should be most plentiful in data processing service firms, software houses, and computer consulting businesses. These types of establishments are part of computer systems design and related services and software publishers, which are projected to be among the fastest growing industries in the economy over the 2002-12 period. As organizations attempt to control costs and keep up with changing technology, they will need programmers to assist in conversions to new computer languages and systems. In addition, numerous job openings will result from the need to replace programmers who leave the labor force or transfer to other occupations such as manager or systems analyst.

Employment of programmers, however, is expected to grow much more slowly than that of other computer specialists. With the rapid gains in technology, sophisticated computer software now has the capability to write basic code, eliminating the need for more programmers to do this routine work. The consolidation and centralization of systems and applications, developments in packaged software; advances in programming languages and tools, and the growing ability of users to design, write, and implement more of their own programs means that more of the programming functions can be transferred from programmers to other types of workers. Furthermore, as the level of technological innovation and sophistication increases, programmers are likely to face increasing competition from programming businesses overseas, to which much routine work can be contracted out at a lower cost.

Nevertheless, employers will continue to need programmers who have strong technical skills and who understand an employer's business and its programming requirements. This means that programmers will have to keep abreast of changing programming languages and techniques. Given the importance of networking and the expansion of client/server, Web-based, and wireless environments, organizations will look for programmers who can support data communications and help to implement electronic commerce and Intranet strategies. Demand for programmers with strong object-oriented programming capabilities and technical specialization in areas such as client/server programming, wireless applications, multimedia technology, and graphic user interface (GUI) should arise from the expansion of intranets, extranets, and Internet applications. Programmers also will be needed to create and maintain expert systems and embed these technologies in more products. Finally, growing emphasis on cyber-security will lead to increased demand for programmers who are familiar with digital security issues and skilled in using appropriate security technology.

As programming tasks become increasingly sophisticated and additional levels of skill and experience are demanded by employers, graduates of 2-year programs and people with less than a 2-year degree or its equivalent in work experience should face strong competition for programming jobs. Competition for entry-level positions, however, also can affect applicants with a bachelor's degree. Prospects should be best for college graduates with knowledge of, and experience working with, a variety of programming languages and tools—including C++ and other object-oriented languages such as Java, as well as newer, domain-specific languages that apply to computer networking, database management, and Internet application development. Obtaining vendor-specific or language-specific certification also can provide a competitive edge. Because demand fluctuates with employers' needs, jobseekers should keep up to date with the latest skills and technologies. Individuals who want to become programmers can enhance their prospects by combining the appropriate formal training with practical work experience.

Earnings

Median annual earnings of computer programmers were $60,290 in 2002. The middle 50 percent earned between $45,960 and $78,140 a year. The lowest 10 percent earned less than $35,080; the highest 10 percent earned more than $96,860. Median annual earnings in the industries employing the largest numbers of computer programmers in 2002 were:

Professional and commercial equipment and supplies merchant wholesalers	$70,440
Software publishers	66,870
Computer systems design and related services	65,640
Management of companies and enterprises	59,850
Data processing, hosting, and related services	59,300

According to the National Association of Colleges and Employers, starting salary offers for graduates with a bachelor's degree in computer programming averaged $45,558 a year in 2003.

According to Robert Half International, a firm providing specialized staffing services, average annual starting salaries in 2003 ranged from $51,500 to $80,500 for applications development programmers/analysts, and from $55,000 to $87,750 for software developers. Average starting salaries for mainframe systems programmers ranged from $53,250 to $68,750 in 2003.

Related Occupations

Other professional workers who deal extensively with data include computer software engineers; computer systems analysts, database administrators, and computer scientists; statisticians; mathematicians; engineers; financial analysts and personal fi-

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nancial advisors; accountants and auditors; actuaries; and operations research analysts.

Sources of Additional Information

State employment service offices can provide information about job openings for computer programmers. Municipal chambers of commerce are an additional source of information on an area's largest employers.

Further information about computer careers is available from:

➤ Association for Computing Machinery (ACM), 1515 Broadway, New York, NY 10036. Internet: **http://www.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

Computer Software Engineers

(0*NET 15-1031.00, 15-1032.00)

Significant Points

- Computer software engineers are projected to be one of the fastest growing occupations over the 2002-12 period.
- Highly favorable opportunities are expected for college graduates with at least a bachelor's degree in computer engineering or computer science and with practical work experience.
- Computer software engineers must continually strive to acquire new skills in conjunction with the rapid changes in computer technology.

Nature of the Work

The explosive impact of computers and information technology on our everyday lives has generated a need to design and develop new computer software systems and to incorporate new technologies in a rapidly growing range of applications. The tasks performed by workers known as computer software engineers evolve quickly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers. Computer software engineers apply the principles and techniques of computer science, engineering, and mathematical analysis to the design, development, testing, and evaluation of the software and systems that enable computers to perform their many applications. (A separate statement on computer hardware engineers appears elsewhere in the *Handbook*.)

Software engineers working in applications or systems development analyze users' needs and design, construct, test, and maintain computer applications software or systems. Software engineers can be involved in the design and development of many types of software, including software for operating systems and network distribution, and compilers, which convert programs for execution on a computer. In programming, or coding, software engineers instruct a computer, line by line, how to perform a function. They also solve technical problems that arise. Software engineers must possess strong programming skills, but are more concerned with developing algorithms and analyzing and solving programming problems than with actually writing code. (A separate statement on computer programmers appears elsewhere in the *Handbook*.)

Computer applications software engineers analyze users' needs and design, construct, and maintain general computer applications software or specialized utility programs. These workers use different programming languages, depending on the purpose of the program. The programming languages most often used are C, C++, and Java, with Fortran and COBOL used less commonly. Some software engineers develop both packaged systems and systems software or create customized applications.

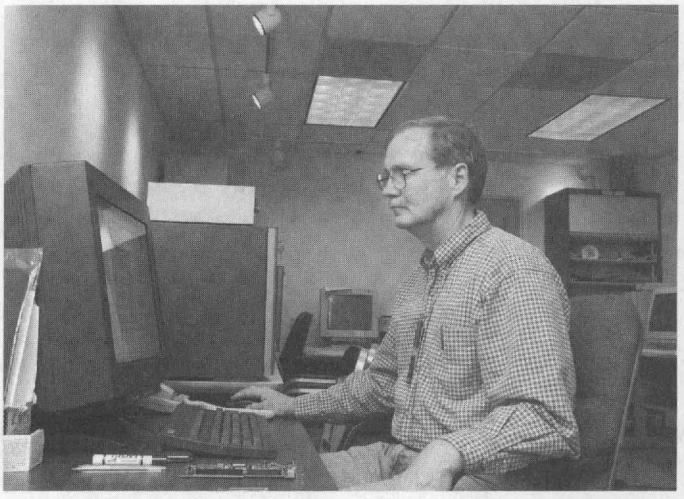
Computer systems software engineers coordinate the construction and maintenance of a company's computer systems and plan their future growth. Working with a company, they coordinate each department's computer needs—ordering, inventory, billing, and payroll recordkeeping, for example—and make suggestions about its technical direction. They also might set up the company's intranets—networks that link computers within the organization and ease communication among the various departments.

Systems software engineers work for companies that configure, implement, and install complete computer systems. They may be members of the marketing or sales staff, serving as the primary technical resource for sales workers and customers. They also may be involved in product sales and in providing their customers with continuing technical support.

Computer software engineers often work as part of a team that designs new hardware, software, and systems. A core team may comprise engineering, marketing, manufacturing, and design people who work together until the product is released.

Working Conditions

Computer software engineers normally work in well-lighted and comfortable offices or computer laboratories in which computer equipment is located. Most software engineers work at least 40 hours a week; however, due to the project-oriented nature of the work, they also may have to work evenings or weekends to meet deadlines or solve unexpected technical problems. Like other workers who sit for hours at a computer, typing on a keyboard, software engineers are susceptible to eyestrain, back



Computer software engineers design, create, and modify computer applications.

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discomfort, and hand and wrist problems such as carpal tunnel syndrome.

As they strive to improve software for users, many computer software engineers interact with customers and coworkers. Computer software engineers who are employed by software vendors and consulting firms, for example, spend much of their time away from their offices, frequently traveling overnight to meet with customers. They call on customers in businesses ranging from manufacturing plants to financial institutions.

As networks expand, software engineers may be able to use modems, laptops, e-mail, and the Internet to provide more technical support and other services from their main office, connecting to a customer's computer remotely to identify and correct developing problems.

Employment

Computer software engineers held about 675,000 jobs in 2002. About 394,000 were computer applications software engineers, and about 281,000 were computer systems software engineers. Although they are employed in most industries, the largest concentration of computer software engineers, about 30 percent, is in computer systems design and related services. Many computer software engineers also work for establishments in other industries, such as government agencies, manufacturers of computers and related electronic equipment, and colleges and universities.

Employers of computer software engineers range from startup companies to established industry leaders. The proliferation of Internet, e-mail, and other communications systems expands electronics to engineering firms traditionally associated with unrelated disciplines. Engineering firms specializing in building bridges and power plants, for example, hire computer software engineers to design and develop new geographic data systems and automated drafting systems. Communications firms need computer software engineers to tap into growth in the personal communications market. Major communications companies have many job openings for both computer software applications and computer systems engineers.

An increasing number of computer software engineers are employed on a temporary or contract basis, with many being self-employed, working independently as consultants. Some consultants work for firms that specialize in developing and maintaining client companies' Web sites and intranets. Consulting opportunities for software engineers should grow as businesses need help managing, upgrading, and customizing increasingly complex computer systems. About 21,000 computer software engineers were self-employed in 2002.

Training, Other Qualifications, and Advancement

Most employers prefer to hire persons who have at least a bachelor's degree and broad knowledge of, and experience with, a variety of computer systems and technologies. Usual degree concentrations for applications software engineers are computer science or software engineering; for systems software engineers, usual concentrations are computer science or computer information systems. Graduate degrees are preferred for some of the more complex jobs.

Academic programs in software engineering emphasize software and may be offered as a degree option or in conjunction with computer science degrees. Increasing emphasis on computer security suggests that software engineers with advanced degrees that include mathematics and systems design will be sought after by software developers, government agencies, and consulting firms specializing in information assurance and security. Students seeking software engineering jobs enhance their employment opportunities by participating in internship or co-op programs offered through their schools. These experiences provide the students with broad knowledge and experience, making them more attractive candidates to employers. Inexperienced college graduates may be hired by large computer and consulting firms that train new hires in intensive, company-based programs. In many firms, new employees are mentored, and their mentors have an input into the new hires' evaluations.

For systems software engineering jobs that require workers who have a college degree, a bachelor's degree in computer science or computer information systems is typical. For systems engineering jobs that place less emphasis on workers having a computer-related degree, computer training programs leading to certification are offered by systems software vendors, including Microsoft, Novell, and Oracle. These programs usually last from 1 to 4 weeks, but the worker is not required to attend classes in order to sit for a certification exam; several study guides also are available to help prepare for the exams. Nonetheless, many training authorities feel that program certification alone is not sufficient for most software engineering jobs.

Professional certification is now offered by the Institute of Electrical and Electronics Engineers (IEEE) Computer Society. To be classified as a Certified Software Development Professional, individuals need a bachelor's degree and work experience that demonstrates that they have mastered a relevant body of knowledge, and must pass a written exam.

Persons interested in jobs as computer software engineers must have strong problem-solving and analytical skills. They also must be able to communicate effectively with team members, other staff, and the customers they meet. Because they often deal with a number of tasks simultaneously, they must be able to concentrate and pay close attention to detail.

As is the case with most occupations, advancement opportunities for computer software engineers increase with experience. Entry-level computer software engineers are likely to test and verify ongoing designs. As they become more experienced, computer software engineers may be involved in designing and developing software. Eventually, they may advance to become a project manager, manager of information systems, or chief information officer. Some computer software engineers with several years of experience or expertise find lucrative opportunities working as systems designers or independent consultants or starting their own computer consulting firms.

As technological advances in the computer field continue, employers demand new skills. Computer software engineers must continually strive to acquire such skills if they wish to remain in this extremely dynamic field. To help them keep up with the changing technology, continuing education and professional development seminars are offered by employers and software vendors, colleges and universities, private training institutions, and professional computing societies.

Job Outlook

Computer software engineers are projected to be one of the fastest growing occupations from 2002 to 2012. Rapid employment growth in the computer systems design and related ser-

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vices industry, which employs the greatest number of computer software engineers, should result in highly favorable opportunities for those college graduates with at least a bachelor's degree in computer engineering or computer science and practical experience working with computers. Employers will continue to seek computer professionals with strong programming, systems analysis, interpersonal, and business skills.

Despite the recent downturn among firms specializing in information technology, employment of computer software engineers is expected to increase much faster than the average for all occupations, as businesses and other organizations adopt and integrate new technologies and seek to maximize the efficiency of their computer systems. Job growth will not be as rapid as during the previous decade, however, as the software industry begins to mature and as routine software engineering work is increasingly outsourced overseas. Competition among businesses will continue to create an incentive for increasingly sophisticated technological innovations, and organizations will need more computer software engineers to implement these changes. In addition to jobs created through employment growth, many job openings will result annually from the need to replace workers who move into managerial positions, transfer to other occupations, or leave the labor force.

Demand for computer software engineers will increase as computer networking continues to grow. For example, the expanding integration of Internet technologies and the explosive growth in electronic commerce—doing business on the Internet—have resulted in rising demand for computer software engineers who can develop Internet, intranet, and World Wide Web applications. Likewise, expanding electronic data-processing systems in business, telecommunications, government, and other settings continue to become more sophisticated and complex. Growing numbers of systems software engineers will be needed to implement, safeguard, and update systems and resolve problems. Consulting opportunities for computer software engineers also should continue to grow as businesses seek help to manage, upgrade, and customize their increasingly complex computer systems.

New growth areas will continue to arise from rapidly evolving technologies. The increasing uses of the Internet, the proliferation of Web sites, and "mobile" technology such as the wireless Internet have created a demand for a wide variety of new products. As individuals and businesses rely more on handheld computers and wireless networks, it will be necessary to integrate current computer systems with this new, more mobile technology. Also, information security concerns have given rise to new software needs. Concerns over "cyber security" should result in businesses and government continuing to invest heavily in security software that protects their networks and vital electronic infrastructure from attack. The expansion of this technology in the next 10 years will lead to an increased need for computer engineers to design and develop the software and systems to run these new applications and that will allow them to be integrated into older systems.

As with other information technology jobs, employment growth of computer software engineers may be tempered somewhat by an increase in contracting out of software development abroad. Firms may look to cut costs by shifting operations to foreign countries with highly educated workers who have strong technical skills.

Earnings

Median annual earnings of computer applications software engineers who worked full time in 2002 were about $70,900. The middle 50 percent earned between $55,510 and $88,660. The lowest 10 percent earned less than $44,830, and the highest 10 percent earned more than $109,800. Median annual earnings in the industries employing the largest numbers of computer applications software engineers in 2002 were:

Software publishers	$76,450
Navigational, measuring, electromedical, and control instruments manufacturing	75,890
Computer systems design and related services	71,890
Architectural, engineering, and related services	70,090
Management of companies and enterprises	67,260

Median annual earnings of computer systems software engineers who worked full time in 2002 were about $74,040. The middle 50 percent earned between $58,500 and $91,160. The lowest 10 percent earned less than $45,890, and the highest 10 percent earned more than $111,600. Median annual earnings in the industries employing the largest numbers of computer systems software engineers in 2002 are shown below:

Scientific research and development services	$82,270
Software publishers	77,120
Navigational, measuring, electromedical, and control instruments manufacturing	76,200
Computer systems design and related services	73,460
Wired telecommunications carriers	68,510

According to the National Association of Colleges and Employers, starting salary offers for graduates with a bachelor's degree in computer engineering averaged $51,343 in 2003, and those with a master's degree averaged $64,200. Starting salary offers for graduates with a bachelor's degree in computer science averaged $47,109.

According to Robert Half International, starting salaries for software engineers in software development ranged from $64,250 to $97,000 in 2003.

In addition to typical benefits, computer software engineers may be provided with profit sharing, stock options, and a company car with a mileage allowance.

Related Occupations

Other workers who use mathematics and logic extensively include computer systems analysts, database administrators, and computer scientists; computer programmers; financial analysts and personal financial advisors; computer hardware engineers; computer support specialists and systems administrators; statisticians; mathematicians; management analysts; actuaries; and operations research analysts.

Sources of Additional Information

Additional information on a career in computer software engineering is available from any of the following sources:

➤ Association for Computing Machinery (ACM), 1515 Broadway, New York, NY 10036. Internet: **http://www.acm.org**

➤ Institute of Electronics and Electrical Engineers Computer Society, Headquarters Office, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

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Computer Support Specialists and Systems Administrators

(0*NET 15-1041.00, 15-1071.00)

Significant Points

- Computer support specialists and systems administrators are projected to be among the fastest growing occupations over the 2002-12 period.
- There are many paths of entry to these occupations.
- Job prospects should be best for college graduates who are up to date with the latest skills and technologies; certifications and practical experience are essential for persons without degrees.

Nature of the Work

In the last decade, computers have become an integral part of everyday life, used for a variety of reasons at home, in the workplace, and at schools. And almost every computer user encounters a problem occasionally, whether it is the disaster of a crashing hard drive or the annoyance of a forgotten password. The explosion of computer use has created a high demand for specialists to provide advice to users, as well as day-to-day administration, maintenance, and support of computer systems and networks.

Computer support specialists provide technical assistance, support, and advice to customers and other users. This occupational group includes *technical support specialists* and *help-desk technicians.* These troubleshooters interpret problems and provide technical support for hardware, software, and systems. They answer telephone calls, analyze problems using automated diagnostic programs, and resolve recurrent difficulties. Support specialists may work either within a company that uses computer systems or directly for a computer hardware or software vendor. Increasingly, these specialists work for help-desk or support services firms, where they provide computer support to clients on a contract basis.

Technical support specialists are troubleshooters, providing valuable assistance to their organization's computer users. Because many nontechnical employees are not computer experts, they often run into computer problems that they cannot resolve on their own. Technical support specialists install, modify, clean, and repair computer hardware and software. They also may work on monitors, keyboards, printers, and mice.

Technical support specialists answer telephone calls from their organizations' computer users and may run automatic diagnostics programs to resolve problems. They also may write training manuals and train computer users how to properly use new computer hardware and software. In addition, technical support specialists oversee the daily performance of their company's computer systems and evaluate software programs for usefulness.

Help-desk technicians assist computer users with the inevitable hardware and software questions not addressed in a product's instruction manual. Help-desk technicians field telephone calls and e-mail messages from customers seeking guidance on technical problems. In responding to these requests for guidance, help-desk technicians must listen carefully to the customer, ask questions to diagnose the nature of the problem, and then patiently walk the customer through the problem-solving steps.

Help-desk technicians deal directly with customer issues, and companies value them as a source of feedback on their products. These technicians are consulted for information about what gives customers the most trouble, as well as other customer concerns. Most computer support specialists start out at the help desk.

Network or *computer systems administrators* design, install, and support an organization's LAN (local-area network), WAN (wide-area network), network segment, Internet, or intranet system. They provide day-to-day onsite administrative support for software users in a variety of work environments, including professional offices, small businesses, government, and large corporations. They maintain network hardware and software, analyze problems, and monitor the network to ensure its availability to system users. These workers gather data to identify customer needs and then use that information to identify, interpret, and evaluate system and network requirements. Administrators also may plan, coordinate, and implement network security measures.

Systems administrators are the information technology employees responsible for the efficient use of networks by organizations. They ensure that the design of an organization's computer site allows all of the components, including computers, the network, and software, to fit together and work properly. Furthermore, they monitor and adjust performance of existing networks and continually survey the current computer site to determine future network needs. Administrators also troubleshoot problems as reported by users and automated network monitoring systems and make recommendations for enhancements in the implementation of future servers and networks.

In some organizations, *computer security specialists* may plan, coordinate, and implement the organization's information security. These workers may be called upon to educate users on computer security, install security software, monitor the network for security breaches, respond to cyber attacks, and in some cases, gather data and evidence to be used in prosecuting cyber crime. This and other growing specialty occupations reflect the increasing emphasis on client-server applications, the expansion of Internet and intranet applications, and the demand for more end-user support.

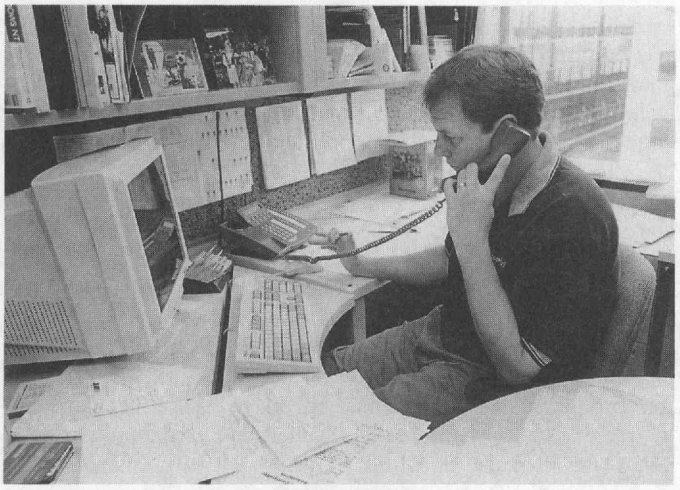
Working Conditions

Computer support specialists and systems administrators normally work in well-lit, comfortable offices or computer laboratories. They usually work about 40 hours a week, but that may include being "on call" via pager or telephone for rotating evening or weekend work if the employer requires computer support over extended hours. Overtime may be necessary when unexpected technical problems arise. Like other workers who type on a keyboard for long periods, computer support specialists and systems administrators are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Due to the heavy emphasis on helping all types of computer users, computer support specialists and systems administrators constantly interact with customers and fellow employees as they answer questions and give valuable advice. Those who work as consultants are away from their offices much of the time, sometimes spending months working in a client's office.

As computer networks expand, more computer support specialists and systems administrators may be able to connect to a customer's computer remotely, using modems, laptops, e-mail, and the Internet, to provide technical support to computer users.

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Computer support specialists provide technical assistance, support, and advice to computer users.

This capability would reduce or eliminate travel to the customer's workplace. Systems administrators also can administer and configure networks and servers remotely, although this practice is not as common as it is with computer support specialists.

Employment

Computer support specialists and systems administrators held about 758,000 jobs in 2002. Of these, about 507,000 were computer support specialists and about 251,000 were network and computer systems administrators. Although they worked in a wide range of industries, 35 percent of all computer support specialists and systems administrators were employed in professional and business services industries, principally in computer systems design and related services. Other organizations that employed substantial numbers of these workers include banks, government agencies, insurance companies, educational institutions, and wholesale and retail vendors of computers, office equipment, appliances, and home electronic equipment. Many computer support specialists also worked for manufacturers of computers, semiconductors, and other electronic components.

Employers of computer support specialists and systems administrators range from startup companies to established industry leaders. With the continued development of the Internet, telecommunications, and e-mail, industries not typically associated with computers—such as construction—increasingly need computer-related workers. Small and large firms across all industries are expanding or developing computer systems, creating an immediate need for computer support specialists and systems administrators.

Training, Other Qualifications, and Advancement

Due to the wide range of skills required, there are many paths of entry to a job as a computer support specialist or systems administrator. While there is no universally accepted way to prepare for a job as a computer support specialist, many employers prefer to hire persons with some formal college education. A bachelor's degree in computer science or information systems is a prerequisite for some jobs; however, other jobs may require only a computer-related associate degree. For systems administrators, many employers seek applicants with bachelor's degrees, although not necessarily in a computer-related field.

Many companies are becoming more flexible about requiring a college degree for support positions because of the explosive demand for specialists. However, certification and practical experience demonstrating these skills will be essential for applicants without a degree. Completion of a certification training program, offered by a variety of vendors and product makers, may help some people to qualify for entry-level positions. Relevant computer experience may substitute for formal education.

Beginning computer support specialists usually work for organizations that deal directly with customers or in-house users. Then, they may advance into more responsible positions in which they use what they have learned from customers to improve the design and efficiency of future products. Job promotions usually depend more on performance than on formal education. Eventually, some computer support specialists become applications developers, designing products rather than assisting users. Computer support specialists at hardware and software companies often enjoy great upward mobility; advancement sometimes comes within months of initial employment.

Entry-level network and computer systems administrators are involved in routine maintenance and monitoring of computer systems, typically working behind the scenes in an organization. After gaining experience and expertise, they often are able to advance into more senior-level positions, in which they take on more responsibilities. For example, senior network and computer systems administrators may present recommendations to management on matters related to a company's network. They also may translate the needs of an organization into a set of technical requirements, based on the available technology. As with support specialists, administrators may become software engineers, actually involved in the designing of the system or network and not just the day-to-day administration.

Persons interested in becoming a computer support specialist or systems administrator must have strong problem-solving, analytical, and communication skills because troubleshooting and helping others are vital parts of the job. The constant interaction with other computer personnel, customers, and employees requires computer support specialists and systems administrators to communicate effectively on paper, via e-mail, or in person. Strong writing skills are useful when preparing manuals for employees and customers.

As technology continues to improve, computer support specialists and systems administrators must keep their skills current and acquire new ones. Many continuing education programs are offered by employers, hardware and software vendors, colleges and universities, and private training institutions. Professional development seminars offered by computing services firms also can enhance one's skills and advancement opportunities.

Job Outlook

Employment of computer support specialist is expected to increase faster than the average for all occupations through 2012, as organizations continue to adopt and integrate increasingly sophisticated technology. Job growth will continue to be driven by the continued expansion of the computer system design and related services industry, which is projected to remain one of the fastest growing industries in the U.S. economy, despite recent job losses. Job growth will not be as explosive as during the previous decade, however, as these jobs are being increasingly outsourced overseas.

Employment growth among computer support specialists reflects the rapid pace of improved technology. As computers and software become more complex, support specialists will be

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needed to provide technical assistance to customers and other users. New mobility technologies, such as the wireless Internet, will continue to create a demand for these workers to familiarize and educate computer users. Consulting opportunities for computer support specialists also should continue to grow as businesses increasingly need help managing, upgrading, and customizing more complex computer systems. However, growth in employment of support specialists may be tempered somewhat as firms continue to cut costs by shifting more routine work abroad to countries where workers are highly skilled but labor costs are lower. Physical location is not as important for these workers as it is for others, because computer support specialists can provide assistance remotely and support services can be provided around the clock.

Employment of systems administrators is expected to increase much faster than average as firms will continue to invest heavily in securing computer networks. Companies are looking for workers knowledgeable about the function and administration of networks. Such employees have become increasingly hard to find as systems administration has moved from being a separate function within corporations to one that forms a crucial element of business in an increasingly high-technology economy. Also, demand for computer security specialists will grow as businesses and government continue to invest heavily in "cyber-security," protecting vital computer networks and electronic infrastructure from attack.

The growth of electronic commerce means that more establishments use the Internet to conduct their business online. This translates into a need for information technology specialists who can help organizations use technology to communicate with employees, clients, and consumers. Explosive growth in these areas also is expected to fuel demand for specialists knowledgeable about network, data, and communications security.

Job prospects should be best for college graduates who are up to date with the latest skills and technologies, particularly if they have supplemented their formal education with some relevant work experience. Employers will continue to seek computer specialists who possess a strong background in fundamental computer skills, combined with good interpersonal and communication skills. Due to the rapid growth in demand for computer support specialists and systems administrators, those who have strong computer skills but do not have a bachelor's degree should continue to qualify for some entry-level positions. However, certifications and practical experience are essential for persons without degrees.

Earnings

Median annual earnings of computer support specialists were $39,100 in 2002. The middle 50 percent earned between $29,760 and $51,680. The lowest 10 percent earned less than $23,060, and the highest 10 percent earned more than $67,550. Median annual earnings in the industries employing the largest numbers of computer support specialists in 2002 were:

Professional and commercial equipment and supplies merchant wholesalers	$46,740
Software publishers	42,870
Computer systems design and related services	41,110
Management of companies and enterprises	40,850
Elementary and secondary schools	33,480

Median annual earnings of network and computer systems administrators were $54,810 in 2002. The middle 50 percent earned between $43,290 and $69,530. The lowest 10 percent earned less than $34,460, and the highest 10 percent earned more than $86,440. Median annual earnings in the industries employing the largest numbers of network and computer systems administrators in 2002 were:

Wired telecommunications carriers	$59,710
Computer systems design and related services	58,790
Management of companies and enterprises	58,610
Data processing, hosting, and related services	56,140
Elementary and secondary schools	48,350

According to Robert Half International, starting salaries in 2003 ranged from $27,500 to $56,500 for help-desk support staff, and from $51,000 to $67,250 for more senior technical support specialists. For systems administrators, starting salaries in 2003 ranged from $49,000 to $70,250.

Related Occupations

Other computer-related occupations include computer programmers; computer software engineers; and computer systems analysts, database administrators, and computer scientists.

Sources of Additional Information

For additional information about a career as a computer support specialist, contact:

➤ Association of Computer Support Specialists, 218 Huntington Rd., Bridgeport, CT 06608. Internet: **http://www.acss.org**

➤ Association of Support Professionals, 122 Barnard Ave., Watertown, MA 02472.

For additional information about a career as a systems administrator, contact:

➤ System Administrators Guild, 2560 9th St., Suite 215, Berkeley, CA 94710. Internet: **http://www.sage.org**

Further information about computer careers is available from:

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

Computer Systems Analysts, Database Administrators, and Computer Scientists

(0*NET 15-1011.00, 15-1051.00, 15-1061.00, 15-1081.00, 15-1099.99)

Significant Points

- Education requirements range from a 2-year degree to a graduate degree.
- Employment is expected to increase much faster than the average as organizations continue to adopt increasingly sophisticated technologies.
- Job prospects are favorable.

Nature of the Work

The rapid spread of computers and information technology has generated a need for highly trained workers to design and develop new hardware and software systems and to incorporate new technologies. These workers—computer systems analysts, database administrators, and computer scientists—include a wide

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range of computer specialists. Job tasks and occupational titles used to describe these workers evolve rapidly, reflecting new areas of specialization or changes in technology, as well as the preferences and practices of employers.

Systems analysts solve computer problems and apply computer technology to meet the individual needs of an organization. They help an organization to realize the maximum benefit from its investment in equipment, personnel, and business processes. Systems analysts may plan and develop new computer systems or devise ways to apply existing systems' resources to additional operations. They may design new systems, including both hardware and software, or add a new software application to harness more of the computer's power. Most systems analysts work with specific types of systems—for example, business, accounting, or financial systems, or scientific and engineering systems—that vary with the kind of organization. Some systems analysts also are known as *systems developers* or *systems architects*.

Systems analysts begin an assignment by discussing the systems problem with managers and users to determine its exact nature. Defining the goals of the system and dividing the solutions into individual steps and separate procedures, systems analysts use techniques such as structured analysis, data modeling, information engineering, mathematical model building, sampling, and cost accounting to plan the system. They specify the inputs to be accessed by the system, design the processing steps, and format the output to meet users' needs. They also may prepare cost-benefit and return-on-investment analyses to help management decide whether implementing the proposed technology will be financially feasible.

When a system is accepted, systems analysts determine what computer hardware and software will be needed to set the system up. They coordinate tests and observe the initial use of the system to ensure that it performs as planned. They prepare specifications, flow charts, and process diagrams for computer programmers to follow; then, they work with programmers to "debug," or eliminate, errors from the system. Systems analysts who do more indepth testing of products may be referred to as *software quality assurance analysts*. In addition to running tests, these individuals diagnose problems, recommend solutions, and determine whether program requirements have been met.

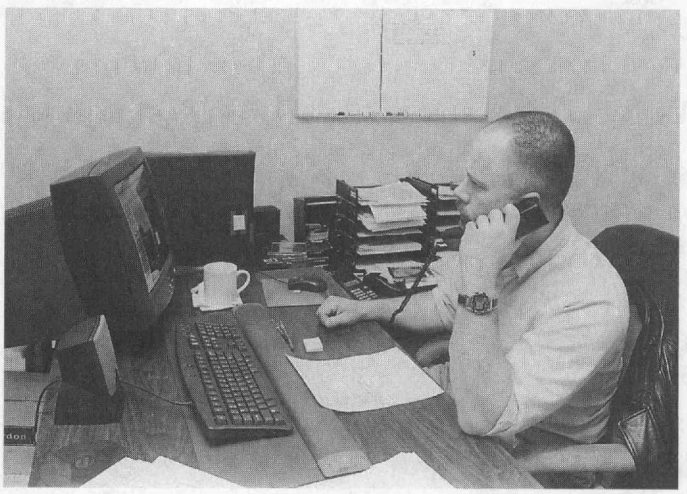
In some organizations, *programmer-analysts* design and update the software that runs a computer. Because they are responsible for both programming and systems analysis, these workers must be proficient in both areas. (A separate statement on computer programmers appears elsewhere in the *Handbook*.) As this dual proficiency becomes more commonplace, these analysts increasingly work with databases, object-oriented programming languages, as well as client-server applications development and multimedia and Internet technology.

One obstacle associated with expanding computer use is the need for different computer systems to communicate with each other. Because of the importance of maintaining up-to-date information-accounting records, sales figures, or budget projections, for example—systems analysts work on making the computer systems within an organization, or among organizations, compatible so that information can be shared among them. Many systems analysts are involved with "networking," connecting all the computers internally—in an individual office, department, or establishment—or externally, because many organizations now rely on e-mail or the Internet. A primary goal of networking is to allow users to retrieve data from a mainframe computer or a server and use it on their desktop computer. Systems analysts must design the hardware and software to allow the free exchange of data, custom applications, and the computer power to process it all. For example, analysts are called upon to ensure the compatibility of computing systems between and among businesses to facilitate electronic commerce.

Networks come in many variations, so *network systems and data communications analysts* are needed to design, test, and evaluate systems such as local area networks (LANs), wide area networks (WANs), the Internet, intranets, and other data communications systems. Systems can range from a connection between two offices in the same building to globally distributed networks, voice mail, and e-mail systems of a multinational organization. Network systems and data communications analysts perform network modeling, analysis, and planning; they also may research related products and make necessary hardware and software recommendations. *Telecommunications specialists* focus on the interaction between computer and communications equipment. These workers design voice and data communication systems, supervise the installation of those systems, and provide maintenance and other services to clients after the system is installed.

The growth of the Internet and the expansion of the World Wide Web (the graphical portion of the Internet) have generated a variety of occupations related to the design, development, and maintenance of Web sites and their servers. For example, *webmasters* are responsible for all technical aspects of a Web site, including performance issues such as speed of access, and for approving the content of the site. *Internet developers* or *Web developers*, also called *Web designers*, are responsible for day-to-day site design and creation.

Computer scientists work as theorists, researchers, or inventors. Their jobs are distinguished by the higher level of theoretical expertise and innovation they apply to complex problems and the creation or application of new technology. Those employed by academic institutions work in areas ranging from complexity theory, to hardware, to programming-language design. Some work on multidisciplinary projects, such as developing and advancing uses of virtual reality, extending human-



Computer systems analysts solve computer problems and use computer technology to meet the needs of an organization.

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computer interaction, or designing robots. Their counterparts in private industry work in areas such as applying theory, developing specialized languages or information technologies, or designing programming tools, knowledge-based systems, or even computer games.

With the Internet and electronic business generating large volumes of data, there is a growing need to be able to store, manage, and extract data effectively. *Database administrators* work with database management systems software and determine ways to organize and store data. They identify user requirements, set up computer databases, and test and coordinate modifications to the systems. An organization's database administrator ensures the performance of the system, understands the platform on which the database runs, and adds new users to the system. Because they also may design and implement system security, database administrators often plan and coordinate security measures. With the volume of sensitive data generated every second growing rapidly, data integrity, backup systems, and database security have become increasingly important aspects of the job of database administrators.

Working Conditions

Computer systems analysts, database administrators, and computer scientists normally work in offices or laboratories in comfortable surroundings. They usually work about 40 hours a week—the same as many other professional or office workers do. However, evening or weekend work may be necessary to meet deadlines or solve specific problems. Given the technology available today, telecommuting is common for computer professionals. As networks expand, more work can be done from remote locations through modems, laptops, electronic mail, and the Internet.

Like other workers who spend long periods in front of a computer terminal typing on a keyboard, computer systems analysts, database administrators, and computer scientists are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome or cumulative trauma disorder.

Employment

Computer systems analysts, database administrators, and computer scientists held about 979,000 jobs in 2002; including about 89,000 who were self-employed. Employment was distributed among the following detailed occupations:

Computer systems analysts	468,000
Network systems and data communications analysts	186,000
Database administrators	110,000
Computer and information scientists, research	23,000
All other computer specialists	192,000

Although they are increasingly employed in every sector of the economy, the greatest concentration of these workers is in the computer systems design and related services industry. Firms in this industry provide services related to the commercial use of computers on a contract basis, including custom computer programming services; computer systems integration design services; computer facilities management services, including computer systems or data-processing facilities support services for clients; and other computer-related services, such as disaster recovery services and software installation. Many computer systems analysts, database administrators, and computer scientists are employed by Internet service providers, web search portals, and data-processing, hosting, and related services firms. Others work for government, manufacturers of computer and electronic products, insurance companies, financial institutions, and universities.

A growing number of computer specialists, such as systems analysts and network and data communications analysts, are employed on a temporary or contract basis; many of these individuals are self-employed, working independently as contractors or consultants. For example, a company installing a new computer system may need the services of several systems analysts just to get the system running. Because not all of the analysts would be needed once the system is functioning, the company might contract for such employees with a temporary help agency or a consulting firm or with the systems analysts themselves. Such jobs may last from several months up to 2 years or more. This growing practice enables companies to bring in people with the exact skills the firm needs to complete a particular project, rather than having to spend time or money training or retraining existing workers. Often, experienced consultants then train a company's in-house staff as a project develops.

Training, Other Qualifications, and Advancement

Rapidly changing technology requires an increasing level of skill and education on the part of employees. Companies look for professionals with an ever-broader background and range of skills, including not only technical knowledge, but also communication and other interpersonal skills. This shift from requiring workers to possess solely sound technical knowledge emphasizes workers who can handle various responsibilities. While there is no universally accepted way to prepare for a job as a systems analyst, computer scientist, or database administrator, most employers place a premium on some formal college education. A bachelor's degree is a prerequisite for many jobs; however, some jobs may require only a 2-year degree. Relevant work experience also is very important. For more technically complex jobs, persons with graduate degrees are preferred.

For systems analyst, programmer-analyst, and database administrator positions, many employers seek applicants who have a bachelor's degree in computer science, information science, or management information systems (MIS). MIS programs usually are part of the business school or college and differ considerably from computer science programs, emphasizing business and management-oriented course work and business computing courses. Employers are increasingly seeking individuals with a master's degree in business administration (MBA), with a concentration in information systems, as more firms move their business to the Internet. For some network systems and data communication analysts, such as webmasters, an associate's degree or certificate is sufficient, although more advanced positions might require a computer-related bachelor's degree. For computer and information scientists, a doctoral degree generally is required due to the highly technical nature of their work.

Despite employers' preference for those with technical degrees, persons with degrees in a variety of majors find employment in these computer occupations. The level of education and type of training that employers require depend on their

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needs. One factor affecting these needs is changes in technology. Employers often scramble to find workers capable of implementing "hot" new technologies. Those workers with formal education or experience in information security, for example, are in demand because of the growing need for their skills and services. Another factor driving employers' needs is the timeframe during which a project must be completed.

Most community colleges and many independent technical institutes and proprietary schools offer an associate's degree in computer science or a related information technology field. Many of these programs may be more geared toward meeting the needs of local businesses and are more occupation specific than are 4-year degree programs. Some jobs may be better suited to the level of training that such programs offer. Employers usually look for people who have broad knowledge and experience related to computer systems and technologies, strong problem-solving and analytical skills, and good interpersonal skills. Courses in computer science or systems design offer good preparation for a job in these computer occupations. For jobs in a business environment, employers usually want systems analysts to have business management or closely related skills, while a background in the physical sciences, applied mathematics, or engineering is preferred for work in scientifically oriented organizations. Art or graphic design skills may be desirable for webmasters or Web developers.

Jobseekers can enhance their employment opportunities by participating in internship or co-op programs offered through their schools. Because many people develop advanced computer skills in a non-computer-related occupation and then transfer those skills to a computer occupation, a background in the industry in which the person's job is located, such as financial services, banking, or accounting, can be important. Others have taken computer science courses to supplement their study in fields such as accounting, inventory control, or other business areas. For example, a financial analyst who is proficient in computers might become a computer support specialist in financial systems development, while a computer programmer might move into a systems analyst job.

Computer systems analysts, database administrators, and computer scientists must be able to think logically and have good communication skills. Because they often deal with a number of tasks simultaneously, the ability to concentrate and pay close attention to detail is important. Although these computer specialists sometimes work independently, they frequently work in teams on large projects. They must be able to communicate effectively with computer personnel, such as programmers and managers, as well as with users or other staff who may have no technical computer background.

Computer scientists employed in private industry may advance into managerial or project leadership positions. Those employed in academic institutions can become heads of research departments or published authorities in their field. Systems analysts may be promoted to senior or lead systems analyst. Those who show leadership ability also can become project managers or advance into management positions such as manager of information systems or chief information officer. Database administrators may advance into managerial positions, such as chief technology officer, on the basis of their experience managing data and enforcing security. Computer specialists with work experience and considerable expertise in a particular subject or a certain application may find lucrative opportunities as independent consultants or may choose to start their own computer consulting firms.

Technological advances come so rapidly in the computer field that continuous study is necessary to keep one's skills up to date. Employers, hardware and software vendors, colleges and universities, and private training institutions offer continuing education. Additional training may come from professional development seminars offered by professional computing societies.

Certification is a way to demonstrate a level of competence in a particular field. Some product vendors or software firms offer certification and require professionals who work with their products to be certified. Many employers regard these certifications as the industry standard. For example, one method of acquiring enough knowledge to get a job as a database administrator is to become certified in a specific type of database management. Voluntary certification also is available through various organizations associated with computer specialists. Professional certification may afford a jobseeker a competitive advantage.

Job Outlook

Computer systems analysts, database administrators, and computer scientists are expected to be among the fastest growing occupations through 2012. Employment of these computer specialists is expected to grow much faster than the average for all occupations as organizations continue to adopt and integrate increasingly sophisticated technologies. Job increases will be driven by very rapid growth in computer system design and related services, which is projected to be one of the fastest-growing industries in the U.S. economy. In addition, many job openings will arise annually from the need to replace workers who move into managerial positions or other occupations or who leave the labor force. Job growth will not be as rapid as during the previous decade, however, as the information technology sector begins to mature and as routine work is increasingly outsourced overseas.

Despite the recent economic downturn among information technology firms, workers in the occupation should still enjoy favorable job prospects. The demand for networking to facilitate the sharing of information, the expansion of client-server environments, and the need for computer specialists to use their knowledge and skills in a problem-solving capacity will be major factors in the rising demand for computer systems analysts, database administrators, and computer scientists. Moreover, falling prices of computer hardware and software should continue to induce more businesses to expand their computerized operations and integrate new technologies into them. In order to maintain a competitive edge and operate more efficiently, firms will keep demanding computer specialists who are knowledgeable about the latest technologies and are able to apply them to meet the needs of businesses.

Increasingly, more sophisticated and complex technology is being implemented across all organizations, which should fuel the demand for these computer occupations. There is a growing demand for system analysts to help firms maximize their efficiency with available technology. Expansion of electronic commerce—doing business on the Internet—and the continuing need to build and maintain databases that store critical informa-

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tion on customers, inventory, and projects are fueling demand for database administrators familiar with the latest technology. Also, the increasing importance being placed on "cybersecurity"—the protection of electronic information—will result in a need for workers skilled in information security.

The development of new technologies usually leads to demand for various kinds of workers. The expanding integration of Internet technologies into businesses, for example, has resulted in a growing need for specialists who can develop and support Internet and intranet applications. The growth of electronic commerce means that more establishments use the Internet to conduct their business online. The introduction of the wireless Internet, known as WiFi, creates new systems to be analyzed and new data to be administered. The spread of such new technologies translates into a need for information technology professionals who can help organizations use technology to communicate with employees, clients, and consumers. Explosive growth in these areas also is expected to fuel demand for specialists who are knowledgeable about network, data, and communications security.

As technology becomes more sophisticated and complex, employers demand a higher level of skill and expertise from their employees. Individuals with an advanced degree in computer science or computer engineering or with an MBA with a concentration in information systems should enjoy highly favorable employment prospects. College graduates with a bachelor's degree in computer science, computer engineering, information science, or MIS also should enjoy favorable prospects for employment, particularly if they have supplemented their formal education with practical experience. Because employers continue to seek computer specialists who can combine strong technical skills with good interpersonal and business skills, graduates with non-computer-science degrees, but who have had courses in computer programming, systems analysis, and other information technology areas, also should continue to find jobs in these computer fields. In fact, individuals with the right experience and training can work in these computer occupations regardless of their college major or level of formal education.

Earnings

Median annual earnings of computer systems analysts were $62,890 in 2002. The middle 50 percent earned between $49,500 and $78,350 a year. The lowest 10 percent earned less than $39,270, and the highest 10 percent earned more than $93,400. Median annual earnings in the industries employing the largest numbers of computer systems analysts in 2002 were as follows:

Federal Government	$68,370
Computer systems design and related services	67,690
Data processing, hosting, and related services	64,560
Management of companies and enterprises	63,390
Insurance carriers	59,510

Median annual earnings of database administrators were $55,480 in 2002. The middle 50 percent earned between $40,550 and $75,100. The lowest 10 percent earned less than $30,750, and the highest 10 percent earned more than $92,910. In 2002, median annual earnings of database administrators employed in computer system design and related services were $66,650, and, for those in management of companies and enterprises, earnings were $59,620.

Median annual earnings of network systems and data communication analysts were $58,420 in 2002. The middle 50 percent earned between $44,850 and $74,290. The lowest 10 percent earned less than $34,880, and the highest 10 percent earned more than $92,110. Median annual earnings in the industries employing the largest numbers of network systems and data communications analysts in 2002 were as follows:

Computer systems design and related services	$65,800
Management of companies and enterprises	63,050
State government	45,110

Median annual earnings of computer and information scientists, research, were $77,760 in 2002. The middle 50 percent earned between $58,630 and $98,490. The lowest 10 percent earned less than $42,890, and the highest 10 percent earned more than $121,650. Median annual earnings of computer and information scientists employed in computer systems design and related services in 2002 were $78,730.

Median annual earnings of all other computer specialists were $54,070 in 2002. Median annual earnings of all other computer specialists employed in computer system design and related services were $49,590, and, for those in scientific research and development services, earnings were $70,150 in 2002.

According to the National Association of Colleges and Employers, starting offers for graduates with a master's degree in computer science averaged $62,806 in 2003. Starting offers averaged $47,109 for graduates with a bachelor's degree in computer science; $45,346 for those with a degree in computer programming; $41,118 for those with a degree in computer systems analysis; $40,556 for those with a degree in management information systems; and $38,282 for those with a degree in information sciences and systems.

According to Robert Half International, starting salaries in 2003 ranged from $69,750 to $101,750 for database administrators. Salaries for networking and Internet-related occupations ranged from $45,500 to $65,750 for LAN administrators and from $51,250 to $73,750 for Internet /Intranet developers. Starting salaries for security professionals ranged from $62,500 to $91,750 in 2003.

Related Occupations

Other workers who use logic and creativity to solve business and technical problems are computer programmers, computer software engineers, computer and information systems managers, financial analysts and personal financial advisors, urban and regional planners, engineers, mathematicians, statisticians, operations research analysts, management analysts, and actuaries.

Sources of Additional Information

Further information about computer careers is available from any of the following organizations:

➤ Association for Computing Machinery (ACM), 1515 Broadway, New York, NY 10036. Internet: **http://www.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

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Mathematicians

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Significant Points

- A Ph.D. degree in mathematics usually is the minimum education needed, except in the Federal Government.
- Employment is expected to contract, reflecting the decline in the number of jobs with the title mathematician; competition will be keen for the limited number of jobs.
- Master's and Ph.D. degree holders with a strong background in mathematics and a related discipline, such as computer science or engineering, should have better employment opportunities in related occupations.

Nature of the Work

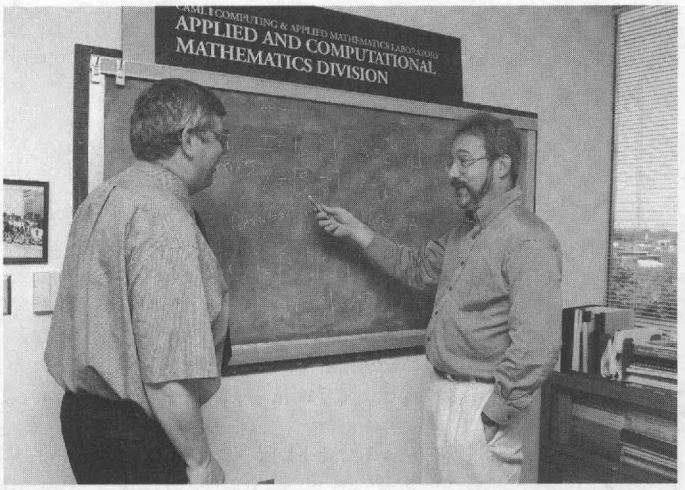
Mathematics is one of the oldest and most fundamental sciences. Mathematicians use mathematical theory, computational techniques, algorithms, and the latest computer technology to solve economic, scientific, engineering, physics, and business problems. The work of mathematicians falls into two broad classes—theoretical (pure) mathematics and applied mathematics. These classes, however, are not sharply defined, and often overlap.

Theoretical mathematicians advance mathematical knowledge by developing new principles and recognizing previously unknown relationships between existing principles of mathematics. Although these workers seek to increase basic knowledge without necessarily considering its practical use, such pure and abstract knowledge has been instrumental in producing or furthering many scientific and engineering achievements. Many theoretical mathematicians are employed as university faculty, and divide their time between teaching and conducting research. (See the statement on teachers—postsecondary, elsewhere in the *Handbook*.)

Applied mathematicians, on the other hand, use theories and techniques, such as mathematical modeling and computational methods, to formulate and solve practical problems in business, government, and engineering, and in the physical, life, and social sciences. For example, they may analyze the most efficient way to schedule airline routes between cities, the effect and safety of new drugs, the aerodynamic characteristics of an experimental automobile, or the cost-effectiveness of alternative manufacturing processes. Applied mathematicians working in industrial research and development may develop or enhance mathematical methods when solving a difficult problem. Some mathematicians, called cryptanalysts, analyze and decipher encryption systems designed to transmit military, political, financial, or law enforcement-related information in code.

Applied mathematicians start with a practical problem, envision the separate elements of the process under consideration, and then reduce the elements to mathematical variables. They often use computers to analyze relationships among the variables and solve complex problems by developing models with alternative solutions.

Much of the work in applied mathematics is done by individuals with titles other than mathematician. In fact, because mathematics is the foundation upon which so many other academic disciplines are built, the number of workers using mathematical techniques is much greater than the number formally designated as mathematicians. For example, engineers, computer scientists, physicists, and economists are among those who use mathematics extensively. Some professionals, including statisticians, actuaries, and operations research analysts, actually are specialists in a particular branch of mathematics. Frequently, applied mathematicians are required to collaborate with other workers in their organizations to achieve common solutions to problems. (For more information, see the statements on actuaries, operations research analysts, and statisticians elsewhere in the *Handbook*.)



Mathematicians often use theory to explain mathematical relationships in the real world.

Working Conditions

Mathematicians usually work in comfortable offices. They often are part of an interdisciplinary team that may include economists, engineers, computer scientists, physicists, technicians, and others. Deadlines, overtime work, special requests for information or analysis, and prolonged travel to attend seminars or conferences may be part of their jobs. Mathematicians who work in academia usually have a mix of teaching and research responsibilities. These mathematicians often conduct research alone, or are aided by graduate students interested in the topic being researched.

Employment

Mathematicians held about 2,900 jobs in 2002. In addition, about 20,000 persons held full-time mathematics faculty positions in colleges and universities in 2002, according to the American Mathematical Society.

Many nonfaculty mathematicians work for Federal or State governments. The U.S. Department of Defense is the primary Federal employer, accounting for about three-fourths of the mathematicians employed by the Federal Government. Most other mathematicians employed by the Federal Government work for the National Aeronautics and Space Administration (NASA). In the private sector, major employers include insurance carriers, scientific research and development services, and management, scientific, and technical consulting services. Within manufacturing, the aerospace and pharmaceutical industries are the key employers. Some mathematicians also work for investment banks, insurance companies, and securities and commodity exchanges.

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Training, Other Qualifications, and Advancement

A Ph.D. degree in mathematics usually is the minimum education needed for prospective mathematicians, except in the Federal Government. In the Federal Government, entry-level job candidates usually must have a 4-year degree with a major in mathematics or a 4-year degree with the equivalent of a mathematics major—24 semester hours of mathematics courses.

In private industry, candidates for mathematician jobs typically need a master's or Ph.D. degree. Most of the positions designated for mathematicians are in research and development laboratories, as part of technical teams. Research scientists in such positions engage either in basic research on pure mathematical principles or in applied research on developing or improving specific products or processes. The majority of those with a bachelor's or master's degree in mathematics who work in private industry do so not as mathematicians, but in related fields such as computer science, where they have titles such as computer programmer, systems analyst, or systems engineer.

A bachelor's degree in mathematics is offered by most colleges and universities. Mathematics courses usually required for this degree include calculus, differential equations, and linear and abstract algebra. Additional courses might include probability theory and statistics, mathematical analysis, numerical analysis, topology, discrete mathematics, and mathematical logic. Many colleges and universities urge or require students majoring in mathematics to take courses in a field that is closely related to mathematics, such as computer science, engineering, life science, physical science, or economics. A double major in mathematics and another related discipline is particularly desirable to many employers. High school students who are prospective college mathematics majors should take as many mathematics courses as possible while in high school.

In 2003, about 225 colleges and universities offered a master's degree as the highest degree in either pure or applied mathematics; about 200 offered a Ph.D. degree in pure or applied mathematics. In graduate school, students conduct research and take advanced courses, usually specializing in a subfield of mathematics.

For jobs in applied mathematics, training in the field in which the mathematics will be used is very important. Mathematics is used extensively in physics, actuarial science, statistics, engineering, and operations research. Computer science, business and industrial management, economics, finance, chemistry, geology, life sciences, and behavioral sciences are likewise dependent on applied mathematics. Mathematicians also should have substantial knowledge of computer programming, because most complex mathematical computation and much mathematical modeling are done on a computer.

Mathematicians need good reasoning ability and persistence in order to identify, analyze, and apply basic principles to technical problems. Communication skills are important, as mathematicians must be able to interact and discuss proposed solutions with people who may not have an extensive knowledge of mathematics.

Job Outlook

Competition is keen for the limited number of jobs as mathematicians. Employment of mathematicians is expected to decline through 2012, reflecting the decline in the number of jobs with the title mathematician. However, master's and Ph.D. degree holders with a strong background in mathematics and a related discipline, such as engineering or computer science, should have better opportunities. Many of these workers have job titles that reflect their occupation, such as systems analyst, rather than the title mathematician, reflecting their primary educational background.

Advancements in technology usually lead to expanding applications of mathematics, and more workers with knowledge of mathematics will be required in the future. However, jobs in industry and government often require advanced knowledge of related scientific disciplines in addition to mathematics. The most common fields in which mathematicians study and find work are computer science and software development, physics, engineering, and operations research. More mathematicians also are becoming involved in financial analysis. Mathematicians must compete for jobs, however, with people who have degrees in these other disciplines. The most successful jobseekers will be able to apply mathematical theory to real-world problems, and possess good communication, teamwork, and computer skills.

Private industry jobs require at least a master's degree in mathematics or in one of the related fields. Bachelor's degree holders in mathematics usually are not qualified for most jobs, and many seek advanced degrees in mathematics or a related discipline. However, bachelor's degree holders who meet State certification requirements may become primary or secondary school mathematics teachers. (For additional information, see the statement on teachers—preschool, kindergarten, elementary, middle, and secondary, elsewhere in the *Handbook*.)

Holders of a master's degree in mathematics will face very strong competition for jobs in theoretical research. Because the number of Ph.D. degrees awarded in mathematics continues to exceed the number of university positions available, many of these graduates will need to find employment in industry and government.

Earnings

Median annual earnings of mathematicians were $76,470 in 2002. The middle 50 percent earned between $56,160 and $91,520. The lowest 10 percent had earnings of less than $38,930, while the highest 10 percent earned over $112,780.

According to a 2003 survey by the National Association of Colleges and Employers, starting salary offers averaged $40,512 a year for mathematics graduates with a bachelor's degree, and $42,348 for those with a master's degree. Doctoral degree candidates averaged $55,485.

In early 2003, the average annual salary for mathematicians employed by the Federal Government in supervisory, nonsupervisory, and managerial positions was $80,877; that for mathematical statisticians was $83,472; and for cryptanalysts, the average was $78,662.

Related Occupations

Other occupations that require extensive knowledge of mathematics or, in some cases, a degree in mathematics include actuaries; statisticians; computer programmers; computer systems analysts, database administrators, and computer scientists; computer software engineers; and operations research analysts. A strong background in mathematics also facilitates employment as teachers—postsecondary; teachers—preschool, kindergarten, middle, elementary, and secondary; engineers; economists; market and survey researchers; financial analysts and personal financial advisors; and physicists and astronomers.

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Sources of Additional Information

For more information about careers and training in mathematics, especially for doctoral-level employment, contact:

➤ American Mathematical Society, 201 Charles St., Providence, RI 02940. Internet: **http://www.ams.org**

For specific information on careers in applied mathematics, contact:

➤ Society for Industrial and Applied Mathematics, 3600 University City Science Center, Philadelphia, PA 19104-2688. Internet: **http://www.siam.org**

Information on obtaining a mathematician position with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Operations Research Analysts

(0*NET 15-2031.00)

Significant Points

- Employers generally prefer applicants with at least a master's degree in operations research or a closely related field, such as computer science, engineering, business, mathematics, information systems, or management science.
- Employment growth is projected to be slower than average, reflecting slow growth in the number of jobs with the title "operations research analyst."
- Individuals with a master's or Ph.D. degree in management science or operations research should have good job opportunities as operations research analysts or in closely related occupations, such as systems analysts, computer scientists, or management analysts.

Nature of the Work

Operations research and *management science* are terms that are used interchangeably to describe the discipline of applying advanced analytical techniques to help make better decisions and to solve problems. The procedures of operations research have given effective assistance during wartime missions, such as deploying radar, searching for enemy submarines, and getting supplies where they were most needed. New analytical methods have been developed and numerous peacetime applications have emerged, leading to the use of operations research in many industries and occupations.

The prevalence of operations research in the Nation's economy reflects the growing complexity of managing large organizations that require the effective use of money, materials, equipment, and people. Operations research analysts help determine better ways to coordinate these elements by applying analytical methods from mathematics, science, and engineering. They solve problems in different ways and propose alternative solutions to management, which then chooses the course of action that best meets the organization's goals. In general, operations research analysts may be concerned with diverse issues such as top-level strategy, planning, forecasting, resource allocation, performance measurement, scheduling, the design of production facilities and systems, supply chain management, pricing, transportation and distribution, and the analysis of large databases.

The duties of the operations research analyst vary according to the structure and management philosophy of the employer or client. Some firms centralize operations research in one department; others use operations research in each division. Operations research analysts also may work closely with senior managers to identify and solve a variety of problems. Some organizations contract operations research services with a consulting firm. Economists, systems analysts, mathematicians, industrial engineers, and others may apply operations research techniques to address problems in their respective fields. (These occupations are discussed elsewhere in the *Handbook*.)

Regardless of the type or structure of the client organization, operations research in its classical role entails a similar set of procedures in carrying out analysis to support management's quest to improve performance. Managers begin the process by describing the symptoms of a problem to the analyst, who then formally defines the problem. For example, an operations research analyst for an auto manufacturer may be asked to determine the best inventory level for each of the parts needed on a production line and to ascertain the optimal number of windshields to be kept in inventory. Too many windshields would be wasteful and expensive, while too few could result in an unintended halt in production.

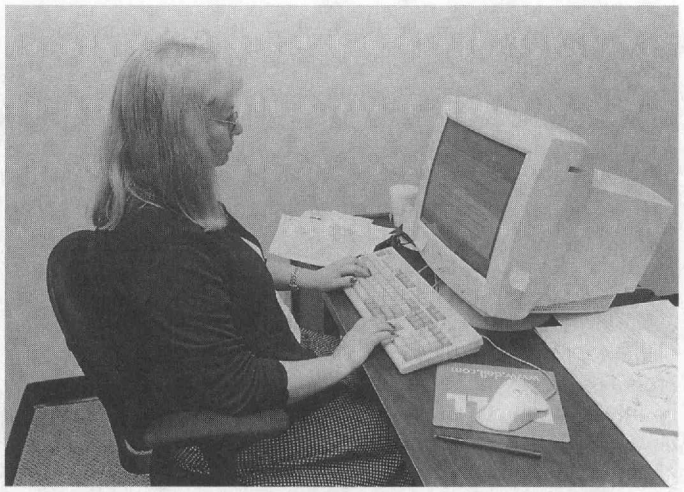
Operations research analysts study such problems, breaking them into their components. Analysts then gather information about each of the components from a variety of sources. To determine the most efficient amount of inventory to be kept on hand, for example, operations research analysts might talk with engineers about production levels, discuss purchasing arrangements with buyers, and examine storage-cost data provided by the accounting department.

With the relevant information in hand, the analyst is ready to select the most appropriate analytical technique. Analysts can use any of several techniques, including simulation, linear and nonlinear programming, dynamic programming, queuing and other stochastic-process models, Markov decision processes, econometric methods, data envelopment analysis, neural networks, expert systems, decision analysis, and the analytic hierarchy process. Nearly all of these techniques, however, involve the construction of a mathematical model that attempts to describe the system being studied. The use of models enables the analyst to assign values to the different components and clarify the relationships among them. The values can be altered to examine what may happen to the system under different circumstances.

In most cases, the computer program developed to solve the model must be modified and run repeatedly to obtain different solutions. A model for airline flight scheduling, for example, might include variables for the cities to be connected, the amount of fuel required to fly the routes, projected levels of passenger demand, varying ticket and fuel prices, pilot scheduling, and maintenance costs. By locating the right combination of values for the variable, the analyst is able to produce the best flight schedule consistent with particular assumptions.

Upon concluding the analysis, the operations research analyst presents management with recommendations based on the results. Additional computer runs to consider different assumptions may be needed before the analyst presents the final

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Operations research analysts study organizational efficiency and suggest ways to improve an organization's performance.

recommendation. Once management reaches a decision, the analyst usually works with others in the organization to ensure the plan's successful implementation.

Working Conditions

Operations research analysts generally work regular hours in an office environment. Because they work on projects that are of immediate interest to top management, operations research analysts often are under pressure to meet deadlines and work more than a 40-hour week.

Employment

Operations research analysts held about 61,700 jobs in 2002. Major employers include telecommunication companies, aerospace manufacturers, computer systems design firms, financial institutions, insurance carriers, engineering and management services firms, and Federal and State governments. More than 4 out of 5 operations research analysts in the Federal Government work for the Department of Defense, and many in private industry work directly or indirectly on national defense. About 1 out of 5 analysts works in architectural, engineering, or related services; computer systems design and related services; management, scientific, and technical consulting services; and scientific research and development firms that offer consulting services in the field of operations research.

Training, Other Qualifications, and Advancement

Employers generally prefer applicants with at least a master's degree in operations research or a closely related field, such as computer science, engineering, business, mathematics, information systems, or management science, coupled with a bachelor's degree in computer science or a quantitative discipline, such as economics, mathematics, or statistics. Dual graduate degrees in operations research and computer science are especially attractive to employers. Operations research analysts also must be able to think logically and work well with people, and employers prefer workers with good oral and written communication skills.

In addition to supporting formal education in one manner or another, employers often sponsor training for experienced workers, helping them keep up with new developments in operations research techniques and computer science. Some analysts attend advanced university classes on these subjects at their employer's expense.

Because computers are the most important tools for performing in-depth analysis, training and experience in programming are required. Operations research analysts typically need to be proficient in database collection and management, programming, and the development and use of sophisticated software packages.

Beginning analysts usually perform routine work under the supervision of more experienced analysts. As the novices gain knowledge and experience, they are assigned more complex tasks and given greater autonomy to design models and solve problems. Operations research analysts advance by assuming positions as technical specialists or supervisors. The skills acquired by operations research analysts are useful for a variety of higher level management jobs, so experienced analysts may leave the field to assume nontechnical managerial or administrative positions. Operations research analysts with significant experience may become consultants, and some may even open their own consulting practice.

Job Outlook

Employment of operations research analysts is expected to grow more slowly than the average for all occupations through 2012, reflecting slow growth in the number of jobs with the title "operations research analyst." Job opportunities in operations research should be good, however, because organizations throughout the economy will strive to improve their productivity, effectiveness, and competitiveness and because of the extensive availability of data, computers, and software. Many jobs in operations research have other titles, such as "operations analyst," "management analyst," "systems analyst," and "policy analyst." Individuals who hold a master's or Ph.D. degree in operations research, management science, or a closely related field should find good job opportunities because the number of openings generated by employment growth and the need to replace those leaving the occupation are expected to exceed the number of persons graduating with those credentials.

Organizations face pressure today from growing domestic and international competition and must work to make their operations as effective as possible. As a result, businesses will increasingly rely on operations research analysts to optimize profits by improving productivity and reducing costs. As new technology is introduced into the marketplace, operations research analysts will be needed to determine how to utilize the technology in the best way.

Opportunities for operations research analysts exist in almost every industry because of the diversity of applications for their work. However, opportunities should be especially good in highly competitive industries, such as manufacturing, transportation, telecommunications, and finance. As businesses and government agencies continue to contract out jobs to cut costs, many operations research analysts also will find opportunities as consultants, either working for a consulting firm or setting up their own practice. Opportunities in the military will exist as well, but will depend on the size of future military budgets. As the military develops new weapons systems and strategies, military leaders will rely on operations research analysts to test and evaluate their accuracy and effectiveness. (See the *Handbook* statement on job opportunities in the Armed Forces.)

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Earnings

Median annual earnings of operations research analysts were $56,920 in 2002. The middle 50 percent earned between $43,220 and $74,460. The lowest 10 percent had earnings of less than $34,140, while the highest 10 percent earned more than $92,430.

The average annual salary for operations research analysts in the Federal Government in nonsupervisory, supervisory, and managerial positions was $83,740 in 2003.

Related Occupations

Operations research analysts apply advanced analytical methods to large, complicated problems. Workers in other occupations that stress advanced analysis include computer systems analysts, database administrators, and computer scientists; computer programmers; engineers; mathematicians; statisticians; economists; and market and survey researchers. Because its goal is improved organizational effectiveness, operations research also is closely allied to managerial occupations, such as computer and information systems managers, and management analysts.

Sources of Additional Information

Information on career opportunities for operations research analysts is available from

➤ Institute for Operations Research and Management Science, 901 Elkridge Landing Rd., Suite 400, Linthicum, MD 21090. Internet: **http://www.informs.org**

For information on operations research careers in the Armed Forces and the U.S. Department of Defense, contact

➤ Military Operations Research Society, 1703 N. Beauregard St., Suite 450, Alexandria, VA 22311. Internet: **http://www.mors.org**

Information on obtaining an operations research analyst position with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Statisticians

(0*NET 15-2041.00)

Significant Points

- Many individuals with degrees in statistics enter jobs that do not have the title statistician.
- A master's degree in statistics or mathematics is the minimum educational requirement for most jobs as a statistician.
- Although slower than average growth is expected in employment of statisticians, job opportunities should remain favorable for individuals with degrees in statistics.

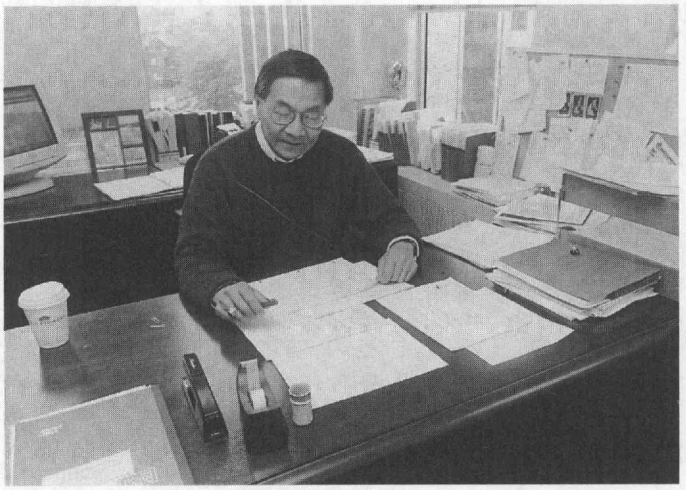
Nature of the Work

Statistics is the scientific application of mathematical principles to the collection, analysis, and presentation of numerical data. Statisticians contribute to scientific inquiry by applying their mathematical and statistical knowledge to the design of surveys and experiments; collection, processing, and analysis of data; and interpretation of the results. Statisticians may apply their knowledge of statistical methods to a variety of subject areas, such as biology, economics, engineering, medicine, public health, psychology, marketing, education, and sports. Many economic, social, political, and military decisions cannot be made without the use of statistical techniques, such as the design of experiments to gain Federal approval of a newly manufactured drug.

One technique that is especially useful to statisticians is sampling—obtaining information about a population of people or group of things by surveying a small portion of the total. For example, to determine the size of the audience for particular programs, television-rating services survey only a few thousand families, rather than all viewers. Statisticians decide where and how to gather the data, determine the type and size of the sample group, and develop the survey questionnaire or reporting form. They also prepare instructions for workers who will collect and tabulate the data. Finally, statisticians analyze, interpret, and summarize the data using computer software.

In business and industry, statisticians play an important role in quality control and in product development and improvement. In an automobile company, for example, statisticians might design experiments to determine the failure time of engines exposed to extreme weather conditions by running individual engines until failure and breakdown. Working for a pharmaceutical company, statisticians might develop and evaluate the results of clinical trials to determine the safety and effectiveness of new medications. And, at a computer software firm, statisticians might help construct new statistical software packages to analyze data more accurately and efficiently. In addition to product development and testing, some statisticians also are involved in deciding what products to manufacture, how much to charge for them, and to whom the products should be marketed. Statisticians also may manage assets and liabilities, determining the risks and returns of certain investments.

Statisticians also are employed by nearly every government agency. Some government statisticians develop surveys that measure population growth, consumer prices, or unemployment. Other statisticians work for scientific, environmental, and agricultural agencies, and may help to determine the amount of pesticides in drinking water, the number of endangered species living in a particular area, or the number of people afflicted with a particular disease. Statisticians also are employed in national



Statisticians work in many different fields, organizing surveys, collecting data, and analyzing the results.

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defense agencies, determining the accuracy of new weapons and the likely effectiveness of defense strategies.

Because statistical specialists are employed in so many work areas, specialists who use statistics often have different professional designations. For example, a person using statistical methods on economic data may have the title econometrician, while statisticians in public health and medicine may hold titles such as biostatistician, biometrician, or epidemiologist.

Working Conditions

Statisticians usually work regular hours in comfortable offices. Some statisticians travel to provide advice on research projects, supervise and set up surveys, or gather statistical data. Some may have duties that vary widely, such as designing experiments or performing fieldwork in various communities. Statisticians who work in academia generally have a mix of teaching and research responsibilities.

Employment

Statisticians held about 20,000 jobs in 2002. Eighteen percent of these jobs were in the Federal Government, where statisticians were concentrated in the Departments of Commerce, Agriculture, and Health and Human Services. Another 16 percent were found in State and local governments, including State colleges and universities. Most of the remaining jobs were in private industry, especially in scientific research and development services; office administrative services; insurance carriers; management, scientific, and technical consulting services; and business, professional, labor, and political organizations; and pharmaceutical and medicine manufacturing. In addition, many professionals with a background in statistics were among the 20,000 full-time mathematics faculty in colleges and universities in 2002, according to the American Mathematical Society. (See the statement on teachers—postsecondary, elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Although more employment opportunities are becoming available to individuals with a bachelor's degree in statistics, a master's degree in statistics or mathematics is usually the minimum educational requirement for most statistician jobs. Research and academic positions in institutions of higher education, for example, require at least a master's degree, and usually a Ph.D., in statistics. Beginning positions in industrial research often require a master's degree combined with several years of experience.

The training required for employment as an entry-level statistician in the Federal Government, however, is a bachelor's degree, including at least 15 semester hours of statistics or a combination of 15 hours of mathematics and statistics, if at least 6 semester hours are in statistics. Qualifying as a mathematical statistician in the Federal Government requires 24 semester hours of mathematics and statistics, with a minimum of 6 semester hours in statistics and 12 semester hours in an area of advanced mathematics, such as calculus, differential equations, or vector analysis.

Many other schools also offered degrees in mathematics, operations research, and other fields that included a sufficient number of courses in statistics to qualify graduates for some beginning positions in the Federal Government. Required subjects for statistics majors include differential and integral calculus, statistical methods, mathematical modeling, and probability theory. Additional courses that undergraduates should take include linear algebra, design and analysis of experiments, applied multivariate analysis, and mathematical statistics.

In 2002, approximately 140 universities offered a master's degree program in statistics or biostatistics, and about 90 offered a doctoral degree program. Many other schools also offered graduate-level courses in applied statistics for students majoring in biology, business, economics, education, engineering, psychology, and other fields. Acceptance into graduate statistics programs does not require an undergraduate degree in statistics, although good training in mathematics is essential.

Because computers are used extensively for statistical applications, a strong background in computer science is highly recommended. For positions involving quality and productivity improvement, training in engineering or physical science is useful. A background in biological, chemical, or health science is important for positions involving the preparation and testing of pharmaceutical or agricultural products. Courses in economics and business administration are helpful for many jobs in market research, business analysis, and forecasting.

Good communications skills are important for prospective statisticians in industry, who often need to explain technical matters to persons without statistical expertise. An understanding of business and the economy also is valuable for those who plan to work in private industry.

Beginning statisticians generally are supervised by an experienced statistician. With experience, they may advance to positions with more technical responsibility and, in some cases, supervisory duties. However, opportunities for promotion are greater for persons with advanced degrees. Master's and Ph.D. degree holders usually enjoy independence in their work and become qualified to engage in research, develop statistical methods, or, after a number of years of experience in a particular area, become statistical consultants.

Job Outlook

Slower than average growth is expected in employment of statisticians over the 2002-12 period. However, job opportunities should remain favorable for individuals with degrees in statistics, although many of these positions will not carry the explicit job title statistician. This is especially true of jobs that involve the analysis and interpretation of data from other disciplines such as economics, biological science, psychology, or computer software engineering. Despite the limited number of jobs resulting from growth, a number of openings will become available as statisticians transfer to other occupations or retire or leave the work force for other reasons.

Among graduates with a master's degree in statistics, those with a strong background in an allied field, such as finance, biology, engineering, or computer science, should have the best prospects of finding jobs related to their field of study. Federal agencies will hire statisticians in many fields, including demography, agriculture, consumer and producer surveys, Social Security, healthcare, and environmental quality. Competition for entry-level positions in the Federal Government is expected to be strong for persons just meeting the minimum qualification standards for statisticians, because the Federal Government is one of the few employers that considers a bachelor's degree to be an adequate entry-level qualification. Those who meet State certification requirements may become high school statistics teachers. (For additional information, see the statement on teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

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Manufacturing firms will hire statisticians with master's and doctoral degrees for quality control of various products, including pharmaceuticals, motor vehicles, aircraft, chemicals, and food. For example, pharmaceutical firms employ statisticians to assess the safety and effectiveness of new drugs. To address global product competition, motor vehicle manufacturers will need statisticians to improve the quality of automobiles, trucks, and their components by developing and testing new designs. Statisticians with knowledge of engineering and the physical sciences will find jobs in research and development, working with teams of scientists and engineers to help improve design and production processes to ensure consistent quality of newly developed products. Many statisticians also will find opportunities developing statistical software for computer software manufacturing firms.

Business firms will rely heavily on workers with a background in statistics to forecast sales, analyze business conditions, and help to solve management problems in order to maximize profits. In addition, consulting firms increasingly will offer sophisticated statistical services to other businesses. Because of the widespread use of computers in this field, statisticians in all industries should have good computer programming skills and knowledge of statistical software.

Earnings

Median annual earnings of statisticians were $57,080 in 2002. The middle 50 percent earned between $40,510 and $76,500. The lowest 10 percent had earnings of less than $30,380, while the highest 10 percent earned more than $91,680.

The average annual salary for statisticians in the Federal Government in nonsupervisory, supervisory, and managerial positions was $75,979 in 2003, while mathematical statisticians averaged $83,472. According to a 2003 survey by the National Association of Colleges and Employers, starting salary offers for mathematics/statistics graduates with a bachelor's degree averaged $40,512 a year.

Related Occupations

People in a wide range of occupations work with statistics. Among these are actuaries; mathematicians; operations research analysts; computer systems analysts, database administrators, and computer scientists; computer programmers; computer software engineers; engineers; economists; market and survey researchers; financial analysts and personal financial advisors; and life, physical, and social scientists.

Sources of Additional Information

For information about career opportunities in statistics, contact:

➤ American Statistical Association, 1429 Duke St., Alexandria, VA 22314. Internet: **http://www.amstat.org**

For more information on doctoral-level careers and training in mathematics, a field closely related to statistics, contact:

➤ American Mathematical Society, 201 Charles St., Providence, RI 02940. Internet: **http://www.ams.org**

Information on obtaining a statistician position with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Architects, Surveyors, and Cartographers

Architects, Except Landscape and Naval

(0*NET 17-1011.00)

Significant Points

- More than 1 in 5 architects was self-employed—about three times the proportion for all professional and related occupations.
- Licensing requirements include a professional degree in architecture, a period of practical training, and passing all divisions of the Architect Registration Examination.
- Architecture graduates may face competition, especially for jobs in the most prestigious firms; opportunities will be best for those with experience working for a firm while still in school and for those with knowledge of computer-aided design and drafting technology.

Nature of the Work

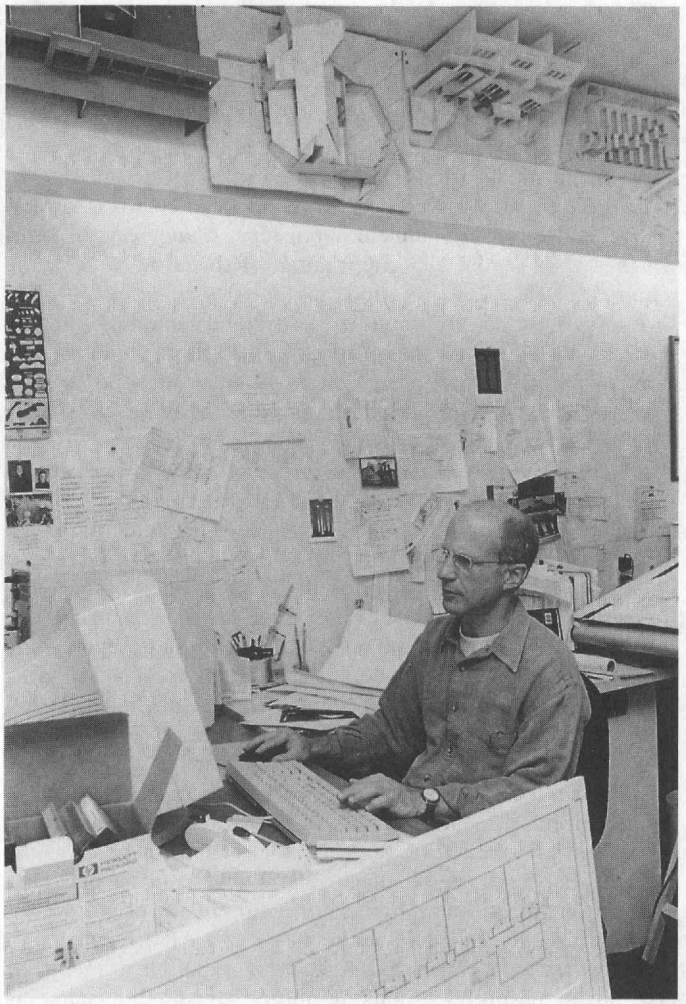
People need places in which to live, work, play, learn, worship, meet, govern, shop, and eat. These places may be private or public; indoors or outdoors; or rooms, buildings, or complexes; and together, they make up neighborhoods, towns, suburbs, and cities. *Architects*—licensed professionals trained in the art and science of building design—transform these needs into concepts and then develop the concepts into images and plans of buildings that can be constructed by others.

Architects design the overall aesthetic and look of buildings and other structures, but the design of a building involves far more than its appearance. Buildings also must be functional, safe, and economical and must suit the needs of the people who use them. Architects consider all these factors when they design buildings and other structures.

Architects provide professional services to individuals and organizations planning a construction project. They may be involved in all phases of development, from the initial discussion with the client through the entire construction process. Their duties require specific skills—designing, engineering, managing, supervising, and communicating with clients and builders. Architects spend a great deal of time explaining their ideas to clients, construction contractors, and others. Successful architects must be able to communicate their unique vision persuasively.

The architect and client discuss the objectives, requirements, and budget of a project. In some cases, architects provide various predesign services—conducting feasibility and environmental impact studies, selecting a site, or specifying the requirements the design must meet. For example, they may determine space requirements by researching the numbers and types of

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Architects update plans after receiving feedback from other professionals.

potential users of a building. The architect then prepares drawings and a report presenting ideas for the client to review.

After discussing and agreeing on the initial proposal, architects develop final construction plans that show the building's appearance and details for its construction. Accompanying these plans are drawings of the structural system; air-conditioning, heating, and ventilating systems; electrical systems; communications systems; plumbing; and, possibly, site and landscape plans. The plans also specify the building materials and, in some cases, the interior furnishings. In developing designs, architects follow building codes, zoning laws, fire regulations, and other ordinances, such as those requiring easy access by disabled persons. Throughout the planning stage, they make necessary changes. Although they have traditionally used pencil and paper to produce design and construction drawings, architects are increasingly turning to computer-aided design and drafting (CADD) technology for these important tasks. Continual revision of plans on the basis of client needs and budget constraints is often necessary.

Architects may also assist clients in obtaining construction bids, selecting contractors, and negotiating construction contracts. As construction proceeds, they may visit building sites to make sure that contractors follow the design, adhere to the schedule, use the specified materials, and meet work quality standards. The job is not complete until all construction is finished, required tests are conducted, and construction costs are paid. Sometimes, architects also provide postconstruction services, such as facilities management. They advise on energy efficiency measures, evaluate how well the building design adapts to the needs of occupants, and make necessary improvements.

Architects design a wide variety of buildings, such as office and apartment buildings, schools, churches, factories, hospitals, houses, and airport terminals. They also design complexes such as urban centers, college campuses, industrial parks, and entire communities. In addition, they may advise on the selection of building sites, prepare cost analysis and land-use studies, and do long-range planning for land development.

Architects sometimes specialize in one phase of work. Some specialize in the design of one type of building—for example, hospitals, schools, or housing. Others focus on planning and predesign services or construction management and do minimal design work. They often work with engineers, urban planners, interior designers, landscape architects, and other professionals. In fact, architects spend a great deal of their time coordinating information from, and the work of, others engaged in the same project. Many architects—particularly at larger firms—use the Internet and e-mail to update designs and communicate changes efficiently. Architects also use the Internet to research product specifications and government regulations.

During the required training period leading up to licensing as architects, entry-level workers are called interns. This training period, which generally lasts 3 years, gives them practical work experience in preparation for the Architect Registration Examination (ARE). Typical duties may include preparing construction drawings on CADD, building models, or assisting in the design of one part of a project.

Working Conditions

Architects usually work in a comfortable environment. Most of their time is spent in offices consulting with clients, developing reports and drawings, and working with other architects and engineers. However, they often visit construction sites to review the progress of projects.

Architects may occasionally be under stress, working nights and weekends to meet deadlines. In 2002, more than half of all full-time architects worked more than 40 hours a week.

Employment

Architects held about 113,000 jobs in 2002. Almost 2 out of 3 jobs were in architectural, engineering, and related services—mostly in architectural firms with fewer than five workers. A small number worked for residential and nonresidential building construction firms and for government agencies responsible for housing, planning, or community development, such as the U.S. Departments of Defense and Interior, and the General Services Administration. About 1 in 5 architects was self-employed.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require individuals to be licensed (registered) before they may call themselves architects or contract to provide architectural services. Nevertheless, many architecture school graduates work in the field while they are in the process of becoming licensed. However, a licensed architect is required to take legal responsibility for all work. Licensing requirements include a professional degree in architecture, a period of practical training or internship, and passage of all divisions of the ARE.

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In most States, the professional degree in architecture must be from one of the 113 schools of architecture that have degree programs accredited by the National Architectural Accrediting Board (NAAB). However, State architectural registration boards set their own standards, so graduation from a non-NAAB-accredited program may meet the educational requirement for licensing in a few States. Three types of professional degrees in architecture are available through colleges and universities. The majority of all architectural degrees are from 5-year Bachelor of Architecture programs, intended for students entering university-level studies from high school or with no previous architectural training. In addition, a number of schools offer a 2-year Master of Architecture program for students with a preprofessional undergraduate degree in architecture or a related area, or a 3- or 4-year Master of Architecture program for students with a degree in another discipline.

The choice of degree depends upon each individual's preference and educational background. Prospective architecture students should consider the available options before committing to a program. For example, although the 5-year Bachelor of Architecture program offers the fastest route to the professional degree, courses are specialized, and if the student does not complete the program, transferring to program offered by another discipline may be difficult. A typical program includes courses in architectural history and theory, building design, structures, technology, construction methods, professional practice, math, physical sciences, and liberal arts. Central to most architectural programs is the design studio, where students put into practice the skills and concepts learned in the classroom. During the final semester of many programs, students devote their studio time to creating an architectural project from beginning to end, culminating in a three-dimensional model of their design.

Many schools of architecture also offer postprofessional degrees for those who already have a bachelor's or master's degree in architecture or other areas. Although graduate education beyond the professional degree is not required for practicing architects, it may be for research, teaching, and certain specialties.

High school students interested in a career in architecture should take courses in English, history, art, social studies, mathematics, physics, and computer science. Students should also visit the design studio of a school of architecture or tour the offices of a local firm. In addition, many schools of architecture offer summer programs for high school students.

Architects must be able to communicate their ideas visually to their clients. Artistic and drawing ability is helpful, but not essential, to such communication. More important are a visual orientation and the ability to conceptualize and understand spatial relationships. Good communication skills, the ability to work independently or as part of a team, and creativity are important qualities for anyone interested in becoming an architect. Computer literacy also is required for writing specifications, for two- and three-dimensional drafting, and for financial management. Knowledge of CADD is helpful and will become essential as architectural firms continue to adopt that technology. Recently, the profession recognized National CAD Standards (NCS); architecture students who master NCS may have an advantage in the job market.

All State architectural registration boards require a training period before candidates may sit for the ARE and become licensed. Most States have adopted the training standards established by the Intern Development Program, a branch of the American Institute of Architects and the National Council of Architectural Registration Boards (NCARB). These standards stipulate broad and diversified training under the supervision of a licensed architect over a 3-year period. New graduates usually begin as interns in architectural firms, where they assist in preparing architectural documents or drawings. Some States allow some of the training to occur in the offices of related professionals, such as engineers or general contractors. Architecture students who complete internships in architectural firms while still in school can count some of that time toward the required 3-year training period.

Interns may research building codes and materials or write specifications for building materials, installation criteria, the quality of finishes, and other, related details. After completing the on-the-job training period, interns are eligible to sit for the ARE. The examination tests candidates' knowledge, skills, and ability to provide the various services required in the design and construction of buildings. Nine critical areas are covered. Candidates who pass the ARE and meet all standards established by their State board are licensed to practice in that State.

Several States require continuing education to maintain a license, and many more States are expected to adopt mandatory continuing education. Requirements vary by State, but usually involve the completion of a certain number of credits every year or two through seminars, workshops, formal university classes, conferences, self-study courses, or other sources.

A growing number of architects voluntarily seek certification by the NCARB, which can facilitate an individual's becoming licensed to practice in additional States. Certification is awarded after independent verification of the candidate's educational transcripts, employment record, and professional references. Certification is the primary requirement for reciprocity of licensing among State Boards that are NCARB members.

After becoming licensed and gaining experience, architects take on increasingly responsible duties, eventually managing entire projects. In large firms, architects may advance to supervisory or managerial positions. Some architects become partners in established firms; others set up their own practices. Graduates with degrees in architecture also enter related fields, such as graphic, interior, or industrial design; urban planning; real estate development; civil engineering; and construction management.

Job Outlook

Prospective architects may face competition for entry-level positions, especially if the number of architectural degrees awarded remains at current levels or increases. Employment of architects is projected to grow about as fast as the average for all occupations through 2012, and additional job openings will stem from the need to replace architects who retire, transfer to new occupations, or leave the labor force permanently for other reasons. However, many individuals are attracted to this occupation, and the number of applicants often exceeds the number of available jobs, especially in the most prestigious firms. Prospective architects who gain career-related experience in an architectural firm while they are still in school and who know CADD technology—especially that which conforms to the new national standards—will have a distinct advantage in obtaining an intern position after graduation.

Employment of architects is strongly tied to the level of local construction, particularly nonresidential structures such as office buildings, shopping centers, schools, and healthcare facilities. Employment in nonresidential construction is expected to grow because the replacement and renovation of many

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industrial plants and buildings has been delayed for years and a large number of structures will have to be replaced or remodeled, particularly in urban areas where space for new buildings is becoming limited. On the other hand, technology enhancements will dampen demand for new commercial construction as nontraditional work and retail environments, such as teleconferencing, home offices, telecommuting, and electronic shopping, proliferate.

Demographic trends and changes in healthcare delivery will influence the demand for certain institutional structures and should also provide more jobs for architects in the future. A growing and aging population will drive demand for the construction of adult daycare, assisted-living, and other outpatient facilities, all of which are preferable, less costly alternatives to hospitals and nursing homes. Similarly, the construction of schools will increase to accommodate growth in the school-aged population. Additions to existing schools (especially colleges and universities), as well as overall modernization, will continue to add to demand for architects through 2012.

Demand for residential construction is also expected to continue to grow. As the baby boomers reach their peak earning years and can afford to spend more on housing, demand for larger homes with more amenities, as well as for second homes, will continue to rise. Some older, more affluent, members of the baby-boom generation will want townhouses and condominiums in conveniently located suburban and urban settings. At the same time, as the "echo boomers" (the children of the baby boomers) start to augment the younger age groups, the demand for starter homes and rental apartments also should increase.

Growth in demand for new-home construction will be tempered by consumers' preference to perform home improvements and renovations—especially in attractive, established neighborhoods—rather than construct new homes. Many starter homes will be remodeled to appeal to more affluent, space- and amenity-hungry buyers. Also, as buyers trade up, some may prefer to remodel existing homes, rather than construct new homes.

Because construction—particularly office and retail construction—is sensitive to cyclical changes in the economy, architects will face especially strong competition for jobs or clients during recessions, and layoffs may ensue. Those involved in the design of institutional buildings, such as schools, hospitals, nursing homes, and correctional facilities, will be less affected by fluctuations in the economy.

Even in times of overall good job opportunities, however, there may be areas of the country with poor opportunities. Architects who are licensed to practice in one State must meet the licensing requirements of other States before practicing elsewhere. Obtaining licensure in other States, after initially receiving licensure in one State, is known as "reciprocity" and is much easier if an architect has received certification from the NCARB.

Earnings

Median annual earnings of wage and salary architects were $56,620 in 2002. The middle 50 percent earned between $44,030 and $74,460. The lowest 10 percent earned less than $36,280, and the highest 10 percent earned more than $92,350.

Earnings of partners in established architectural firms may fluctuate because of changing business conditions. Some architects may have difficulty establishing their own practices and may go through a period when their expenses are greater than their income, requiring substantial financial resources.

Related Occupations

Architects design buildings and related structures. Construction managers, like architects, also plan and coordinate activities concerned with the construction and maintenance of buildings and facilities. Others who engage in similar work are landscape architects, civil engineers, urban and regional planners, and designers, including interior designers, commercial and industrial designers, and graphic designers.

Sources of Additional Information

Information about education and careers in architecture can be obtained from:

➤ The American Institute of Architects, 1735 New York Ave. NW., Washington, DC 20006. Internet: **http://www.aia.org**

➤ Intern Development Program, National Council of Architectural Registration Boards, Suite 1100K, 1801 K Street NW., Washington, D.C. 20006-1310. Internet: **http://www.ncarb.org**

Landscape Architects

(0*NET 17-1012.00)

Significant Points

- Almost 23 percent are self-employed—more than 3 times the proportion for all professionals.
- A bachelor's degree in landscape architecture is the minimum requirement for entry-level jobs; many employers prefer to hire landscape architects who also have completed at least one internship.
- A growing demand for incorporating natural elements into man-made environments, along with the need to meet a wide array of environmental restrictions, will increase the demand for landscape architects.

Nature of the Work

Everyone enjoys attractively designed residential areas, public parks and playgrounds, college campuses, shopping centers, golf courses, parkways, and industrial parks. Landscape architects design these areas so that they are not only functional, but also beautiful, and compatible with the natural environment. They plan the location of buildings, roads, and walkways, and the arrangement of flowers, shrubs, and trees.

Landscape architects work for many types of organizations—from real estate development firms starting new projects to municipalities constructing airports or parks—and they often are involved with the development of a site from its conception. Working with architects, surveyors, and engineers, landscape architects help determine the best arrangement of roads and buildings. They also collaborate with environmental scientists, foresters, and other professionals to find the best way to conserve or restore natural resources. Once these decisions are made, landscape architects create detailed plans indicating new topography, vegetation, walkways, and other landscaping details, such as fountains and decorative features.

In planning a site, landscape architects first consider the nature and purpose of the project and the funds available. They analyze the natural elements of the site, such as the climate, soil, slope of the land, drainage, and vegetation; observe where sunlight falls on the site at different times of the day and examine the site from various angles; and assess the effect of existing buildings, roads, walkways, and utilities on the project.

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After studying and analyzing the site, landscape architects prepare a preliminary design. To account for the needs of the client as well as the conditions at the site, they frequently make changes before a final design is approved. They also take into account any local, State, or Federal regulations, such as those protecting wetlands or historic resources. In preparing designs, computer-aided design (CAD) has become an essential tool for most landscape architects. Many landscape architects also use video simulation to help clients envision the proposed ideas and plans. For larger scale site planning, landscape architects also use geographic information systems technology, a computer mapping system.

Throughout all phases of the planning and design, landscape architects consult with other professionals involved in the project. Once the design is complete, they prepare a proposal for the client. They produce detailed plans of the site, including written reports, sketches, models, photographs, land-use studies, and cost estimates, and submit them for approval by the client and by regulatory agencies. When the plans are approved, landscape architects prepare working drawings showing all existing and proposed features. They also outline in detail the methods of construction and draw up a list of necessary materials. Although many landscape architects monitor the installation of their design, the developer's project general contractor or a landscape contractor usually directs the actual construction and installation of plantings.

Some landscape architects work on a variety of projects. Others specialize in a particular area, such as residential development, street and highway beautification, waterfront improvement projects, parks and playgrounds, or shopping centers. Still others work in regional planning and resource management; feasibility, environmental impact, and cost studies; or site construction. Increasingly, landscape architects are becoming involved with projects in environmental remediation, such as preservation and restoration of wetlands. Historic landscape preservation and restoration is another important area where landscape architects are increasingly playing an important role.

Most landscape architects do at least some residential work, but relatively few limit their practice to individual homeowners. Residential landscape design projects usually are too small to provide suitable income compared with larger commercial or multiunit residential projects. Some nurseries offer residential landscape design services, but these services often are performed by lesser qualified landscape designers, or others with training and experience in related areas.



Landscape architects often visit the worksite to check that plans are implemented properly.

Landscape architects who work for government agencies do site and landscape design for government buildings, parks, and other public lands, as well as park and recreation planning in national parks and forests. In addition, they prepare environmental impact statements and studies on environmental issues such as public land-use planning. Some restore degraded land, such as mines or landfills. Other architects use their skills in traffic-calming, the "art" of slowing traffic down through use of traffic design, enhancement of the physical environment, and greater attention to aesthetics.

Working Conditions

Landscape architects spend most of their time in offices creating plans and designs, preparing models and cost estimates, doing research, or attending meetings with clients and other professionals involved in a design or planning project. The remainder of their time is spent at the site. During the design and planning stage, landscape architects visit and analyze the site to verify that the design can be incorporated into the landscape. After the plans and specifications are completed, they may spend additional time at the site observing or supervising the construction. Those who work in large national or regional firms may spend considerably more time out of the office traveling to sites away from the local area.

Salaried employees in both government and landscape architectural firms usually work regular hours; however, they may work overtime to meet a project deadline. Hours of self-employed landscape architects vary depending on the demands of the projects on which they are working.

Employment

Landscape architects held about 23,000 jobs in 2002. About 4 out of 10 workers were employed in firms that provide architectural, engineering, and related services. The Federal Government also employs these workers, primarily in the U.S. Departments of Agriculture, Defense, and Interior. Almost 1 of every 4 landscape architects was self-employed.

Employment of landscape architects is concentrated in urban and suburban areas throughout the country; some landscape architects work in rural areas, particularly those employed by the Federal Government to plan and design parks and recreation areas.

Training, Other Qualifications, and Advancement

A bachelor's or master's degree in landscape architecture usually is necessary for entry into the profession. The bachelor's degree in landscape architecture takes 4 or 5 years to complete. There also are two types of accredited master's degree programs. The most common type of master's degree is a 3-year first professional degree program designed for students with an undergraduate degree in another discipline. The second type is of master's degree is a 2-year second professional degree program for students who have a bachelor's degree in landscape architecture and who wish to teach or specialize in some aspect of landscape architecture, such as regional planning or golf course design.

In 2002, 58 colleges and universities offered 75 undergraduate and graduate programs in landscape architecture that were accredited by the Landscape Architecture Accreditation Board of the American Society of Landscape Architects. College courses required in these programs usually include technical

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subjects such as surveying, landscape design and construction, landscape ecology, site design, and urban and regional planning. Other courses include history of landscape architecture, plant and soil science, geology, professional practice, and general management. Many landscape architecture programs also are adding courses that address environmental issues, a growing concern of landscape architects. The design studio is another important aspect of many landscape architecture curriculums. Whenever possible, students are assigned real projects, providing them with valuable hands-on experience. While working on these projects, students become more proficient in the use of computer-aided design, geographic information systems, and video simulation.

In 2002, 46 States required landscape architects to be licensed or registered. Licensing is based on the Landscape Architect Registration Examination (L.A.R.E.), sponsored by the Council of Landscape Architectural Registration Boards and administered over a 3-day period. Admission to the exam usually requires a degree from an accredited school plus 1 to 4 years of work experience under the supervision of a registered landscape architect, although standards vary from State to State. Currently, 15 States require the passage of a State examination in addition to the L.A.R.E. to satisfy registration requirements. State examinations, which usually are 1 hour in length and completed at the end of the L.A.R.E., focus on laws, environmental regulations, plants, soils, climate, and any other characteristics unique to the State.

Because State requirements for licensure are not uniform, landscape architects may not find it easy to transfer their registration from one State to another. However, those who meet the national standards of graduating from an accredited program, serving 3 years of internship under the supervision of a registered landscape architect, and passing the L.A.R.E. can satisfy requirements in most States. Through this means, a landscape architect can obtain certification from the Council of Landscape Architectural Registration Boards, and so gain reciprocity (the right to work) in other States.

In the Federal Government, candidates for entry positions should have a bachelor's or master's degree in landscape architecture. The Federal Government does not require its landscape architects to be licensed.

Persons planning a career in landscape architecture should appreciate nature, enjoy working with their hands, and possess strong analytical skills. Creative vision and artistic talent also are desirable qualities. Good oral communication skills are essential; landscape architects must be able to convey their ideas to other professionals and clients and to make presentations before large groups. Strong writing skills also are valuable, as is knowledge of computer applications of all kinds, including word processing, desktop publishing, and spreadsheets. Landscape architects use these tools to develop presentations, proposals, reports, and land impact studies for clients, colleagues, and superiors. The ability to draft and design using CAD software is essential. Many employers recommend that prospective landscape architects complete at least one summer internship with a landscape architecture firm in order to gain an understanding of the day-to-day operations of a small business, including how to win clients, generate fees, and work within a budget.

In States where licensure is required, new hires may be called "apprentices" or "intern landscape architects" until they become licensed. Their duties vary depending on the type and size of the employing firm. They may do project research or prepare working drawings, construction documents, or base maps of the area to be landscaped. Some are allowed to participate in the actual design of a project. However, interns must perform all work under the supervision of a licensed landscape architect. Additionally, all drawings and specifications must be signed and sealed by the licensed landscape architect, who takes legal responsibility for the work. After gaining experience and becoming licensed, landscape architects usually can carry a design through all stages of development. After several years, they may become project managers, taking on the responsibility for meeting schedules and budgets, in addition to overseeing the project design. Later, they may become associates or partners of a firm, with a proprietary interest in the business.

Many landscape architects are self-employed because start-up costs, after an initial investment in CAD software, are relatively low. Self-discipline, business acumen, and good marketing skills are important qualities for those who choose to open their own business. Even with these qualities, however, some may struggle while building a client base.

Those with landscape architecture training also qualify for jobs closely related to landscape architecture, and may, after gaining some experience, become construction supervisors, land or environmental planners, or landscape consultants.

Job Outlook

Employment of landscape architects is expected to increase faster than the average for all occupations through the year 2012. Their expertise will be highly sought after in the planning and development of new residential, commercial, and other types of construction, to meet the needs of a growing population. With land costs rising and the public demanding more beautiful spaces, the importance of good site planning and landscape design grows. Also, new construction is increasingly contingent upon compliance with environmental regulations, land use zoning, and water restrictions, spurring demand for landscape architects to help plan sites and integrate man-made structures with the natural environment in the least disruptive way. Landscape architects also will be increasingly involved in preserving and restoring wetlands and other environmentally sensitive sites. However, opportunities will vary from year to year, and by geographic region, depending on local economic conditions. During a recession, when real estate sales and construction slow down, landscape architects may face layoffs and greater competition for jobs. The need to replace landscape architects who retire or leave the labor force will produce some additional job openings.

Continuation of the Transportation Equity Act for the Twenty-First Century is expected to spur employment for landscape architects, particularly within State and local governments. This Act, known as TEA-21, provides funds for surface transportation and transit programs, such as interstate highway construction and maintenance and environment-friendly pedestrian and bicycle trails. Budget tightening in the Federal Government might restrict hiring in the U.S. Forest Service and the National Park Service, agencies that traditionally employ the most landscape architects in the Federal Government. Instead, such agencies may increasingly contract out for landscape architecture services, providing additional employment opportunities in private landscape architecture firms.

In addition to the work related to new development and construction, landscape architects are expected to be involved in

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historic preservation, land reclamation, and refurbishment of existing sites. They are also doing more residential design work as households spend more on landscaping than in the past. Because landscape architects can work on many different types of projects, they may have an easier time than other design professionals finding employment when traditional construction slows down.

New graduates can expect to face competition for jobs in the largest and most prestigious landscape architecture firms, but should face good job opportunities overall as demand increases, while the number of graduates of landscape architecture holds steady or goes up slightly. Opportunities will be best for landscape architects who develop strong technical skills—such as computer design—and communication skills, as well as knowledge of environmental codes and regulations. Those with additional training or experience in urban planning increase their opportunities for employment in landscape architecture firms that specialize in site planning as well as landscape design. Many employers prefer to hire entry-level landscape architects who have internship experience, which significantly reduces the amount of on-the-job training required.

Earnings

In 2002, median annual earnings for landscape architects were $47,400. The middle 50 percent earned between $36,140 and $62,470. The lowest 10 percent earned less than $28,730 and the highest 10 percent earned over $79,620. Architectural, engineering, and related services employed more landscape architects than any other group of industries, and there the median annual earnings were $46,980 in 2002.

In 2003, the average annual salary for all landscape architects in the Federal Government in nonsupervisory, supervisory, and managerial positions was $68,959.

Because many landscape architects work for small firms or are self-employed, benefits tend to be less generous than those provided to workers in large organizations.

Related Occupations

Landscape architects use their knowledge of design, construction, land-use planning, and environmental issues to develop a landscape project. Others whose work requires similar skills are architects, except landscape and naval; surveyors, cartographers, photogrammetrists, and surveying technicians; civil engineers; and urban and regional planners. Landscape architects also must know how to grow and use plants in the landscape. Some conservation scientists and foresters and biological and medical scientists study plants in general and do related work, while environmental scientists and geoscientists work in the area of environmental remediation.

Sources of Additional Information

Additional information, including a list of colleges and universities offering accredited programs in landscape architecture, is available from:

➤ American Society of Landscape Architects, Career Information, 636 Eye St. NW., Washington, DC 20001-3736. Internet: **http://www.asla.org**

General information on registration or licensing requirements is available from:

➤ Council of Landscape Architectural Registration Boards, 144 Church Street NW., Suite 201, Vienna, VA 22180-4550. Internet: **http://www.clarb.org**

Surveyors, Cartographers, Photogrammetrists, and Surveying Technicians

(0*NET 17-1021.00, 17-1022.00, 17-3031.01, 17-3031.02)

Significant Points

- Almost 2 out of 3 jobs were in architectural, engineering, and related services.
- Opportunities will be best for surveyors, cartographers, and photogrammetrists who have at least a bachelor's degree and strong technical skills.
- Computer skills enhance employment opportunities.

Nature of the Work

Several different types of workers are responsible for measuring and mapping the earth's surface. Traditional *land surveyors* establish official land, air space, and water boundaries. They write descriptions of land for deeds, leases, and other legal documents; define airspace for airports; and measure construction and mineral sites. Other surveyors provide data relevant to the shape, contour, location, elevation, or dimension of land or land features. *Cartographers* compile geographic, political, and cultural information and prepare maps of large areas. *Photogrammetrists* measure and analyze aerial photographs that are subsequently used to prepare detailed maps and drawings. *Surveying technicians* assist land surveyors by operating survey instruments and collecting information in the field and by performing computations and computer-aided drafting in offices. *Mapping technicians* calculate mapmaking information from field notes. They also draw topographical maps and verify their accuracy.

Land surveyors manage survey parties who measure distances, directions, and angles between points and elevations of points, lines, and contours on, above, and below the earth's surface. They plan the fieldwork, select known survey reference points, and determine the precise location of important features in the survey area. Surveyors research legal records, look for evidence of previous boundaries, and analyze the data to determine the location of boundary lines. They also record the results of surveys, verify the accuracy of data, and prepare plots, maps, and reports. Surveyors who establish boundaries must be licensed by the State in which they work. Known as professional land surveyors, they are sometimes called to provide expert testimony in court cases concerning matters pertaining to surveying.

A survey party gathers the information needed by the land surveyor. A typical survey party consists of a party chief and one or more surveying technicians and helpers. The party chief, who may be either a land surveyor or a senior surveying technician, leads day-to-day work activities. Surveying technicians assist the party chief by adjusting and operating surveying instruments, such as the theodolite (used to measure horizontal and vertical angles) and electronic distance-measuring equipment. Surveying technicians or assistants position and hold the vertical rods, or targets, that the theodolite operator sights on to measure angles, distances, or elevations. In addition, they may hold measuring tapes, if electronic distance-measuring equipment is not used. Surveying technicians compile notes, make sketches, and enter the data obtained from surveying

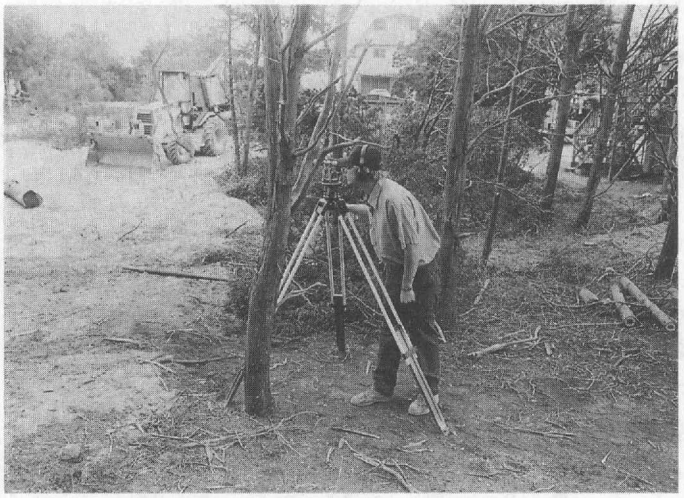
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instruments into computers. Survey parties also may include laborers or helpers who perform less skilled duties, such as clearing brush from sight lines, driving stakes, or carrying equipment.

New technology is changing the nature of the work of surveyors and surveying technicians. On larger projects, surveyors are increasingly using the Global Positioning System (GPS), a satellite system that locates points on the earth to a high degree of precision by using radio signals transmitted via satellites. To use this system, a surveyor places a satellite signal receiver—a small instrument mounted on a tripod—on a desired point. The receiver simultaneously collects information from several satellites to establish a precise position. The receiver also can be placed in a vehicle for tracing out road systems. Because receivers now come in different sizes and shapes, and because the cost of receivers has fallen, much more surveying work can be done with GPS. Surveyors then must interpret and check the results produced by the new technology.

Cartographers measure, map, and chart the earth's surface. Their work involves everything from performing geographical research and compiling data to actually producing maps. Cartographers collect, analyze, and interpret both spatial data—such as latitude, longitude, elevation, and distance—and nonspatial data—for example, population density, land-use patterns, annual precipitation levels, and demographic characteristics. They prepare maps in either digital or graphic form, using information provided by geodetic surveys, aerial photographs, and satellite data. *Photogrammetrists* prepare detailed maps and drawings from aerial photographs, usually of areas that are inaccessible, difficult, or less cost efficient to survey by other methods. *Map editors* develop and verify the contents of maps, using aerial photographs and other reference sources. Some States require photogrammetrists to be licensed as professional land surveyors.

Some surveyors perform specialized functions closer to those of cartographers than to those of traditional surveyors. For example, *geodetic surveyors* use high-accuracy techniques, including satellite observations (remote sensing), to measure large areas of the earth's surface. *Geophysical prospecting surveyors* mark sites for subsurface exploration, usually in relation to petroleum. *Marine or hydrographic surveyors* survey harbors, rivers, and other bodies of water to determine shorelines, the topography of the bottom, water depth, and other features.



Surveyors select known survey reference points and determine the precise location of important features in the survey area.

The work of surveyors and cartographers is changing because of advancements in technology, including not only the GPS, but also new earth resources data satellites, improved aerial photography, and geographic information systems (GIS)—computerized data banks of spatial data, along with the hardware, software, and staff needed to use them. These systems are capable of assembling, integrating, analyzing, and displaying data identified according to location. A GIS typically is used to handle maps which combine information that is useful for environmental studies, geology, engineering, planning, business marketing, and other disciplines. As more of these systems are developed, a new type of mapping scientist is emerging from the older specialties of photogrammetrist and cartographer: the *geographic information specialist* combines the functions of mapping science and surveying into a broader field concerned with the collection and analysis of geographic data.

Working Conditions

Surveyors usually work an 8-hour day, 5 days a week, and may spend a lot of time outdoors. Sometimes they work longer hours during the summer, when weather and light conditions are most suitable for fieldwork. Seasonal demands for longer hours are related to demand for specific surveying services. Home purchases traditionally are related to the start and end of the school year; construction is related to the materials to be used (unlike wood framing, concrete and asphalt are restricted by outside temperatures); and aerial photography is most effective when the leaves are off the trees.

Land surveyors and technicians engage in active, sometimes strenuous, work. They often stand for long periods, walk considerable distances, and climb hills with heavy packs of instruments and other equipment. They also can be exposed to all types of weather. Traveling often is part of the job, and land surveyors and technicians may commute long distances, stay away from home overnight, or temporarily relocate near a survey site.

Although surveyors can spend considerable time indoors, planning surveys, analyzing data, and preparing reports and maps, cartographers and photogrammetrists spend virtually all of their time in offices and seldom visit the sites they are mapping.

Employment

Surveyors, cartographers, photogrammetrists, and surveying technicians held about 124,000 jobs in 2002. Architectural, engineering, and related services firms—including firms that provided surveying and mapping services to other industries on a contract basis—provided about two-thirds of jobs for these workers. Federal, State, and local governmental agencies provided almost 1 in 6 jobs. Major Federal Government employers are the U.S. Geological Survey (USGS), the Bureau of Land Management (BLM), the Army Corps of Engineers, the Forest Service (USFS), the National Oceanic and Atmospheric Administration (NOAA), the National Imagery and Mapping Agency (NIMA), and the Federal Emergency Management Agency (FEMA). Most surveyors in State and local government work for highway departments and urban planning and redevelopment agencies. Construction firms, mining and oil and gas extraction companies, and utilities also employ surveyors, cartographers, photogrammetrists, and surveying technicians. Only a small number were self-employed in 2002.

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Training, Other Qualifications, and Advancement

Most people prepare for a career as a licensed surveyor by combining postsecondary school courses in surveying with extensive on-the-job training. However, as technology advances, a 4-year college degree is increasingly becoming a prerequisite. About 50 universities now offer 4-year programs leading to a B.S. degree in surveying. Junior and community colleges, technical institutes, and vocational schools offer 1-, 2-, and 3-year programs in both surveying and surveying technology.

All 50 States and all U.S. territories (Puerto Rico, Guam, the Mariana Islands, and the Virgin Islands) license land surveyors. For licensure, most State licensing boards require that individuals pass a written examination given by the National Council of Examiners for Engineering and Surveying. Most States also require surveyors to pass a written examination prepared by the State licensing board. In addition, candidates must meet varying standards of formal education and work experience in the field.

In the past, many with little formal training in surveying started as members of survey crews and worked their way up to become licensed surveyors. However, because of advancing technology and rising licensing standards, formal education requirements are increasing. Specific requirements vary among States. Generally, the quickest route to licensure is a combination of 4 years of college, up to 4 years of experience under the supervision of an experienced surveyor (a few States do not require any such experience), and passing the licensing examinations. An increasing number of States require a bachelor's degree in surveying or in a closely related field, such as civil engineering or forestry (with courses in surveying), regardless of the number of years of experience. Many states also have a continuing education requirement.

High school students interested in surveying should take courses in algebra, geometry, trigonometry, drafting, mechanical drawing, and computer science. High school graduates with no formal training in surveying usually start as apprentices. Beginners with postsecondary school training in surveying usually can start as technicians or assistants. With on-the-job experience and formal training in surveying—either in an institutional program or from a correspondence school—workers may advance to senior survey technician, then to party chief, and, in some cases, to licensed surveyor (depending on State licensing requirements).

The National Society of Professional Surveyors, a member organization of the American Congress on Surveying and Mapping, has a voluntary certification program for surveying technicians. Technicians are certified at four levels requiring progressive amounts of experience, in addition to the passing of written examinations. Although not required for State licensure, many employers require certification for promotion to positions with greater responsibilities.

Surveyors should have the ability to visualize objects, distances, sizes, and abstract forms. They must work with precision and accuracy, because mistakes can be costly. Members of a survey party must be in good physical condition, because they work outdoors and often carry equipment over difficult terrain. They need good eyesight, coordination, and hearing to communicate verbally and manually (using hand signals). Surveying is a cooperative operation, so good interpersonal skills and the ability to work as part of a team are important. Good office skills also are essential, because surveyors must be able to research old deeds and other legal papers and prepare reports that document their work.

Cartographers and photogrammetrists usually have a bachelor's degree in a field such as engineering, forestry, geography, or a physical science. Although it is possible to enter these positions through previous experience as a photogrammetric or cartographic technician, nowadays most cartographic and photogrammetric technicians have had some specialized postsecondary school training. With the development of GIS, cartographers and photogrammetrists need additional education and stronger technical skills—including more experience with computers—than in the past.

The American Society for Photogrammetry and Remote Sensing has a voluntary certification program for photogrammetrists. To qualify for this professional distinction, individuals must meet work experience standards and pass an oral or a written examination.

Job Outlook

Overall employment of surveyors, cartographers, photogrammetrists, and surveying technicians is expected to grow about as fast as the average for all occupations through the year 2012. The widespread availability and use of advanced technologies, such as GPS, GIS, and remote sensing, will continue to increase both the accuracy and productivity of these workers, resulting in modest overall growth in employment. However, job openings will continue to result from the need to replace workers who transfer to other occupations or who leave the labor force altogether.

Employment of surveying and mapping technicians is expected to grow faster than the average for all occupations through 2012. The short training period needed to learn to operate the equipment, the current lack of any formal testing or licensing, the growing demand for people to do basic GIS-related data-entry work, and relatively lower wages all encourage demand for these technicians. However, many persons possess the basic skills needed to qualify for the jobs that are available, so competition for job openings may result.

As technologies become more complex, opportunities will be best for surveyors, cartographers, and photogrammetrists who have at least a bachelor's degree and strong technical skills. Increasing demand for geographic data, as opposed to traditional surveying services, will mean better opportunities for cartographers and photogrammetrists who are involved in the development and use of geographic and land information systems. New technologies, such as GPS and GIS, also may enhance employment opportunities for surveyors, as well as for those surveying technicians who have the educational background and who have acquired technical skills that enable them to work with the new systems. At the same time, upgraded licensing requirements will continue to limit opportunities for professional advancement for those without bachelor's degrees.

Opportunities for surveyors, cartographers, and photogrammetrists should remain concentrated in architectural, engineering, and related services firms. However, nontraditional areas, such as urban planning, emergency preparedness, and natural resource exploration and mapping, also should provide employment growth, particularly with regard to producing maps for the management of emergencies and updating maps with the newly available technology. Continued growth in construction through 2012 will require surveyors to lay out streets, shopping centers, housing developments, factories, office buildings, and recreation areas, while setting aside flood plains, wetlands, wildlife habitats, and environmentally sensitive areas for protection.

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However, employment may fluctuate from year to year along with construction activity or with mapping needs for land and resource management.

Earnings

Median annual earnings of cartographers and photogrammetrists were $42,870 in 2002. The middle 50 percent earned between $32,580 and $55,610. The lowest 10 percent earned less than $25,810 and the highest 10 percent earned more than $69,320.

Median annual earnings of surveyors were $39,970 in 2002. The middle 50 percent earned between $29,320 and $53,440. The lowest 10 percent earned less than $22,260, and the highest 10 percent earned more than $67,700. Median hourly earnings of surveyors employed in architectural, engineering, and related services were $38,370 in 2002.

Median annual earnings of surveying and mapping technicians were $29,230 in 2002. The middle 50 percent earned between $22,640 and $39,070 in 2002. The lowest 10 percent earned less than $18,490, and the highest 10 percent earned more than $48,970. Median annual earnings of surveying and mapping technicians employed in architectural, engineering, and related services were $27,130 in 2002, while those employed by local governments had median annual earnings of $33,680.

In 2003, land surveyors in nonsupervisory, supervisory, and managerial positions in the Federal Government earned an average salary of $62,980; cartographers, $67,989; geodetic technicians, $55,374; surveying technicians, $33,316; and cartographic technicians, $43,517.

Related Occupations

Surveying is related to the work of civil engineers, architects, and landscape architects because an accurate survey is the first step in land development and construction projects. Cartography and geodetic surveying are related to the work of environmental scientists and geoscientists, who study the earth's internal composition, surface, and atmosphere. Cartography also is related to the work of geographers and urban and regional planners, who study and decide how the earth's surface is to be used.

Sources of Additional Information

For career information on surveyors, cartographers, photogrammetrists, and surveying technicians, contact:

➤ The American Congress on Surveyong and Mapping, Suite #403, 6 Montgomery Village Ave., Gaithersburg, MD 20879. Internet: **http://www.acsm.net**

Information about career opportunities, licensure requirements, and the surveying technician certification program is available from:

➤ National Society of Professional Surveyors, Suite #403, 6 Montgomery Village Ave., Gaithersburg, MD 20879. Internet: **http://www.acsm.net/nsps**

For information on a career as a geodetic surveyor, contact:

➤ American Association of Geodetic Surveying (AAGS), Suite #403, 6 Montgomery Village Ave., Gaithersburg, MD 20879. Internet: **http://www.acsm.net/aags**

General information on careers in photogrammetry and remote sensing is available from:

➤ ASPRS: The Imaging and Geospatial Information Society, 5410 Grosvenor Ln., Suite 210, Bethesda, MD 20814-2160. Internet: **http://www.asprs.org**

Engineers

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Significant Points

- Overall, job opportunities in engineering are expected to be good, but will vary by specialty.
- A bachelor's degree is required for most entry-level jobs.
- Starting salaries are significantly higher than those of college graduates in other fields.
- Continuing education is critical to keep abreast of the latest technology.

Nature of the Work

Engineers apply the theories and principles of science and mathematics to research and develop economical solutions to technical problems. Their work is the link between perceived social needs and commercial applications. Engineers design products, machinery to build those products, plants in which those products are made, and the systems that ensure the quality of the products and the efficiency of the workforce and manufacturing process. Engineers design, plan, and supervise the construction of buildings, highways, and transit systems. They develop and implement improved ways to extract, process, and use raw materials, such as petroleum and natural gas. They develop new materials that both improve the performance of products and take advantage of advances in technology. They harness the power of the sun, the Earth, atoms, and electricity for use in supplying the Nation's power needs, and create millions of products using power. They analyze the impact of the products they develop or the systems they design on the environment and on people using them. Engineering knowledge is applied to improving many things, including the quality of healthcare, the safety of food products, and the operation of financial systems.

Engineers consider many factors when developing a new product. For example, in developing an industrial robot, engineers determine precisely what function the robot needs to perform; design and test the robot's components; fit the components together in an integrated plan; and evaluate the design's overall effectiveness, cost, reliability, and safety. This process applies to many different products, such as chemicals, computers, gas turbines, helicopters, and toys.

In addition to design and development, many engineers work in testing, production, or maintenance. These engineers super-

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vise production in factories, determine the causes of breakdowns, and test manufactured products to maintain quality. They also estimate the time and cost to complete projects. Some move into engineering management or into sales. In sales, an engineering background enables them to discuss technical aspects and assist in product planning, installation, and use. (See the statements on engineering and natural sciences managers, and sales engineers, elsewhere in the *Handbook*.)

Most engineers specialize. More than 25 major specialties are recognized by professional societies, and the major branches have numerous subdivisions. Some examples include structural and transportation engineering, which are subdivisions of civil engineering; and ceramic, metallurgical, and polymer engineering, which are subdivisions of materials engineering. Engineers also may specialize in one industry, such as motor vehicles, or in one field of technology, such as turbines or semiconductor materials.

This statement, which contains an overall discussion of engineering, is followed by separate statements on 14 branches of engineering: Aerospace; agricultural; biomedical; chemical; civil; computer hardware; electrical and electronics, except computer; environmental; industrial, including health and safety; materials; mechanical; mining and geological, including mining safety; nuclear; and petroleum engineering. (Computer software engineers are discussed elsewhere in the *Handbook*.) Some branches of engineering not covered in detail in the *Handbook*, but for which there are established college programs, include architectural engineering—the design of a building's internal support structure; and marine engineering—the design and installation of ship machinery and propulsion systems.

Engineers in each branch have a base of knowledge and training that can be applied in many fields. Electronics engineers, for example, work in the medical, computer, communications, and missile guidance fields. Because there are many separate problems to solve in a large engineering project, engineers in one field often work closely with specialists in other scientific, engineering, and business occupations.

Engineers use computers to produce and analyze designs; to simulate and test how a machine, structure, or system operates; and to generate specifications for parts. Using the Internet or related communications systems, engineers can collaborate on designs with other engineers around the country or even abroad. Many engineers also use computers to monitor product quality and control process efficiency. They spend a great deal of time writing reports and consulting with other engineers, as complex projects often require an interdisciplinary team of engineers. Supervisory engineers are responsible for major components or entire projects.

Working Conditions

Most engineers work in office buildings, laboratories, or industrial plants. Others may spend time outdoors at construction sites and oil and gas exploration and production sites, where they monitor or direct operations or solve onsite problems. Some engineers travel extensively to plants or worksites.

Many engineers work a standard 40-hour week. At times, deadlines or design standards may bring extra pressure to a job, sometimes requiring engineers to work longer hours.

Employment

In 2002 engineers held 1.5 million jobs. The following tabulation shows the distribution of employment by engineering specialty.

Specialty	*Employment*	*Percent*
Total, all engineers	1,478,000	100
Electrical and electronics	292,000	19.8
Civil	228,000	15.4
Mechanical	215,000	14.5
Industrial, including health and safety	194,000	13.1
Aerospace	78,000	5.3
Computer hardware	74,000	5.0
Environmental	47,000	3.2
Chemical	33,000	2.2
Materials	24,000	1.6
Nuclear	16,000	1.1
Petroleum	14,000	0.9
Biomedical	7,600	0.5
Mining and geological, including mining safety	5,200	0.4
Marine engineers and naval architects	4,900	0.3
Agricultural	2,900	0.2
All other engineers	243,000	16.4

Almost 4 in 10 of all engineering jobs were found in manufacturing industries, such as transportation and equipment manufacturing and computer and electronic product manufacturing. About 354,000 wage and salary jobs were in the professional, scientific, and technical service industry, primarily in architectural, engineering, and related services and in scientific research and development services, where firms designed construction projects or did other engineering work on a contractual basis. Engineers also worked in the construction and transportation, telecommunications, and utilities industries.

Federal, State, and local governments employed about 192,000 engineers in 2002. About 88,000 of these were in the Federal Government, mainly in the U.S. Departments of Defense, Transportation, Agriculture, Interior, and Energy, and in the National Aeronautics and Space Administration. Most engineers in State and local government agencies worked in highway and public works departments. In 2002, about 55,000 engineers were self-employed, many as consultants.

Engineers are employed in every State, in small and large cities, and in rural areas. Some branches of engineering are concentrated in particular industries and geographic areas, as discussed later in this chapter.

Training, Other Qualifications, and Advancement

A bachelor's degree in engineering is required for almost all entry-level engineering jobs. College graduates with a degree in a physical science or mathematics occasionally may qualify for some engineering jobs, especially in specialties in high demand. Most engineering degrees are granted in electrical, electronics, mechanical, or civil engineering. However, engineers trained in one branch may work in related branches. For example, many aerospace engineers have training in mechanical engineering. This flexibility allows employers to meet staffing needs in new technologies and specialties in which engineers may be in short supply. It also allows engineers to shift to fields with better employment prospects or to those that more closely match their interests.

Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both math-

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ematics and science. Most programs include a design course, sometimes accompanied by a computer or laboratory class or both.

In addition to the standard engineering degree, many colleges offer 2- or 4-year degree programs in engineering technology. These programs, which usually include various hands-on laboratory classes that focus on current issues, prepare students for practical design and production work, rather than for jobs that require more theoretical and scientific knowledge. Graduates of 4-year technology programs may get jobs similar to those obtained by graduates with a bachelor's degree in engineering. Engineering technology graduates, however, are not qualified to register as professional engineers under the same terms as graduates with degrees in engineering. Some employers regard technology program graduates as having skills between those of a technician and an engineer.

Graduate training is essential for engineering faculty positions and many research and development programs, but is not required for the majority of entry-level engineering jobs. Many engineers obtain graduate degrees in engineering or business administration to learn new technology and broaden their education. Many high-level executives in government and industry began their careers as engineers.

About 340 colleges and universities offer bachelor's degree programs in engineering that are accredited by the Accreditation Board for Engineering and Technology (ABET), and about 240 colleges offer accredited bachelor's degree programs in engineering technology. ABET accreditation is based on an examination of an engineering program's student achievement, program improvement, faculty, curricular content, facilities, and institutional commitment. Although most institutions offer programs in the major branches of engineering, only a few offer programs in the smaller specialties. Also, programs of the same title may vary in content. For example, some programs emphasize industrial practices, preparing students for a job in industry, whereas others are more theoretical and are designed to prepare students for graduate work. Therefore, students should investigate curricula and check accreditations carefully before selecting a college.

Admissions requirements for undergraduate engineering schools include a solid background in mathematics (algebra, geometry, trigonometry, and calculus) and science (biology, chemistry, and physics), and courses in English, social studies, humanities, and computer and information technology. Bachelor's degree programs in engineering typically are designed to last 4 years, but many students find that it takes between 4 and 5 years to complete their studies. In a typical 4-year college curriculum, the first 2 years are spent studying mathematics, basic sciences, introductory engineering, humanities, and social sciences. In the last 2 years, most courses are in engineering, usually with a concentration in one branch. For example, the last 2 years of an aerospace program might include courses in fluid mechanics, heat transfer, applied aerodynamics, analytical mechanics, flight vehicle design, trajectory dynamics, and aerospace propulsion systems. Some programs offer a general engineering curriculum; students then specialize in graduate school or on the job.

Some engineering schools and 2-year colleges have agreements whereby the 2-year college provides the initial engineering education, and the engineering school automatically admits students for their last 2 years. In addition, a few engineering schools have arrangements whereby a student spends 3 years in a liberal arts college studying pre-engineering subjects and 2 years in an engineering school studying core subjects, and then receives a bachelor's degree from each school. Some colleges and universities offer 5-year master's degree programs. Some 5-year or even 6-year cooperative plans combine classroom study and practical work, permitting students to gain valuable experience and to finance part of their education.

All 50 States and the District of Columbia require licensure for engineers who offer their services directly to the public. Engineers who are licensed are called Professional Engineers (PE). This licensure generally requires a degree from an ABET-accredited engineering program, 4 years of relevant work experience, and successful completion of a State examination. Recent graduates can start the licensing process by taking the examination in two stages. The initial Fundamentals of Engineering (FE) examination can be taken upon graduation. Engineers who pass this examination commonly are called Engineers in Training (EIT) or Engineer Interns (EI). After acquiring suitable work experience, EITs can take the second examination, the Principles and Practice of Engineering exam. Several States have imposed mandatory continuing education requirements for relicensure. Most States recognize licensure from other States provided that the manner in which the initial license was obtained meets or exceeds their licensure requirements. Many civil, electrical, mechanical, and chemical engineers are licensed PEs.

Engineers should be creative, inquisitive, analytical, and detail-oriented. They should be able to work as part of a team and to communicate well, both orally and in writing. Communication abilities are important because engineers often interact with specialists in a wide range of fields outside engineering.

Beginning engineering graduates usually work under the supervision of experienced engineers and, in large companies, also may receive formal classroom or seminar-type training. As new engineers gain knowledge and experience, they are assigned more difficult projects with greater independence to develop designs, solve problems, and make decisions. Engineers may advance to become technical specialists or to supervise a staff or team of engineers and technicians. Some may eventually become engineering managers or enter other managerial or sales jobs. (See the statements under management and business and financial operations occupations, and sales and related occupations, elsewhere in the *Handbook*.)

Job Outlook

Overall engineering employment is expected to increase more slowly than the average for all occupations over the 2002-12 period. Engineers tend to be concentrated in slow-growing manufacturing industries, a factor which tends to hold down their employment growth. Also, many employers are increasing their use of engineering services performed in other countries. Despite this, overall job opportunities in engineering are expected to be good because the number of engineering graduates should be in rough balance with the number of job openings over this period. Expected changes in employment and, thus, job opportunities vary by specialty. Projections range from a decline in employment of mining and geological engineers, petroleum engineers, and nuclear engineers to much faster than average growth among environmental engineers.

Competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes. Employers will rely on engineers to further increase productivity, as investment in plant and equipment increases to expand output of goods and ser-

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vices. New computer and communications systems have improved the design process, enabling engineers to produce and analyze various product designs much more rapidly than in the past and to collaborate on designs with other engineers throughout the world. Despite these widespread applications, computer technology is not expected to limit employment opportunities. Finally, additional engineers will be needed to improve or build new roads, bridges, water and pollution control systems, and other public facilities.

There is a large number of well-trained, often English-speaking engineers available in many countries who are willing to work at much lower salaries than U.S. engineers. The rise of the Internet and other electronic communications systems has made it relatively easy for much of the engineering work previously done by engineers in this country to be done by engineers in other countries, a factor that will tend to hold down employment growth.

Compared with most other workers, a smaller proportion of engineers leave their jobs each year. Nevertheless, many job openings will arise from replacement needs, reflecting the large size of this profession. Numerous job openings will be created by engineers who transfer to management, sales, or other professional occupations; additional openings will arise as engineers retire or leave the labor force for other reasons.

Many engineers work on long-term research and development projects or in other activities that continue even during economic slowdowns. In industries such as electronics and aerospace, however, large cutbacks in defense expenditures and government research and development funds in the past, as well as the trend toward contracting out engineering work to engineering services firms, both domestic and foreign, have resulted in significant layoffs of engineers.

It is important for engineers, like those working in other technical occupations, to continue their education throughout their careers because much of their value to their employer depends on their knowledge of the latest technology. Although the pace of technological change varies by engineering specialty and industry, advances in technology have significantly affected every engineering discipline. Engineers in high-technology areas, such as advanced electronics or information technology, may find that technical knowledge can become outdated rapidly. Even those who continue their education are vulnerable to layoffs if the particular technology or product in which they have specialized becomes obsolete. By keeping current in their field, engineers are able to deliver the best solutions and greatest value to their employers. Engineers who have not kept current in their field may find themselves passed over for promotions or vulnerable to layoffs, should they occur. On the other hand, it often is these high-technology areas that offer the greatest challenges, the most interesting work, and the highest salaries. Therefore, the choice of engineering specialty and employer involves an assessment not only of the potential rewards but also of the risk of technological obsolescence.

Related Occupations

Engineers apply the principles of physical science and mathematics in their work. Other workers who use scientific and mathematical principles include architects, except landscape and naval; engineering and natural sciences managers; computer and information systems managers; mathematicians; drafters; engineering technicians; sales engineers; science technicians; and physical and life scientists, including agricultural and food scientists, biological scientists, conservation scientists and foresters, atmospheric scientists, chemists and materials scientists, environmental scientists and geoscientists, and physicists and astronomers.

Sources of Additional Information

High school students interested in obtaining information about careers in engineering should visit the JETS Web site: **http://www.jets.org**.

➤ JETS-Guidance, 1420 King St., Suite 405, Alexandria, VA 22314-2794.

Information on ABET-accredited engineering programs is available from:

➤ The Accreditation Board for Engineering and Technology, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012. Internet: **http://www.abet.org**

Those interested in information on the Professional Engineer licensure should contact:

➤ The National Society of Professional Engineers, 1420 King St., Alexandria, VA 22314-2794. Internet: **http://www.nspe.org**

➤ National Council of Examiners for Engineers and Surveying, P.O. Box 1686, Clemson, SC 29633-1686. Internet: **http://www.ncees.org**

Information on general engineering education and career resources is available from:

➤ American Society for Engineering Education, 1818 N St. NW., Suite 600, Washington, DC 20036-2479. Internet: **http://www.asee.org**

Information on obtaining an engineering position with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site **http://www.usajobs.opm.gov**

Non-high school students wanting more detailed information on an engineering specialty should contact societies representing the individual branches of engineering. Each can provide information about careers in the particular branch. The individual statements that follow also provide other detailed information on aerospace; agricultural; biomedical; chemical; civil; computer hardware; electrical and electronics, except computer; environmental; industrial, including health and safety; materials; mechanical; mining and geological, including mining safety; nuclear; and petroleum engineering.

Aerospace Engineers

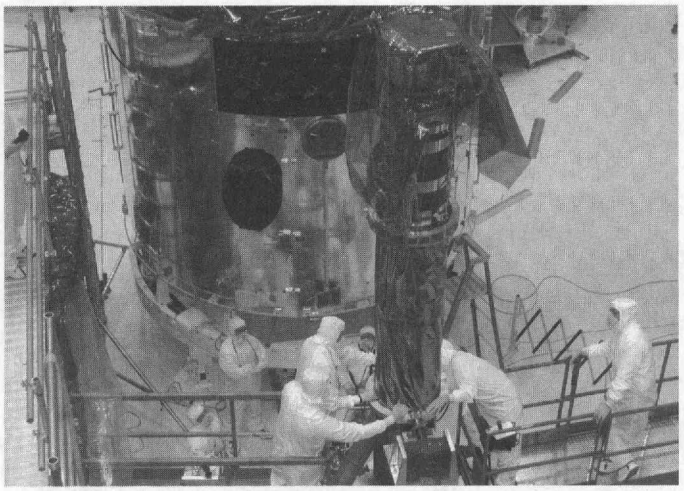
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Nature of the Work

Aerospace engineers create extraordinary machines, from airplanes that weigh over a half a million pounds to spacecraft that travel over 17,000 miles an hour. They design, develop, and test aircraft, spacecraft, and missiles and supervise the manufacture of these products. Aerospace engineers who work with aircraft are called *aeronautical engineers*, and those working specifically with spacecraft are *astronautical engineers*.

Aerospace engineers develop new technologies for use in aviation, defense systems, and space exploration, often specializing in areas such as structural design, guidance, navigation and control, instrumentation and communication, or produc-

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Aerospace engineers prepare a space vehicle for launch.

tion methods. They often use computer-aided design (CAD) software, robotics, and lasers and advanced electronic optics. They also may specialize in a particular type of aerospace product, such as commercial transports, military fighter jets, helicopters, spacecraft, or missiles and rockets. Aerospace engineers may be experts in aerodynamics, thermodynamics, celestial mechanics, propulsion, acoustics, or guidance and control systems.

Aerospace engineers typically are employed in the aerospace product and parts industry, although their skills are becoming increasingly valuable in other fields. For example, in the motor vehicles manufacturing industry, aerospace engineers design vehicles that have lower air resistance and, thus, increased fuel efficiency.

Employment

Aerospace engineers held about 78,000 jobs in 2002. Most worked in the aerospace product and parts manufacturing industries. Federal Government agencies, primarily the U.S. Department of Defense and the National Aeronautics and Space Administration, provided 10 percent of jobs. Architectural, engineering and related services, scientific research and development services, and navigational, measuring, electromedical, and control instruments manufacturing industry firms accounted for most of the remaining jobs.

Job Outlook

Employment of aerospace engineers is expected to decline over the projection period. Foreign competition and the slowdown in air travel will limit the number of new jobs for aerospace engineers related to the design and production of commercial aircraft over the projection period. Despite the expected decline in employment, favorable opportunities are expected for aerospace engineers through 2012 because the number of degrees granted in aerospace engineering has declined greatly over the last decade due to the perceived lack of opportunities in this occupation. The decline in degree production has reached the point that the number trained in aerospace engineering may not be adequate to replace the large numbers of aerospace engineers who are expected to leave the occupation, especially due to retirement, over the 2002-12 period. Some employment opportunities also will occur in industries not typically associated with aerospace, such as motor vehicle manufacturing.

Earnings

Median annual earnings of aerospace engineers were $72,750 in 2002. The middle 50 percent earned between $59,520 and $88,310. The lowest 10 percent earned less than $49,640, and the highest 10 percent earned more than $105,060. Median annual earnings in the industries employing the largest numbers of aerospace engineers in 2002 were:

Federal government	$81,830
Architectural, engineering, and related services	74,890
Aerospace product and parts manufacturing	70,920

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in aerospace engineering received starting salary offers averaging $48,028 a year, master's degree candidates were offered $61,162, and Ph.D. candidates were offered $68,406.

Sources of Additional Information

For further information about careers in the aerospace industry, contact:

➤ Aerospace Industries Association, 1250 Eye St. NW., Suite 1200, Washington, DC 20005-3924. Internet: **http://www.aia-aerospace.org**

➤ American Institute of Aeronautics and Astronautics, Inc., 1801 Alexander Bell Dr., Suite 500, Reston, VA 20191-4344. Internet: **http://www.aiaa.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

Agricultural Engineers

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Nature of the Work

Agricultural engineers apply knowledge of engineering technology and biological science to agriculture. (See biological scientists and agricultural and food scientists elsewhere in the *Handbook*.) They design agricultural machinery and equipment and agricultural structures. Some specialties include power systems and machinery design; structures and environment; and food and bioprocess engineering. They develop ways to conserve soil and water and to improve the processing of agricultural products. Agricultural engineers work in research and development, production, sales, or management.

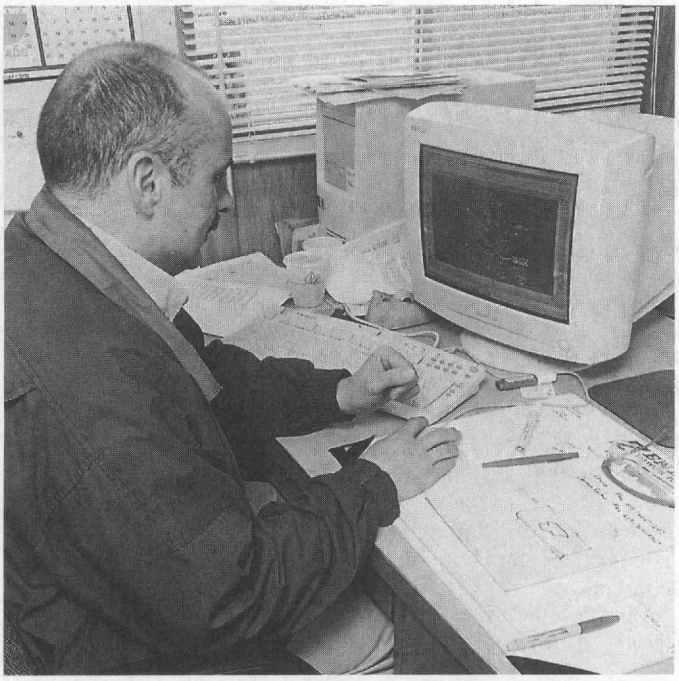
Employment

About one third of the 2,900 agricultural engineers employed in 2002 worked for professional, scientific, and technical services, supplying consultant services to farmers and farm-related industries. Others worked in a wide variety of industries, including crops and livestock as well as manufacturing and government.

Job Outlook

Employment of agricultural engineers is expected to increase about as fast as the average for all occupations through 2012. The growing interest in worldwide standardization of agricultural equipment should result in increased employment of agricultural engineers. Job opportunities also should result from the increasing demand for agricultural products, the continued efforts for more efficient agricultural production, and the increasing emphasis on the conservation of resources. In addition to those resulting from employment growth, job openings will

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Agricultural engineers apply knowledge of engineering technology and biological science to agriculture.

be created by the need to replace agricultural engineers who transfer to other occupations or leave the labor force.

Earnings

Median annual earnings of agricultural engineers were $50,700 in 2002. The middle 50 percent earned between $40,320 and $70,100. The lowest 10 percent earned less than $35,590, and the highest 10 percent earned more than $87,220.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in agricultural engineering received starting offers averaging $42,987 a year, and master's degree candidates, on average, were offered $54,000.

Sources of Additional Information

Information on a career as an agricultural engineer can be obtained from:

➤ American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, MI 49085-9659. Internet: **http://www.asae.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

Biomedical Engineers

(0*NET 17-2031.00)

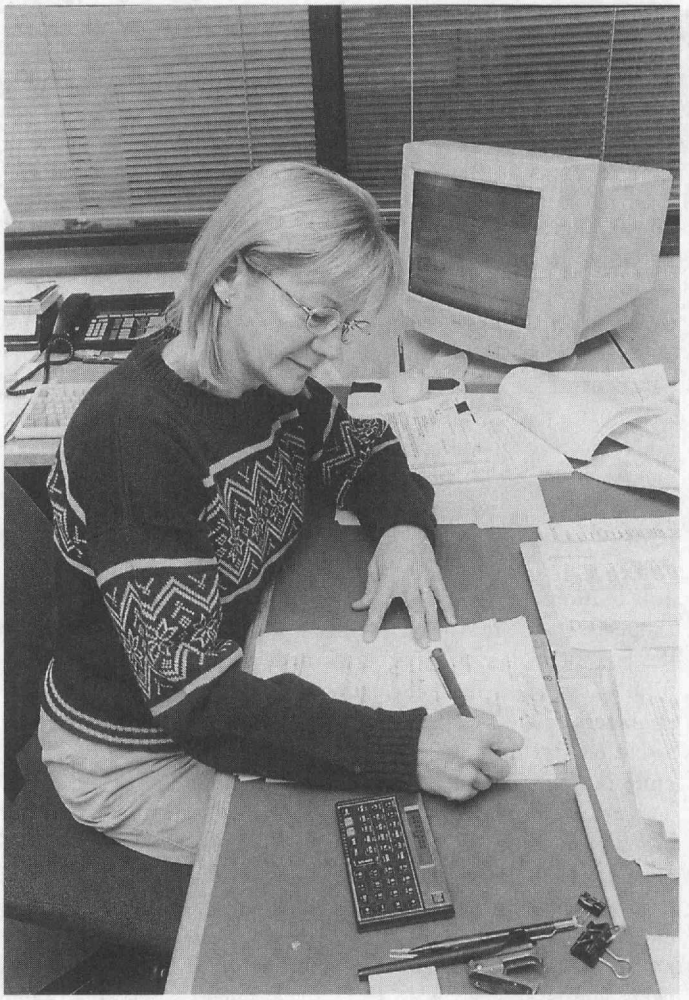
Nature of the Work

By combining biology and medicine with engineering, biomedical engineers develop devices and procedures that solve medical and health-related problems. Many do research, along with life scientists, chemists, and medical scientists, to develop and evaluate systems and products for use in the fields of biology and health, such as artificial organs, prostheses (artificial devices that replace missing body parts), instrumentation, medical information systems, and health management and care delivery systems. (See biological scientists, medical scientists, and chemists and materials scientists elsewhere in the *Handbook*.) Biomedical engineers design devices used in various medical procedures, such as the computers used to analyze blood or the laser systems used in corrective eye surgery. They develop artificial organs, imaging systems such as magnetic resonance, ultrasound, and x-ray, and devices for automating insulin injections or controlling body functions. Most engineers in this specialty require a sound background in one of the basic engineering specialties, such as mechanical or electronics engineering, in addition to specialized biomedical training. Some specialties within biomedical engineering include biomaterials, biomechanics, medical imaging, rehabilitation engineering, and orthopedic engineering.

Unlike many other engineering specialties, a graduate degree is recommended or required for many entry-level jobs.

Employment

Biomedical engineers held about 7,600 jobs in 2002. Manufacturing industries employed 38 percent of all biomedical engineers, primarily in the pharmaceutical and medicine manufacturing and medical instruments and supplies industries. Many others worked for hospitals. Some also worked for government agencies or as independent consultants.



Many biomedical engineers conduct research to develop and evaluate systems and products for use in the fields of biology and health.

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Job Outlook

Employment of biomedical engineers is expected to increase faster than the average for all occupations through 2012. The aging of the population and the focus on health issues will increase the demand for better medical devices and equipment designed by biomedical engineers. For example, computer-assisted surgery and molecular, cellular, and tissue engineering are being more heavily researched and are developing rapidly. In addition, the rehabilitation and orthopedic engineering specialties are growing quickly, increasing the need for biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures is an increased concern for cost efficiency and effectiveness that also will boost demand for biomedical engineers. However, because of the growing interest in this field, the number of degrees granted in biomedical engineering has increased greatly, leading to the potential for competition for jobs.

Earnings

Median annual earnings of biomedical engineers were $60,410 in 2002. The middle 50 percent earned between $58,320 and $88,830. The lowest 10 percent earned less than $48,450, and the highest 10 percent earned more than $107,520.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in biomedical engineering received starting offers averaging $39,126 a year, and master's degree candidates, on average, were offered $61,000.

Sources of Additional Information

For further information about biomedical engineering careers, contact:

➤ Biomedical Engineering Society, 8401 Corporate Dr., Suite 225, Landover, MD 20785-2224. Internet: **http://www.bmes.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

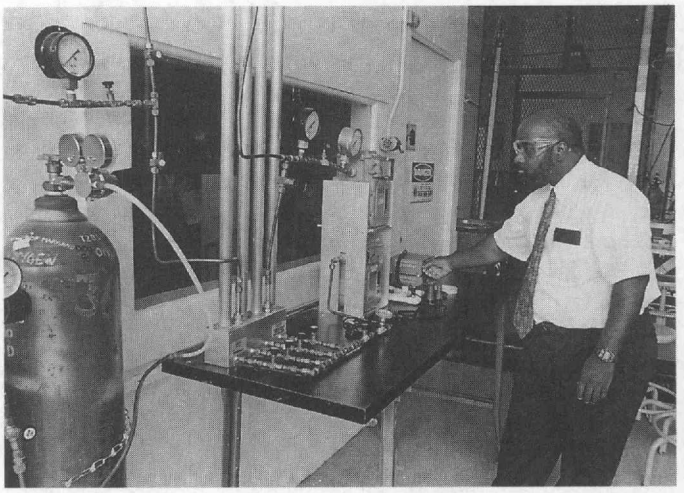
Chemical Engineers

(0*NET 17-2041.00)

Nature of the Work

Chemical engineers build a bridge between science and manufacturing, applying the principles of chemistry and engineering to solve problems involving the production or use of chemicals. They design equipment and develop processes for large-scale chemical manufacturing, plan and test methods of manufacturing products and treating byproducts, and supervise production. Chemical engineers also work in a variety of manufacturing industries other than chemical manufacturing, such as those producing electronics, photographic equipment, clothing, and pulp and paper. They also work in the healthcare, biotechnology, and business services industries.

The knowledge and duties of chemical engineers overlap many fields. Chemical engineers apply principles of chemistry, physics, mathematics, and mechanical and electrical engineering. (See chemists and materials scientists; physicists and astronomers; mechanical engineers; electrical and electronics engineers, except computer; and mathematicians elsewhere in the *Handbook*.) They frequently specialize in a particular chemical process such as oxidation or polymerization. Others specialize in a particular field, such as materials science, or the development of specific products such as fertilizers and pesticides, automotive plastics, or chlorine bleach. They must be aware of all aspects of chemicals manufacturing and how it affects the environment, the safety of workers, and customers. Because chemical engineers use computer technology to optimize all phases of research and production, they need to understand how to apply computer skills to chemical process analysis, automated control systems, and statistical quality control.



In addition to working in the chemical industry, chemical engineers are employed in a variety of other manufacturing industries and professional, scienitfic, and technical services firms.

Employment

Chemical engineers held about 33,000 jobs in 2002. Manufacturing industries employed 55 percent of all chemical engineers, primarily in the chemicals, electronics, petroleum refining, paper, and related industries. Most others worked for professional, scientific, or technical services firms that design chemical plants or perform research and development or other services, mainly for chemical companies.

Job Outlook

Little or no growth in employment of chemical engineers is expected though 2012. Although overall employment in the chemical manufacturing industry is expected to decline, chemical companies will continue to research and develop new chemicals and more efficient processes to increase output of existing chemicals. Among manufacturing industries, pharmaceuticals may provide the best opportunities for jobseekers. Many of the jobs for chemical engineers, however, will be in nonmanufacturing industries, especially services industries such as research and testing services. Even though no new jobs due to growth are expected to be created, many openings will result from the need to replace chemical engineers who transfer to other occupations or leave the labor force.

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Earnings

Median annual earnings of chemical engineers were $72,490 in 2002. The middle 50 percent earned between $58,320 and $88,830. The lowest 10 percent earned less than $48,450, and the highest 10 percent earned more than $107,520.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in chemical engineering received starting offers averaging $52,384 a year, master's degree candidates averaged $57,857, and Ph.D. candidates averaged $70,729.

Sources of Additional Information

Information on careers, employment, education, training, conferences, and publications on chemical engineering is available from:

➤ American Institute of Chemical Engineers, 3 Park Ave., New York, NY 10016-5901. Internet: **http://www.aiche.org**

Additional information on careers in chemical engineering is available from:

➤ American Chemical Society, Department of Career Services, 1155 16th St. NW., Washington, DC 20036. Internet: **http://www.chemistry.org/portal/Chemistry**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

Civil Engineers

(0*NET 17-2051.00)

Nature of the Work

Civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems. Civil engineering, considered one of the oldest engineering disciplines, encompasses many specialties. The major specialties within civil engineering are structural, water resources, environmental, construction, transportation, and geotechnical engineering.

Many civil engineers hold supervisory or administrative positions, from supervisor of a construction site to city engineer. Others may work in design, construction, research, and teaching.

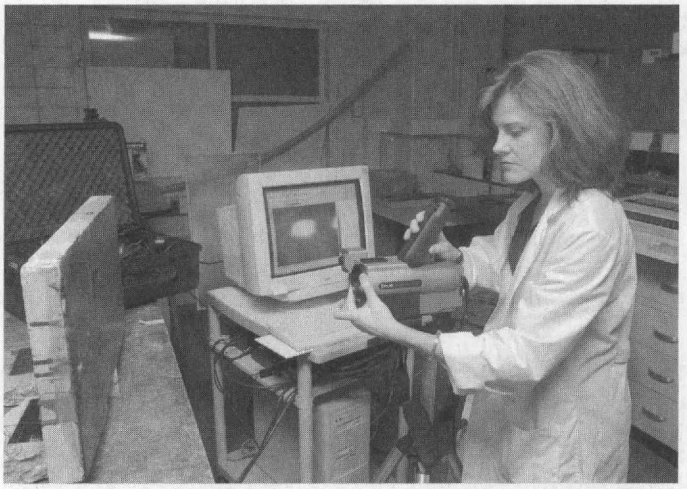
Employment

Civil engineers held about 228,000 jobs in 2002. More than 4 in 10 were employed by firms providing architectural, engineering, and related services, primarily developing designs for new construction projects. Almost one-third of the jobs were in Federal, State, and local government agencies. The construction industry accounted for most of the remaining employment. About 15,000 civil engineers were self-employed, many as consultants.

Civil engineers usually work near major industrial and commercial centers, often at construction sites. Some projects are situated in remote areas or in foreign countries. In some jobs, civil engineers move from place to place to work on different projects.

Job Outlook

Employment of civil engineers is expected to increase more slowly than the average for all occupations through 2012.



Some civil engineers do research on building materials.

Spurred by general population growth and an increased emphasis on infrastructure and security, more civil engineers will be needed to design and construct safe and higher capacity transportation, water supply, and pollution control systems, and large buildings and building complexes. They also will be needed to repair or replace existing roads, bridges, and other public structures. In addition to those arising from job growth, openings will result from the need to replace civil engineers who transfer to other occupations or leave the labor force.

Because construction and related industries—including those providing design services—employ many civil engineers, employment opportunities will vary by geographic area and may decrease during economic slowdowns, when construction often is curtailed.

Earnings

Median annual earnings of civil engineers were $60,070 in 2002. The middle 50 percent earned between $48,360 and $74,700. The lowest 10 percent earned less than $39,960, and the highest 10 percent earned more than $91,010. Median annual earnings in the industries employing the largest numbers of civil engineers in 2002 were:

Federal government	$67,410
Local government	62,210
Architectural, engineering, and related services	59,060
State government	58,350
Nonresidential building construction	54,190

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in civil engineering received starting offers averaging $41,669 a year; master's degree candidates received an average offer of $47,245, and Ph.D. candidates were offered $69,079, on average, as an initial salary.

Sources of Additional Information

General information about civil engineers, as well as career, education, and related information, can be obtained from:

➤ American Society of Civil Engineers, 1801 Alexander Bell Dr., Reston, VA 20191-4400. Internet: **http://www.asce.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

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Computer Hardware Engineers

(0*NET 17-2061.00)

Nature of the Work

Computer hardware engineers research, design, develop, and test computer hardware and supervise its manufacture and installation. Hardware refers to computer chips, circuit boards, computer systems, and related equipment such as keyboards, modems, and printers. (Computer software engineers—often simply called computer engineers—design and develop the software systems that control computers. These workers are covered elsewhere in the *Handbook*.) The work of computer hardware engineers is very similar to that of electronics engineers, but, unlike electronics engineers, computer hardware engineers work exclusively with computers and computer-related equipment. (See electrical and electronics engineers elsewhere in the *Handbook*.) In addition to design and development duties, computer hardware engineers may supervise the manufacture and installation of computers and computer-related equipment. The rapid advances in computer technology are largely a result of the research, development, and design efforts of computer hardware engineers. To keep up with technological advances, these engineers must continually update their knowledge.

Employment

The number of computer hardware engineers is relatively small compared with the number of computer-related workers who work with software or computer applications. Computer hardware engineers held about 74,000 jobs in 2002. Almost 40 percent worked in computer and electronic product manufacturing. Almost one-quarter worked in professional, scientific, and technical services firms, many of which provided services to the computer industry. Many of the rest were employed in the telecommunications.

Job Outlook

Computer hardware engineers may face competition for jobs because the number of degrees granted in this field has increased rapidly and because employment is expected to grow more slowly than average. Although the use of information technology continues to expand rapidly, the manufacture of computer hardware is expected to be adversely affected by intense foreign competition. Also, this industry is expected to continue to experience very high levels of productivity growth, which will even affect computer hardware engineers. The utilization of foreign computer hardware engineering services also will serve to limit growth. In addition to job openings arising from employment growth, other vacancies will result from the need to replace workers who move into managerial positions, transfer to other occupations, or leave the labor force.



The work of computer hardware engineers is similar to that of electronics engineers, but, unlike electronics engineers, computer hardware engineers work exclusively with computers and computer-related equipment.

Earnings

Median annual earnings of computer hardware engineers were $72,150 in 2002. The middle 50 percent earned between $56,490 and $91,730. The lowest 10 percent earned less than $46,190, and the highest 10 percent earned more than $114,880. Median annual earnings in the industries employing the largest numbers of computer hardware engineers in 2002 were:

Semiconductor and other electronic component manufacturing	$76,600
Computer and peripheral equipment manufacturing	75,300
Computer systems designs and related services	74,320

According to the National Association of Colleges and Employers, starting salary offers in 2003 for bachelor's degree candidates in computer engineering averaged $51,343 a year; master's degree candidates averaged $64,200.

Sources of Additional Information

For further information on careers, education, certification, publications, and conferences related to computer hardware engineers, contact:

➤ IEEE Computer Society, 1730 Massachusetts Ave. NW., Washington, DC 20036-1992. Internet: **http://www.computer.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

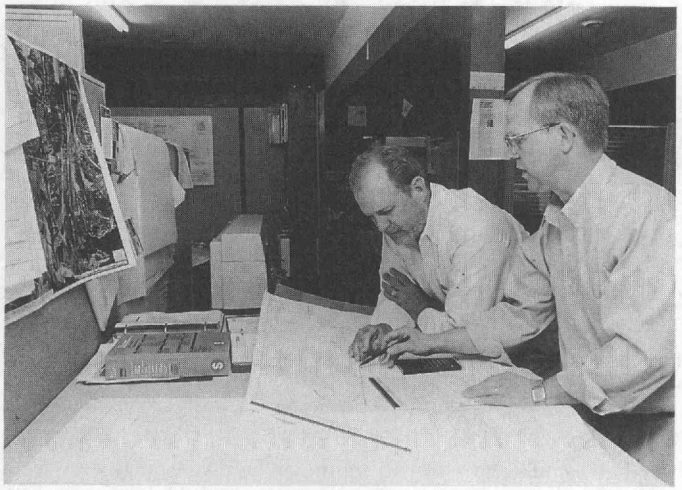
Electrical and Electronics Engineers

(0*NET 17-2071.00, 17-2072.00)

Nature of the Work

From the global positioning system that can continuously provide the location of a vehicle to giant electric power generators, electrical and electronics engineers are responsible for a wide range of technologies. Electrical and electronics engineers design, develop, test, and supervise the manufacture of electrical and electronic equipment. Some of this equipment includes broadcast and communications systems; electric motors, machinery controls, lighting, and wiring in buildings, automobiles, aircraft, and radar and navigation systems; and power generating, controlling, and transmission devices used by electric utilities. Many electrical and electronics engineers also work in areas closely related to computers. However, engineers whose work is related exclusively to computer hardware are considered computer hardware engineers, another engineering specialty covered elsewhere in the *Handbook*.

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Electrical and electronics engineering graduates should have favorable employment opportunities.

Electrical and electronics engineers specialize in different areas such as power generation, transmission, and distribution; communications; and electrical equipment manufacturing, or a specialty within one of these areas—industrial robot control systems or aviation electronics, for example. Electrical and electronics engineers design new products, write performance requirements, and develop maintenance schedules. They also test equipment, solve operating problems, and estimate the time and cost of engineering projects.

Employment

Electrical and electronics engineers held about 292,000 jobs in 2002, making up the largest branch of engineering. Most jobs were in professional, scientific, and technical services firms, government agencies, and manufacturers of computer and electronic products and machinery. Wholesale trade, communications, and utilities firms accounted for most of the remaining jobs.

Job Outlook

Electrical and electronics engineering graduates should have favorable employment opportunities. The number of job openings resulting from employment growth and the need to replace electrical engineers who transfer to other occupations or leave the labor force is expected to be in rough balance with the supply of graduates.

Employment of electrical and electronics engineers is expected to increase more slowly than the average for all occupations through 2012. Although rising demand for electrical and electronic goods, including advanced communications equipment, defense-related electronic equipment, and consumer electronics products should increase, foreign competition for electronic products and increasing use of engineering services performed in other countries will act to limit employment growth Job growth is expected to be fastest in services industries—particularly consulting firms that provide electronic engineering expertise.

Continuing education is important for electrical and electronics engineers. Engineers who fail to keep up with the rapid changes in technology risk becoming more susceptible to layoffs or, at a minimum, more likely to be passed over for advancement.

Earnings

Median annual earnings of electrical engineers were $68,180 in 2002. The middle 50 percent earned between $54,550 and $84,670. The lowest 10 percent earned less than $44,780, and the highest 10 percent earned more than $100,980. Median annual earnings in the industries employing the largest numbers of electrical engineers in 2002 were:

Scientific research and development services	$77,410
Semiconductor and other electronic component manufacturing	72,670
Electric power generation, transmission, and distribution	71,640
Navigational, measuring, electromedical, and control instruments manufacturing	70,430
Architectural, engineering, and related services	66,980

Median annual earnings of electronics engineers, except computer, were $69,930 in 2002. The middle 50 percent earned between $55,930 and $85,980. The lowest 10 percent earned less than $46,310, and the highest 10 percent earned more than $103,860. Median annual earnings in the industries employing the largest numbers of electronics engineers in 2002 were:

Federal government	$78,830
Architectural, engineering, and related services	72,850
Navigational, measuring, electromedical, and control instruments manufacturing	70,950
Semiconductor and other electronic component manufacturing	70,800
Wired telecommunications carriers	62,670

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in electrical/electronics and communications engineering received starting offers averaging $49,794 a year; master's degree candidates averaged $64,556; and Ph.D. candidates averaged $74,283.

Sources of Additional Information

Information on careers and employment, education, publications, and conferences related to electrical and electronics engineers is available from:

➤ Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08855-1331. Internet: **http://www.ieee.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

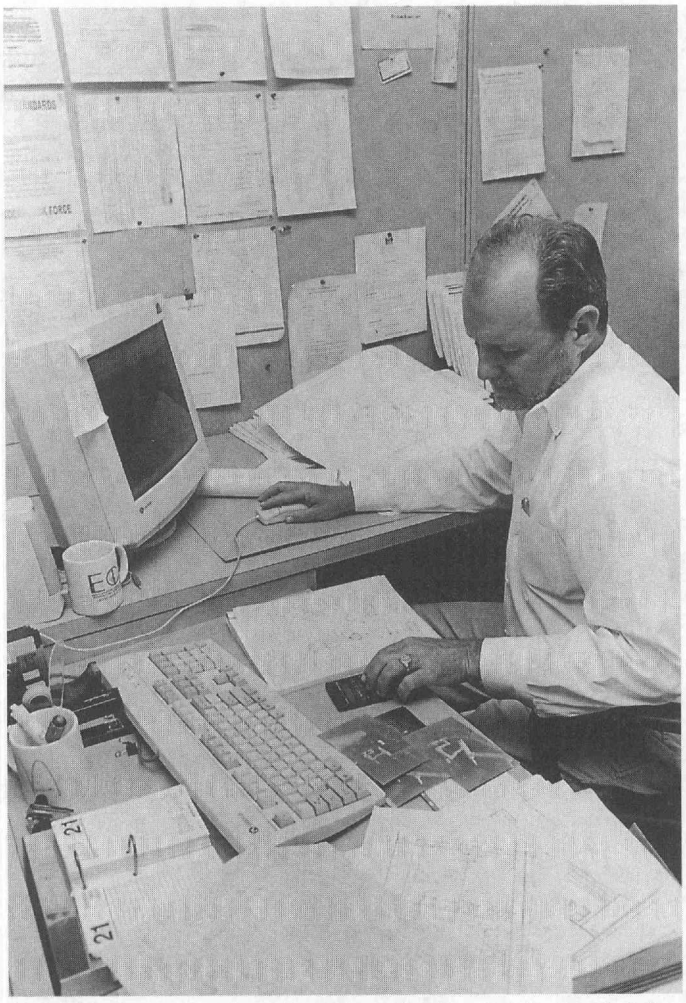
Environmental Engineers

(0*NET 17-2081.00)

Nature of the Work

Using the principles of biology and chemistry, environmental engineers develop solutions to environmental problems. They are involved in water and air pollution control, recycling, waste disposal, and public health issues. Environmental engineers conduct hazardous-waste management studies in which they evaluate the significance of the hazard, offer analysis on treatment and containment, and develop regulations to prevent mishaps. They design municipal water supply and industrial wastewater treatment systems. They conduct research on proposed environmental projects, analyze scientific data, and perform quality control checks.

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Many environmental engineers work as consultants, helping their clients to comply with regulations and to clean up hazardous sites.

Environmental engineers are concerned with local and worldwide environmental issues. They study and attempt to minimize the effects of acid rain, global warming, automobile emissions, and ozone depletion. They also are involved in the protection of wildlife.

Many environmental engineers work as consultants, helping their clients to comply with regulations and to clean up hazardous sites.

Employment

Environmental engineers held about 47,000 jobs in 2002. Almost half worked in professional, scientific, and technical services and about 15,000 were employed in Federal, State, and local government agencies. Most of the rest worked in various manufacturing industries.

Job Outlook

Environmental engineering graduates should have favorable job opportunities. Employment of environmental engineers is expected to increase much faster than the average for all occupations through 2012. Much of the expected growth will be due to the emergence of this occupation as a widely recognized engineering specialty rather than as an area that other engineering specialties, such as civil engineers, specialize in. More environmental engineers will be needed to comply with environmental regulations and to develop methods of cleaning up existing hazards. A shift in emphasis toward preventing problems rather than controlling those that already exist, as well as increasing public health concerns, also will spur demand for environmental engineers. However, political factors determine the job outlook for environmental engineers more than that for other engineers. Looser environmental regulations would reduce job opportunities; stricter regulations would enhance opportunities.

Even though employment of environmental engineers should be less affected by economic conditions than that of most other types of engineers, a significant economic downturn could reduce the emphasis on environmental protection, reducing employment opportunities. Environmental engineers need to keep abreast of a range of environmental issues to ensure their steady employment because their area of focus may change frequently—for example, from hazardous waste cleanup to the prevention of water pollution.

Earnings

Median annual earnings of environmental engineers were $61,410 in 2002. The middle 50 percent earned between $47,650 and $77,360. The lowest 10 percent earned less than $38,640, and the highest 10 percent earned more than $91,510. Median annual earnings in the industries employing the largest numbers of environmental engineers in 2002 were:

Architectural, engineering, and related services	$58,620
Management, scientific, and technical consulting services	57,800
State government	54,160

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in environmental/environmental health engineering received starting offers averaging $44,702 a year.

Sources of Additional Information

Further information about environmental engineering careers, training, and certification can be obtained from:

➤ American Academy of Environmental Engineers, 130 Holiday Court, Suite 100, Annapolis, MD 21401. Internet: **http://www.aaee.net**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

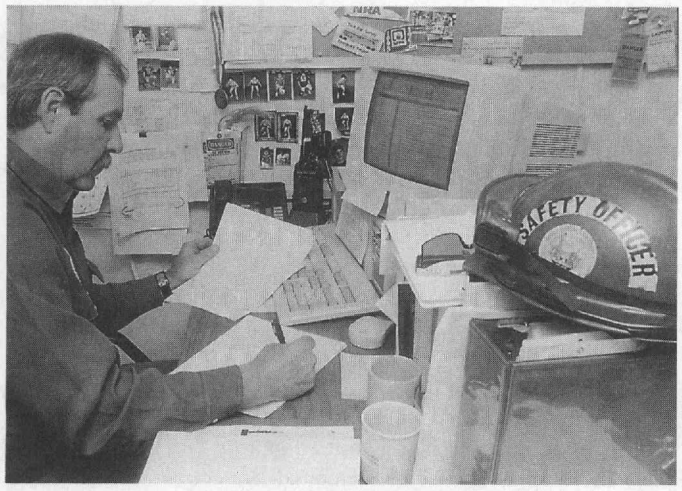
Industrial Engineers, Including Health and Safety

(0*NET 17-2111.01, 17-2111.02, 17-2111.03, 17-2112.00)

Nature of the Work

Industrial engineers determine the most effective ways to use the basic factors of production—people, machines, materials, information, and energy—to make a product or to provide a service. They are the bridge between management goals and operational performance. They are more concerned with in-

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Most industrial engineers work in manufacturing.

creasing productivity through the management of people, methods of business organization, and technology than are engineers in other specialties, who generally work more with products or processes. Although most industrial engineers work in manufacturing industries, they may also work in consulting services, healthcare, and communications.

To solve organizational, production, and related problems most efficiently, industrial engineers carefully study the product and its requirements, use mathematical methods such as operations research to meet those requirements, and design manufacturing and information systems. They develop management control systems to aid in financial planning and cost analysis and design production planning and control systems to coordinate activities and ensure product quality. They also design or improve systems for the physical distribution of goods and services. Industrial engineers determine which plant location has the best combination of raw materials availability, transportation facilities, and costs. Industrial engineers use computers for simulations and to control various activities and devices, such as assembly lines and robots. They also develop wage and salary administration systems and job evaluation programs. Many industrial engineers move into management positions because the work is closely related.

The work of health and safety engineers is similar to that of industrial engineers in that it deals with the entire production process. Health and safety engineers promote worksite or product safety and health by applying knowledge of industrial processes, as well as mechanical, chemical, and psychological principles. They must be able to anticipate, recognize, and evaluate hazardous conditions as well as develop hazard control methods. They also must be familiar with the application of health and safety regulations.

Employment

Industrial engineers, including health and safety, held about 194,000 jobs in 2002. Six in 10 of these jobs were in manufacturing industries, and an additional 1 in 10 worked in professional, scientific, and technical services firms, many of whom provide consulting services to manufacturing firms. Because their skills can be used in almost any type of organization, industrial engineers are more widely distributed among industries than are other engineers.

Job Outlook

Overall employment of industrial engineers, including health and safety, is projected to increase as fast as the average for all occupations through 2012. In addition, many openings will be created by the need to replace industrial engineers who transfer to other occupations or leave the labor force. Employment of industrial engineers is expected to increase as fast as the average while that of health and safety engineers is expected to grow more slowly than average.

Because the main function of industrial and health and safety engineers is to make a higher quality product as efficiently and as safely as possible, their services should be in demand in the manufacturing sector as firms seek to reduce costs and increase productivity. The concern for health and safety within work environments should increase the need for health and safety engineers.

Earnings

Median annual earnings of industrial engineers were $62,150 in 2002. The middle 50 percent earned between $50,160 and $75,440. The lowest 10 percent earned less than $40,380, and the highest 10 percent earned more than $90,420. Median annual earnings in the manufacturing industries employing the largest numbers of industrial engineers in 2002 were:

Semiconductor and other electronic component manufacturing	$67,460
Navigational, measuring, electromedical, and control instruments manufacturing	65,470
Architectural, engineering, and related services	64,020
Aerospace products and parts manufacturing	63,630
Motor vehicle parts manufacturing	62,610

Median annual earnings of health and safety engineers were $58,010 in 2002. The middle 50 percent earned between $46,580 and $71,980. The lowest 10 percent earned less than $37,230, and the highest 10 percent earned more than $87,250.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in industrial/manufacturing engineering received starting offers averaging about $47,051 a year and master's degree candidates averaged $54,565 a year.

Sources of Additional Information

For further information about industrial engineering careers, education, and training, contact:

➤ Institute of Industrial Engineers, 3577 Parkway Lane, Suite 200, Norcross, GA 30092. Internet: **http://www.iienet.org**

Information on careers, education, accreditation and certification, and salaries of safety engineers is available from:

➤ American Society of Safety Engineers, 1800 E Oakton St., Des Plaines, IL 60018. Internet: **http://www.asse.org**

Information on certification, accreditation, careers, and safety-related degree programs for safety professionals, including safety engineers, is available from:

➤ Board of Certified Safety Professionals, 208 Burwash Ave., Savoy, Il 61874. Internet: **http://www.bcsp.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

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Materials Engineers

(0*NET 17-2131.00)

Nature of the Work

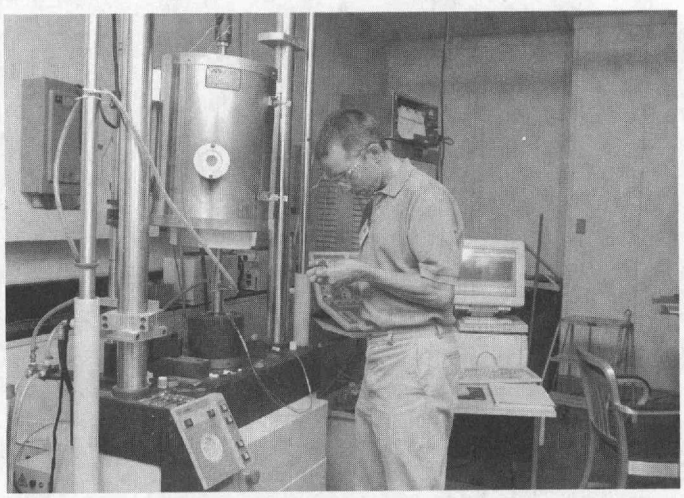
Materials engineers are involved in the extraction, development, processing, and testing of the materials used to create a diversity of products, from computer chips and television screens to golf clubs and snow skis. They work with metals, ceramics, plastics, semiconductors, and combinations of materials called composites to create new materials that meet certain mechanical, electrical, and chemical requirements. They also are involved in selecting materials for new applications.

There are numerous new developments within materials engineering that make it possible to manipulate and use materials in various ways. For example, materials engineers have developed the ability to create and then study materials at an atomic level using advanced processes to replicate the characteristics of materials and their components with computers.

Most metallurgical engineers work in 1 of the 3 main branches of metallurgy—extractive or chemical, physical, and process. Extractive metallurgists are concerned with removing metals from ores and refining and alloying them to produce suitable inputs for a number of industrial processes. Physical metallurgists study the nature, structure, and physical properties of metals and their alloys to find the best methods of processing basic materials into final products. Process metallurgists develop and improve metalworking processes such as casting, forging, rolling, and drawing. Most materials engineers specialize in a particular material. For example, metallurgical engineers specialize in metals, while ceramic engineers develop ceramic materials and the processes for making ceramic materials into useful products. Ceramics include all nonmetallic, inorganic materials that generally require high temperatures in their processing. Ceramic engineers work on products as diverse as glassware, automobile and aircraft engine components, fiberoptic communication lines, tile, and electric insulators.

Employment

Materials engineers held about 24,000 jobs in 2002. Because materials are building blocks for other goods, materials engineers are widely distributed among manufacturing industries. In fact, 68 percent of materials engineers worked in manufacturing industries, primarily computer and electronic products, transportation equipment, fabricated metal products, primary metal production, and machinery manufacturing. They also worked in services industries such as professional, scientific, and technical services. Most remaining materials engineers worked for Federal and State governments.



Because materials are building blocks for other goods, materials engineers are widely distributed among manufacturing industries.

Job Outlook

Employment of materials engineers is expected to grow more slowly than the average for all occupations through 2012. Although many of the manufacturing industries in which materials engineers are concentrated are expected to experience declines in employment, more materials engineers will be needed to develop new materials for electronics, biotechnology, and plastics products. As manufacturing firms contract for their materials engineering needs, employment growth is expected in professional, scientific, and technical services industries. In addition to those arising from employment growth, job openings will result from the need to replace materials engineers who transfer to other occupations or leave the labor force.

Earnings

Median annual earnings of materials engineers were $62,590 in 2002. The middle 50 percent earned between $49,810 and $77,500. The lowest 10 percent earned less than $39,360, and the highest 10 percent earned more than $92,690.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in materials engineering received starting offers averaging $44,680 a year.

Sources of Additional Information

For information on careers, education, accreditation, and other topics related to materials engineers, contact:

➤ The Minerals, Metals, & Materials Society, 184 Thorn Hill Rd., Warrendale, PA 15086. Internet: **http://www.tms.org**

➤ ASM International, 9639 Kinsman Rd., Materials Park, OH 44073-0002. Internet: **http://www.asm-intl.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

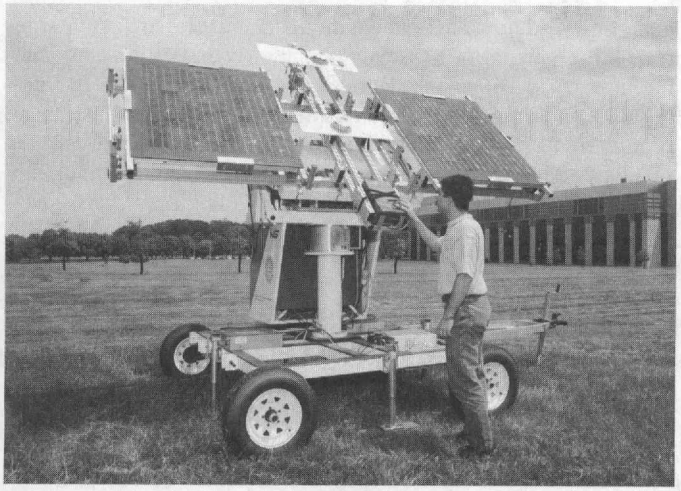
Mechanical Engineers

(0*NET 17-2141.00)

Nature of the Work

Mechanical engineers research, develop, design, manufacture, and test tools, engines, machines, and other mechanical devices. They work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines. They also develop power-using machines such as refrigeration and air-conditioning equipment, machine tools, material handling systems, elevators and escalators, industrial production equipment, and robots used in manufacturing. Mechanical engineers also design tools that other engineers need for their work. The field of nanotechnology, which involves the creation of high-performance materials and components by integrating atoms and molecules, is introducing entirely new principles to the design process.

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Some mechanical engineers specialize in developing new energy systems.

Computers assist mechanical engineers by accurately and efficiently performing computations, and by permitting the modeling and simulation of new designs as well as facilitating changes to existing designs. Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) are used for design data processing and for turning the design into a product.

Mechanical engineers work in many industries, and their work varies by industry and function. Some specialize in energy systems; applied mechanics; automotive design; manufacturing; materials; plant engineering and maintenance; pressure vessels and piping; and heating, refrigeration, and air-conditioning systems. Mechanical engineering is one of the broadest engineering disciplines. Mechanical engineers may work in production operations in manufacturing or agriculture, maintenance, or technical sales; many are administrators or managers.

Employment

Mechanical engineers held about 215,000 jobs in 2002. More than half of the jobs were in manufacturing—mostly in machinery, transportation equipment, computer and electronic products, and fabricated metal products manufacturing industries. Architectural, engineering, and related services, and the Federal Government provided many of the remaining jobs.

Job Outlook

Employment of mechanical engineers is projected to grow more slowly than the average for all occupations though 2012. Although overall employment in manufacturing industries—where employment of mechanical engineers is concentrated—is expected to decrease slightly, employment of mechanical engineers in manufacturing should increase more rapidly as the demand for improved machinery and machine tools grows and as industrial machinery and processes become increasingly complex. Also, emerging technologies in biotechnology, materials science, and nanotechnology will create new job opportunities for mechanical engineers. Additional opportunities for mechanical engineers will arise because a degree in mechanical engineering often can be applied in other engineering specialties. In addition to job openings arising from growth, many openings should result from the need to replace workers who transfer to other occupations or leave the labor force.

Earnings

Median annual earnings of mechanical engineers were $62,880 in 2002. The middle 50 percent earned between $50,800 and $78,040. The lowest 10 percent earned less than $41,490, and the highest 10 percent earned more than $93,430. Median annual earnings in the industries employing the largest numbers of mechanical engineers in 2002 were:

Federal government	$72,500
Architectural, engineering, and related services	65,610
Navigational, measuring, electromedical, and control instruments manufacturing	65,430
Aerospace products and parts manufacturing	65,160
Other general purpose machinery manufacturing	55,850

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in mechanical engineering received starting offers averaging $48,585 a year, master's degree candidates had offers averaging $54,565, and Ph.D. candidates were initially offered $69,904.

Sources of Additional Information

General information about mechanical engineers as well as information on careers, education, and training is available from:

➤ The American Society of Mechanical Engineers, 3 Park Ave., New York, NY 10016. Internet: **http://www.asme.org**

Information about heating, refrigeration, and air-conditioning engineering, a mechanical engineering specialty, is available from:

➤ American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle NE., Atlanta, GA 30329. Internet: **http://www.ashrae.org**

Information about automotive engineering, a mechanical engineering specialty, is available from:

➤ Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, PA 15096-0001. Internet: **http://www.sae.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

Mining and Geological Engineers, Including Mining Safety Engineers

(0*NET 17-2151.00)

Nature of the Work

Mining and geological engineers find, extract, and prepare coal, metals, and minerals for use by manufacturing industries and utilities. They design open pit and underground mines, often using computers; supervise the construction of mine shafts and tunnels in underground operations; and devise methods for transporting minerals to processing plants. Mining engineers are responsible for the safe, economical, and environmentally sound operation of mines. Some mining engineers work with geologists and metallurgical engineers to locate and appraise new ore deposits. Others develop new mining equipment or direct mineral processing operations to separate minerals from the dirt, rock, and other materials with which they are mixed. Mining engineers frequently specialize in the mining of one mineral or metal, such as coal or gold. With increased emphasis on protecting the environment, many mining engineers work to solve problems related to land reclamation and water and air pollution.

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Mining engineers frequently specialize in the mining of one mineral or metal, such as coal or gold.

Mining safety engineers use their knowledge of mine design and practices to ensure the safety of workers and to comply with State and Federal safety regulations. They inspect walls and roof surfaces, test air samples, and examine mining equipment for compliance with safety practices.

Employment

Mining and geological engineers, including mining safety engineers, held about 5,200 jobs in 2002. While about 4 out of 10 mining engineers worked in the mining industry, over one-third worked in professional, scientific, and technical services firms, mostly providing consulting and other services to the mining industry. Most of the rest worked in State or Federal government.

Mining engineers often are employed at the location of natural deposits, often near small communities, and sometimes outside the United States. Those in research and development, management, consulting, or sales, however, often are located in metropolitan areas.

Job Outlook

Despite a projected decline in employment, very good employment opportunities are expected in this small occupation. A significant number of mining engineers currently employed are approaching retirement age, which should create some job openings over the 2002-12 period. In addition, relatively few schools offer mining engineering programs, and the small number of graduates is not expected to increase.

Favorable job opportunities also may be available worldwide as mining operations around the world recruit graduates of U.S. mining engineering programs. As a result, some graduates should expect to travel frequently, or even live abroad.

Employment of mining and geological engineers, including mining safety engineers, is projected to decline through 2012. Most of the industries in which mining engineers are concentrated—such as coal, metal, and copper mining—are expected to experience declines in employment.

Earnings

Median annual earnings of mining and geological engineers, including mining safety engineers, were $61,770 in 2002. The middle 50 percent earned between $48,250 and $77,160. The lowest 10 percent earned less than $36,720, and the highest 10 percent earned more than $93,660.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in mining and mineral engineering (including geological) received starting offers averaging $44,326 a year.

Sources of Additional Information

For more information on careers, education, accreditation, and related topics for mining engineers, contact:

➤ The Society for Mining, Metallurgy, and Exploration, Inc., 8307 Shaffer Parkway, P.O. Box 277002, Littleton, CO 80127. Internet: **http://www.smenet.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

Nuclear Engineers

(0*NET 17-2161.00)

Nature of the Work

Nuclear engineers research and develop the processes, instruments, and systems used to derive benefits from nuclear energy and radiation. They design, develop, monitor, and operate nuclear plants used to generate power. They may work on the nuclear fuel cycle—the production, handling, and use of nuclear fuel and the safe disposal of waste produced by the generation of nuclear energy—or on the production of fusion energy. Some specialize in the development of nuclear power sources for spacecraft; others find industrial and medical uses for radioactive materials, such as equipment to diagnose and treat medical problems.

Employment

Nuclear engineers held about 16,000 jobs in 2002. Almost half were employed in utilities, one-quarter in professional, scientific, and technical services firms, and 14 percent in the Federal Government. Many Federally employed nuclear engineers were civilian employees of the U.S. Navy, and most of the rest worked for the U.S. Department of Energy.

Job Outlook

Good opportunities should exist for nuclear engineers because the small number of nuclear engineering graduates is likely to



Almost half of all nuclear engineers work in utilities.

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be in rough balance with the number of job openings. Because this is a small occupation, projected job growth will generate few openings; consequently, most openings will result from the need to replace nuclear engineers who transfer to other occupations or leave the labor force.

Little or no growth in employment of nuclear engineers is expected through 2012. Due to public concerns over the cost and safety of nuclear power, no commercial nuclear powerplants have been built in the United States for many years. Nevertheless, nuclear engineers will be needed to operate existing plants. In addition, nuclear engineers may be needed to research and develop future nuclear power sources. They also will be needed to work in defense-related areas, to develop nuclear medical technology, and to improve and enforce waste management and safety standards.

Earnings

Median annual earnings of nuclear engineers were $81,350 in 2002. The middle 50 percent earned between $67,970 and $92,930. The lowest 10 percent earned less than $58,350, and the highest 10 percent earned more than $111,260. In the Federal Government, nuclear engineers in supervisory, nonsupervisory, and management positions earned an average of $73,769 a year in 2003.

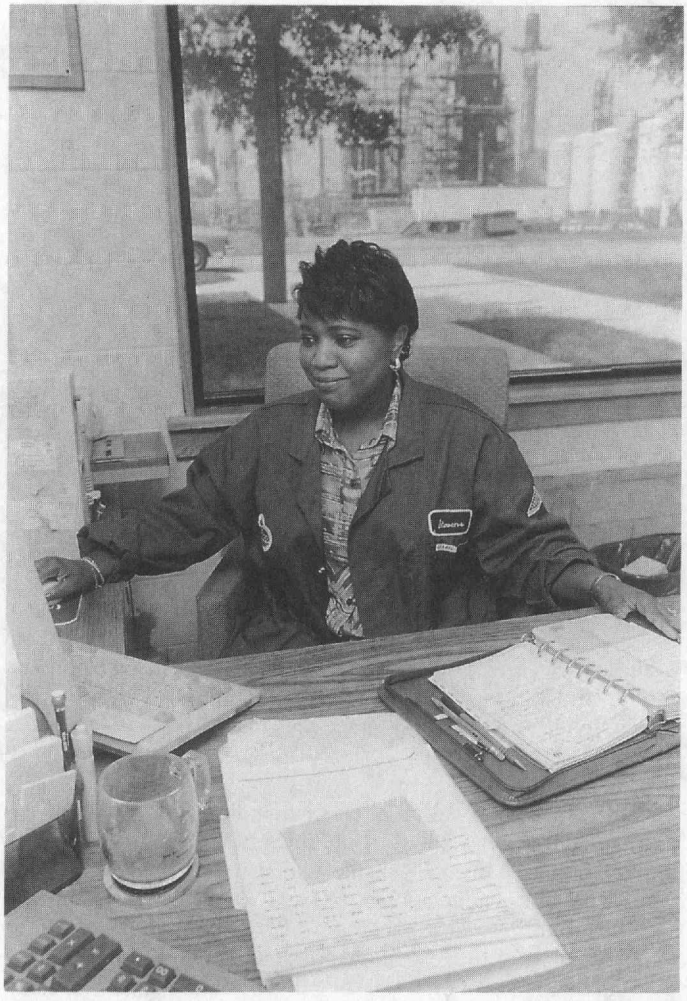
According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in nuclear engineering received starting offers averaging $50,104 a year.

Sources of Additional Information

Information on careers and related topics for nuclear engineers is available from:

➤ American Nuclear Society, 555 North Kensington Ave., LaGrange Park, IL 60526. Internet: **http://www.ans.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.



Even though employment is expected to decline, favorable opportunities are expected for petroleum engineers because the number of job openings is likely to exceed the relatively small number of graduates.

Petroleum Engineers

(0*NET 17-2171.00)

Nature of the Work

Petroleum engineers search the world for reservoirs containing oil or natural gas. Once these resources are discovered, petroleum engineers work with geologists and other specialists to understand the geologic formation and properties of the rock containing the reservoir, determine the drilling methods to be used, and monitor drilling and production operations. They design equipment and processes to achieve the maximum profitable recovery of oil and gas. Petroleum engineers rely heavily on computer models to simulate reservoir performance using different recovery techniques. They also use computer models for simulations of the effects of various drilling options.

Because only a small proportion of oil and gas in a reservoir will flow out under natural forces, petroleum engineers develop and use various enhanced recovery methods. These include injecting water, chemicals, gases, or steam into an oil reservoir to force out more of the oil, and computer-controlled drilling or fracturing to connect a larger area of a reservoir to a single well. Because even the best techniques in use today recover only a portion of the oil and gas in a reservoir, petroleum engineers research and develop technology and methods to increase recovery and lower the cost of drilling and production operations.

Employment

Petroleum engineers held about 14,000 jobs in 2002, mostly in oil and gas extraction, professional, scientific and technical services, and petroleum refining. Employers include major oil companies and hundreds of smaller, independent oil exploration, production, and service companies.

Most petroleum engineers work where oil and gas are found. Large numbers are employed in Texas, Louisiana, Oklahoma, Alaska, and California, including offshore sites. Many American petroleum engineers also work overseas in oil-producing countries.

Job Outlook

Employment of petroleum engineers is expected to decline through 2012 because most of the potential petroleum-producing areas in the United States already have been explored. Even so, favorable opportunities are expected for petroleum engineers because the number of job openings is likely to exceed the relatively small number of graduates. All job openings should

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result from the need to replace petroleum engineers who transfer to other occupations or leave the labor force.

Petroleum engineers work around the world and, in fact, the best employment opportunities may be in other countries. Many foreign employers seek U.S.-trained petroleum engineers, and many U.S. employers maintain overseas branches where petroleum engineers work.

Earnings

Median annual earnings of petroleum engineers were $83,370 in 2002. The middle 50 percent earned between $63,390 and $105,920. The lowest 10 percent earned less than $49,010, and the highest 10 percent earned more than $127,950.

According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor's degree candidates in petroleum engineering received starting offers averaging $55,987 year.

Sources of Additional Information

For further information on careers, education, and salaries for petroleum engineers, contact:

➤ Society of Petroleum Engineers, P.O. Box 833836, Richardson, TX 75083-3836. Internet: **http://www.spe.org**

See the introduction to the section on engineers for information on working conditions, training requirements, and other sources of additional information.

Drafters and Engineering Technicians

Drafters

(0*NET 17-3011.01, 17-3011.02, 17-3012.01, 17-3012.02, 17-3013.00)

Significant Points

- The type and quality of postsecondary drafting programs vary considerably; prospective students should be careful in selecting a program.
- Opportunities should be best for individuals with at least 2 years of postsecondary training in drafting and considerable skill and experience using computer-aided design and drafting (CADD) systems.
- Demand for particular drafting specialties varies geographically, depending on the needs of local industry.

Nature of the Work

Drafters prepare technical drawings and plans used by production and construction workers to build everything from manufactured products, such as toys, toasters, industrial machinery, and spacecraft, to structures, such as houses, office buildings, and oil and gas pipelines. Their drawings provide visual guidelines, show the technical details of the products and structures, and specify dimensions, materials, and procedures. Drafters fill in technical details, using drawings, rough sketches, specifications, codes, and calculations previously made by engineers, surveyors, architects, or scientists. For example, they use their knowledge of standardized building techniques to draw in the details of a structure. Some drafters use their knowledge of engineering and manufacturing theory and standards to draw the parts of a machine in order to determine design elements, such as the numbers and kinds of fasteners needed to assemble the machine. Drafters use technical handbooks, tables, calculators, and computers to complete their work.

Traditionally, drafters sat at drawing boards and used pencils, pens, compasses, protractors, triangles, and other drafting devices to prepare a drawing manually. Most drafters now use computer-aided design and drafting (CADD) systems to prepare drawings. Consequently, some drafters are referred to as *CADD operators*. CADD systems employ computer workstations to create a drawing on a video screen. The drawings are stored electronically to facilitate revisions and create duplications easily. These systems also permit drafters to quickly prepare variations of a design. Although drafters use CADD extensively, it is only a tool: Persons who produce technical drawings with CADD still function as drafters and need the knowledge of traditional drafters, in addition to CADD skills. Despite the near-universal use of CADD systems, manual drafting and sketching still is used in certain applications.

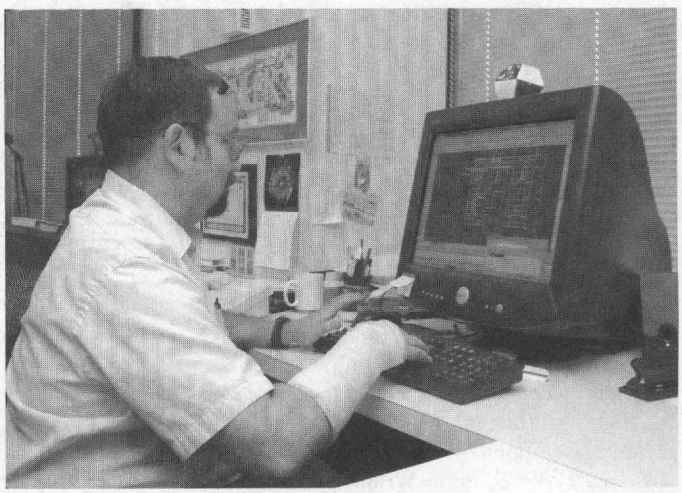
Drafting work has many specialties, and titles may denote a particular discipline of design or drafting.

Aeronautical drafters prepare engineering drawings detailing plans and specifications used in the manufacture of aircraft, missiles, and related parts.

Architectural drafters draw architectural and structural features of buildings and other structures. These workers may specialize in a type of structure, such as residential or commercial, or in a kind of material used, such as reinforced concrete, masonry, steel, or timber.

Civil drafters prepare drawings and topographical and relief maps used in major construction or civil engineering projects, such as highways, bridges, pipelines, flood control projects, and water and sewage systems.

Electrical drafters prepare wiring and layout diagrams used by workers who erect, install, and repair electrical equipment



Most drafters now use computer-aided design drafting (CADD) systems to prepare drawings.

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and wiring in communication centers, powerplants, electrical distribution systems, and buildings.

Electronics drafters draw wiring diagrams, circuit board assembly diagrams, schematics, and layout drawings used in the manufacture, installation, and repair of electronic devices and components.

Mechanical drafters prepare detail and assembly drawings of a wide variety of machinery and mechanical devices, indicating dimensions, fastening methods, and other requirements.

Process piping or *pipeline drafters* prepare drawings used in the layout, construction, and operation of oil and gas fields, refineries, chemical plants, and process piping systems.

Working Conditions

Most drafters work a standard 40-hour week; only a small number work part time. Drafters usually work in comfortable offices furnished to accommodate their tasks. They may sit at adjustable drawing boards or drafting tables when doing manual drawings, although most drafters work at computer terminals much of the time. Because they spend long periods in front of computer terminals doing detailed work, drafters may be susceptible to eyestrain, back discomfort, and hand and wrist problems.

Employment

Drafters held about 216,000 jobs in 2002. Architectural and civil drafters held about half of all jobs for drafters, mechanical drafters held about a third of all jobs, and the rest of all jobs were held by electrical and electronics drafters.

Almost half of all jobs for drafters were in architectural, engineering, and related services firms that design construction projects or do other engineering work on a contract basis for other industries. More than a quarter of jobs were in manufacturing industries, such as machinery manufacturing, including metalworking and other general machinery; fabricated metal products manufacturing, including architectural and structural metals; computer and electronic products manufacturing, including navigational, measuring, electromedical, and control instruments; and transportation equipment manufacturing, including aerospace products and parts manufacturing, as well as ship and boat building. Most of the rest were employed in construction, government, wholesale trade, utilities, and employment services. Only a small number were self-employed in 2002.

Training, Other Qualifications, and Advancement

Employers prefer applicants who have completed postsecondary school training in drafting, which is offered by technical institutes, community colleges, and some 4-year colleges and universities. Employers are most interested in applicants with well-developed drafting and mechanical-drawing skills; knowledge of drafting standards, mathematics, science, and engineering technology; and a solid background in computer-aided design and drafting techniques. In addition, communication and problem-solving skills are important.

Training and course work differ somewhat within the drafting specialties. The initial training for each specialty is similar. All incorporate math and communication skills, for example, but course work relating to the specialty varies. In an electronics drafting program, for example, students learn how to depict electronic components and circuits in drawings.

Many types of publicly and privately operated schools provide some form of training in drafting. The kind and quality of programs vary considerably; therefore, prospective students should be careful in selecting a program. They should contact prospective employers regarding their preferences and ask schools to provide information about the kinds of jobs that are obtained by the school's graduates, the types and conditions of the instructional facilities and equipment, and the faculty's qualifications.

Technical institutes offer intensive technical training, but less general education than do junior and community colleges. Certificates or diplomas based on the completion of a certain number of course hours may be awarded. Many technical institutes offer 2-year associate degree programs, which are similar to, or part of, the programs offered by community colleges or State university systems. Their programs vary considerably in both length and type of courses offered. Some area vocational-technical schools are postsecondary public institutions that serve local students and emphasize the type of training preferred by local employers. Many offer introductory drafting instruction. Most require a high school diploma or its equivalent for admission. Other technical institutes are run by private, often for-profit, organizations, sometimes called proprietary schools.

Community colleges offer curricula similar to those in technical institutes, but include more courses on theory and liberal arts. Often, there is little or no difference between technical institute and community college programs. However, courses taken at community colleges are more likely than those given at technical institutes to be accepted for credit at 4-year colleges. After completing a 2-year associate degree program, graduates may obtain jobs as drafters or continue their education in a related field at 4-year colleges. Most 4-year colleges usually do not offer training in drafting, but college courses in engineering, architecture, and mathematics are useful for obtaining a job as a drafter.

Technical training obtained in the Armed Forces also can be applied in civilian drafting jobs. Some additional training may be necessary, depending on the technical area or military specialty.

The American Design Drafting Association (ADDA) has established a certification program for drafters. Although employers usually do not require drafters to be certified, certification demonstrates an understanding of nationally recognized practices and standards of knowledge. Individuals who wish to become certified must pass the Drafter Certification Test, which is administered periodically at ADDA-authorized sites. Applicants are tested on their knowledge and understanding of basic drafting concepts, such as geometric construction, working drawings, and architectural terms and standards.

Individuals planning careers in drafting should take courses in mathematics, science, computer technology, design, and computer graphics, as well as any high school drafting courses available. Mechanical ability and visual aptitude also are important. Prospective drafters should be able to draw well and perform detailed work accurately and neatly. Artistic ability is helpful in some specialized fields, as is knowledge of manufacturing and construction methods. In addition, prospective drafters should have good interpersonal skills, because they work closely with engineers, surveyors, architects, other professionals, and, sometimes, customers.

Entry-level or junior drafters usually do routine work under close supervision. After gaining experience, they may become intermediate-level drafters and progress to more difficult work with less supervision. At the intermediate level, they may need to exercise more judgment and perform calculations when preparing and modifying drawings. Drafters may eventually advance

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to senior drafter, designer, or supervisor. Many employers pay for continuing education, and, with appropriate college degrees, drafters may go on to become engineering technicians, engineers, or architects.

Job Outlook

Employment of drafters is expected to grow more slowly than the average for all occupations through 2012. Industrial growth and increasingly complex design problems associated with new products and manufacturing processes will increase the demand for drafting services. Further, drafters are beginning to break out of the traditional drafting role and increasingly do work traditionally performed by engineers and architects, thus also increasing demand for drafters. However, the greater use of CADD equipment by drafters, as well as by architects and engineers, should limit demand for lesser skilled drafters, resulting in slower-than-average overall employment growth. Most job openings are expected to arise from the need to replace drafters who transfer to other occupations, leave the labor force, or retire.

Opportunities should be best for individuals with at least 2 years of postsecondary training in a drafting program that provides strong technical skills, as well as considerable experience with CADD systems. CADD has increased the complexity of drafting applications while enhancing the productivity of drafters. It also has enhanced the nature of drafting by creating more possibilities for design and drafting. As technology continues to advance, employers will look for drafters with a strong background in fundamental drafting principles, a higher level of technical sophistication, and an ability to apply their knowledge to a broader range of responsibilities.

Demand for particular drafting specialties varies throughout the country because employment usually is contingent upon the needs of local industry. Employment of drafters remains highly concentrated in industries that are sensitive to cyclical changes in the economy, such as manufacturing and architectural and engineering services. During recessions, drafters may be laid off. However, a growing number of drafters should continue to find employment on a temporary or contract basis as more companies turn to the employment services industry to meet their changing needs.

Earnings

Earnings for drafters vary by specialty and level of responsibility. Median annual earnings of architectural and civil drafters were $37,330 in 2002. The middle 50 percent earned between $30,170 and $45,500. The lowest 10 percent earned less than $24,570, and the highest 10 percent earned more than $56,260. Median annual earnings for architectural and civil drafters in architectural, engineering, and related services were $36,780.

Median annual earnings of mechanical drafters were $40,730 in 2002. The middle 50 percent earned between $32,100 and $51,950. The lowest 10 percent earned less than $25,950, and the highest 10 percent earned more than $64,780. Median annual earnings for mechanical drafters in architectural, engineering, and related services were $41,170.

Median annual earnings of electrical and electronics drafters were $41,090 in 2002. The middle 50 percent earned between $32,060 and $53,440. The lowest 10 percent earned less than $25,710, and the highest 10 percent earned more than $68,000. In architectural, engineering, and related services, median annual earnings for electrical and electronics drafters were $39,760.

Related Occupations

Other workers who prepare or analyze detailed drawings and make precise calculations and measurements include architects, except landscape and naval; landscape architects; designers; engineers; engineering technicians; science technicians; and surveyors, cartographers, photogrammetrists, and surveying technicians.

Sources of Additional Information

Information on schools offering programs in drafting and related fields is available from:

➤ Accrediting Commission of Career Schools and Colleges of Technology, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201. Internet: **http://www.accsct.org**

Information about certification is available from:

➤ American Design Drafting Association, 105 E. Main St., Newbern, TN 38059. Internet: **http://www.adda.org**

Engineering Technicians

(0*NET 17-3021.00, 17-3022.00, 17-3023.01, 17-3023.02, 17-3023.03, 17-3024.00, 17-3025.00, 17-3026.00, 17-3027.00)

Significant Points

- Electrical and electronic engineering technicians make up 42 percent of all engineering technicians.
- Because the type and quality of training programs vary considerably, prospective students should carefully investigate training programs before enrolling.
- Opportunities will be best for individuals with an associate degree or extensive job training in engineering technology.

Nature of the Work

Engineering technicians use the principles and theories of science, engineering, and mathematics to solve technical problems in research and development, manufacturing, sales, construction, inspection, and maintenance. Their work is more limited in scope and more practically oriented than that of scientists and engineers. Many engineering technicians assist engineers and scientists, especially in research and development. Others work in quality control—inspecting products and processes, conducting tests, or collecting data. In manufacturing, they may assist in product design, development, or production. Although many workers who repair or maintain various types of electrical, electronic, or mechanical equipment are called technicians, these workers are covered in the *Handbook* section on installation, maintenance, and repair occupations.

Engineering technicians who work in research and development build or set up equipment, prepare and conduct experiments, collect data, calculate or record results, and help engineers or scientists in other ways, such as making prototype versions of newly designed equipment. They also assist in design work, often using computer-aided design (CAD) equipment.

Most engineering technicians specialize in certain areas, learning skills and working in the same disciplines as engineers. Occupational titles, therefore, tend to reflect those of engineers.

Aerospace engineering and operations technicians install, construct, maintain, and test systems used to test, launch, or track aircraft and space vehicles. They may calibrate test equip-

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ment and determine causes of equipment malfunctions. Using computer and communications systems, aerospace engineering and operations technicians often record and interpret test data.

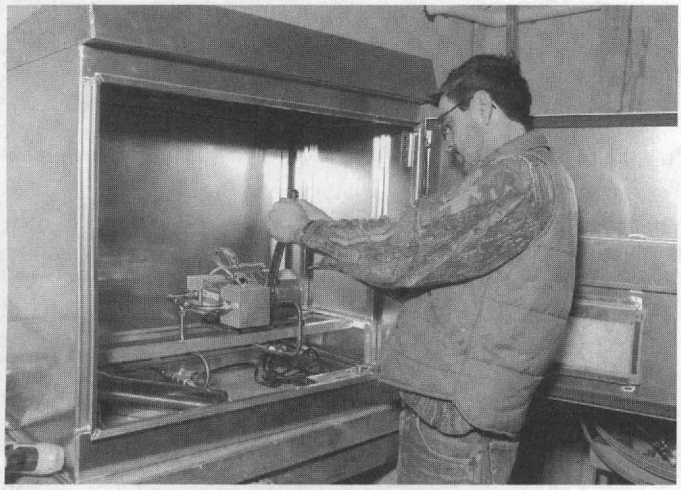
Chemical engineering technicians usually are employed in industries producing pharmaceuticals, chemicals, and petroleum products, among others. They work in laboratories as well as processing plants. They help to develop new chemical products and processes, test processing equipment and instrumentation, gather data, and monitor quality.

Civil engineering technicians help civil engineers to plan and build highways, buildings, bridges, dams, wastewater treatment systems, and other structures, and to do related research. Some estimate construction costs and specify materials to be used, and some may even prepare drawings or perform land-surveying duties. Others may set up and monitor instruments used to study traffic conditions. (Cost estimators; drafters; and surveyors, cartographers, photogrammetrists, and surveying technicians are covered elsewhere in the *Handbook*.)

Electrical and electronics engineering technicians help to design, develop, test, and manufacture electrical and electronic equipment such as communication equipment, radar, industrial and medical measuring or control devices, navigational equipment, and computers. They may work in product evaluation and testing, using measuring and diagnostic devices to adjust, test, and repair equipment. (Workers whose jobs are limited to repairing electrical and electronic equipment, who often are referred to as electronics technicians, are included with electrical and electronics installers and repairers elsewhere in the *Handbook*.)

Electrical and electronic engineering technology also is applied to a wide variety of systems such as communication and process controls. *Electromechanical engineering technicians* combine fundamental principles of mechanical engineering technology with knowledge of electrical and electronic circuits to design, develop, test, and manufacture electrical and computer-controlled mechanical systems.

Environmental engineering technicians work closely with environmental engineers and scientists in developing methods and devices used in the prevention, control, or correction of environmental hazards. They inspect and maintain equipment affecting air pollution and recycling. Some inspect water and wastewater treatment systems to ensure that pollution control requirements are met.



Many engineering technicians assist engineers and scientists, especially in research and development.

Industrial engineering technicians study the efficient use of personnel, materials, and machines in factories, stores, repair shops, and offices. They prepare layouts of machinery and equipment, plan the flow of work, make statistical studies, and analyze production costs.

Mechanical engineering technicians help engineers to design, develop, test, and manufacture industrial machinery, consumer products, and other equipment. They may assist in product tests—by setting up instrumentation for auto crash tests, for example. They may make sketches and rough layouts, record data, make computations, analyze results, and write reports. When planning production, mechanical engineering technicians prepare layouts and drawings of the assembly process and of parts to be manufactured. They estimate labor costs, equipment life, and plant space. Some test and inspect machines and equipment or work with engineers to eliminate production problems.

Working Conditions

Most engineering technicians work at least 40 hours a week in laboratories, offices, or manufacturing or industrial plants, or on construction sites. Some may be exposed to hazards from equipment, chemicals, or toxic materials.

Employment

Engineering technicians held 478,000 jobs in 2002. 204,000 of these were electrical and electronics engineering technicians, as indicated by the following tabulation.

Electrical and electronic engineering technicians	204,000
Civil engineering technicians	92,000
Industrial engineering technicians	62,000
Mechanical engineering technicians	55,000
Electro-mechanical technicians	31,000
Environmental engineering technicians	19,000
Aerospace engineering and operations technicians	15,000

About 39 percent of all engineering technicians worked in manufacturing, mainly in the computer and electronic equipment, transportation equipment, and machinery manufacturing industries. Another 20 percent worked in professional, scientific, and technical service industries, mostly in engineering or business services companies that do engineering work on contract for government, manufacturing firms, or other organizations.

In 2002, the Federal Government employed 11,000 engineering technicians. State governments employed 34,000, and local governments employed 24,000.

Training, Other Qualifications, and Advancement

Although it may be possible to qualify for certain engineering technician jobs without formal training, most employers prefer to hire someone with at least a 2-year associate degree in engineering technology. Training is available at technical institutes, community colleges, extension divisions of colleges and universities, and public and private vocational-technical schools, and in the Armed Forces. Persons with college courses in science, engineering, and mathematics may qualify for some positions but may need additional specialized training and experience. Although employers usually do not require engineering technicians to be certified, such certification may provide jobseekers a competitive advantage.

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Prospective engineering technicians should take as many high school science and math courses as possible to prepare for postsecondary programs in engineering technology. Most 2-year associate degree programs accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) require, at a minimum, college algebra and trigonometry, and one or two basic science courses. Depending on the specialty, more math or science may be required.

The type of technical courses required also depends on the specialty. For example, prospective mechanical engineering technicians may take courses in fluid mechanics, thermodynamics, and mechanical design; electrical engineering technicians may need classes in electric circuits, microprocessors, and digital electronics; and those preparing to work in environmental engineering technology need courses in environmental regulations and safe handling of hazardous materials.

Because many engineering technicians assist in design work, creativity is desirable. Because these workers often are part of a team of engineers and other technicians, good communication skills and the ability to work well with others also are important.

Engineering technicians usually begin by performing routine duties under the close supervision of an experienced technician, technologist, engineer, or scientist. As they gain experience, they are given more difficult assignments with only general supervision. Some engineering technicians eventually become supervisors.

Many publicly and privately operated schools provide technical training; the type and quality of training varies considerably. Therefore, prospective students should be careful in selecting a program. They should contact prospective employers regarding their preferences and ask schools to provide information about the kinds of jobs obtained by graduates, instructional facilities and equipment, and faculty qualifications. Graduates of ABET-accredited programs usually are recognized to have achieved an acceptable level of competence in the mathematics, science, and technical courses required for this occupation.

Technical institutes offer intensive technical training through application and practice, but less theory and general education than do community colleges. Many offer 2-year associate degree programs, and are similar to or part of a community college or State university system. Other technical institutes are run by private, often for-profit organizations, sometimes called proprietary schools. Their programs vary considerably in length and types of courses offered, although some are 2-year associate degree programs.

Community colleges offer curriculums that are similar to those in technical institutes, but that may include more theory and liberal arts. There may be little or no difference between programs at technical institutes and community colleges, as both offer associate degrees. After completing the 2-year program, some graduates get jobs as engineering technicians, while others continue their education at 4-year colleges. However, there is a difference between an associate degree in pre-engineering and one in engineering technology. Students who enroll in a 2-year pre-engineering program may find it very difficult to find work as an engineering technician should they decide not to enter a 4-year engineering program, because pre-engineering programs usually focus less on hands-on applications and more on academic preparatory work. Conversely, graduates of 2-year engineering technology programs may not receive credit for some of the courses they have taken if they choose to transfer to a 4-year engineering program. Colleges with these 4-year programs usually do not offer engineering technician training, but college courses in science, engineering, and mathematics are useful for obtaining a job as an engineering technician. Many 4-year colleges offer bachelor's degrees in engineering technology, but graduates of these programs often are hired to work as technologists or applied engineers, not technicians.

Area vocational-technical schools, another source of technical training, include postsecondary public institutions that serve local students and emphasize training needed by local employers. Most require a high school diploma or its equivalent for admission.

Other training in technical areas may be obtained in the Armed Forces. Many military technical training programs are highly regarded by employers. However, skills acquired in military programs are often narrowly focused, so they may not be useful in civilian industry, which often requires broader training. Therefore, some additional training may be needed, depending on the acquired skills and the kind of job.

The National Institute for Certification in Engineering Technologies (NICET) has established a voluntary certification program for engineering technicians. Certification is available at various levels, each level combining a written examination in 1 of about 30 specialties with a certain amount of job-related experience, a supervisory evaluation, and a recommendation.

Job Outlook

Opportunities will be best for individuals with an associate degree or extensive job training in engineering technology. As technology becomes more sophisticated, employers will continue to look for technicians who are skilled in new technology and require a minimum of additional job training. An increase in the number of jobs related to public health and safety should create job opportunities for engineering technicians with the appropriate certification.

Overall employment of engineering technicians is expected to increase about as fast as the average for all occupations through 2012. Competitive pressures will force companies to improve and update manufacturing facilities and product designs, resulting in more jobs for engineering technicians. However, the growing use of advanced technologies, such as computer simulation and computer-aided design and drafting will continue to increase productivity and limit job growth. In addition to growth, many job openings will stem from the need to replace technicians who retire or leave the labor force.

As is the case for engineers, employment of engineering technicians is influenced by local and national economic conditions. As a result, the employment outlook varies with industry and specialization. Growth in the largest specialty—electrical and electronics engineering technicians—is expected to be about as fast as the average, and there will also be many jobs created by the need to replace technicians who retire or leave the labor force. Employment of environmental engineering technicians is expected to grow faster than average, partly due to increased demand for environmental protection and partly due to recognition of environmental engineering technicians as a separate occupation.

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Earnings

Median annual earnings of engineering technicians by specialty is shown in the following tabulation.

Aerospace engineering and operations technicians	$51,650
Electrical and electronic engineering technicians	42,950
Industrial engineering technicians	41,910
Mechanical engineering technicians	41,280
Electro-mechanical technicians	38,120
Civil engineering technicians	37,720
Environmental engineering technicians	36,850

Median annual earnings of electrical and electronics engineering technicians were $42,950 in 2002. The middle 50 percent earned between $33,760 and $53,200. The lowest 10 percent earned less than $26,770, and the highest 10 percent earned more than $64,070. Median annual earnings in the industries employing the largest numbers of electrical and electronics engineering technicians in 2002 are shown below.

Federal government	$58,520
Wired telecommunications carriers	49,610
Architectural, engineering, and related services	43,670
Semiconductor and other electronic component manufacturing	40,110
Navigational, measuring, electromedical, and control instruments manufacturing	39,760

Median annual earnings of civil engineering technicians were $37,720 in 2002. The middle 50 percent earned between $29,030 and $47,260. The lowest 10 percent earned less than $23,080, and the highest 10 percent earned more than $56,910. Median annual earnings in the industries employing the largest numbers of civil engineering technicians in 2002 are shown below.

Local government	42,120
Architectural, engineering, and related services	36,930
State government	34,800

In 2002, the average annual salary for aerospace engineering and operations technicians in the aerospace products and parts manufacturing industry was $54,530, and the average annual salary for environmental engineering technicians in the architectural, engineering, and related services industry was $32,690. The average annual salary for industrial engineering technicians in the semiconductor and other electronic component manufacturing industry was $38,230. In the architectural, engineering, and related services industry, the average annual salary for mechanical engineering technicians was $42,090.

Related Occupations

Engineering technicians apply scientific and engineering principles usually acquired in postsecondary programs below the baccalaureate level. Similar occupations include science technicians; drafters; surveyors, cartographers, photogrammetrists, and surveying technicians; and broadcast and sound engineering technicians and radio operators.

Sources of Additional Information

High school students interested in obtaining information about careers in engineering technology should visit the JETS Web site: **http://www.jets.org**.

➤ JETS-Guidance, 1420 King St., Suite 405, Alexandria, VA 22314-2794.

Information on ABET-accredited engineering technology programs is available from:

➤ Accreditation Board for Engineering and Technology, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202. Internet: **http://www.abet.org**

Information on certification of engineering technicians as well as job and career information is available from:

➤ National Institute for Certification in Engineering Technologies (NICET), 1420 King St., Alexandria, VA 22314-2794. Internet: **http://www.nicet.org**

Life Scientists

Agricultural and Food Scientists

(0*NET 19-1011.00, 19-1012.00, 19-1013.01, 19-1013.02)

Significant Points

- Almost 4 in 10 salaried agricultural and food scientists work for Federal, State, or local governments.
- A bachelor's degree in agricultural science is sufficient for some jobs in applied research; a master's or doctoral degree is required for basic research.
- Slower-than-average job growth is projected because of limited growth in the Federal Government and modest growth in State and local governments, the largest employers of these scientists.

Nature of the Work

The work of agricultural and food scientists plays an important part in maintaining the Nation's food supply by ensuring agricultural productivity and the safety of the food supply. Agricultural scientists study farm crops and animals, and develop ways of improving their quantity and quality. They look for ways to improve crop yield with less labor, control pests and weeds more safely and effectively, and conserve soil and water. They research methods of converting raw agricultural commodities into attractive and healthy food products for consumers.

Agricultural science is closely related to biological science, and agricultural scientists use the principles of biology, chemistry, physics, mathematics, and other sciences to solve problems in agriculture. They often work with biological scientists on basic biological research and on applying to agriculture the advances in knowledge brought about by biotechnology.

In the past two decades, rapid advances in basic biological knowledge related to genetics spurred growth in the field of biotechnology. Some agricultural and food scientists use this technology to manipulate the genetic material of plants and crops, attempting to make organisms more productive or resistant to disease. These advances in biotechnology have opened up research opportunities in many areas of agricultural and food science, including commercial applications in agriculture, environmental remediation, and the food industry.

Many agricultural scientists work in basic or applied research and development. Others manage or administer research and development programs, or manage marketing or production operations in companies that produce food products or agricultural

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chemicals, supplies, and machinery. Some agricultural scientists are consultants to business firms, private clients, or government.

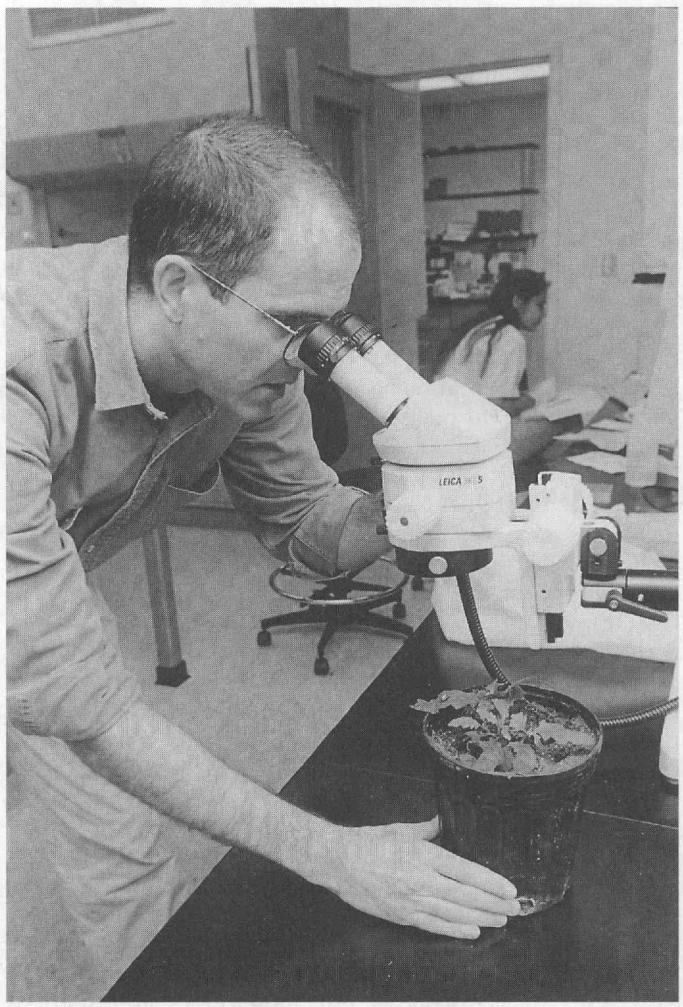
Depending on the agricultural or food scientist's area of specialization, the nature of the work performed varies.

Food science. Food scientists and technologists usually work in the food processing industry, universities, or the Federal Government, and help to meet consumer demand for food products that are healthful, safe, palatable, and convenient. To do this, they use their knowledge of chemistry, physics, engineering, microbiology, biotechnology, and other sciences to develop new or better ways of preserving, processing, packaging, storing, and delivering foods. Some food scientists engage in basic research, discovering new food sources; analyzing food content to determine levels of vitamins, fat, sugar, or protein; or searching for substitutes for harmful or undesirable additives, such as nitrites. They also develop ways to process, preserve, package, or store food according to industry and government regulations. Traditional food processing research into functions involving baking, blanching, canning, drying, evaporation, and pasteurization will continue to be conducted and will find new applications. Other food scientists enforce government regulations, inspecting food processing areas and ensuring that sanitation, safety, quality, and waste management standards are met. Food technologists generally work in product development, applying the findings from food science research to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome food.

Plant science. Agronomy, crop science, entomology, and plant breeding are included in plant science. Scientists in these disciplines study plants and their growth in soils, helping producers of food, feed, and fiber crops to continue to feed a growing population while conserving natural resources and maintaining the environment. Agronomists and crop scientists not only help increase productivity, but also study ways to improve the nutritional value of crops and the quality of seed, often through biotechnology. Some crop scientists study the breeding, physiology, and management of crops and use genetic engineering to develop crops resistant to pests and drought. Entomologists conduct research to develop new technologies to control or eliminate pests in infested areas and to prevent the spread of harmful pests to new areas, as well as technologies that are compatible with the environment. They also conduct research or engage in oversight activities aimed at halting the spread of insect-borne disease.

Soil science. Soil scientists study the chemical, physical, biological, and mineralogical composition of soils as they relate to plant or crop growth. They also study the responses of various soil types to fertilizers, tillage practices, and crop rotation. Many soil scientists who work for the Federal Government conduct soil surveys, classifying and mapping soils. They provide information and recommendations to farmers and other landowners regarding the best use of land, plant growth, and methods to avoid or correct problems such as erosion. They may also consult with engineers and other technical personnel working on construction projects about the effects of, and solutions to, soil problems. Because soil science is closely related to environmental science, persons trained in soil science also apply their knowledge to ensure environmental quality and effective land use.

Animal science. Animal scientists work to develop better, more efficient ways of producing and processing meat, poultry, eggs, and milk. Dairy scientists, poultry scientists, animal breeders, and other scientists in related fields study the genetics, nutrition, reproduction, growth, and development of domestic farm animals. Some animal scientists inspect and grade livestock food products, purchase livestock, or work in technical sales or marketing. As extension agents or consultants, animal scientists advise agricultural producers on how to upgrade animal housing facilities properly, lower mortality rates, handle waste matter, or increase production of animal products, such as milk or eggs.



The work of agricultural and food scientists plays an important part in maintaining the Nation's food supply.

Working Conditions

Agricultural scientists involved in management or basic research tend to work regular hours in offices and laboratories. The work environment for those engaged in applied research or product development varies, depending on the discipline of agricultural science and on the type of employer. For example, food scientists in private industry may work in test kitchens while investigating new processing techniques. Animal scientists working for Federal, State, or university research stations may spend part of their time at dairies, farrowing houses, feedlots, or farm animal facilities or outdoors conducting research associated with livestock. Soil and crop scientists also spend time outdoors conducting research on farms and agricultural research stations. Entomologists work in laboratories, insectories, or agricultural research stations, and also may spend time outdoors studying or collecting insects in their natural habitat.

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Employment

Agricultural and food scientists held about 18,000 jobs in 2002. In addition, several thousand persons held agricultural science faculty positions in colleges and universities. (See the statement on postsecondary teachers elsewhere in the *Handbook*.)

Almost 4 in 10 salaried agricultural and food scientists work for Federal, State, or local governments. One out of 6 worked for the Federal Government in 2002, mostly in the U.S. Department of Agriculture. Another 1 in 6 worked for State governments at State agricultural colleges or agricultural research stations. Some worked for agricultural service companies; others worked for commercial research and development laboratories, seed companies, pharmaceutical companies, wholesale distributors, and food products companies. Over 1,600 agricultural scientists were self-employed in 2002, mainly as consultants.

Training, Other Qualifications, and Advancement

Training requirements for agricultural scientists depend on their specialty and on the type of work they perform. A bachelor's degree in agricultural science is sufficient for some jobs in applied research or for assisting in basic research, but a master's or doctoral degree is required for basic research. A Ph.D. in agricultural science usually is needed for college teaching and for advancement to administrative research positions. Degrees in related sciences such as biology, chemistry, or physics or in related engineering specialties also may qualify persons for some agricultural science jobs.

All States have a land-grant college that offers agricultural science degrees. Many other colleges and universities also offer agricultural science degrees or some agricultural science courses. However, not every school offers all specialties. A typical undergraduate agricultural science curriculum includes communications, mathematics, economics, business, and physical and life sciences courses, in addition to a wide variety of technical agricultural science courses. For prospective animal scientists, these technical agricultural science courses might include animal breeding, reproductive physiology, nutrition, and meats and muscle biology. Graduate students typically specialize in a subfield of agricultural science, such as animal breeding and genetics, crop science, or horticulture science, depending on their interest and the kind of work they wish to do. For example, those interested in doing genetic and biotechnological research in the food industry need to develop a strong background in life and physical sciences, such as cell and molecular biology, microbiology, and inorganic and organic chemistry. However, students normally need not specialize at the undergraduate level. In fact, undergraduates who are broadly trained have greater flexibility when changing jobs than if they had narrowly defined their interests.

Students preparing as food scientists take courses such as food chemistry, food analysis, food microbiology, food engineering, and food processing operations. Those preparing as crop or soil scientists take courses in plant pathology, soil chemistry, entomology, plant physiology, and biochemistry, among others. Advanced degree programs include classroom and fieldwork, laboratory research, and a thesis or dissertation based on independent research.

Agricultural and food scientists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both orally and in writing. Most of these scientists also need an understanding of basic business principles, and the ability to apply basic statistical techniques. Employers increasingly prefer job applicants who are able to apply computer skills to determine solutions to problems, to collect and analyze data, and to control various processes.

The American Society of Agronomy offers certification programs in crop science, agronomy, crop advising, soil science, plant pathology, and weed science. To become certified, applicants must pass designated examinations and have at least 2 years of experience with at least a bachelor's degree in agriculture or 4 years of experience with no degree. To become a certified crop advisor, however, candidates do not need a degree.

Agricultural scientists who have advanced degrees usually begin in research or teaching. With experience, they may advance to jobs such as supervisors of research programs or managers of other agriculture-related activities.

Job Outlook

Employment of agricultural and food scientists is expected to grow more slowly than the average for all occupations through 2012. This projection reflects limited growth in the Federal Government and modest growth in State and local governments. The need to replace agricultural and food scientists who retire or otherwise leave the occupation permanently will account for many more job openings than will projected growth.

Past agricultural research has resulted in the development of higher yielding crops, crops with better resistance to pests and plant pathogens, and chemically based fertilizers and pesticides. Research is still necessary, particularly as insects and diseases continue to adapt to pesticides and as soil fertility and water quality continue to need improvement, resulting in job opportunities in biotechnology. Agricultural scientists are using new avenues of research in biotechnology to develop plants and food crops that require less fertilizer, fewer pesticides and herbicides, and even less water for growth.

Biotechnological research, including studies and approaches relying on the tools of genomics, will continue to offer possibilities for the development of new food products. This research will allow agricultural and food scientists to develop techniques to detect and control food pathogens, and should lead to better understanding of other physiological responses of pathogens in food environments.

Agricultural scientists will be needed to balance increased agricultural output with protection and preservation of soil, water, and ecosystems. They will increasingly encourage the practice of "sustainable agriculture" by developing and implementing plans to manage pests, crops, soil fertility and erosion, and animal waste in ways that reduce the use of harmful chemicals and do little damage to the natural environment.

Further food research will result in more job opportunities for food scientists and technologists. This research will be stimulated by a heightened public focus on diet, health, and food safety, as well as domestic and global issues such as increasing world population, availability and cost of usable water, loss of arable land, deforestation, environmental pollution, and climate change.

Those with doctorates in agricultural and food science may face competition for jobs, due to an increase in the number of graduates and the limited numbers of research and teaching positions. Opportunities may be more numerous for those with a master's degree, particularly for graduates seeking basic research positions in a laboratory. Most of these positions, however, entail working under the guidance and direction of a Ph.D. scientist.

Graduates with a bachelor's degree should have opportunities, although not necessarily as an agricultural or food scientist.

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A bachelor's degree in agricultural science is useful for managerial jobs in businesses that deal with ranchers and farmers, such as feed, fertilizer, seed, and farm equipment manufacturers; retailers or wholesalers; and farm credit institutions. In some cases, persons with a 4-year degree can provide consulting services, or become a certified crop advisor, providing crop management recommendations to farmers to help them meet their objectives. Bachelor's degree holders also can work in some applied research and product development positions, but usually only in certain subfields, such as food science and technology, and the Federal Government hires bachelor's degree holders to work as soil scientists. Four-year degrees also may help persons enter occupations such as farmer, or farm or ranch manager; cooperative extension service agent; agricultural products inspector; or purchasing or sales agent for agricultural commodity or farm supply companies.

Employment of agricultural and food scientists is relatively stable during periods of economic recession. Layoffs are less likely among agricultural and food scientists than in some other occupations because food is a staple item and its demand fluctuates very little with economic activity.

Earnings

Median annual earnings of agricultural and food scientists were $48,670 in 2002. The middle 50 percent earned between $35,770 and $65,990. The lowest 10 percent earned less than $28,750, and the highest 10 percent earned more than $85,460.

The average Federal salary for employees in nonsupervisory, supervisory, and managerial positions in 2003 was $82,729 in animal science and $68,846 in agronomy.

According to the National Association of Colleges and Employers, beginning salary offers in 2003 for graduates with a bachelor's degree in animal sciences averaged $30,026 a year; plant sciences, $28,203 a year; and in other agricultural sciences, $29,971 a year.

Related Occupations

The work of agricultural scientists is closely related to that of other scientists, including biological scientists, chemists, and conservation scientists and foresters. It also is related to the work of managers of agricultural production, such as farmers, ranchers, and agricultural managers. Certain specialties of agricultural science also are related to other occupations. For example, the work of animal scientists is related to that of veterinarians, and horticulturists perform duties similar to those of landscape architects.

Sources of Additional Information

Information on careers in agricultural science is available from:

➤ American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, 677 S. Segoe Rd., Madison, WI 53711-1086. Internet: **http://www.agronomy.org**

➤ Food and Agricultural Careers for Tomorrow, Purdue University, 1140 Agricultural Administration Bldg., West Lafayette, IN 47907-1140.

For information on careers in food technology, write to:

➤ Institute of Food Technologists, Suite 300, 221 N. LaSalle St., Chicago IL 60601-1291. Internet: **http://www.ift.org**

Information on acquiring a job as an agricultural scientist with the Federal Government is available from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the Internet site **http://www.usajobs.opm.gov**.

Biological Scientists

(0*NET 19-1020.01, 19-1021.01, 19-1021.02, 19-1022.00, 19-1023.00, 19-1029.99)

Significant Points

- A Ph.D. degree usually is required for independent research, but a master's degree is sufficient for some jobs in applied research or product development; a bachelor's degree is adequate for some nonresearch jobs.
- Doctoral degree holders face considerable competition for independent research positions, particularly in universities; holders of bachelor's or master's degrees in biological science can expect better opportunities in nonresearch positions.
- Biotechnological research and development will continue to drive employment growth.

Nature of the Work

Biological scientists study living organisms and their relationship to their environment. They research problems dealing with life processes. Most specialize in some area of biology such as zoology (the study of animals) or microbiology (the study of microscopic organisms). (Medical scientists, whose work is closely related to that of biological scientists, are discussed elsewhere in the *Handbook*.)

Many biological scientists work in research and development. Some conduct basic research to advance knowledge of living organisms, including viruses, bacteria, and other infectious agents. Basic biological research continues to provide the building blocks necessary to develop solutions to human health problems, and to preserve and repair the natural environment. Biological scientists mostly work independently in private industry, university, or government laboratories, often exploring new areas of research or expanding on specialized research started in graduate school. Those who are not wage and salary workers in private industry typically submit grant proposals to obtain funding for their projects. Colleges and universities, private industry, and Federal Government agencies, such as the National Institutes of Health and the National Science Foundation, contribute to the support of scientists whose research proposals are determined to be financially feasible and to have the potential to advance new ideas or processes.

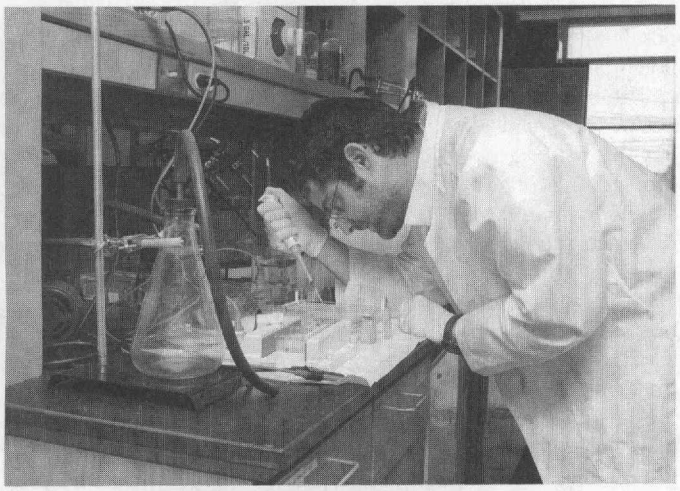
Biological scientists who work in applied research or product development use knowledge provided by basic research to develop new drugs and treatments, increase crop yields, and protect and clean up the environment. They usually have less autonomy than basic researchers to choose the emphasis of their research, relying instead on market-driven directions based on the firm's products and goals. Biological scientists doing applied research and product development in private industry may be required to describe their research plans or results to nonscientists who are in a position to veto or approve their ideas, and they must understand the potential cost of their work and its impact on business. Scientists increasingly are working as part of teams, interacting with engineers, scientists of other disciplines, business managers, and technicians. Some biological scientists also work with customers or suppliers and manage budgets.

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Those who conduct research usually work in laboratories and use electron microscopes, computers, thermal cyclers, or a wide variety of other equipment. Some conduct experiments using laboratory animals or greenhouse plants. This is particularly true of botanists, physiologists, and zoologists. For some biological scientists, research also is performed outside of laboratories. For example, a botanist might do research in tropical rain forests to see what plants grow there, or an ecologist might study how a forest area recovers after a fire. Some marine biologists also work outdoors, often on research vessels from which they study various marine organisms such as marine plankton or fish.

Some biological scientists work in managerial or administrative positions, usually after spending some time doing research and learning about the firm, agency, or project. They may plan and administer programs for testing foods and drugs, for example, or direct activities at zoos or botanical gardens. Some work as consultants to business firms or to government, while others test and inspect foods, drugs, and other products.

Recent advances in biotechnology and information technology are transforming the industries in which biological scientists work. In the 1980s, swift advances in basic biological knowledge related to genetics and molecules spurred growth in the field of biotechnology. Biological scientists using this technology manipulate the genetic material of animals or plants, attempting to make organisms more productive or resistant to disease. Research using biotechnology techniques, such as recombining DNA, has led to the production of important substances, including human insulin and growth hormone. Many other substances not previously available in large quantities are starting to be produced by biotechnological means; some may be useful in treating cancer and other diseases. Today, many biological scientists are involved in biotechnology. Those who work on the Human Genome project continue to isolate genes and determine their functionality. This work continues to lead to the discovery of the genes associated with specific diseases and inherited traits, such as certain types of cancer or obesity. These advances in biotechnology have opened up research opportunities in almost all areas of biology, including commercial applications in agriculture, environmental remediation, and the food and chemical industries.



Many biological scientists work in research and development, often in offices and laboratories.

Most biological scientists are further classified by the type of organism they study or by the specific activity they perform, although recent advances in the understanding of basic life processes at the molecular and cellular levels have blurred some traditional classifications.

Aquatic biologists study micro-organisms, plants, and animals living in water. *Marine biologists* study salt water organisms, and *limnologists* study fresh water organisms. Much of the work of marine biology centers on molecular biology, the study of the biochemical processes that take place inside living cells. Marine biologists sometimes are mistakenly called oceanographers, but oceanography is the study of the physical characteristics of oceans and the ocean floor. (See the statement on environmental scientists and geoscientists elsewhere in the *Handbook*.)

Biochemists study the chemical composition of living things. They analyze the complex chemical combinations and reactions involved in metabolism, reproduction, growth, and heredity. Biochemists and molecular biologists do most of their work in the field of biotechnology, which involves understanding the complex chemistry of life.

Botanists study plants and their environment. Some study all aspects of plant life, including algae, fungi, lichens, mosses, ferns, conifers, and flowering plants; others specialize in areas such as identification and classification of plants, the structure and function of plant parts, the biochemistry of plant processes, the causes and cures of plant diseases, the interaction of plants with other organisms and the environment, and the geological record of plants.

Microbiologists investigate the growth and characteristics of microscopic organisms such as bacteria, algae, or fungi. Most microbiologists specialize in environmental, food, agricultural, or industrial microbiology; virology (the study of viruses); or immunology (the study of mechanisms that fight infections). Many microbiologists use biotechnology to advance knowledge of cell reproduction and human disease.

Physiologists study life functions of plants and animals, both in the whole organism and at the cellular or molecular level, under normal and abnormal conditions. Physiologists often specialize in functions such as growth, reproduction, photosynthesis, respiration, or movement, or in the physiology of a certain area or system of the organism.

Biophysicists study the application of principles of physics, such as electrical and mechanical energy and related phenomena, to living cells and organisms.

Zoologists and wildlife biologists study animals and wildlife—their origin, behavior, diseases, and life processes. Some experiment with live animals in controlled or natural surroundings, while others dissect dead animals in order to study their structure. They also may collect and analyze biological data to determine the environmental effects of current and potential use of land and water areas. Zoologists usually are identified by the animal group studied—ornithologists (birds), mammalogists (mammals), herpetologists (reptiles), and ichthyologists (fish).

Ecologists study the relationships among organisms and between organisms and their environments, and the effects of influences such as population size, pollutants, rainfall, temperature, and altitude. Utilizing knowledge of various scientific disciplines, they may collect, study, and report data on the quality of air, food, soil, and water.

Agricultural and food scientists, who are sometimes referred to as biological scientists, are discussed elsewhere in the *Handbook*.

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Working Conditions

Biological scientists usually work regular hours in offices or laboratories and usually are not exposed to unsafe or unhealthy conditions. Those who work with dangerous organisms or toxic substances in the laboratory must follow strict safety procedures to avoid contamination. Many biological scientists such as botanists, ecologists, and zoologists take field trips that involve strenuous physical activity and primitive living conditions. Biological scientists in the field may work in warm or cold climates, in all kinds of weather. In their research, they may dig, chip with a hammer, scoop with a net, and carry equipment in a backpack. They also may climb, stand, kneel, or dive.

The work of a marine biologist varies dramatically, depending on the type of work involved. Some work in a laboratory, while others work on research ships. Marine biologists who work underwater must practice safe diving while working around sharp coral reefs and hazardous marine life. Although some marine biologists obtain their specimens from the sea, many still spend a good deal of their time in laboratories and offices, conducting tests, running experiments, recording results, and compiling data.

Some biological scientists depend on grant money to support their research. They may be under pressure to meet deadlines and to conform to rigid grant-writing specifications when preparing proposals to seek new or extended funding.

Employment

Biological scientists held about 75,000 jobs in 2002. Almost half of all biological scientists were employed by Federal, State, and local governments. Federal biological scientists worked mainly for the U.S. Departments of Agriculture, Interior, and Defense, and for the National Institutes of Health. Most of the rest worked in scientific research and testing laboratories, the pharmaceutical and medicine manufacturing industry, or hospitals.

In addition, many biological scientists held biology faculty positions in colleges and universities. (See the statement on teachers—postsecondary elsewhere in the *Handbook.*)

Training, Other Qualifications, and Advancement

A Ph.D. degree usually is necessary for independent research, industrial research, and college teaching, and for advancement to administrative positions. A master's degree is sufficient for some jobs in basic research, applied research or product development, management, or inspection; it may also qualify one to work as a research technician or as a teacher in an aquarium. The bachelor's degree is adequate for some nonresearch jobs. For example, some graduates with a bachelor's degree start as biological scientists in testing and inspection, or get jobs related to biological science, such as technical sales or service representatives. In some cases, graduates with a bachelor's degree are able to work in a laboratory environment on their own projects, but this is unusual. Some may work as research assistants, while others become biological laboratory technicians or, with courses in education, high school biology teachers. (See the statements on clinical laboratory technologists and technicians; science technicians; and teachers-preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook.*) Many with a bachelor's degree in biology enter medical, dental, veterinary, or other health profession schools.

In addition to required courses in chemistry and biology, undergraduate biological science majors usually study allied disciplines such as mathematics, physics, and computer science. Computer courses are essential, as employers prefer job applicants who are able to apply computer skills to modeling and simulation tasks and to operate computerized laboratory equipment. Those interested in studying the environment also should take courses in environmental studies and become familiar with current legislation and regulations. Prospective biological scientists who hope to work as marine biologists should have at least a bachelor's degree in a biological or marine science. However, students should not overspecialize in undergraduate study, as knowledge of marine biology often is acquired in graduate study. Most colleges and universities offer bachelor's degrees in biological science, and many offer advanced degrees. Curriculums for advanced degrees often emphasize a subfield such as microbiology or botany, but not all universities offer all curriculums. Larger universities frequently have separate departments specializing in different areas of biological science. For example, a program in botany might cover agronomy, horticulture, or plant pathology. Advanced degree programs include classroom and fieldwork, laboratory research, and a thesis or dissertation.

Biological scientists with a Ph.D. often take temporary postdoctoral research positions that provide specialized research experience. In private industry, some may become managers or administrators within the field of biology; others leave biology for nontechnical managerial, administrative, or sales jobs.

Biological scientists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both orally and in writing. Those in private industry, especially those who aspire to management or administrative positions, should possess strong business and communication skills and be familiar with regulatory issues and marketing and management techniques. Those doing field research in remote areas must have physical stamina. Biological scientists also must have patience and self-discipline to conduct long and detailed research projects.

Job Outlook

Despite projected as fast as average job growth for biological scientists over the 2002-12 period, doctoral degree holders can expect to face competition for basic research positions. The Federal Government funds much basic research and development, including many areas of medical research that relate to biological science. Recent budget increases at the National Institutes of Health have led to large increases in Federal basic research and development expenditures, with research grants growing both in number and in dollar amount. At the same time, the number of newly trained scientists has continued to increase at least as fast as available research funds, so both new and established scientists have experienced difficulty winning and renewing research grants. Currently, about 1 in 3 grant proposals are approved for long-term research projects. If the number of advanced degrees awarded continues to grow, as seems likely based on enrollment trends, this competitive situation will persist. Additionally, applied research positions in private industry may become more difficult to obtain if increasing numbers of scientists seek jobs in private industry because of the competitive job market for independent research positions in universities and for college and university faculty.

Opportunities for those with a bachelor's or master's degree in biological science are expected to be better. The number of science-related jobs in sales, marketing, and research management, for which non-Ph.D.s usually qualify, is expected to exceed the number of independent research positions. Non-Ph.D.s

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also may fill positions as science or engineering technicians or health technologists and technicians. Some may become high school biology teachers.

Biological scientists enjoyed very rapid gains in employment between the mid-1980s and mid-1990s, in part reflecting increased staffing requirements in new biotechnology companies. Employment growth should slow somewhat as increases in the number of new biotechnology firms slow and existing firms merge or are absorbed into larger ones. However, much of the basic biological research done in recent years has resulted in new knowledge, including the isolation and identification of genes. Biological scientists will be needed to take this knowledge to the next stage, which is the understanding of how certain genes function within an entire organism, so that gene therapies can be developed to treat diseases. Even pharmaceutical and other firms not solely engaged in biotechnology use biotechnology techniques extensively, spurring employment increases for biological scientists. Expected expansion of research related to health issues, such as AIDS, cancer, and Alzheimer's disease, also should create more jobs for these scientists. In addition, efforts to discover new and improved ways to clean up and preserve the environment will continue to add to job growth. More biological scientists, including some botanists, will be needed to determine the environmental impact of industry and government actions and to prevent or correct environmental problems, while some will find opportunities in environmental regulatory agencies. Botanists also will use their expertise to advise lawmakers on legislation for environmental protection and for ways to save environmentally sensitive areas. There will continue to be demand for biological scientists specializing in botany, zoology, and marine biology, but opportunities will be limited because of the small size of these fields.

Biological scientists are less likely to lose their jobs during recessions than are those in many other occupations because many are employed on long-term research projects. However, an economic downturn could influence the amount of money allocated to new research and development efforts, particularly in areas of risky or innovative research. An economic downturn could also limit the possibility of extension or renewal of existing projects.

Earnings

Median annual earnings of biochemists and biophysicists were $60,390 in 2002. The middle 50 percent earned between $43,110 and $82,080. The lowest 10 percent earned less than $33,930, and the highest 10 percent earned more than $102,930. Median annual earnings of microbiologists were $51,020 in 2002. The middle 50 percent earned between $39,100 and $67,420. The lowest 10 percent earned less than $31,250, and the highest 10 percent earned more than $87,060. Median annual earnings of zoologists and wildlife biologists were $47,740 in 2002. The middle 50 percent earned between $37,100 and $58,040. The lowest 10 percent earned less than $29,260, and the highest 10 percent earned more than $71,270. Median annual earnings of biochemists and biophysicists employed in scientific research and development services were $64,390 in 2002.

According to the National Association of Colleges and Employers, beginning salary offers in 2003 averaged $29,456 a year for bachelor's degree recipients in biological and life sciences; $33,600 for master's degree recipients; and $42,244 for doctoral degree recipients.

In the Federal Government in 2003, general biological scientists in nonsupervisory, supervisory, and managerial positions earned an average salary of $66,262; microbiologists, $73,513; ecologists, $65,207; physiologists, $85,181; geneticists, $78,652; zoologists, $90,178; and botanists, $55,727.

Related Occupations

Many other occupations deal with living organisms and require a level of training similar to that of biological scientists. These include medical scientists, agricultural and food scientists, and conservation scientists and foresters, as well as health occupations such as physicians and surgeons, dentists, and veterinarians.

Sources of Additional Information

For information on careers in the biological sciences, contact:

➤ American Institute of Biological Sciences, Suite 200, 1444 I St. NW., Washington, DC 20005. Internet: **http://www.aibs.org**

For information on careers in biochemistry or biological sciences, contact:

➤ Federation of American Societies for Experimental Biology, 9650 Rockville Pike, Bethesda, MD 20814. Internet: **http://www.faseb.org**

For information on careers in microbiology, contact:

➤ American Society for Microbiology, Office of Education and Training—Career Information, 1325 Massachusetts Ave. NW., Washington, DC 20005. Internet: **http://www.asmusa.org**

Information on obtaining a biological scientist position with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Conservation Scientists and Foresters

(0*NET 19-1031.01, 19-1031.02, 19-1031.03, 19-1032.00)

Significant Points

- Nearly two-thirds of salaried conservation scientists and foresters work for Federal, State, or local governments.
- A bachelor's degree in forestry, range management, or a related discipline is the minimum educational requirement.
- Slower-than-average job growth is projected because of limited growth in government and in forestry and logging; most employment opportunities will be in private sector consulting.

Nature of the Work

Forests and rangelands supply wood products, livestock forage, minerals, and water; serve as sites for recreational activities; and provide habitats for wildlife. Conservation scientists and foresters manage, develop, use, and help to protect these and other natural resources.

Foresters manage forested lands for a variety of purposes. Those working in private industry may manage company forest land or procure timber from private landowners. Company forests usually are managed to produce a sustainable supply of wood for company mills. Procurement foresters contact local

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forest owners and gain permission to take inventory of the type, amount, and location of all standing timber on the property, a process known as timber cruising. Foresters then appraise the timber's worth, negotiate its purchase, and draw up a contract for procurement. Next, they subcontract with loggers or pulpwood cutters for tree removal, aid in road layout, and maintain close contact with the subcontractor's workers and the landowner to ensure that the work meets the landowner's requirements, as well as Federal, State, and local environmental specifications. Forestry consultants often act as agents for the forest owner, performing these duties and negotiating timber sales with industrial procurement foresters.

Throughout the forest management and procurement processes, foresters consider the economics as well as the environmental impact on natural resources. To do this, they determine how to conserve wildlife habitats, creek beds, water quality, and soil stability, and how best to comply with environmental regulations. Foresters must balance the desire to conserve forested ecosystems for future generations with the need to use forest resources for recreational or economic purposes.

Through a process called regeneration, foresters also supervise the planting and growing of new trees. They choose and prepare the site, using controlled burning, bulldozers, or herbicides to clear weeds, brush, and logging debris. They advise on the type, number, and placement of trees to be planted. Foresters then monitor the seedlings to ensure healthy growth and to determine the best time for harvesting. If they detect signs of disease or harmful insects, they consult with forest pest management specialists to decide on the best course of treatment. Foresters who work for Federal and State governments manage public forests and parks and work with private landowners to protect and manage forest land outside of the public domain. They may also design campgrounds and recreation areas.

Foresters use a number of tools to perform their jobs. Clinometers measure the height, diameter tapes measure the diameter, and increment borers and bark gauges measure the growth of trees so that timber volumes can be computed and growth rates estimated. Remote sensing (aerial photographs and other imagery taken from airplanes and satellites) and Geographic Information Systems (GIS) data often are used for mapping large forest areas and for detecting widespread trends of forest and land use. Once the map is generated, the data are digitized to create a computerized inventory of information required to manage the forest land and its resources. Moreover, hand-held computers, Global Positioning Satellite (GPS), and World Wide Web-based applications are used extensively.

Range managers, also called *range conservationists*, *range ecologists*, or *range scientists*, study, manage, improve, and protect rangelands to maximize their use without damaging the environment. Rangelands cover about 1 billion acres of the United States, mostly in Western States and Alaska. They contain many natural resources, including grass and shrubs for animal grazing, wildlife habitats, water from vast watersheds, recreation facilities, and valuable mineral and energy resources. Range managers may inventory soils, plants, and animals, develop resource management plans, help to restore degraded ecosystems, or assist in managing a ranch. For example, they may help ranchers attain optimum livestock production by determining the number and kind of animals to graze, the grazing system to use, and the best season for grazing. At the same time, however, range managers maintain soil stability and vegetation for other uses such as wildlife habitats and outdoor recreation. They also plan and implement revegetation of disturbed sites.



Conservation scientists and foresters often work outdoors, sometimes in isolated areas.

Soil and water conservationists provide technical assistance to farmers, ranchers, forest managers, State and local agencies, and others concerned with the conservation of soil, water, and related natural resources. They develop programs for private landowners designed to make the most productive use of land without damaging it. Soil conservationists also assist landowners by visiting areas with erosion problems, finding the source of the problem, and helping landowners and managers develop management practices to combat it. Water conservationists also assist private landowners and Federal, State, and local governments by advising on a broad range of natural resource topics—specifically, issues of water quality, preserving water supplies, groundwater contamination, and management and conservation of water resources.

Foresters and conservation scientists often specialize in one area, such as wildlife management, urban forestry, wood technology, native species, or forest economics.

Working Conditions

Working conditions vary considerably. Although some of the work is solitary, foresters and conservation scientists also deal regularly with landowners, loggers, forestry technicians and aides, farmers, ranchers, government officials, special interest groups, and the public in general. Some foresters and conservation scientists work regular hours in offices or labs. Others may split their time between fieldwork and office work, while independent consultants and especially new, less experienced workers spend the majority of their time outdoors overseeing or participating in hands-on work.

The work can be physically demanding. Some foresters and conservation scientists work outdoors in all types of weather, sometimes in isolated areas. Other foresters may need to walk long distances through densely wooded land to carry out their work. Foresters also may work long hours fighting fires. Conservation scientists often are called to prevent erosion after a forest fire, and they provide emergency help after floods, mudslides, and tropical storms.

Employment

Conservation scientists and foresters held about 33,000 jobs in 2002. Nearly one-third of all workers were employed by the Federal Government, many in the U.S. Department of Agriculture (USDA). Foresters were concentrated in the USDA's Forest

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Service; soil conservationists were employed primarily in the USDA's Natural Resource Conservation Service. Most range managers worked in the U.S. Department of the Interior's Bureau of Land Management, the Natural Resource Conservation Service, or the Forest Service. Another 20 percent of conservation scientists and foresters worked for State governments, and about 10 percent worked for local governments. The remainder worked in private industry, mainly in support activities for agriculture and forestry or in wood product manufacturing. Some were self-employed as consultants for private landowners, Federal and State governments, and forestry-related businesses.

Although conservation scientists and foresters work in every State, employment of foresters is concentrated in the Western and Southeastern States, where many national and private forests and parks, and most of the lumber and pulpwood-producing forests, are located. Range managers work almost entirely in the Western States, where most of the rangeland is located. Soil conservationists, on the other hand, are employed in almost every county in the country. Besides the jobs described above, some foresters and conservation scientists held faculty positions in colleges and universities. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

A bachelor's degree in forestry, range management, or a related discipline is the minimum educational requirement for careers in forestry or conservation science. In the Federal Government, a combination of experience and appropriate education occasionally may substitute for a 4-year forestry degree, but job competition makes this difficult.

Sixteen States have mandatory licensing or voluntary registration requirements that a forester must meet in order to acquire the title "professional forester" and practice forestry in the State. Of those 16 States, 7 have mandatory licensing; 5 have mandatory registration, and the remaining 4 States have optional registration. Both licensing and registration requirements usually entail completing a 4-year degree in forestry and several years of forestry work experience. Candidates pursuing licensing also must pass a comprehensive written exam.

Foresters who wish to perform specialized research or teach should have an advanced degree, preferably a Ph.D.

Most land-grant colleges and universities offer bachelor's or higher degrees in forestry; about 110 of these degree programs at around 50 educational institutions are accredited by the Society of American Foresters. Curriculums stress four components: Ecology, measurement of forest resources, management of forest resources, and public policy. Students should balance general science courses such as ecology, biology, tree physiology, taxonomy, and soil formation with technical forestry courses, such as forest inventory or wildlife habitat assessment, remote sensing, land surveying, GPS technology, integrated forest resource management, silviculture, and forest protection. In addition, communications skills, mathematics, statistics, and computer science courses also are recommended. Many forestry curriculums include advanced computer applications such as GIS and resource assessment programs. Courses in resource policy and administration, specifically forest economics and business administration, supplement the student's scientific and technical knowledge. Forestry curriculums increasingly include courses on best management practices, wetlands analysis, and sustainability and regulatory issues in response to the growing focus on protecting forested lands during timber harvesting operations. Prospective foresters should have a strong grasp of Federal, State, and local policy issues and of increasingly numerous and complex environmental regulations that affect many forestry-related activities. Many colleges require students to complete a field session either in a camp operated by the college or in a cooperative work-study program with a Federal or State agency or private industry. All schools encourage students to take summer jobs that provide experience in forestry or conservation work.

A bachelor's degree in range management or range science is the usual minimum educational requirement for range managers; graduate degrees usually are required for teaching and research positions. More than 30 colleges and universities offer degrees in range management that are accredited by the Society of Range Management. A number of other schools offer degree programs in range science or in a closely related discipline with a range management or range science option. Specialized range management courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include economics, statistics, forestry, hydrology, agronomy, wildlife, animal husbandry, computer science, and recreation. Selection of a minor in range management, such as wildlife ecology, watershed management, animal science, or agricultural economics, can often enhance qualifications for certain types of employment. The Society for Range Management offers certification as a professional rangeland manager (CPRM). Candidates seeking certification must have at least a bachelor's degree in range science or a closely related field, have a minimum of 5 years of full-time work experience, and pass a comprehensive written exam.

Very few colleges and universities offer degrees in soil conservation. Most soil conservationists have degrees in environmental studies, agronomy, general agriculture, hydrology, or crop or soil science; a few have degrees in related fields such as wildlife biology, forestry, and range management. Programs of study usually include 30 semester hours in natural resources or agriculture, including at least 3 hours in soil science.

In addition to meeting the demands of forestry and conservation research and analysis, foresters and conservation scientists generally must enjoy working outdoors, be physically hardy, and be willing to move to where the jobs are. They also must work well with people and have good communication skills.

Recent forestry and range management graduates usually work under the supervision of experienced foresters or range managers. After gaining experience, they may advance to more responsible positions. In the Federal Government, most entry-level foresters work in forest resource management. An experienced Federal forester may supervise a ranger district, and may advance to forest supervisor, to regional forester, or to a top administrative position in the national headquarters. In private industry, foresters start by learning the practical and administrative aspects of the business and acquiring comprehensive technical training. They are then introduced to contract writing, timber harvesting, and decisionmaking. Some foresters work their way up to top managerial positions within their companies. Foresters in management usually leave the fieldwork behind, spending more of their time in an office, working with teams to develop management plans and supervising others. After gaining several years of experience, some foresters may become consulting foresters, working alone or with one or several partners. They contract with State or local governments, private landowners, private industry, or other forestry consulting groups.

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Soil conservationists usually begin working within one county or conservation district and, with experience, may advance to the area, State, regional, or national level. Also, soil conservationists can transfer to related occupations, such as farm or ranch management advisor or land appraiser.

Job Outlook

Employment of conservation scientists and foresters is expected to grow more slowly than the average for all occupations through 2012. Growth should be strongest in private sector consulting firms and in scientific research and development services. Demand will be spurred by a continuing emphasis on environmental protection, responsible land management, and water-related issues. Job opportunities for conservation scientists will arise because government regulations, such as those regarding the management of storm water and coastlines, have created demand for persons knowledgeable about runoff and erosion on farms and in cities and suburbs. Soil and water quality experts will be needed as States design initiatives to improve water resources by preventing pollution by agricultural producers and industrial plants.

Fewer opportunities for conservation scientists and foresters are expected in Federal and State Government, mostly due to budgetary constraints and the trend among governments toward contracting functions out to private consulting firms. Also, Federal land management agencies, such as the USDA Forest Service, have de-emphasized their timber programs and increasingly focused on wildlife, recreation, and sustaining ecosystems, thereby spurring demand for other life and social scientists rather than for foresters. However, departures of foresters who retire or leave the Government for other reasons will result in some job openings between 2002 and 2012. A small number of new jobs will result from the need for range and soil conservationists to provide technical assistance to owners of grazing land through the Natural Resource Conservation Service.

Reductions in timber harvesting on public lands, most of which are located in the Northwest and California, also will dampen job growth for private industry foresters in these regions. Opportunities will be better for foresters in the Southeast, where much forested land is privately owned. Salaried foresters working for private industry—such as paper companies, sawmills, and pulpwood mills—and consulting foresters will be needed to provide technical assistance and management plans to landowners.

Scientific research and development services have increased their hiring of conservation scientists and foresters in recent years in response to demand for professionals to prepare environmental impact statements and erosion and sediment control plans, monitor water quality near logging sites, and advise on tree harvesting practices required by Federal, State, or local regulations. Hiring in these firms should continue during the 2002-12 period, although at a slower rate than over the last 10 years.

Earnings

Median annual earnings of conservation scientists in 2002 were $50,340. The middle 50 percent earned between $39,300 and $61,440. The lowest 10 percent earned less than $30,630, and the highest 10 percent earned more than $70,770.

Median annual earnings of foresters in 2002 were $46,730. The middle 50 percent earned between $36,330 and $56,890. The lowest 10 percent earned less than $29,690, and the highest 10 percent earned more than $69,600.

In 2003, most bachelor's degree graduates entering the Federal Government as foresters, range managers, or soil conservationists started at $23,442 or $29,037, depending on academic achievement. Those with a master's degree could start at $35,519 or $42,976. Holders of doctorates could start at $51,508. Beginning salaries were slightly higher in selected areas where the prevailing local pay level was higher. In 2003, the average Federal salary for foresters in nonsupervisory, supervisory, and managerial positions was $59,233; for soil conservationists, $57,084; and for rangeland managers, $53,657.

According to the National Association of Colleges and Employers, graduates with a bachelor's degree in conservation and renewable natural resources received an average starting salary offer of $29,715 in 2003.

In private industry, starting salaries for students with a bachelor's degree were comparable with starting salaries in the Federal Government, but starting salaries in State and local governments were usually lower.

Conservation scientists and foresters who work for Federal, State, and local governments and large private firms generally receive more generous benefits than do those working for smaller firms.

Related Occupations

Conservation scientists and foresters manage, develop, and protect natural resources. Other workers with similar responsibilities include environmental engineers; agricultural and food scientists; biological scientists; environmental scientists and geoscientists; and farmers, ranchers, and agricultural managers.

Sources of Additional Information

For information about the forestry profession and lists of schools offering education in forestry, send a self-addressed, stamped business envelope to:

➤ Society of American Foresters, 5400 Grosvenor Lane, Bethesda, MD 20814, or visit the society's Web site: **http://www.safnet.org**

For information about career opportunities in forestry in the Federal Government, contact:

➤ Chief, U.S. Forest Service, U.S. Department of Agriculture, P.O. Box 96090, Washington, DC 20090-6090. Internet: **http://www.fs.fed.us**

Information about a career as a range manager, as well as a list of schools offering training, is available from:

➤ Society for Range Management, 445 Union Blvd., Suite 230, Lakewood, CO 80228-1259. Internet: **http://www.rangelands.org/ScriptContent/Index.cfm**

Medical Scientists

(0*NET 19-1041.00, 19-1042.00)

Significant Points

- Epidemiologists typically require a master's degree in public health or, in some cases, a medical degree; other medical scientists need a Ph.D. degree in a biological science.
- Competition is expected for most positions.
- Most medical scientists work in research and development.

Nature of the Work

Medical scientists research human diseases in order to improve human health. Most medical scientists work in research and development. Some conduct basic research to advance knowledge of living organisms, including viruses, bacteria, and other infectious agents. Past research has resulted in the development

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of vaccines, medicines, and treatments for many diseases. Basic medical research continues to provide the building blocks necessary to develop solutions to human health problems. Medical scientists also engage in clinical investigation, technical writing, drug application review, patent examination, or related activities.

Medical scientists study biological systems to understand the causes of disease and other health problems and to develop treatments. They try to identify changes in a cell or chromosomes that signal the development of medical problems, such as different types of cancer. For example, a medical scientist involved in cancer research may formulate a combination of drugs that will lessen the effects of the disease. Medical scientists who are also physicians can administer these drugs to patients in clinical trials, monitor their reactions, and observe the results. Those who are not physicians normally collaborate with a physician who deals directly with patients. Medical scientists examine the results of clinical trials and, if necessary, adjust the dosage levels to reduce negative side effects or to try to induce even better results. In addition to developing treatments for health problems, medical scientists attempt to discover ways to prevent health problems, such as affirming the link between smoking and lung cancer, or between alcoholism and liver disease.

Many medical scientists work independently in private industry, university, or government laboratories, often exploring new areas of research or expanding on specialized research that they started in graduate school. Medical scientists working in colleges and universities, hospitals, and nonprofit medical research organizations typically submit grant proposals to obtain funding for their projects. Colleges and universities, private industry, and Federal Government agencies, such as the National Institutes of Health and the National Science Foundation, contribute to the support of scientists whose research proposals are determined to be financially feasible and have the potential to advance new ideas or processes.

Medical scientists who work in applied research or product development use knowledge provided by basic research to develop new drugs and medical treatments. They usually have less autonomy than basic researchers to choose the emphasis of their research, relying instead on market-driven directions based on the firm's products and goals. Medical scientists doing applied research and product development in private industry may be required to express their research plans or results to nonscientists who are in a position to veto or approve their ideas, and they must understand the impact of their work on business. Scientists increasingly work as part of teams, interacting with engineers, scientists of other disciplines, business managers, and technicians.

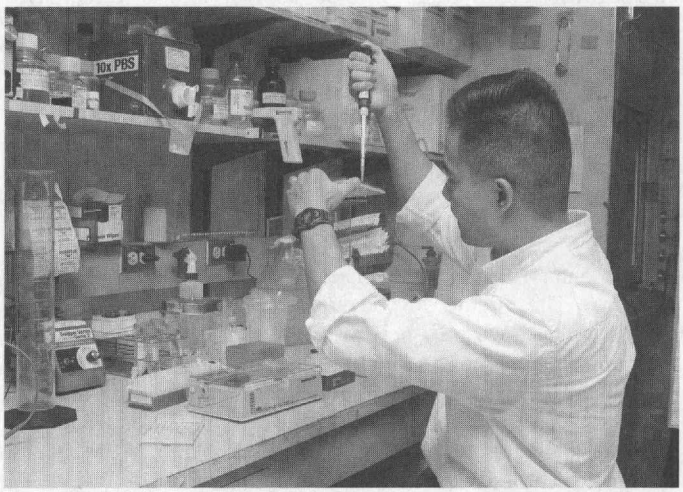
Medical scientists who conduct research usually work in laboratories and use electron microscopes, computers, thermal cyclers, or a wide variety of other equipment. Some may work directly with individual patients or larger groups as they administer drugs and monitor and observe the patients during clinical trials. Medical scientists who are also physicians may administer gene therapy to human patients, draw blood, excise tissue, or perform other invasive procedures.

Some medical scientists work in managerial, consulting, or administrative positions, usually after spending some time doing research and learning about the firm, agency, or project. In the 1980s, swift advances in basic medical knowledge related to genetics and molecules spurred growth in the field of biotechnology. Medical scientists using this technology manipulate the genetic material of animals, attempting to make organisms more productive or resistant to disease. Research using biotechnology techniques, such as recombining DNA, has led to the discovery of important drugs, including human insulin and growth hormone. Many other substances not previously available in large quantities are now produced by biotechnological means; some may be useful in treating diseases such as Parkinson's or Alzheimer's. Today, many medical scientists are involved in the science of genetic engineering—isolating, identifying, and sequencing human genes and then determining their functionality. This work continues to lead to the discovery of the genes associated with specific diseases and inherited traits, such as certain types of cancer or obesity. These advances in biotechnology have opened up research opportunities in almost all areas of medical science.

Some medical scientists specialize in epidemiology. This branch of medical science investigates and describes the determinants of disease, disability, and other health outcomes and develops the means for prevention and control. Epidemiologists may study many different diseases such as tuberculosis, influenza, or cholera, often focusing on epidemics.

Epidemiologists can be separated into two groups, research and clinical. Research epidemiologists conduct basic and advanced research on infectious diseases that affect the entire body, such as AIDS or typhus—attempting to eradicate or control these diseases. Others may focus only on localized infections of the brain, lungs, or digestive tract, for example. Research epidemiologists work at colleges and universities, schools of public health, medical schools, and research and development services firms. For example, Government agencies such as the Department of Defense may contract with a research firm's epidemiologists to evaluate the incidence of malaria in certain parts of the world. While some perform consulting services, other research epidemiologists may work as college and university faculty.

Clinical epidemiologists work primarily in consulting roles at hospitals, informing the medical staff of infectious outbreaks and providing containment solutions. These clinical epidemiologists sometimes are referred to as infection control professionals. Consequently, many epidemiologists in this specific area often are physicians. Epidemiologists who are not physicians often collaborate with physicians to find ways to contain diseases and outbreaks. In addition to traditional duties of studying and controlling diseases, clinical epidemiologists also may



Most medical scientists conduct basic research to advance knowledge of living organisms.

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be required to develop standards and guidelines for the treatment and control of communicable diseases. Some clinical epidemiologists may work in outpatient settings.

Working Conditions

Medical scientists typically work regular hours in offices or laboratories and usually are not exposed to unsafe or unhealthy conditions. Those who work with dangerous organisms or toxic substances in the laboratory must follow strict safety procedures to avoid contamination. Medical scientists also spend time working in clinics and hospitals administering drugs and treatments to patients in clinical trials. On occasion, epidemiologists may be required to work evenings and weekends to attend meetings and hearings for medical investigations.

Some medical scientists depend on grant money to support their research. They may be under pressure to meet deadlines and to conform to rigid grant-writing specifications when preparing proposals to seek new or extended funding.

Employment

Medical scientists, including epidemiologists, held about 62,000 jobs in 2002. Medical scientists accounted for 58,000 of the total; epidemiologists, 3,900. In addition, many medical scientists held faculty positions in colleges and universities, but they are classified as college or university faculty. (See teachers—postsecondary elsewhere in the *Handbook*.)

Almost 30 percent of medical scientists were employed in scientific research and development services firms, another 24 percent worked in Government, 14 percent in pharmaceutical and medicine manufacturing, 13 percent in private hospitals, and most of the remainder worked in private educational services and ambulatory health care services. About 1,000 were self-employed.

Among epidemiologists, nearly 45 percent were employed in Government, another 20 percent worked in management, scientific, and technical consulting services firms, 14 percent in private hospitals, and 12 percent in scientific research and development services firms.

Training, Other Qualifications, and Advancement

A Ph.D. degree in a biological science is the minimum education required for most prospective medical scientists, except epidemiologists, because the work of medical scientists is almost entirely research oriented. A Ph.D. degree qualifies one to do research on basic life processes or on particular medical problems or diseases, and to analyze and interpret the results of experiments on patients. Some medical scientists obtain a medical degree instead of a Ph.D., but may not be licensed physicians because they have not taken the State licensing examination or completed a residency program, typically because they prefer research to clinical practice. Medical scientists who administer drug or gene therapy to human patients, or who otherwise interact medically with patients—drawing blood, excising tissue, or performing other invasive procedures—must be licensed physicians. To be licensed, physicians must graduate from an accredited medical school, pass a licensing examination, and complete 1 to 7 years of graduate medical education. (See physicians and surgeons elsewhere in the *Handbook*.) It is particularly helpful for medical scientists to earn both Ph.D. and medical degrees.

Students planning careers as medical scientists should have a bachelor's degree in a biological science. In addition to required courses in chemistry and biology, undergraduates should study allied disciplines such as mathematics, physics, and computer science, or courses in their field of interest. Once they have completed undergraduate studies, they can then select a specialty area for their advanced degree, such as cytology, genomics, or pathology. In addition to formal education, medical scientists usually spend several years in a postdoctoral position before they apply for permanent jobs. Postdoctoral work provides valuable laboratory experience, including experience in specific processes and techniques such as gene splicing, which is transferable to other research projects. In some institutions, the postdoctoral position can lead to a permanent job.

Medical scientists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both orally and in writing. Those in private industry, especially those who aspire to consulting and administrative positions, should possess strong communication skills so they can provide instruction and advice to physicians and other healthcare professionals.

The minimum educational requirement for epidemiology is a master's degree from a school of public health. Some jobs require a Ph.D. or medical degree, depending on the work performed. Epidemiologists who work in hospitals and healthcare centers often must have a medical degree with specific training in infectious diseases. Currently, 134 infectious disease training programs exist in 42 States. Some employees in research epidemiology positions are required to be licensed physicians, as they are required to administer drugs in clinical trials.

Epidemiologists who perform laboratory tests often require the knowledge and expertise of a licensed physician in order to administer drugs to patients in clinical trials. Epidemiologists who are not physicians frequently work closely with one.

Very few students select epidemiology for undergraduate study. Undergraduates, nonetheless, should study biological sciences and should have a solid background in chemistry, mathematics, and computer science. Once a student is prepared for graduate studies, he or she can choose a specialty within epidemiology. For example, those interested in studying environmental epidemiology should focus on environmental coursework, such as water pollution, air pollution, or pesticide use. The core work of environmental studies includes toxicology and molecular biology, and students may continue with advanced coursework in environmental or occupational epidemiology. Some epidemiologists are registered nurses and medical technologists seeking advancement.

Job Outlook

Employment of medical scientists is expected to grow faster than the average for all occupations through 2012. Despite projected rapid job growth for medical scientists, doctoral degree holders can expect to face considerable competition for basic research positions. The Federal Government funds much basic research and development, including many areas of medical research. Recent budget increases at the National Institutes of Health have led to large increases in Federal basic research and development expenditures, with the number of grants awarded to researchers growing in number and dollar amount. At the same time, the number of newly trained medical scientists has continued to increase at least as fast as employment opportunities, so both new and established scientists have experienced greater difficulty winning and renewing research grants. If the number of advanced degrees awarded continues to grow unabated, as expected, this competitive situation is likely to persist.

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Medical scientists enjoyed rapid gains in employment between the mid-1980s and mid-1990s, in part reflecting increased staffing requirements in new biotechnology companies. Employment growth should slow somewhat as increases in the number of new biotechnology firms slow and existing firms merge or are absorbed into larger ones. However, much of the basic medical research done in recent years has resulted in new knowledge, including the isolation and identification of new genes. Medical scientists will be needed to take this knowledge to the next stage, which is understanding how certain genes function within an entire organism, so that gene therapies can be developed to treat diseases. Even pharmaceutical and other firms not solely engaged in biotechnology are expected to increasingly use biotechnology techniques, thus creating employment for medical scientists.

Expected expansion in research related to health issues such as AIDS, cancer, and Alzheimer's disease also should result in employment growth. Although medical scientists greatly contributed to developing many vaccines and antibiotics, more medical research will be required to better understand these and other epidemics and to improve human health.

Opportunities in epidemiology also should be highly competitive, as the number of available positions remains limited. However, an increasing focus on monitoring patients at hospitals and healthcare centers to ensure positive patient outcomes will contribute to job growth. In addition, a heightened awareness of bioterrorism and infectious diseases such as West Nile Virus or SARS should also spur demand for these workers. As hospitals enhance their infection control programs, many will seek to boost the quality and quantity of their staff. Besides job openings due to employment growth, additional openings will result as workers leave the labor force or transfer to other occupations. Because employment of epidemiologists is somewhat tied to the healthcare industry, industry conditions will influence occupational demand.

Medical scientists and some epidemiologists are less likely to lose their jobs during recessions than are those in many other occupations because they are employed on long-term research projects. However, a recession could influence the amount of money allocated to new research and development efforts, particularly in areas of risky or innovative medical research. A recession also could limit the possibility of extension or renewal of existing projects.

Earnings

Median annual earnings of medical scientists, except epidemiologists, were $56,980 in 2002. The middle 50 percent earned between $40,180 and $82,720. The lowest 10 percent earned less than $29,980, and the highest 10 percent earned more than $114,640. Median annual earnings in the industries employing the largest numbers of medical scientists in 2002 were:

Pharmaceutical and medicine manufacturing	$72,330
Scientific research and development services	61,470
General medical and surgical hospitals	50,660
Colleges, universities, and professional schools	35,520

Median annual earnings of epidemiologists were $53,840 in 2002. The middle 50 percent earned between $44,900 and $66,510. The lowest 10 percent earned less than $35,910, and the highest 10 percent earned more than $85,930.

Related Occupations

Many other occupations deal with living organisms and require a level of training similar to that of medical scientists. These include biological scientists, agricultural and food scientists, and health occupations such as physicians and surgeons, dentists, and veterinarians.

Sources of Additional Information

For a brochure entitled *Is a Career in the Pharmaceutical Sciences Right for Me?*, contact:

➤ American Association of Pharmaceutical Scientists (AAPS), 2107 Wilson Blvd., Suite #700, Arlington, VA 22201.

For a career brochure entitled *A Million and One,* contact:

➤ American Society for Microbiology, Education Department, 1752 N St. NW., Washington, D.C. 20036-2804. Internet: **http://www.asmusa.org**

For information on infectious diseases training programs, contact:

➤ Infectious Diseases Society of America, Guide to Training Programs, 66 Canal Center Plaza, Suite # 600, Alexandria, VA 22314. Internet: **http://www.idsociety.org**

Information on obtaining a medical scientist position with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Physical Scientists

Atmospheric Scientists

(0*NET 19-2021.00)

Significant Points

- Almost 4 in 10 atmospheric scientists work for the Federal Government, which is the largest employer of such workers.
- A bachelor's degree in meteorology, or in a closely related field with courses in meteorology, is the minimum educational requirement; a master's degree is necessary for some positions, and a Ph.D. is required for most research positions.

Nature of the Work

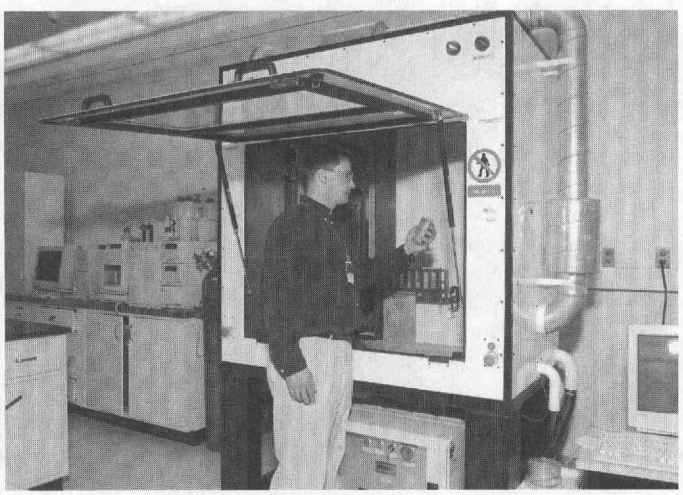
Atmospheric science is the study of the atmosphere—the blanket of air covering the Earth. *Atmospheric scientists*, commonly called *meteorologists*, study the atmosphere's physical characteristics, motions, and processes, and the way in which it affects the rest of our environment. The best known application of this knowledge is in forecasting the weather. Aside from predicting the weather, scientists also attempt to identify and interpret climate trends, understand past weather, and analyze today's weather. However, weather information and meteorological research also are applied in air-pollution control, agriculture, forestry, air and sea transportation, defense, and the study of possible trends in the Earth's climate, such as global warming, droughts, or ozone depletion.

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Atmospheric scientists who forecast the weather, known professionally as *operational meteorologists*, are the largest group of specialists. They study information on air pressure, temperature, humidity, and wind velocity; and apply physical and mathematical relationships to make short-range and long-range weather forecasts. Their data come from weather satellites, weather radars, sensors, and weather stations in many parts of the world. Meteorologists use sophisticated computer models of the world's atmosphere to make long-term, short-term, and local-area forecasts. More accurate instruments for measuring and observing weather conditions, as well as high-speed computers to process and analyze weather data, have revolutionized weather forecasting. Using satellite data, climate theory, and sophisticated computer models of the world's atmosphere, meteorologists can more effectively interpret the results of these models to make local-area weather predictions. These forecasts inform not only the general public, but also those who need accurate weather information for both economic and safety reasons, such as the shipping, air transportation, agriculture, fishing, forestry, and utilities industries.

The use of weather balloons, launched a few times a day to measure wind, temperature, and humidity in the upper atmosphere, is currently supplemented by sophisticated atmospheric monitoring equipment that transmits data as frequently as every few minutes. Doppler radar, for example, can detect airflow patterns in violent storm systems—allowing forecasters to better predict tornadoes and other hazardous winds, and to monitor the storms' direction and intensity. Combined radar and satellite observations allow meteorologists to predict flash floods.

Some atmospheric scientists work in research. *Physical meteorologists*, for example, study the atmosphere's chemical and physical properties; the transmission of light, sound, and radio waves; and the transfer of energy in the atmosphere. They also study factors affecting the formation of clouds, rain, and snow; the dispersal of air pollutants over urban areas; and other weather phenomena, such as the mechanics of severe storms. *Synoptic meteorologists* develop new tools for weather forecasting using computers and sophisticated mathematical models of atmospheric activity. *Climatologists* study climactic variations spanning hundreds or even millions of years. They also may collect, analyze, and interpret past records of wind, rainfall, sunshine, and temperature in specific areas or regions. Their studies are used to design buildings, plan heating and cooling systems, and aid in effective land use and agricultural production. Environmental problems, such as pollution and shortages of fresh water, have widened the scope of the meteorological profession. *Environmental meteorologists* study these problems and may evaluate and report on air quality for environmental impact statements. Other research meteorologists examine the most effective ways to control or diminish air pollution.



Atmospheric scientists utilize sophisticated instruments and high-speed computers to predict weather and identify climate trends.

Working Conditions

Most weather stations operate around the clock, 7 days a week. Jobs in such facilities usually involve night, weekend, and holiday work, often with rotating shifts. During weather emergencies, such as hurricanes, operational meteorologists may work overtime. Operational meteorologists also are often under pressure to meet forecast deadlines. Weather stations are found everywhere—at airports, in or near cities, and in isolated and remote areas. Some atmospheric scientists also spend time observing weather conditions and collecting data from aircraft. Weather forecasters who work for radio or television stations broadcast their reports from station studios, and may work evenings and weekends. Meteorologists in smaller weather offices often work alone; in larger ones, they work as part of a team. Meteorologists not involved in forecasting tasks work regular hours, usually in offices. Those who work for private consulting firms or for companies analyzing and monitoring emissions to improve air quality usually work with other scientists or engineers; fieldwork and travel may be common for these workers.

Employment

Atmospheric scientists held about 7,700 jobs in 2002. The Federal Government was the largest single employer of civilian meteorologists, accounting for about 2,900. The National Oceanic and Atmospheric Administration (NOAA) employed most Federal meteorologists in National Weather Service stations throughout the Nation; the remainder of NOAA's meteorologists worked mainly in research and development or management. The U.S. Department of Defense employed several hundred civilian meteorologists. Others worked for professional, scientific, and technical services firms, including private weather consulting services; radio and television broadcasting; air carriers; and State government.

Although several hundred people teach atmospheric science and related courses in college and university departments of meteorology or atmospheric science, physics, earth science, or geophysics, these individuals are classified as college or university faculty, rather than atmospheric scientists. (See the statement on postsecondary teachers elsewhere in the *Handbook*.)

In addition to civilian meteorologists, hundreds of Armed Forces members are involved in forecasting and other meteorological work. (See the statement on job opportunities in the Armed Forces elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

A bachelor's degree in meteorology or atmospheric science, or in a closely related field with courses in meteorology, usually is the minimum educational requirement for an entry-level position as an atmospheric scientist.

The preferred educational requirement for entry-level meteorologists in the Federal Government is a bachelor's degree—not necessarily in meteorology—with at least 24 semester hours of meteorology courses, including 6 hours in the analysis and prediction of weather systems, 6 hours of atmospheric dynamics

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and thermodynamics, 3 hours of physical meteorology, and 2 hours of remote sensing of the atmosphere or instrumentation. Other required courses include 3 semester hours of ordinary differential equations, 6 hours of college physics, and at least 9 hours of courses appropriate for a physical science major—such as statistics, chemistry, physical oceanography, physical climatology, physical hydrology, radiative transfer, aeronomy, advanced thermodynamics, advanced electricity and magnetism, light and optics, and computer science. Sometimes, a combination of education and appropriate experience may be substituted for a degree.

Although positions in operational meteorology are available for those with only a bachelor's degree, obtaining a second bachelor's degree or a master's degree enhances employment opportunities and advancement potential. A master's degree usually is necessary for conducting applied research and development, and a Ph.D. is required for most basic research positions. Students planning on a career in research and development need not necessarily major in atmospheric science or meteorology as an undergraduate. In fact, a bachelor's degree in mathematics, physics, or engineering provides excellent preparation for graduate study in atmospheric science.

Because atmospheric science is a small field, relatively few colleges and universities offer degrees in meteorology or atmospheric science, although many departments of physics, earth science, geography, and geophysics offer atmospheric science and related courses. Prospective students should make certain that courses required by the National Weather Service and other employers are offered at the college they are considering. Computer science courses, additional meteorology courses, a strong background in mathematics and physics, and good communication skills are important to prospective employers. Many programs combine the study of meteorology with another field, such as agriculture, oceanography, engineering, or physics. For example, hydrometeorology is the blending of hydrology (the science of Earth's water) and meteorology, and is the field concerned with the effect of precipitation on the hydrologic cycle and the environment. Students who wish to become broadcast meteorologists for radio or television stations should develop excellent communication skills through courses in speech, journalism, and related fields. Those interested in air quality work should take courses in chemistry and supplement their technical training with coursework in policy or government affairs. Prospective meteorologists seeking opportunities at weather consulting firms should possess knowledge of business, statistics, and economics, as an increasing emphasis is being placed on long-range seasonal forecasting to assist businesses.

Beginning atmospheric scientists often do routine data collection, computation, or analysis, and some basic forecasting. Entry-level operational meteorologists in the Federal Government usually are placed in intern positions for training and experience. During this period, they learn about the Weather Service's forecasting equipment and procedures, and rotate to different offices to learn about various weather systems. After completing the training period, they are assigned a permanent duty station. Experienced meteorologists may advance to supervisory or administrative jobs, or may handle more complex forecasting jobs. After several years of experience, some meteorologists establish their own weather consulting services.

The American Meteorological Society offers professional certification of consulting meteorologists, administered by a Board of Certified Consulting Meteorologists. Applicants must meet formal education requirements (though not necessarily have a college degree), pass an examination to demonstrate thorough meteorological knowledge, have a minimum of 5 years of experience or a combination of experience plus an advanced degree, and provide character references from fellow professionals.

Job Outlook

Employment of atmospheric scientists is projected to increase about as fast as the average for all occupations through 2012. The National Weather Service has completed an extensive modernization of its weather forecasting equipment and finished all hiring of meteorologists needed to staff the upgraded stations. The Service has no plans to increase the number of weather stations or the number of meteorologists in existing stations. Employment of meteorologists in other Federal agencies is expected to remain stable.

On the other hand, job opportunities for atmospheric scientists in private industry are expected to be better than for those in the Federal Government over the 2002-12 period. As research leads to continuing improvements in weather forecasting, demand should grow for private weather consulting firms to provide more detailed information than has formerly been available, especially to weather-sensitive industries. Farmers, commodity investors, radio and television stations, and utilities, transportation, and construction firms can greatly benefit from additional weather information more closely targeted to their needs than the general information provided by the National Weather Service. Additionally, research on seasonal and other long-range forecasting is yielding positive results, which should spur demand for more atmospheric scientists to interpret these forecasts and advise weather-sensitive industries. However, because many customers for private weather services are in industries sensitive to fluctuations in the economy, the sales and growth of private weather services depend on the health of the economy.

There will continue to be demand for atmospheric scientists to analyze and monitor the dispersion of pollutants into the air to ensure compliance with Federal environmental regulations outlined in the Clean Air Act of 1990, but related employment increases are expected to be small. Opportunities in broadcasting are rare and highly competitive, making for very few job openings.

Earnings

Median annual earnings of atmospheric scientists in 2002 were $60,200. The middle 50 percent earned between $39,970 and $76,880. The lowest 10 percent earned less than $30,220, and the highest 10 percent earned more than $92,430.

The average salary for meteorologists in nonsupervisory, supervisory, and managerial positions employed by the Federal Government was about $74,528 in 2003. Meteorologists in the Federal Government with a bachelor's degree and no experience received a starting salary of $23,442 or $29,037, depending on their college grades. Those with a master's degree could start at $35,519 or $42,976; those with the Ph.D., at $51,508. Beginning salaries for all degree levels are slightly higher in areas of the country where the prevailing local pay level is higher.

Related Occupations

Workers in other occupations concerned with the physical environment include environmental scientists and geoscientists, physicists and astronomers, mathematicians, and civil, chemical, and environmental engineers.

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Sources of Additional Information

Information about careers in meteorology is available on the Internet from:

❮➤American Meteorological Society. Internet: **http://www.ametsoc.org/AMS. Phone: (617)-227-2425.**

Information on obtaining a meteorologist position with the Federal Government is available from the U.S. Office of Personnel Management through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the Internet site: **http://www.usajobs.opm.gov**.

Chemists and Materials Scientists

(0*NET 19-2031.00, 19-2032.00)

Significant Points

- A bachelor's degree in chemistry or a related discipline is the minimum educational requirement; however, many research jobs require a Ph.D.
- Job growth will be concentrated in pharmaceutical and medicine manufacturing companies and in scientific research and development services firms.
- Graduates with a master's degree, and particularly those with a Ph.D., will enjoy better opportunities than those with a bachelor's degree.

Nature of the Work

Everything in the environment, whether naturally occurring or of human design, is composed of chemicals. Chemists and materials scientists search for and use new knowledge about chemicals. Chemical research has led to the discovery and development of new and improved synthetic fibers, paints, adhesives, drugs, cosmetics, electronic components, lubricants, and thousands of other products. Chemists and materials scientists also develop processes that save energy and reduce pollution, such as improved oil refining and petrochemical processing methods. Research on the chemistry of living things spurs advances in medicine, agriculture, food processing, and other fields.

Materials scientists research and study the structures and chemical properties of various materials to develop new products or enhance existing ones. They also determine ways to strengthen or combine materials or develop new materials for use in a variety of products. Materials science encompasses the natural and synthetic materials used in a wide range of products and structures, from airplanes, cars, and bridges to clothing and household goods. Companies whose products are made of metals, ceramics, and rubber employ most materials scientists. Other applications of materials science include studies of superconducting materials, graphite materials, integrated-circuit chips, and fuel cells. Materials scientists, applying chemistry and physics, study all aspects of these materials. Chemistry plays an increasingly dominant role in materials science, because it provides information about the structure and composition of materials. Materials scientists often specialize in specific areas such as ceramics or metals.

Many chemists and materials scientists work in research and development (R&D). In basic research, they investigate properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances. In applied R&D, they create new products and processes or improve existing ones, often using knowledge gained from basic research. For example, synthetic rubber and plastics resulted from research on small molecules uniting to form large ones, a process called polymerization. R&D chemists and materials scientists use computers and a wide variety of sophisticated laboratory instrumentation for modeling and simulation in their work.

The use of computers to analyze complex data has had the dramatic impact of allowing chemists and materials scientists to practice combinatorial chemistry. This technique makes and tests large quantities of chemical compounds simultaneously in order to find compounds with certain desired properties. As an integral part of drug and materials discovery, combinatorial chemistry speeds up materials design and R&D, permitting useful compounds to be developed more quickly and inexpensively than was formerly possible. Combinatorial chemistry has allowed chemists to produce thousands of compounds each year and to assist in the completion of the sequencing of human genes. Today, chemists are working with life scientists to translate this knowledge into viable new drugs.

Chemists also work in production and quality control in chemical manufacturing plants. They prepare instructions for plant workers that specify ingredients, mixing times, and temperatures for each stage in the process. They also monitor automated processes to ensure proper product yield, and test samples of raw materials or finished products to make certain that they meet industry and government standards, including the regulations governing pollution. Chemists report and document test results and analyze those results in hopes of further improving existing theories or developing new test methods.

Chemists often specialize. *Analytical chemists* determine the structure, composition, and nature of substances by examining and identifying the various elements or compounds that make up a substance. These chemists are absolutely crucial to the pharmaceutical industry because pharmaceutical companies need to know the identity of compounds that they hope to turn into drugs. Furthermore, they study the relations and interactions of the parts of compounds and develop analytical techniques. They also identify the presence and concentration of chemical pollutants in air, water, and soil. *Organic chemists* study the chemistry of the vast number of carbon compounds that make up all living things. Organic chemists who synthesize elements or simple compounds to create new compounds or substances that have different properties and applications have developed many commercial products, such as drugs, plastics, and elastomers (elastic substances similar to rubber). *Inorganic chemists* study compounds consisting mainly of elements other than carbon, such as those in electronic components. *Physical* and *theoretical chemists* study the physical characteristics of atoms and molecules and the theoretical properties of matter, and investigate how chemical reactions work. Their research may result in new and better energy sources. *Macromolecular chemists* study the behavior of atoms and molecules. *Medicinal chemists* study the structural properties of compounds intended for applications to human medicine. *Materials chemists* study and develop new materials to improve existing products or make new ones. In fact, virtually all chemists are involved in this quest in one way or another. Developments in the field of chemistry that involve life sciences will expand, resulting in more interaction among biologists, engineers, and chemists. (*Bio-*

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chemists, whose work encompasses both biology and chemistry, are discussed in the *Handbook* s tatement on biological scientists.)

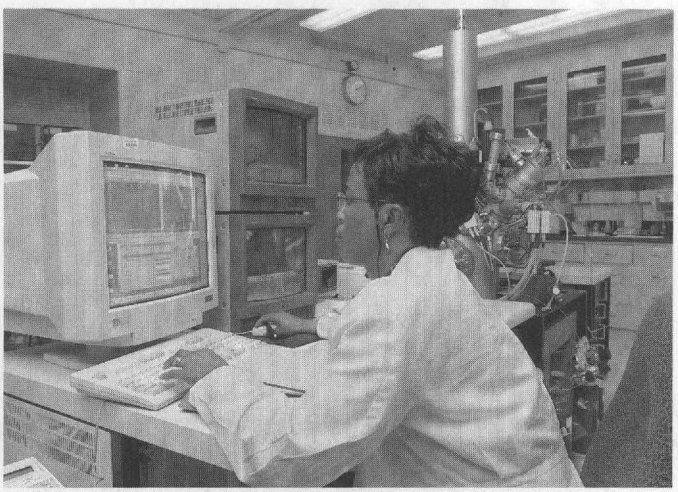
Working Conditions

Chemists and materials scientists usually work regular hours in offices and laboratories. R&D chemists and materials scientists spend much time in laboratories, but also work in offices when they do theoretical research or plan, record, and report on their lab research. Although some laboratories are small, others are large enough to incorporate prototype chemical manufacturing facilities as well as advanced equipment for chemists. In addition to working in a laboratory, materials scientists also work with engineers and processing specialists in industrial manufacturing facilities. After a material is sold, materials scientists often help customers tailor the material to suit their needs. Chemists do some of their work in a chemical plant or outdoors—while gathering water samples to test for pollutants, for example. Some chemists are exposed to health or safety hazards when handling certain chemicals, but there is little risk if proper procedures are followed.

Employment

Chemists and materials scientists held about 91,000 jobs in 2002. About 44 percent of all chemists and material scientists are employed in manufacturing firms—mostly in the chemical manufacturing industry, which includes firms that produce plastics and synthetic materials, drugs, soaps and cleaners, pesticides and fertilizers, paint, industrial organic chemicals, and other chemical products. About 15 percent of chemists and material scientists work in scientific research and development services; another 13 percent work in architectural, engineering, and related services. In addition, thousands of persons with a background in chemistry and materials science hold teaching positions in high schools and in colleges and universities. (See the statements on teachers—postsecondary, and teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

Chemists and materials scientists are employed in all parts of the country, but they are mainly concentrated in large industrial areas.



The use of computers allows chemists to test large quantities of chemical compounds with desired properties.

Training, Other Qualifications, and Advancement

A bachelor's degree in chemistry or a related discipline usually is the minimum educational requirement for entry-level chemist jobs. However, many research jobs require a master's degree, or more often a Ph.D. While some materials scientists hold a degree in materials science, a bachelor's degree in chemistry, physics, or electric engineering also is accepted. Similar to chemists, many R&D jobs require a Ph.D. in materials science or a related science.

Many colleges and universities offer a bachelor's degree program in chemistry; about 620 are approved by the American Chemical Society (ACS). The number of colleges that offer a degree program in materials science is small, but gradually increasing. Several hundred colleges and universities also offer advanced degree programs in chemistry; around 320 master's programs and about 190 doctoral programs are ACS-approved.

Students planning careers as chemists and materials scientists should take courses in science and mathematics, should like working with their hands building scientific apparatus and performing laboratory experiments, and should like computer modeling. Perseverance, curiosity, and the ability to concentrate on detail and to work independently are essential. Interaction among specialists in this field is increasing, especially for chemists in drug development. One type of chemist often relies on the findings of another type of chemist. For example, an organic chemist must understand findings on the identity of compounds prepared by an analytical chemist.

In addition to required courses in analytical, inorganic, organic, and physical chemistry, undergraduate chemistry majors usually study biological sciences, mathematics, and physics. Those interested in the environmental field also should take courses in environmental studies and become familiar with current legislation and regulations. Computer courses are essential, because employers prefer job applicants who are able to apply computer skills to modeling and simulation tasks and operate computerized laboratory equipment. This is increasingly important as combinatorial chemistry techniques are more widely applied. Additionally, courses in statistics are useful because both chemists and materials scientists need the ability to apply basic statistical techniques.

Because R&D chemists and materials scientists are increasingly expected to work on interdisciplinary teams, some understanding of other disciplines, including business and marketing or economics, is desirable, along with leadership ability and good oral and written communication skills. Experience, either in academic laboratories or through internships, fellowships, or work-study programs in industry, also is useful. Some employers of research chemists, particularly in the pharmaceutical industry, prefer to hire individuals with several years of postdoctoral experience.

Graduate students typically specialize in a subfield of chemistry, such as analytical chemistry or polymer chemistry, depending on their interests and the kind of work they wish to do. For example, those interested in doing drug research in the pharmaceutical industry usually develop a strong background in synthetic organic chemistry. However, students normally need not specialize at the undergraduate level. In fact, undergraduates who are broadly trained have more flexibility when job hunting or changing jobs than if they had narrowly defined their interests. Most employers provide new graduates additional training or education.

In government or industry, beginning chemists with a bachelor's degree work in quality control, perform analytical

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testing, or assist senior chemists in R&D laboratories. Many employers prefer chemists and materials scientists with a Ph.D., or at least a master's degree, to lead basic and applied research. Nonetheless, relevant work experience is an asset. Chemists who hold a Ph.D. and have previous industrial experience may be particularly attractive to employers because such people are more likely to understand the complex regulations that apply to the pharmaceutical industry. Within materials science, a broad background in various sciences is preferred. This broad base may be obtained through degrees in physics, engineering, or chemistry. While many companies prefer hiring Ph.D.s, many materials scientists have bachelor's and master's degrees.

Job Outlook

Employment of chemists is expected to grow about as fast as the average for all occupations through 2012. Job growth will be concentrated in pharmaceutical and medicine manufacturing and in scientific research and development services firms. The chemical industry, the major employer of chemists, should face continued demand for goods such as new and better pharmaceuticals and personal care products, as well as for more specialty chemicals designed to address specific problems or applications. To meet these demands, some chemical firms will continue to devote money to research and development—through in-house teams or outside contractors—spurring employment growth of chemists. Those with at least a master's degree, and particularly those with a Ph.D., will enjoy better opportunities than those with just a bachelor's degree for most research and upper management positions. Opportunities for individuals with a bachelor's degree are expected to be more competitive. The number of science-related jobs in sales, marketing, and middle management, for which bachelor's and master's degree holders may qualify, are expected to be fewer as companies continue to streamline their operations. Some bachelor's and master's degree holders become chemical technicians or technologists or high school chemistry teachers.

Within the chemical industry, job opportunities are expected to be most plentiful in pharmaceutical and biotechnology firms. Biotechnological research, including studies of human genes, continues to offer possibilities for the development of new drugs and products to combat illnesses and diseases that have previously been unresponsive to treatments derived by traditional chemical processes. Stronger competition among drug companies and an aging population are contributing to the need for innovative and improved drugs discovered through scientific research.

Employment in the remaining segments of the chemical industry is expected to decline as companies downsize and turn to outside contractors to provide specialized services. As a result, scientific research and development services firms will experience healthy growth. To control costs, some chemical companies, including drug manufacturers, are increasingly turning to these firms to perform specialized research and other work formerly done by in-house chemists. Despite downsizing, some job openings will result from the need to replace chemists who retire or otherwise leave the labor force. Quality control will continue to be an important issue in chemical manufacturing and other industries that use chemicals in their manufacturing processes. Chemists also will be needed to develop and improve the technologies and processes used to produce chemicals for all purposes, and to monitor and measure air and water pollutants to ensure compliance with local, State, and Federal environmental regulations. Environmental research will offer many new opportunities for chemists and materials scientists. To satisfy public concerns and to comply with government regulations, the chemical industry will continue to invest billions of dollars each year in technology that reduces pollution and cleans up existing wastesites. Chemists also are needed to find ways to use less energy and to discover new sources of energy.

During periods of economic recession, layoffs of chemists may occur—especially in the industrial chemicals industry. This industry provides many of the raw materials to the auto manufacturing and construction industries, both of which are vulnerable to temporary slowdowns during recessions.

Earnings

Median annual earnings of chemists in 2002 were $52,890. The middle 50 percent earned between $39,410 and $71,710. The lowest 10 percent earned less than $30,980, and the highest 10 percent earned more than $92,170. Median annual earnings of materials scientists in 2002 were $64,590. The middle 50 percent earned between $46,280 and $86,240. The lowest 10 percent earned less than $33,480, and the highest 10 percent earned more than $107,400. Median annual earnings in the industries employing the largest numbers of chemists in 2002 were:

Federal government	$72,010
Scientific research and development services	60,400
Pharmaceutical and medicine manufacturing	53,070
Architectural, engineering, and related services	38,780

The American Chemical Society reports that the median salary of all of its members with a bachelor's degree was $32,800 a year in 2002; for those with a master's degree, it was $50,000; and for those with a Ph.D., it was $68,000. Median salaries were highest for those working in private industry; those in academia earned the least. According to an ACS survey of recent graduates, inexperienced chemistry graduates with a bachelor's degree earned a median starting salary of $31,000 in 2002; those with a master's degree earned a median salary of $45,000; and those with a Ph.D. made median earnings of $67,500. Among bachelor's degree graduates, those who had completed internships or had other work experience while in school commanded the highest starting salaries.

In 2003, chemists in nonsupervisory, supervisory, and managerial positions in the Federal Government averaged $76,857 a year.

Related Occupations

The research and analysis conducted by chemists and materials scientists is closely related to work done by agricultural and food scientists, biological scientists, medical scientists, chemical engineers, materials engineers, physicists, and science technicians.

Sources of Additional Information

General information on career opportunities and earnings for chemists is available from:

❮➤American Chemical Society, Education Division, 1155 16th St. NW., Washington, DC 20036. Internet: **http://www.acs.org**

For general information on materials science, contact:

❮➤Materials Research Society (MRS), 506 Keystone Dr., Warrendale, PA 15086-7573. Internet: **http://www.mrs.org**

Information on obtaining a position as a chemist with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local

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number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Environmental Scientists and Geoscientists

(0*NET 19-2041.00, 19-2042.01, 19-2043.00)

Significant Points

- Work at remote field sites is common.
- Federal, State, and local governments employ nearly one-half of all environmental scientists and geoscientists.
- A bachelor's degree is adequate for a few entry-level jobs, but a master's degree is usually the minimum educational requirement; a Ph.D. degree is required for most high-level research positions.
- Employment of geoscientists is expected to grow as fast as average, while environmental scientists and hydrologists will experience faster than average growth.

Nature of the Work

Environmental scientists and geoscientists use their knowledge of the physical makeup and history of the Earth to protect the environment; locate water, mineral, and energy resources; predict future geologic hazards; and offer advice on construction and land-use projects.

Environmental scientists conduct research to identify and abate or eliminate sources of pollutants that affect people, wildlife, and their environments. These workers analyze and report measurements and observations of air, water, soil, and other sources and make recommendations on how best to clean and preserve the environment. Understanding the issues involved in protecting the environment—degradation, conservation, recycling, and replenishment—is central to the work of environmental scientists, who often use their skills and knowledge to design and monitor waste disposal sites, preserve water supplies, and reclaim contaminated land and water to comply with Federal environmental regulations.

Many environmental scientists do work and have training that is similar to other physical or life scientists, but is applied to environmental areas. Many specialize in some specific area, such as environmental ecology and conservation, environmental chemistry, environmental biology, or fisheries science. Most environmental scientists are further classified by the specific activity they perform (although recent advances in the understanding of basic life processes within the ecosystem have blurred some traditional classifications). For example, *environmental ecologists* study the relationships between organisms and their environments and the effects of influences such as population size, pollutants, rainfall, temperature, and altitude. Utilizing their knowledge of various scientific disciplines, they may collect, study, and report data on air, food, soil, and water. *Ecological modelers* study ecosystems, the control of environmental pollution, and the management of resources. These environmental scientists may use mathematical modeling, systems analysis, thermodynamics, and computer techniques. *Environmental chemists* may study the toxicity of various chemicals—how those chemicals affect plants, animals, and people. *Geochemists* study the nature and distribution of chemical elements in ground water and Earth materials.

Some environmental scientists work in managerial positions, usually after spending some time performing research or learning about environmental laws and regulations. Many work as consultants to business firms or to government agencies, helping them comply with environmental policy, particularly with regard to ground-water contamination and flood control. Environmental scientists who determine policy may help identify how human behavior can be modified in the future to avoid such problems as ground-water contamination and depletion of the ozone layer.

Geoscientists study the composition, structure, and other physical aspects of the Earth. With the use of sophisticated instruments and by analyzing the composition of the earth and water, geoscientists study the Earth's geologic past and present. Many geoscientists are involved in searching for oil and gas, while others work closely with environmental scientists in preserving and cleaning up the environment.

Geoscientists usually study, and are subsequently classified into, one of several closely related fields of geoscience. *Geologists* study the composition, processes, and history of the Earth. They try to find out how rocks were formed and what has happened to them since their formation. They also study the evolution of life by analyzing plant and animal fossils. *Geophysicists* use the principles of physics, mathematics, and chemistry to study not only the Earth's surface, but also its internal composition; ground and surface waters; atmosphere; oceans; and magnetic, electrical, and gravitational forces.

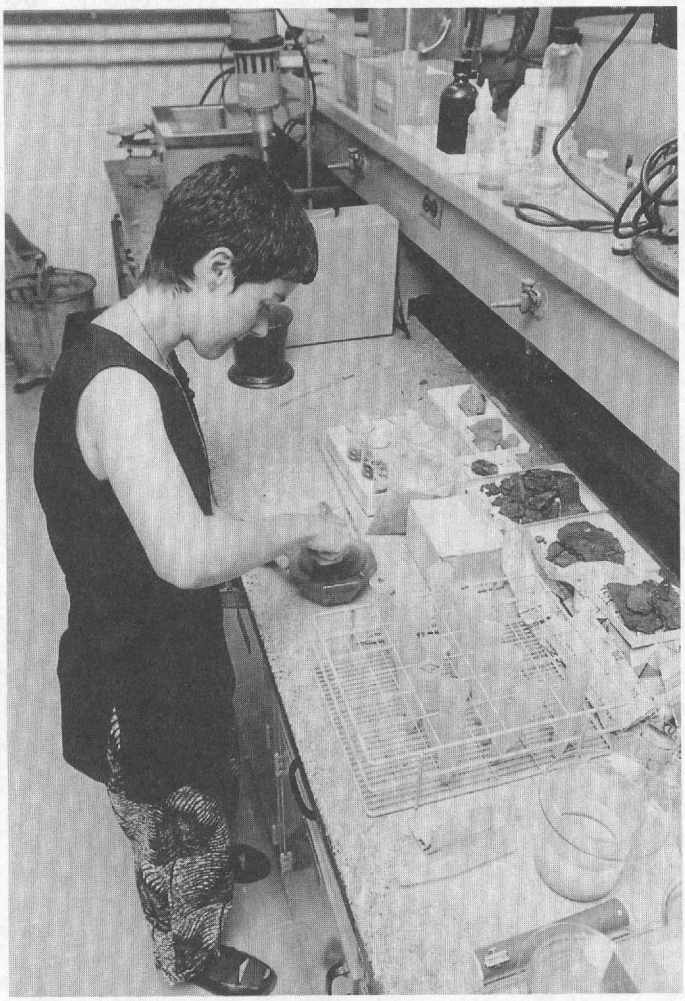
Oceanographers use their knowledge of geology and geophysics, in addition to biology and chemistry, to study the world's oceans and coastal waters. They study the motion and circulation of the ocean waters; the physical and chemical properties of the oceans; and how these properties affect coastal areas, climate, and weather. Oceanographers are further broken down according to their areas of expertise. For example, *physical oceanographers* study the ocean tides, waves, currents, temperatures, density, and salinity. They examine the interaction of various forms of energy, such as light, radar, sound, heat, and wind, with the sea, in addition to investigating the relationship between the sea, weather, and climate. *Chemical oceanographers* study the distribution of chemical compounds and chemical interactions that occur in the ocean and on the sea floor. They may investigate how pollution affects the chemistry of the ocean. *Geological and geophysical oceanographers* study the topographic features and the physical makeup of the ocean floor. Their knowledge can help companies find oil and gas off coastal waters. (*Biological oceanographers*, often called marine biologists, study the distribution and migration patterns of the many diverse forms of sea life in the ocean, but because they are considered biological scientists, they are not covered in this statement on environmental scientists and geoscientists. See instead the statement on biological scientists elsewhere in the *Handbook*.)

Geoscientists can spend a large part of their time in the field, identifying and examining rocks, studying information collected by remote sensing instruments in satellites, conducting geological surveys, constructing field maps, and using instruments to measure the Earth's gravity and magnetic field. For example, they often perform seismic studies, which involve bouncing

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energy waves off buried rock layers, to search for oil and gas or to understand the structure of subsurface rock layers. Seismic signals generated by an earthquake are used to determine the earthquake's location and intensity. In laboratories, geologists and geophysicists examine the chemical and physical properties of specimens. They study fossil remains of animal and plant life or experiment with the flow of water and oil through rocks.

Numerous specialties that further differentiate the type of work geoscientists do fall under the two major disciplines of geology and geophysics. For example, *petroleum geologists* explore for oil and gas deposits by studying and mapping the subsurface of the ocean or land. They use sophisticated geophysical instrumentation and computers to interpret geological information. *Engineering geologists* apply geologic principles to the fields of civil and environmental engineering, offering advice on major construction projects and assisting in environmental remediation and natural hazard reduction projects. *Mineralogists* analyze and classify minerals and precious stones according to their composition and structure. They study the environment surrounding rocks in order to find new mineral resources. *Paleontologists* study fossils found in geological formations to trace the evolution of plant and animal life and the geologic history of the Earth. *Stratigraphers* examine the formation and layering of rocks to understand the environment in which they were formed. *Volcanologists* investigate volcanoes and volcanic phenomena to try to predict the potential for future eruptions and possible hazards to human health and welfare. *Hydrologists* study the quantity, distribution, circulation, and physical properties of underground and surface waters. They examine the form and intensity of precipitation, its rate of infiltration into the soil, its movement through the earth, and its return to the ocean and atmosphere. The work hydrologists do is particularly important in environmental preservation, remediation, and flood control.



Some environmental scientists and geoscientists spend the majority of their time in an office, but many others divide their time between fieldwork and laboratory work.

Geophysicists specialize in areas such as geodesy, seismology, or magnetic geophysics. *Geodesists* study the Earth's size, shape, gravitational field, tides, polar motion, and rotation. *Seismologists* interpret data from seismographs and other geophysical instruments to detect earthquakes and locate earthquake-related faults. *Geomagnetists* measure the Earth's magnetic field and use measurements taken over the past few centuries to devise theoretical models that explain the Earth's origin. *Paleomagnetists* interpret fossil magnetization in rocks and sediments from the continents and oceans to record the spreading of the sea floor, the wandering of the continents, and the many reversals of polarity that the Earth's magnetic field has undergone through time. Other geophysicists study atmospheric sciences and space physics. (See the statements on atmospheric scientists, and physicists and astronomers, elsewhere in the *Handbook*.)

Working Conditions

Some environmental scientists and geoscientists spend the majority of their time in an office, but many others divide their time between fieldwork and office or laboratory work. Many environmental scientists, such as environmental ecologists, environmental chemists, and hydrologists, often take field trips that involve physical activity. Environmental scientists in the field may work in warm or cold climates, in all kinds of weather. In their research, they may dig or chip with a hammer, scoop with a net, and carry equipment in a backpack. Oceanographers may spend considerable time at sea on academic research ships. Fieldwork often requires working long hours. Geologists frequently travel to remote field sites by helicopter or four-wheel-drive vehicles and cover large areas on foot. An increasing number of exploration geologists and geophysicists work in foreign countries, sometimes in remote areas and under difficult conditions. Travel often is required to meet with prospective clients or investors.

Environmental scientists and geoscientists in research positions with the Federal Government or in colleges and universities frequently are required to design programs and write grant proposals in order to continue their data collection and research. Environmental scientists and geoscientists in consulting jobs face similar pressures to market their skills and write proposals so that they will have steady work.

Employment

Environmental scientists and geoscientists held about 101,000 jobs in 2002. Environmental scientists accounted for 65,000 of the total; geoscientists, 28,000; and hydrologists, 8,000. Many more individuals held environmental science and geoscience faculty positions in colleges and universities, but they are classified as college and university faculty. (See the statement on teachers-postsecondary elsewhere in the *Handbook*.)

About 47 percent of environmental scientists were employed in State and local governments, 14 percent in architectural, engineering and related services, 13 percent in management,

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scientific, and technical consulting services, and 9 percent in the Federal Government. About 1,900 were self-employed.

Among geoscientists, 30 percent were employed in architectural, engineering, and related services, and 15 percent worked for oil and gas extraction companies. In 2002, the Federal Government employed about 3,000 geoscientists, including geologists, geophysicists, and oceanographers, mostly within the U.S. Department of the Interior for the U.S. Geological Survey (USGS) and within the U.S. Department of Defense. Another 3,400 worked for State agencies, such as State geological surveys and State departments of conservation. Nearly 3 percent of geoscientists were self-employed, most as consultants to industry or government.

Approximately 32 percent of hydrologists worked in the Federal Government in 2002, another 21 percent in architectural, engineering, and related services, 17 percent worked in management, scientific, and technical consulting services, and 16 percent for State governments.

Training, Other Qualifications, and Advancement

A bachelor's degree is adequate for a few entry-level positions, but environmental scientists and geoscientists increasingly need a master's degree in a natural science. A master's degree also is the minimum educational requirement for most entry-level research positions in private industry, Federal agencies, and State geological surveys. A doctoral degree is necessary for most high-level research positions.

Many environmental scientists earn degrees in life science, chemistry, geology, geophysics, atmospheric science, or physics and then, either through further education or through their research interests and work experience, apply their education to environmental areas. Others earn a degree in environmental science. A bachelor's degree in environmental science offers an interdisciplinary approach to the natural sciences, with an emphasis on biology, chemistry, and geology. In addition, undergraduate environmental science majors should focus on data analysis and physical geography, particularly if they are interested in studying pollution abatement, water resources, or ecosystem protection, restoration, or management. Those students interested in working in the environmental or regulatory fields, either in environmental consulting firms or for Federal or State governments, should take courses in hydrology, hazardous waste management, environmental legislation, chemistry, fluid mechanics, and geologic logging. An understanding of environmental regulations and government permit issues also is valuable for those planning to work in mining and oil and gas extraction. Hydrologists and environmental scientists should have some knowledge of the potential liabilities associated with some environmental work. Students interested in the field of hydrology should take courses in the physical sciences, geophysics, chemistry, engineering science, soils, mathematics, aquatic biology, atmospheric science, meteorology, geology, oceanography, or the management or conservation of water resources. In some cases, graduates with a bachelor's degree in a hydrologic science are qualified for positions in environmental consulting and planning regarding water quality or waste-water treatment. Curricula for advanced degrees often emphasize the natural sciences, but not all universities offer all curricula.

Traditional geoscience courses emphasizing classical geologic methods and topics (such as mineralogy, petrology, paleontology, stratigraphy, and structural geology) are important for all geoscientists. Persons studying physics, chemistry, biology, mathematics, engineering, or computer science may also qualify for some geoscience positions if their course work includes study in geology or natural sciences.

Computer skills are essential for prospective environmental scientists and geoscientists; students who have some experience with computer modeling, data analysis and integration, digital mapping, remote sensing, and geographic information systems will be the most prepared entering the job market. A knowledge of the Global Information System (GIS) and Global Positioning System (GPS)—a locator system that uses satellites—also is very helpful. Some employers seek applicants with field experience, so a summer internship may be beneficial to prospective geoscientists.

Environmental scientists and geoscientists must have excellent interpersonal skills, because they usually work as part of a team with other scientists, engineers, and technicians. Strong oral and written communication skills also are important, because writing technical reports and research proposals, as well as communicating research results to others, are important aspects of the work. Because many jobs require foreign travel, knowledge of a second language is becoming an important attribute to employers. Geoscientists must be inquisitive, be able to think logically, and have an open mind. Those involved in fieldwork must have physical stamina.

Environmental scientists and geoscientists often begin their careers in field exploration or as research assistants or technicians in laboratories or offices. They are given more difficult assignments as they gain experience. Eventually, they may be promoted to project leader, program manager, or some other management and research position.

Job Outlook

Overall employment of environmental scientists and geoscientists is expected to grow about as fast as the average for all occupations through 2012. Driving job growth will be public policy, which will force companies and organizations to comply with environmental laws and regulations, particularly those regarding ground-water contamination, clean air, and flood control.

Projected employment growth varies by occupational specialty. Environmental scientists and hydrologists are expected to grow faster than average. A general heightened awareness regarding the need to monitor the quality of the environment, to interpret the impact of human actions on terrestrial and aquatic ecosystems, and to develop strategies for ecosystem restoration are all increasingly important issues that will drive demand for environmental scientists. Issues related to water conservation, deteriorating coastal environments, and rising sea levels also will stimulate employment growth of these workers. As the population increases and moves to more environmentally sensitive locations, environmental scientists and hydrologists will be needed to assess building sites for potential geologic hazards, to mitigate the effects of natural hazards such as floods, tornadoes, and earthquakes, and to address issues related to pollution control and waste disposal. Hydrologists and environmental scientists also will be needed to conduct research on hazardous-waste sites in order to determine the impact of hazardous pollutants on soil and ground water so that engineers can design remediation systems. Demand is growing for environmental scientists who understand both the science and engineering aspects of waste remediation.

In contrast to employment of environmental scientists and hydrologists, that of geoscientists is expected to grow about as fast as the average for all occupations. In the past, employment

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of geologists and some other geoscientists has been cyclical and largely affected by the price of oil and gas. When prices were low, oil and gas producers curtailed exploration activities and laid off geologists. When prices were higher, companies had the funds and incentive to renew exploration efforts and hire geoscientists in large numbers. In recent years, a growing worldwide demand for oil and gas and for new exploration and recovery techniques—particularly in deep water and previously inaccessible sites—has returned a modicum of stability to the petroleum industry. Growth in this area, though, will be limited due to increasing efficiencies in finding oil and gas. Geoscientists who speak a foreign language and who are willing to work abroad should enjoy the best opportunities. An expected increase in highway building and other infrastructure projects will be a source of jobs for engineering geologists. The need to replace geoscientists who retire also will result in job openings over the next decade.

Earnings

Median annual earnings of environmental scientists were $47,600 in 2002. The middle 50 percent earned between $36,820 and $62,400. The lowest 10 percent earned less than $29,920, and the highest 10 percent earned more than $78,200.

Median annual earnings of geoscientists were $67,470 in 2002. The middle 50 percent earned between $48,370 and $102,120; the lowest 10 percent, less than $36,580 and the highest 10 percent more than $133,310.

Median annual earnings of hydrologists were $56,530 in 2002, with the middle 50 percent earning between $44,080 and $70,160, the lowest 10 percent less than $36,790, and the highest 10 percent more than $86,620.

Median annual earnings in the industries employing the largest number of environmental scientists in 2002 were as follows:

Federal Government	$66,190
Management, scientific, and technical consulting services	45,560
Local government	45,270
Architectural, engineering, and related services	44,590
State government	44,580

According to the National Association of Colleges and Employers, beginning salary offers in 2003 for graduates with bachelor's degrees in geology and related sciences averaged about $32,828 a year; graduates with a master's degree averaged $47,981, and graduates with a doctoral degree averaged $61,050.

In 2003, the Federal Government's average salary for geologists in managerial, supervisory, and nonsupervisory positions was $76,389 for geologists, $86,809 for geophysicists, $70,525 for hydrologists, and $79,023 for oceanographers.

The petroleum, mineral, and mining industries are vulnerable to recessions and to changes in oil and gas prices, among other factors, and usually release workers when exploration and drilling slow down. Consequently, they offer higher salaries, but less job security, than do other industries.

Related Occupations

Many geoscientists work in the petroleum and natural gas industry, an industry that also employs many other workers in the scientific and technical aspects of petroleum and natural gas exploration and extraction. Among these other workers are engineering technicians, science technicians, petroleum engineers, surveyors, cartographers, photogrammetrists, and surveying technicians. Also, some physicists, chemists, and atmospheric scientists—as well as mathematicians, computer systems analysts, database administrators, and computer scientists—perform related work both in petroleum and natural gas exploration and extraction and in environment-related activities.

Sources of Additional Information

Information on training and career opportunities for geologists is available from either of the following organizations:

❮➤American Geological Institute, 4220 King St., Alexandria, VA 22302-1502. Internet: **http://www.agiweb.org**

❮➤American Association of Petroleum Geologists, P.O. Box 979, Tulsa, OK 74101. Internet: **http://www.aapg.org**

A packet of free career information and a list of education and training programs in oceanography and related fields, priced at $6.00, is available from

❮➤Marine Technology Society, 5565 Sterrett Place, Suite 108, Columbia, MD 21004. Telephone: (410) 884-5330. Internet: **http://www.mtsociety.org**

Information on applying for a job as a geologist, a geophysicist, a hydrologist, or an oceanographer with the Federal Government may be obtained through a telephone-based system from the Office of Personnel Management. Consult your telephone directory under "U.S. Government" for a local number, or call (703) 724-1850 or Federal Relay Service (800) 877-8339. This number is not toll free, and charges may accrue. Information also is available from the Internet site **http://www.usajobs.opm.gov**.

Physicists and Astronomers

(0*NET 19-2011.00, 19-2012.00)

Significant Points

- Scientific research and development services firms and the Federal Government employ 3 out of 5 physicists and astronomers.
- Most jobs are in basic research and development, usually requiring a doctoral degree; master's degree holders qualify for many jobs in applied research and development, while bachelor's degree holders may qualify as technicians or research assistants.
- Ph.D. graduates will face competition for basic research jobs.

Nature of the Work

Physicists explore and identify basic principles governing the structure and behavior of matter, the generation and transfer of energy, and the interaction of matter and energy. Some physicists use these principles in theoretical areas, such as the nature of time and the origin of the universe; others apply their physics knowledge to practical areas, such as the development of advanced materials, electronic and optical devices, and medical equipment.

Physicists design and perform experiments with lasers, particle accelerators, telescopes, mass spectrometers, and other equipment. Based on observations and analysis, they attempt to discover and explain laws describing the forces of nature, such as gravity, electromagnetism, and nuclear interactions. Physicists also find ways to apply physical laws and theories to problems in nuclear energy, electronics, optics, materials,

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communications, aerospace technology, and medical instrumentation.

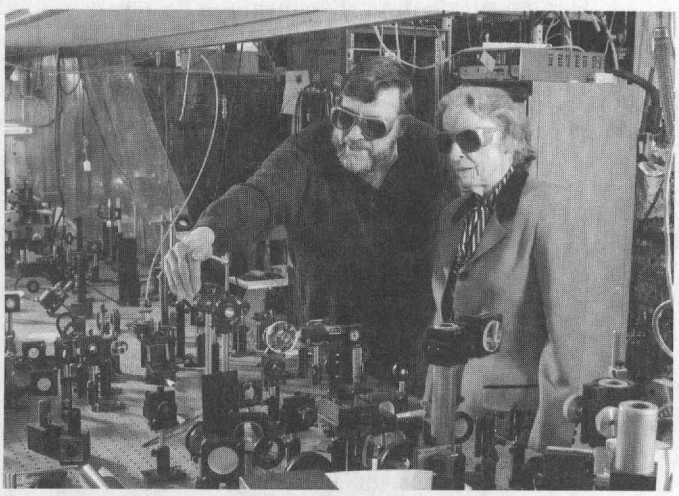
Astronomy is sometimes considered a subfield of physics. *Astronomers* use the principles of physics and mathematics to learn about the fundamental nature of the universe, including the sun, moon, planets, stars, and galaxies. They also apply their knowledge to solve problems in navigation, space flight, and satellite communications, and to develop the instrumentation and techniques used to observe and collect astronomical data.

Most physicists work in research and development. Some do basic research to increase scientific knowledge. Physicists who conduct applied research build upon the discoveries made through basic research and work to develop new devices, products, and processes. For example, basic research in solid-state physics led to the development of transistors and, then, integrated circuits used in computers.

Physicists also design research equipment. This equipment often has additional unanticipated uses. For example, lasers are used in surgery, microwave devices are used in ovens, and measuring instruments can analyze blood or the chemical content of foods. A small number of physicists work in inspection, testing, quality control, and other production-related jobs in industry.

Much physics research is done in small or medium-sized laboratories. However, experiments in plasma, nuclear, and high energy and in some other areas of physics require extremely large, expensive equipment, such as particle accelerators. Physicists in these subfields often work in large teams. Although physics research may require extensive experimentation in laboratories, research physicists still spend time in offices planning, recording, analyzing, and reporting on research.

Almost all astronomers do research. Some are theoreticians, working on the laws governing the structure and evolution of astronomical objects. Others analyze large quantities of data gathered by observatories and satellites, and write scientific papers or reports on their findings. Some astronomers actually operate large space- or ground-based telescopes, usually as part of a team. However, astronomers may spend only a few weeks each year making observations with optical telescopes, radio telescopes, and other instruments. For many years, satellites and other space-based instruments, such as the Hubble space telescope, have provided tremendous amounts of astronomical data. New technology resulting in improvements in analytical techniques and instruments, such as computers and optical telescopes and mounts, is leading to a resurgence in ground-based research. A small number of astronomers work in museums housing planetariums. These astronomers develop and revise programs presented to the public, and may direct planetarium operations.



Most physicist and astronomer jobs are in basic research and development, usually requiring a doctoral degree.

Physicists generally specialize in one of many subfields—elementary particle physics, nuclear physics, atomic and molecular physics, physics of condensed matter (solid-state physics), optics, acoustics, space physics, plasma physics, or the physics of fluids. Some specialize in a subdivision of one of these subfields. For example, within condensed matter physics, specialties include superconductivity, crystallography, and semiconductors. However, all physics involves the same fundamental principles, so specialties may overlap, and physicists may switch from one subfield to another. Also, growing numbers of physicists work in interdisciplinary fields, such as biophysics, chemical physics, and geophysics.

Working Conditions

Physicists often work regular hours in laboratories and offices. At times, however, those who are deeply involved in research may work long or irregular hours. Most do not encounter unusual hazards in their work. Some physicists temporarily work away from home at national or international facilities with unique equipment, such as particle accelerators. Astronomers who make observations using ground-based telescopes may spend long periods in observatories; this work usually involves travel to remote locations and may require long hours, including nightwork.

Physicists and astronomers whose work depends on grant money often are under pressure to write grant proposals to keep their work funded.

Employment

Physicists and astronomers held about 14,000 jobs in 2002. Jobs for astronomers accounted for only 7 percent of the total. Nearly one-third of physicists and astronomers worked for scientific research and development services firms. The Federal Government employed 29 percent, mostly in the U.S. Department of Defense, but also in the National Aeronautics and Space Administration (NASA), and in the U.S. Departments of Commerce, Health and Human Services, and Energy. Other physicists and astronomers worked in colleges and universities in nonfaculty, usually research, positions, or for State governments, information technology companies, pharmaceutical and medicine manufacturing companies, or electronic equipment manufacturers.

Besides the jobs described above, many physicists and astronomers held faculty positions in colleges and universities. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Although physicists and astronomers are employed in all parts of the country, most work in areas in which universities, large research and development laboratories, or observatories are located.

Training, Other Qualifications, and Advancement

Because most jobs are in basic research and development, a doctoral degree is the usual educational requirement for physicists and astronomers. Additional experience and training in a postdoctoral research appointment, although not required, is important for physicists and astronomers aspiring to permanent

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positions in basic research in universities and government laboratories. Many physics and astronomy Ph.D. holders ultimately teach at the college or university level.

Master's degree holders usually do not qualify for basic research positions but do qualify for many kinds of jobs requiring a physics background, including positions in manufacturing and applied research and development. Increasingly, many master's degree programs specifically prepare students for physics-related research and development that does not require a Ph.D. degree. These master's degree programs teach students specific research skills that can be used in private industry jobs. A master's degree may suffice for teaching jobs in high schools or at 2-year colleges.

Those with bachelor's degrees in physics are rarely qualified to fill positions in research or in teaching at the college level. They are, however, usually qualified to work as technicians or research assistants in engineering-related areas, in software development and other scientific fields, or in setting up computer networks and sophisticated laboratory equipment. Some may qualify for applied research jobs in private industry or nonresearch positions in the Federal Government. Some become science teachers in secondary schools.Astronomy bachelor's or master's degree holders often enter a field unrelated to astronomy, and they are qualified to work in planetariums running science shows, to assist astronomers doing research, and to operate space-based and ground-based telescopes and other astronomical instrumentation. (See the statements on engineers; environmental scientists and geoscientists; computer programmers; computer systems analysts, database administrators, and computer scientists; and computer software engineers, elsewhere in the *Handbook*.)

More than 500 colleges and universities offer a bachelor's degree in physics. Undergraduate programs provide a broad background in the natural sciences and mathematics. Typical physics courses include electromagnetism, optics, thermodynamics, atomic physics, and quantum mechanics.

About 180 colleges and universities have departments offering Ph.D. degrees in physics. More than 70 additional colleges offer a master's as their highest degree in physics. Graduate students usually concentrate in a subfield of physics, such as elementary particles or condensed matter. Many begin studying for their doctorate immediately after receiving their bachelor's degree.

About 70 universities grant degrees in astronomy, either through an astronomy, physics, or combined physics/astronomy department. Currently, more than 30 departments are combined with the physics department and nearly 40 are administered separately. With fewer than 40 doctoral programs in astronomy, applicants face considerable competition for available slots. Those planning a career in astronomy should have a very strong physics background. In fact, an undergraduate degree in either physics or astronomy is excellent preparation, followed by a Ph.D. in astronomy.

Mathematical ability, problem-solving and analytical skills, an inquisitive mind, imagination, and initiative are important traits for anyone planning a career in physics or astronomy. Prospective physicists who hope to work in industrial laboratories applying physics knowledge to practical problems should broaden their educational background to include courses outside of physics, such as economics, information technology, and business management. Good oral and written communication skills also are important because many physicists work as part of a team, write research papers or proposals, or have contact with clients or customers with nonphysics backgrounds.

Many physics and astronomy Ph.D. holders begin their careers in a postdoctoral research position, in which they may work with experienced physicists as they continue to learn about their specialty and develop ideas and results to be used in later work. Initial work may be under the close supervision of senior scientists. After some experience, physicists perform increasingly complex tasks and work more independently. Those who develop new products or processes sometimes form their own companies or join new firms to exploit their own ideas.

Job Outlook

Employment of physicists and astronomers is expected to grow more slowly than the average for all occupations through 2012. Federal research expenditures are the major source of physics-related and astronomy-related research funds, especially for basic research. Although these expenditures are expected to steadily increase over the 2002-12 projection period, resulting in some growth in employment and opportunities, the limited research funds available still will result in competition among Ph.D. holders for basic research jobs. The need to replace physicists and astronomers who retire or otherwise leave the occupation permanently will account for most expected job openings.

Although research and development budgets in private industry will continue to grow, many research laboratories in private industry are expected to continue to reduce basic research, which includes much physics research, in favor of applied or manufacturing research and product and software development. Nevertheless, persons with a physics background continue to be in demand in the areas of information technology, semiconductor technology, and other applied sciences. This trend is expected to continue; however, many of the new workers will have job titles such as computer software engineer, computer programmer, engineer, and systems developer, rather than physicist.

Through the 1990s, the number of doctorates granted in physics was much greater than the number of job openings for physicists, resulting in keen competition, particularly for research positions in colleges and universities and in research and development centers. Competitive conditions have eased somewhat because the number of doctorate degrees awarded has been dropping for several years, in line with declining enrollment in graduate physics programs. Recent increases in undergraduate physics enrollments, however, may again lead to growth in enrollments in graduate physics programs, meaning that, toward the end of the projection period, there may be an increase in the number of doctoral degrees granted that will intensify the competition for job openings.

Opportunities may be more numerous for those with a master's degree, particularly graduates from programs preparing students for applied research and development, product design, and manufacturing positions in private industry. Many of these positions, however, will have titles other than physicist, such as engineer or computer scientist.

Persons with only a bachelor's degree in physics or astronomy are not qualified to enter most physicist or astronomer research jobs but may qualify for a wide range of positions related to engineering, mathematics, computer science, and environmental science. Those who meet State certification requirements can become high school physics teachers, an occupation in strong demand in many school districts. Most States require new teachers to obtain a master's degree in education within a certain

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time. (See the statement on teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.) Despite competition for traditional physics and astronomy research jobs, individuals with a physics degree at any level will find their knowledge of science and mathematics useful for entry to many other occupations.

Earnings

Median annual earnings of physicists were $85,020 in 2002. The middle 50 percent earned between $66,680 and $107,410. The lowest 10 percent earned less than $50,350, and the highest 10 percent earned more than $129,250.

Median annual earnings of astronomers were $81,690 in 2002. The middle 50 percent earned between $53,390 and $106,230; the lowest 10 percent, less than $40,140, and the highest 10 percent more than $126,320.

According to a 2003 National Association of Colleges and Employers survey, the average annual starting salary offer to physics doctoral degree candidates was $55,485.

The American Institute of Physics reported a median annual salary of $95,000 in 2002 for its full time members with Ph.D.'s (excluding those in postdoctoral positions); the median was $87,000 for those with master's degrees, and $78,000 for bachelor's degree holders. Those working in temporary postdoctoral positions earned significantly less.

The average annual salary for physicists employed by the Federal Government was $95,685 in 2003; for astronomy and space scientists, it was $100,591.

Related Occupations

The work of physicists and astronomers relates closely to that of engineers; chemists and materials scientists; atmospheric scientists; environmental scientists and geoscientists; computer systems analysts, computer scientists, and database administrators; computer programmers; and mathematicians.

Sources of Additional Information

General information on career opportunities in physics is available from:


American Institute of Physics, Career Services Division and Education and Employment Division, One Physics Ellipse, College Park, MD 20740-3843. Internet: **http://www.aip.org**


The American Physical Society, One Physics Ellipse, College Park, MD 20740-3844. Internet: **http://www.aps.org**

Social Scientists and Related Occupations

Economists

(0*NET 19-3011.00)

Significant Points

- Quantitative skills are important in all economics specialties.
- Employment of economists is expected to grow about as fast as the average; most new jobs will arise in private industry, including economic research and consulting firms.
- Candidates who hold a master's or Ph.D. degree in economics will have the best employment prospects and advancement opportunities.

Nature of the Work

Economists study how society distributes scarce resources such as land, labor, raw materials, and machinery to produce goods and services. They conduct research, collect and analyze data, monitor economic trends, and develop forecasts. They research issues such as energy costs, inflation, interest rates, exchange rates, business cycles, taxes, or employment levels.

Economists devise methods and procedures for obtaining the data they need. For example, sampling techniques may be used to conduct a survey, and various mathematical modeling techniques may be used to develop forecasts. Preparing reports, including tables and charts, on research results is an important part of an economist's job. Presenting economic and statistical concepts in a clear and meaningful way is particularly important for economists whose research is directed toward making policies for an organization. Some economists might also provide economic analysis to the media.

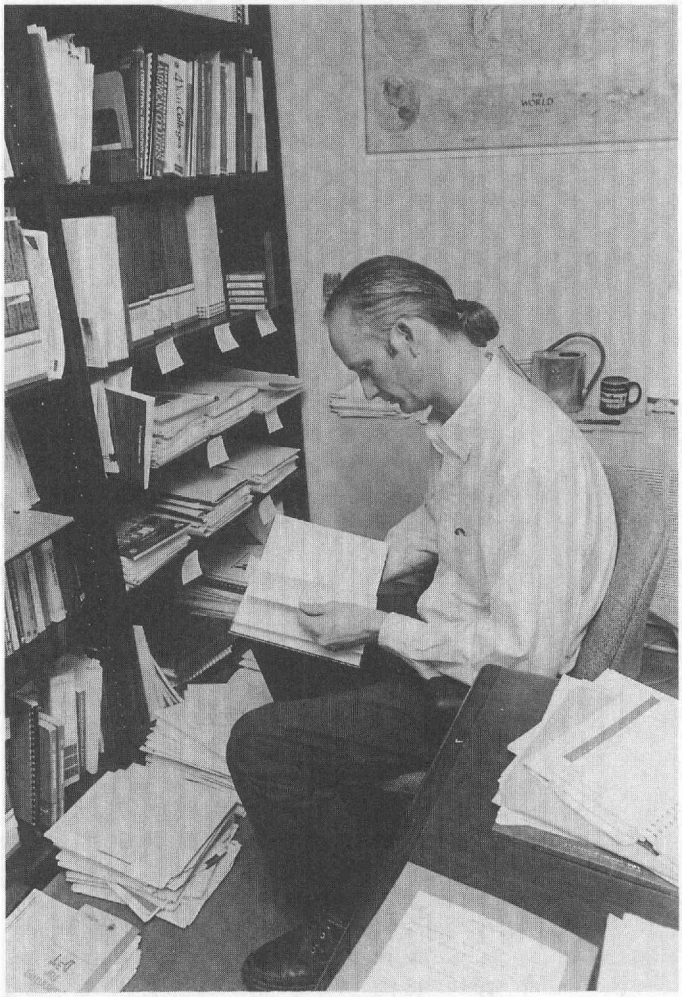
Many economists specialize in a particular area of economics, although general knowledge of basic economic principles is useful in each area. *Microeconomists* study the supply and demand decisions of individuals and firms, such as how profits can be maximized and how much of a good or service consumers will demand at a certain price. *Industrial/organizational economists* study the market structure of particular industries in terms of the number of competitors, and the market decisions of competitive firms and monopolies. These economists may also be concerned with antitrust policy and its impact on market structure. *Macroeconomists* study historical trends in the whole economy and forecast future trends in areas such as unemployment, inflation, economic growth, productivity, and investment. Closely related to macroeconomists are *monetary or financial economists*, who study the money and banking system and the effects of rising interest rates. *International economists* study international financial markets, exchange rates, and the effects of various trade policies such as tariffs. *Labor* or *demographic economists* study the supply and demand for labor and the determination of wages. These economists also try to explain the reasons for unemployment, and the effects on labor markets of changing demographic trends such as an aging population and increasing immigration. *Public finance* economists primarily are involved in studying the role of the government in the economy and the effects of tax cuts, budget deficits, and welfare policies. *Econometricians* are involved in all areas of economics and use mathematical techniques such as calculus, game theory, and regression analysis to formulate economic models. These models help to explain economic relationships and are used to develop forecasts related to the nature and length of business cycles, the effects of a specific rate of inflation on the economy, the effects of tax legislati on on unemployment levels, and other economic phenomena. Many economists have applied these fundamental areas of economics to more narrow

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areas with specific applications such as health, education, agriculture, urban and regional economics, law, history, energy, and the environment.

Most economists are concerned with practical applications of economic policy, and work for a variety of organizations. Economists working for corporations are involved primarily in microeconomic issues, such as forecasting consumer demand and sales of the firm's products. Economists working for corporations might also analyze their competitors' growth and market share and advise their company on how to handle the competition. Other economists working for corporations monitor legislation passed by Congress, such as environmental and worker safety regulations, and assess its impact on their business. Corporations with many international branches or subsidiaries might employ economists to monitor the economic situations in countries where they do business, or to provide a risk assessment of a country into which the company might expand.

Corporations that are too small or that do not have sufficient funding might hire economists working in economic consulting or research firms to perform the same tasks as staff economists. Economists in consulting firms also perform much of the macroeconomic analysis and forecasting that is completed in the United States. These economists collect data on various indicators, maintain databases, analyze historical trends, and develop models to forecast growth, inflation, unemployment, or interest rates. These analyses and forecasts are frequently published in newspapers and journal articles.



Economists frequently conduct research, write reports and articles, and present findings to clients and colleagues.

Another large employer of economists is government. Economists in the Federal Government administer most of the surveys and collect most of the economic data in the United States. For example, economists in the U.S. Department of Commerce collect and analyze data on the production, distribution, and consumption of commodities produced in the United States and overseas, while economists employed by the U.S. Department of Labor collect and analyze data on the domestic economy, including those having to do with prices, wages, employment, productivity, and safety and health. Economists who work for government agencies also assess economic conditions in the United States or abroad in order to estimate the economic effects of specific changes in legislation or public policy. Government economists advise policy makers in areas such as telecommunications deregulation, Social Security revamping, the effects of tax cuts on the budget deficit, and the effectiveness of imposing tariffs on imported steel. An economist working in State or local government might analyze data on the growth of school-age or prison populations, and on employment and unemployment rates, in order to project future spending needs.

Working Conditions

Economists have structured work schedules. They often work alone, writing reports, preparing statistical charts, and using computers, but they also may be an integral part of a research team. Most work under pressure of deadlines and tight schedules, which may require overtime. Their routine may be interrupted by special requests for data, and by the need to attend meetings or conferences. Frequent travel may be necessary.

Employment

Economists held about 16,000 jobs in 2002. Private industry employed 53 percent of salaried economists, particularly in scientific research and development firms; management, scientific, and technical consulting firms; banks and securities firms, and business, professional, labor, and political organizations. A wide range of government agencies provided the remaining jobs. The U.S. Departments of Labor, Agriculture, and State are the largest Federal employers of economists. A number of economists combine a full-time job in government, academia, or business with part-time or consulting work in another setting. A little over 11 percent of economists are self-employed.

Employment of economists is concentrated in large cities. Some work abroad for companies with major international operations, for U.S. Government agencies, and for international organizations, such as the World Bank, International Monetary fund, and United Nations.

Besides the jobs described above, many economists hold faculty positions in colleges and universities. Economics faculties have flexible work schedules, and may divide their time among teaching, research, consulting, and administration. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

A master's or Ph.D. degree in economics is required for many private sector economist jobs, and for advancement to more responsible positions. Economics includes many specialties at the graduate level, such as advanced economic theory, econometrics, international economics, and labor economics. Students should select graduate schools strong in specialties in

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which they are interested. Undergraduate economics majors can choose from a variety of courses, ranging from microeconomics, macroeconomics, and econometrics, to more philosophical courses, such as the history of economic thought. Because of the importance of quantitative skills to economists, courses in mathematics, statistics, econometrics, sampling theory and survey design, and computer science are extremely helpful. Some schools help graduate students find internships or part-time employment in government agencies, economic consulting or research firms, or financial institutions prior to graduation.

In the Federal Government, candidates for entry-level economist positions must have a bachelor's degree with a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus.

Whether working in government, industry, research organizations, or consulting firms, economists with a bachelor's degree usually qualify for most entry-level positions as a research assistant, for administrative or management trainee positions, or for various sales jobs. A master's degree usually is required to qualify for more responsible research and administrative positions. Many businesses, research and consulting firms, and government agencies seek individuals who have strong computer and quantitative skills and can perform complex research. A Ph.D. is necessary for top economist positions in many organizations. Many corporation and government executives have a strong background in economics.

A master's degree is usually the minimum requirement for a job as an instructor in junior and community colleges. In most colleges and universities, however, a Ph.D. is necessary for appointment as an instructor. A Ph.D. and extensive publications in academic journals are required for a professorship, tenure, and promotion.

Aspiring economists should gain experience gathering and analyzing data, conducting interviews or surveys, and writing reports on their findings while in college. This experience can prove invaluable later in obtaining a full-time position in the field, because much of the economist's work, especially in the beginning, may center on these duties. With experience, economists eventually are assigned their own research projects. Related job experience, such as work as a stock or bond trader, might be advantageous.

Those considering careers as economists should be able to pay attention to details because much time is spent on precise data analysis. Patience and persistence are necessary qualities because economists must spend long hours on independent study and problem solving. Economists must be able to present their findings, both orally and in writing, in a clear, concise manner.

Job Outlook

Employment of economists is expected to grow about as fast as the average for all occupations through 2012. Many job openings are likely to result from the need to replace experienced workers who transfer to other occupations or who retire or leave the labor force for other reasons.

Opportunities for economists should be best in private industry, especially in scientific research and development, and consulting firms, as more companies contract out for economic research services. Rising demand for economists should stem from the growing complexity of the global economy, competition, and increased reliance on quantitative methods for analyzing and forecasting business, sales, and other economic trends. A greater need for economic analyses in virtually every industry could result in additional jobs for economists, although some corporations are eliminating some or all of their economist positions in favor of hiring economic consultants. Employment of economists in the Federal Government should decline, but not by as much as other occupations in the Federal workforce. Average employment growth is expected among economists in State and local government.

A master's or Ph.D. degree, coupled with a strong background in economic theory, mathematics, statistics, and econometrics, provides the basis for acquiring any specialty within the economics field. Those skilled in quantitative techniques and their application to economic modeling and forecasting, and who have good communications skills, should have the best job opportunities. Like those in many other disciplines, however, Ph.D. holders are likely to face keen competition for tenured teaching positions in colleges and universities.

Bachelor's degree holders may face competition for the limited number of economist positions for which they qualify. They will qualify for a number of other positions, however, in which they can take advantage of their economic knowledge by conducting research, developing surveys, or analyzing data. Many graduates with bachelor's degrees will find jobs in industry and business as management or sales trainees, or as administrative assistants. Bachelor's degree holders with good quantitative skills and a strong background in mathematics, statistics, survey design, and computer science also may be hired by private firms as researchers. Some will find jobs in government.

Candidates who meet State certification requirements may become high school economics teachers. The demand for secondary school economics teachers is expected to grow, as economics becomes an increasingly important and popular course. (See the statement on teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

Earnings

Median annual wage and salary earnings of economists were $68,550 in 2002. The middle 50 percent earned between $50,560 and $90,710. The lowest 10 percent earned less than $38,690, and the highest 10 percent earned more than $120,440.

The Federal Government recognizes education and experience in certifying applicants for entry-level positions. The entrance salary for economists having a bachelor's degree was about $23,442 a year in 2003; however, those with superior academic records could begin at $29,037. Those having a master's degree could qualify for positions at an annual salary of $35,519. Those with a Ph.D. could begin at $42,976, while some individuals with experience and an advanced degree could start at $51,508. Starting salaries were slightly higher in selected areas where the prevailing local pay was higher. The average annual salary for economists employed by the Federal Government was $81,852 a year in 2003.

Related Occupations

Economists are concerned with understanding and interpreting financial matters, among other subjects. Other jobs in this area include accountants and auditors; actuaries; budget analysts; financial analysts and personal financial advisors; financial managers; insurance underwriters; loan counselors and officers; and purchasing managers, buyers, and purchasing agents. Other occupations involved in market research and data collection are management analysts, as well as market and survey researchers.

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Sources of Additional Information

For information on careers in business economics, contact:

➤ National Association for Business Economics, 1233 20th St. NW., Suite 505, Washington, DC 20036.

Information on obtaining a position as an economist with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Market and Survey Researchers

(0*NET 19-3021.00, 19-3022.00)

Significant Points

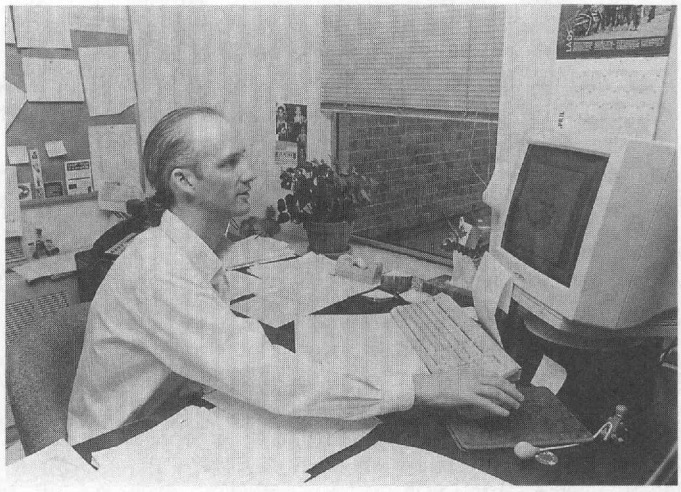
- Strong demand is expected for market and survey researchers.
- A master's degree is the minimum requirement for many private sector jobs.
- Quantitative skills are critical.

Nature of the Work

Market, or *marketing, research analysts* are concerned with the potential sales of a product or service. They analyze statistical data on past sales to predict future sales. They gather data on competitors and analyze prices, sales, and methods of marketing and distribution. Market research analysts devise methods and procedures for obtaining the data they need. They often design telephone, mail, or Internet surveys to assess consumer preferences. Some surveys are conducted as personal interviews by going door-to-door, leading focus group discussions, or setting up booths in public places such as shopping malls. Trained interviewers, under the market research analyst's direction, usually conduct the surveys.

After compiling the data, market research analysts evaluate them and make recommendations to their client or employer based upon their findings. They provide a company's management with information needed to make decisions on the promotion, distribution, design, and pricing of products or services. The information may also be used to determine the advisability of adding new lines of merchandise, opening new branches, or otherwise diversifying the company's operations. Market research analysts might also develop advertising brochures and commercials, sales plans, and product promotions such as rebates and giveaways.

Survey researchers design and conduct surveys for a variety of clients such as corporations, government agencies, political candidates, and service providers. They use surveys to collect information that is used for research, making fiscal or policy decisions, measuring policy effectiveness, and improving customer satisfaction. Analysts may conduct opinion research to determine public attitudes on various issues, which may help political or business leaders and others assess public support for their electoral prospects or social policies. Like market research analysts, survey researchers may use a variety of mediums to conduct surveys, such as the Internet, personal or telephone interviews, or mail questionnaires. They also may supervise interviewers who conduct surveys in person or over the telephone.



Market and survey researchers conduct research and design surveys.

Survey researchers design surveys in many different formats, depending upon the scope of research and method of collection. Interview surveys, for example, are common because they can increase survey participation rates. Survey researchers may consult with economists, statisticians, market research analysts, or other data users in order to design surveys. They also may present survey results to clients.

Working Conditions

Market and survey researchers generally have structured work schedules. Some often work alone, writing reports, preparing statistical charts, and using computers, but they also may be an integral part of a research team. Market researchers who conduct personal interviews will have frequent contact with the public. Most work under pressure of deadlines and tight schedules, which may require overtime. Their routine may be interrupted by special requests for data, as well as by the need to attend meetings or conferences. Travel may be necessary.

Employment

Market and survey researchers held about a total of 155,000 jobs in 2002. Most of these jobs were held by market research analysts, who held 135,000 jobs. Private industry provided about 97 percent of salaried market research analyst jobs. Because of the applicability of market research to many industries, market research analysts are employed in most industries. The industries which employ the largest number of market research analysts are management, scientific, and technical consulting firms, insurance carriers, computer systems design and related firms, software publishers, securities and commodities brokers, and advertising and related firms. Survey researchers held about 20,000 jobs in 2002. Survey researchers were mainly employed by professional, scientific, and technical services firms, including management, scientific and technical consulting firms, and scientific research and development firms; employment services, State government, and internet service providers and web search portals. A number of market and survey researchers combine a full-time job in government, academia, or business with part-time or consulting work in another setting. About 8 percent of market and survey researchers are self-employed.

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Besides the jobs described above, many market and survey researchers held faculty positions in colleges and universities. Marketing faculties have flexible work schedules and may divide their time among teaching, research, consulting, and administration. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

A master's degree is the minimum requirement for many private sector market and survey research jobs, and for advancement to more responsible positions. Market and survey researchers may earn advanced degrees in business administration, marketing, statistics, communications, or some closely related discipline. Some schools help graduate students find internships or part-time employment in government agencies, consulting firms, financial institutions, or marketing research firms prior to graduation.

In addition to courses in business, marketing, and consumer behavior, prospective market and survey researchers should take other liberal arts and social science courses, including economics, psychology, English, and sociology. Because of the importance of quantitative skills to market and survey researchers, courses in mathematics, statistics, sampling theory and survey design, and computer science are extremely helpful.

Bachelor's degree holders who majored in marketing and related fields may qualify for many entry-level positions that might or might not be related to market and survey research. These positions include research assistant, administrative or management trainee, marketing interviewer, and salesperson, among others. Many businesses, research and consulting firms, and government agencies seek individuals who have strong computer and quantitative skills and can perform complex research. Many corporation and government executives have a strong background in marketing.

In addition to being required for most market and survey research jobs in business and industry, a master's degree is usually the minimum requirement for a job as an instructor in junior and community colleges. In most colleges and universities, however, a Ph.D. is necessary for appointment as an instructor. A Ph.D. and extensive publications in academic journals are required for a professorship, tenure, and promotion.

Aspiring market and survey researchers should gain experience gathering and analyzing data, conducting interviews or surveys, and writing reports on their findings while in college. This experience can prove invaluable later in obtaining a full-time position in the field, because much of the work, in the beginning, may center on these duties. With experience, market and survey researchers eventually are assigned their own research projects.

Those considering careers as market and survey researchers should be able to pay attention to details because much time is spent on precise data analysis. Patience and persistence are necessary qualities because market and survey researchers must spend long hours on independent study and problem solving. At the same time, they must work well with others, because they often oversee interviews of a wide variety of individuals. Communication skills are very important because market and survey researchers must be able to present their findings both orally and in writing, in a clear, concise manner.

Job Outlook

Employment of market and survey researchers is expected to grow faster than the average for all occupations through 2012. Many job openings are likely to result from the need to replace experienced workers who transfer to other occupations or who retire or leave the labor force for other reasons. Opportunities should be best for those with a master's or Ph.D. degree in marketing or a related field and strong quantitative skills.

Demand for market research analysts should be strong because of an increasingly competitive economy. Marketing research provides organizations valuable feedback from purchasers, allowing companies to evaluate consumer satisfaction and more effectively plan for the future. As companies seek to expand their market and as consumers become better informed, the need for marketing professionals will increase. As globalization of the marketplace continues, market researchers will also be increasingly utilized to analyze foreign markets and competition for goods and services.

Market research analysts should have opportunities in a wide range of employment settings, particularly in marketing research firms, as companies find it more profitable to contract for marketing research services rather than support their own marketing department. Increasingly, marketing research analysts are not only collecting and analyzing information, but are also helping the client implement their ideas and recommendations. Other organizations, including computer systems design companies, financial services organizations, healthcare institutions, advertising firms, manufacturing firms producing consumer goods, and insurance companies may offer job opportunities for market research analysts. Survey researchers will be needed to meet the growing demand for market and opinion research, as an increasingly competitive economy requires businesses to more effectively and efficiently allocate advertising funds.

Bachelor's degree holders may face competition for the limited number of market and survey research jobs for which they are eligible. However, they will qualify for a number of other positions, however, in which they can take advantage of their knowledge in conducting research, developing surveys, or analyzing data. Some graduates with bachelor's degrees will find jobs in industry and business as management or sales trainees or as administrative assistants. Bachelor's degree holders with good quantitative skills, including a strong background in mathematics, statistics, survey design, and computer science, may be hired by private firms as research assistants or interviewers.

Ph.D. degree holders in marketing and related fields should have a range of opportunities in industry and consulting firms. As in many other disciplines, however, Ph.D. holders are likely to face keen competition for tenured teaching positions in colleges and universities.

Earnings

Median annual earnings of market research analysts in 2002 were $53,810. The middle 50 percent earned between $38,760 and $76,310. The lowest 10 percent earned less than $29,390, and the highest 10 percent earned more than $100,160. Median annual earnings in the industries employing the largest numbers of market research analysts in 2002 were as follows:

Management of companies and enterprises	$56,750
Insurance carriers	46,700
Other professional, scientific, and technical services	46,380
Management, scientific, and technical consulting services	44,580

Median annual earnings of survey researchers in 2002 were $22,200. The middle 50 percent earned between $17,250 and $38,530. The lowest 10 percent earned less than $15,140, and the highest 10 percent earned more than $57,080. Median

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annual earnings of survey researchers in 2002 in other professional, scientific, and technical services were $19,610.

Related Occupations

Market and survey researchers do research to find out how well the market receives products or services. This may include planning, implementation, and analysis of surveys to determine people's needs and preferences. Other jobs using these skills include economists, psychologists, sociologists, statisticians, and urban and regional planners.

Sources of Additional Information

For information about careers and salaries in market and survey research, contact:

➤ Marketing Research Association, 1344 Silas Deane Hwy., Suite 306, Rocky Hill, CT 06067-0230. Internet: **http://www.mra-net.org**

➤ Council of American Survey Research Organizations, 3 Upper Devon, Port Jefferson, NY 11777. Internet: **http://www.casro.org**

Psychologists

(0*NET 19-3031.01, 19-3031.02, 19-3031.03, 19-3032.00)

Significant Points

- More than 1 out of 4 psychologists are self-employed, nearly four times the average for professional workers.
- Most specialists, including clinical and counseling psychologists, need a doctoral degree; school and industrial-organizational psychologists need a master's degree.
- Opportunities in psychology are limited for those with only a bachelor's degree.

Nature of the Work

Psychologists study the human mind and human behavior. Research psychologists investigate the physical, cognitive, emotional, or social aspects of human behavior. Psychologists in health service provider fields provide mental health care in hospitals, clinics, schools, or private settings. Psychologists employed in applied settings such as business, industry, government or non-profits provide training, conduct research, design systems, and act as advocates for psychology.

Like other social scientists, psychologists formulate hypotheses and collect data to test their validity. Research methods vary depending on the topic under study. Psychologists sometimes gather information through controlled laboratory experiments or by administering personality, performance, aptitude, and intelligence tests. Other methods include observation, interviews, questionnaires, clinical studies, and surveys.

Psychologists apply their knowledge to a wide range of endeavors, including health and human services, management, education, law, and sports. In addition to working in a variety of settings, psychologists usually specialize in one of a number of different areas.

Clinical psychologists—who constitute the largest specialty—most often work in counseling centers, independent or group practices, hospitals, or clinics. They help mentally and emotionally disturbed clients adjust to life and may help medical and surgical patients deal with illnesses or injuries. Some clinical psychologists work in physical rehabilitation settings, treating patients with spinal cord injuries, chronic pain or illness, stroke, arthritis, and neurological conditions. Others help people deal with times of personal crisis, such as divorce or the death of a loved one.

Clinical psychologists often interview patients and give diagnostic tests. They may provide individual, family, or group psychotherapy, and design and implement behavior modification programs. Some clinical psychologists collaborate with physicians and other specialists to develop and implement treatment and intervention programs that patients can understand and comply with. Other clinical psychologists work in universities and medical schools, where they train graduate students in the delivery of mental health and behavioral medicine services. Some administer community mental health programs.

Areas of specialization within clinical psychology include health psychology, neuropsychology, and geropsychology. *Health psychologists* promote good health through health maintenance counseling programs designed to help people achieve goals, such as to stop smoking or lose weight. *Neuropsychologists* study the relation between the brain and behavior. They often work in stroke and head injury programs. *Geropsychologists* deal with the special problems faced by the elderly. The emergence and growth of these specialties reflects the increasing participation of psychologists in providing direct services to special patient populations.

Often, clinical psychologists will consult with other medical personnel regarding the best treatment for patients, especially treatment that includes medications. Clinical psychologists generally are not permitted to prescribe medications to treat patients; only psychiatrists and other medical doctors may prescribe medications. (See the statement on physicians and surgeons elsewhere in the *Handbook.)* However, one State, New Mexico, has passed legislation allowing clinical psychologists who undergo additional training to prescribe medication, and similar proposals have been made in additional States.

Counseling psychologists use various techniques, including interviewing and testing, to advise people on how to deal with problems of everyday living. They work in settings such as university counseling centers, hospitals, and individual or group practices. (Also see the statements on counselors and social workers elsewhere in the *Handbook.*)

School psychologists work in elementary and secondary schools or school district offices to resolve students' learning and behavior problems. They collaborate with teachers, parents, and school personnel to improve classroom management strategies or parenting skills, counter substance abuse, work with students with disabilities or gifted and talented students, and improve teaching and learning strategies. They may evaluate the effectiveness of academic programs, behavior management procedures, and other services provided in the school setting.

Industrial-organizational psychologists apply psychological principles and research methods to the workplace in the interest of improving productivity and the quality of worklife. They also are involved in research on management and marketing problems. They conduct applicant screening, training and development, counseling, and organizational development and analysis. An industrial psychologist might work with management to reorganize the work setting to improve productivity or quality of life in the workplace. They frequently act as consultants, brought in by management in order to solve a particular problem.

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Developmental psychologists study the physiological, cognitive, and social development that takes place throughout life. Some specialize in behavior during infancy, childhood, and adolescence, or changes that occur during maturity or old age. They also may study developmental disabilities and their effects. Increasingly, research is developing ways to help elderly people remain independent as long as possible.

Social psychologists examine people's interactions with others and with the social environment. They work in organizational consultation, marketing research, systems design, or other applied psychology fields. Prominent areas of study include group behavior, leadership, attitudes, and perception.

Experimental or *research psychologists* work in university and private research centers and in business, nonprofit, and governmental organizations. They study behavior processes using human beings and animals, such as rats, monkeys, and pigeons. Prominent areas of study in experimental research include motivation, thought, attention, learning and memory, sensory and perceptual processes, effects of substance abuse, and genetic and neurological factors affecting behavior.

Working Conditions

A psychologist's subfield and place of employment determine working conditions. Clinical, school, and counseling psychologists in private practice have their own offices and set their own hours. However, they often offer evening and weekend hours to accommodate their clients. Those employed in hospitals, nursing homes, and other health facilities may work shifts including evenings and weekends, while those who work in schools and clinics generally work regular hours.

Psychologists employed as faculty by colleges and universities divide their time between teaching and research and also may have administrative responsibilities. Many have part-time consulting practices. Most psychologists in government and industry have structured schedules.

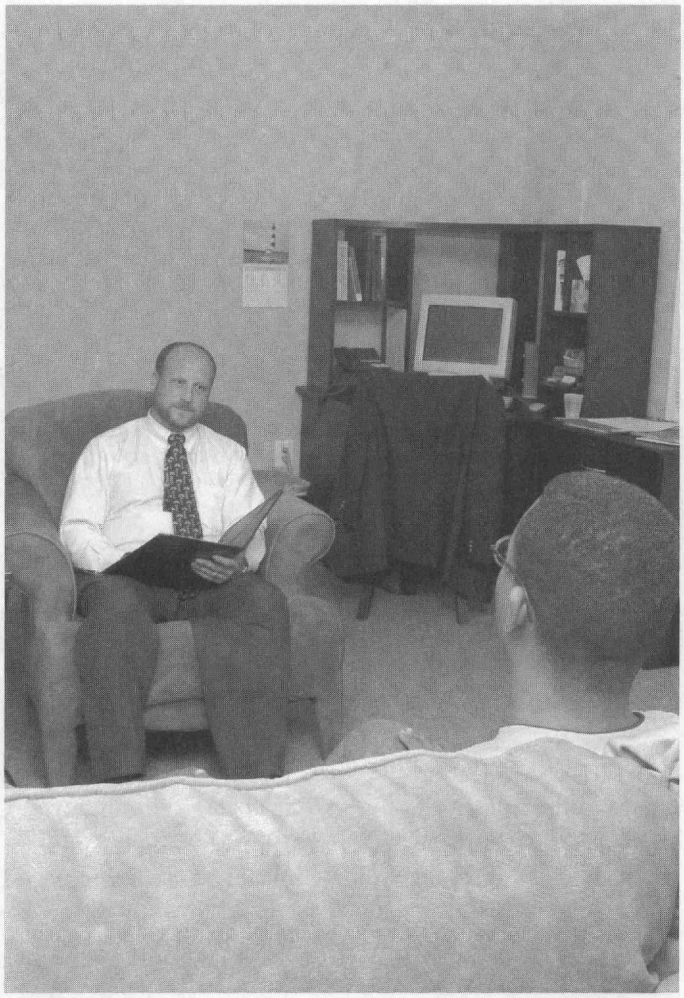
Increasingly, many psychologists work as part of a team and consult with other psychologists and professionals. Many experience pressures due to deadlines, tight schedules, and overtime work. Their routine may be interrupted frequently. Travel usually is required, in order to attend conferences or conduct research.

Employment

Psychologists held about 139,000 jobs in 2002. Educational institutions employed about 3 out of 10 salaried psychologists in positions other than teaching, such as counseling, testing, research, and administration. Three out of 10 were employed in health care, primarily in offices of mental health practitioners and in outpatient care facilities, private hospitals, nursing and residential care facilities, and individual and family service organizations. Government agencies at the State and local levels employed 1 in 10 psychologists, primarily in public hospitals, clinics, correctional facilities, and other settings. Some psychologists work in, research organizations, management consulting firms, marketing research firms, religious organizations, and other businesses.

After several years of experience, some psychologists—usually those with doctoral degrees—enter private practice or set up private research or consulting firms. More than 1 out of 4 psychologists were self-employed.

In addition to the jobs described above, many psychologists held faculty positions at colleges and universities, and as high school psychology teachers. (See the statements on teachers—postsecondary and teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)



Because psychologists interact with people daily, they must possess good communication and interpersonal skills.

Training, Other Qualifications, and Advancement

A doctoral degree usually is required for employment as an independent licensed clinical or counseling psychologist. Psychologists with a Ph.D. qualify for a wide range of teaching, research, clinical, and counseling positions in universities, healthcare services, elementary and secondary schools, private industry, and government. Psychologists with a Doctor of Psychology (Psy.D.) degree usually work in clinical positions or in private practices.

A doctoral degree usually requires 5 to 7 years of graduate study. The Ph.D. degree culminates in a dissertation based on original research. Courses in quantitative research methods, which include the use of computer-based analysis, are an integral part of graduate study and are necessary to complete the dissertation. The Psy.D. may be based on practical work and examinations rather than a dissertation. In clinical or counseling psychology, the requirements for the doctoral degree usually include at least a 1-year internship.

Persons with a master's degree in psychology may work as industrial-organizational psychologists or school psychologists. They also may work as psychological assistants, under the supervision of doctoral-level psychologists, and conduct research

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or psychological evaluations. A master's degree in psychology requires at least 2 years of full-time graduate study. Requirements usually include practical experience in an applied setting and a master's thesis based on an original research project. Competition for admission to graduate programs is keen. Some universities require applicants to have an undergraduate major in psychology. Others prefer only coursework in basic psychology with courses in the biological, physical, and social sciences; and statistics and mathematics.

A bachelor's degree in psychology qualifies a person to assist psychologists and other professionals in community mental health centers, vocational rehabilitation offices, and correctional programs. They may work as research or administrative assistants or become sales or management trainees in business. Some work as technicians in related fields, such as marketing research.

In the Federal Government, candidates having at least 24 semester hours in psychology and one course in statistics qualify for entry-level positions. However, competition for these jobs is keen because this is one of the few areas in which one can work as a psychologist without an advanced degree.

The American Psychological Association (APA) presently accredits doctoral training programs in clinical, counseling, and school psychology. The National Council for Accreditation of Teacher Education, with the assistance of the National Association of School Psychologists, also is involved in the accreditation of advanced degree programs in school psychology. The APA also accredits institutions that provide internships for doctoral students in school, clinical, and counseling psychology.

Psychologists in independent practice or those who offer any type of patient care—including clinical, counseling, and school psychologists—must meet certification or licensing requirements in all States and the District of Columbia. Licensing laws vary by State and by type of position and require licensed or certified psychologists to limit their practice to areas in which they have developed professional competence through training and experience. Clinical and counseling psychologists usually require a doctorate in psychology, completion of an approved internship, and 1 to 2 years of professional experience. In addition, all States require that applicants pass an examination. Most State licensing boards administer a standardized test, and many supplement that with additional oral or essay questions. Most States certify those with a master's degree as school psychologists after completion of an internship. Some States require continuing education for license renewal.

The National Association of School Psychologists (NASP) awards the Nationally Certified School Psychologist (NCSP) designation, which recognizes professional competency in school psychology at a national level, rather than at a State level. Currently, 22 States recognize the NCSP and allow those with the certification to transfer credentials from one State to another without taking a new State certification exam. In those States that recognize the NCSP, the requirements for State licensure and the NCSP often are the same or similar. Requirements for the NCSP include completion of 60 graduate semester hours in school psychology; a 1,200-hour internship, 600 hours of which must be completed in a school setting; and a passing score on the National School Psychology Examination.

The American Board of Professional Psychology (ABPP) recognizes professional achievement by awarding specialty certification, primarily in clinical psychology, clinical neuropsychology, and counseling, forensic, industrial-organizational, and school psychology. Candidates for ABPP certification need a doctorate in psychology, postdoctoral training in their specialty, 5 years of experience, professional endorsements, and a passing grade on an examination.

Aspiring psychologists who are interested in direct patient care must be emotionally stable, mature, and able to deal effectively with people. Sensitivity, compassion, good communication skills, and the ability to lead and inspire others are particularly important qualities for persons wishing to do clinical work and counseling. Research psychologists should be able to do detailed work independently and as part of a team. Patience and perseverance are vital qualities because achieving results from psychological treatment of patients or from research usually takes a long time.

Job Outlook

Overall employment of psychologists is expected to grow faster than the average for all occupations through 2012, due to increased demand for psychological services in schools, hospitals, social service agencies, mental health centers, substance abuse treatment clinics, consulting firms, and private companies. Clinical, counseling, and school psychologists will grow faster than the average, while industrial-organizational psychologists will have average growth.

Among the specialties in this field, school psychologists may enjoy the best job opportunities. Growing awareness of how students' mental health and behavioral problems, such as bullying, affect learning is increasing demand for school psychologists to offer student counseling and mental health services. Clinical and counseling psychologists will be needed to help people deal with depression and other mental disorders, marriage and family problems, job stress, and addiction. The rise in healthcare costs associated with unhealthy lifestyles, such as smoking, alcoholism, and obesity, has made prevention and treatment more critical. The increase in the number of employee assistance programs, which help workers deal with personal problems, also should spur job growth in clinical and counseling specialties. Industrial-organizational psychologists will be in demand to help to boost worker productivity and retention rates in a wide range of businesses. Industrial-organizational psychologists will help companies deal with issues such as workplace diversity and antidiscrimination policies. Companies also will use psychologists' expertise in survey design, analysis, and research to develop tools for marketing evaluation and statistical analysis.

Demand should be particularly strong for persons holding doctorates from leading universities in applied specialties, such as counseling, health, and school psychology. Psychologists with extensive training in quantitative research methods and computer science may have a competitive edge over applicants without this background.

Master's degree holders in fields other than school or industrial-organizational psychology will face keen competition for jobs, because of the limited number of positions that require only a master's degree. Master's degree holders may find jobs as psychological assistants or counselors, providing mental health services under the direct supervision of a licensed psychologist. Still others may find jobs involving research and data collection and analysis in universities, government, or private companies.

Opportunities directly related to psychology will be limited for bachelor's degree holders. Some may find jobs as assistants in rehabilitation centers, or in other jobs involving data collec-

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tion and analysis. Those who meet State certification requirements may become high school psychology teachers.

Earnings

Median annual earnings of wage and salary clinical, counseling, and school psychologists in 2002 were $51,170. The middle 50 percent earned between $38,560 and $66,970. The lowest 10 percent earned less than $30,090, and the highest 10 percent earned more than $87,060. Median annual earnings in the industries employing the largest numbers of clinical, counseling, and school psychologists in 2002 were as follows:

Offices of other health practitioners	$59,600
Elementary and secondary schools	54,480
Offices of physicians	51,140
Outpatient care centers	44,010
Individual and family services	37,490

Median annual earnings of wage and salary industrial-organizational psychologists in 2002 were $63,710. The middle 50 percent earned between $48,540 and $81,880. The lowest 10 percent earned less than $36,620, and the highest 10 percent earned more than $112,660.

Related Occupations

Psychologists are trained to conduct research and teach, evaluate, counsel, and advise individuals and groups with special needs. Others who do this kind of work include clergy, counselors, physicians and surgeons, social workers, sociologists, and special education teachers.

Sources of Additional Information

For information on careers, educational requirements, financial assistance, and licensing in all fields of psychology, contact:

➤ American Psychological Association, 750 1st St. NE., Washington, DC 20002. Internet: **http://www.apa.org**

For information on careers, educational requirements, certification, and licensing of school psychologists, contact:

➤ National Association of School Psychologists, 4340 East West Hwy., Suite 402, Bethesda, MD 20814. Internet: **http://www.nasponline.org**

Information about State licensing requirements is available from:

➤ Association of State and Provincial Psychology Boards, P.O. Box 241245, Montgomery, AL 36124-1245. Internet: **http://www.asppb.org**

Information about psychology specialty certifications is available from:

➤ American Board of Professional Psychology, Inc., 514 East Capitol Ave., Jefferson City, MO 65101. Internet: **http://www.abpp.org**

Urban and Regional Planners

(0*NET 19-3051.00)

Significant Points

- Local governments employ 7 out of 10 urban and regional planners.
- Most entry-level jobs require a master's degree; bachelor's degree holders may find some entry-level positions, but advancement opportunities are limited.
- Most new jobs will arise in affluent, rapidly growing urban and suburban communities.

Nature of the Work

Planners develop long-term and short-term plans to use land for the growth and revitalization of urban, suburban, and rural communities, while helping local officials make decisions concerning social, economic, and environmental problems. Because local governments employ the majority of urban and regional planners, they often are referred to as community, regional, or city planners.

Planners promote the best use of a community's land and resources for residential, commercial, institutional, and recreational purposes. Planners may be involved in various other activities, including making decisions relating to establishing alternative public transportation systems, developing resources, and protecting ecologically sensitive regions. Urban and regional planners address issues such as traffic congestion, air pollution, and the effects of growth and change on a community. They may formulate plans relating to the construction of new school buildings, public housing, or other kinds of infrastructure. Some planners are involved in environmental issues ranging from pollution control to wetland preservation, forest conservation, and the location of new landfills. Planners also may be involved in drafting legislation on environmental, social, and economic issues, such as sheltering the homeless, planning a new park, or meeting the demand for new correctional facilities.

Planners examine proposed community facilities, such as schools, to be sure that these facilities will meet the changing demands placed upon them over time. They keep abreast of economic and legal issues involved in zoning codes, building codes, and environmental regulations. They ensure that builders and developers follow these codes and regulations. Planners also deal with land-use issues created by population movements. For example, as suburban growth and economic development create more new jobs outside cities, the need for public transportation that enables workers to get to those jobs increases. In response, planners develop transportation models and explain their details to planning boards and the general public.

Before preparing plans for community development, planners report on the current use of land for residential, business, and community purposes. Their reports include information on the location and capacity of streets, highways, airports, water and sewer lines, schools, libraries, and cultural and recreational sites. They also provide data on the types of industries in the community, the characteristics of the population, and employment and economic trends. Using this information, along with input from citizens' advisory committees, planners design the layout of land uses for buildings and other facilities such as subway lines and stations. Planners prepare reports showing how their programs can be carried out and what they will cost.

Planners use computers to record and analyze information and to prepare reports and recommendations for government executives and others. Computer databases, spreadsheets, and analytical techniques are widely utilized to project program costs and forecast future trends in employment, housing, transportation, or population. Computerized geographic information systems enable planners to map land areas, to overlay maps with geographic variables such as population density, and to combine or manipulate geographic information to produce alternative plans for land use or development.

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Urban and regional planners help to determine the locations of housing developments, businesses, schools, and hospitals in a community.

Urban and regional planners often confer with land developers, civic leaders, and public officials and may function as mediators in community disputes, presenting alternatives that are acceptable to opposing parties. Planners may prepare material for community relations programs, speak at civic meetings, and appear before legislative committees and elected officials to explain and defend their proposals.

In large organizations, planners usually specialize in a single area, such as transportation, demography, housing, historic preservation, urban design, environmental and regulatory issues, or economic development. In small organizations, planners do various kinds of planning.

Working Conditions

Urban and regional planners often travel to inspect the features of land under consideration for development or regulation, including its current use and the types of structures on it. Some local government planners involved in site development inspections spend most of their time in the field. Although most planners have a scheduled 40-hour workweek, they frequently attend evening or weekend meetings or public hearings with citizens' groups. Planners may experience the pressure of deadlines and tight work schedules, as well as political pressure generated by interest groups affected by proposals related to urban development and land use.

Employment

Urban and regional planners held about 32,000 jobs in 2002. About 7 out of 10 were employed by local governments. Companies involved with architectural, engineering, and related services, as well as management, scientific, and technical consulting services, employ an increasing proportion of planners in the private sector. Others are employed in State government agencies dealing with housing, transportation, or environmental protection, and a small number work for the Federal Government.

Training, Other Qualifications, and Advancement

For jobs as urban and regional planners, employers prefer workers who have advanced training. Most entry-level jobs in Federal, State, and local government agencies require a master's degree from an accredited program in urban or regional planning or a master's degree in a related field, such as urban design or geography. A bachelor's degree from an accredited planning program, coupled with a master's degree in architecture, landscape architecture, or civil engineering, is good preparation for entry-level planning jobs in various areas, including urban design, transportation, and the environment. A master's degree from an accredited planning program provides the best training for a wide range of planning fields. Although graduates from one of the limited number of accredited bachelor's degree programs qualify for some entry-level positions, their advancement opportunities often are limited, unless they acquire an advanced degree.

Courses in related disciplines, such as architecture, law, earth sciences, demography, economics, finance, health administration, geographic information systems, and management, are highly recommended. Because familiarity with computer models and statistical techniques is important, courses in statistics and computer science also are recommended.

In 2003, 67 colleges and universities offered an accredited master's degree program, and 13 offered an accredited bachelor's degree program, in urban or regional planning. Accreditation for these programs is from the Planning Accreditation Board, which consists of representatives of the American Institute of Certified Planners, the American Planning Association, and the Association of Collegiate Schools of Planning. Most graduate programs in planning require a minimum of 2 years of study.

Specializations most commonly offered by planning schools are environmental planning, land use and comprehensive planning, economic development, housing, historic preservation, and social planning. Other popular offerings include community development, transportation, and urban design. Graduate students spend considerable time in studios, workshops, and laboratory courses learning to analyze and solve planning problems. They often are required to work in a planning office part time or during the summer. Local government planning offices frequently offer students internships, providing experience that proves invaluable in obtaining a full-time planning position after graduation.

The American Institute of Certified Planners, a professional institute within the American Planning Association, grants certification to individuals who have the appropriate combination of education and professional experience and who pass an examination. Certification may be helpful for promotion.

Planners must be able to think in terms of spatial relationships and visualize the effects of their plans and designs. They should be flexible and be able to reconcile different viewpoints and make constructive policy recommendations. The ability to communicate effectively, both orally and in writing, is necessary for anyone interested in this field.

After a few years of experience, planners may advance to assignments requiring a high degree of independent judgment, such as designing the physical layout of a large development or recommending policy and budget options. Some public-sector planners are promoted to community planning director and spend a great deal of time meeting with officials, speaking to civic groups, and supervising a staff. Further advancement occurs through a transfer to a larger jurisdiction with more complex problems and greater responsibilities or into related occu-

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pations, such as director of community or director of economic development.

Job Outlook

Employment of urban and regional planners is expected to grow about as fast as the average for all occupations through 2012. Employment growth will be driven by the need for State and local governments to provide public services such as regulation of commercial development, the environment, transportation, housing, and land use and development for an expanding population. Nongovernmental initiatives dealing with historic preservation and redevelopment will provide additional openings. Some job openings also will arise from the need to replace experienced planners who transfer to other occupations, retire, or leave the labor force for other reasons. Graduates with a degree from an accredited program should have an advantage in the job market.

Most planners work for local governments with limited resources and many demands for services. When communities need to cut expenditures, planning services may be cut before basic services, such as police, firefighting, and education. Budget constraints could limit job growth in government; as a result, the number of openings for consulting positions in private industry is expected to grow more rapidly than the number of openings in government.

Most new jobs for urban and regional planners will arise in affluent, rapidly expanding communities. Local governments need planners to address an array of problems associated with population growth. For example, new housing developments require roads, sewer systems, fire stations, schools, libraries, and recreation facilities that must be planned for in the midst of a consideration of budgetary constraints. Smalltown chambers of commerce, economic development authorities, and tourism bureaus may hire planners, preferably with some background in marketing and public relations.

Earnings

Median annual earnings of urban and regional planners were $49,880 in 2002. The middle 50 percent earned between $39,210 and $62,710. The lowest 10 percent earned less than $31,830, and the highest 10 percent earned more than $76,700. Median annual earnings in local government, the industry employing the largest number of urban and regional planners, were $48,950.

Related Occupations

Urban and regional planners develop plans for the growth of urban, suburban, and rural communities. Others whose work is similar include architects, civil engineers, environmental engineers, landscape architects, and geographers.

Sources of Additional Information

Information on careers, salaries, and certification in urban and regional planning is available from

➤ American Planning Association, Education Division, 122 South Michigan Ave., Suite 1600, Chicago, IL 60603-6107. Internet: **http://www.planning.org**

➤ Information on accredited urban and regional planning programs is available from

➤ Association of Collegiate Schools of Planning, 6311 Mallard Trace, Tallahassee, FL 32312. Internet: **http://www.acsp.org**

Social Scientists, Other

(0*NET 19-3041.00, 19-3091.01, 19-3091.02, 19-3092.00, 19-3093.00, 19-3094.00)

Significant Points

- The educational attainment of social scientists is among the highest of all occupations.
- Anthropologists and archaeologists, geographers, and sociologists will experience average growth, but slower-than-average growth is expected for historians and political scientists because they enjoy fewer opportunities outside of government and academic settings.
- Competition for jobs will remain keen for all specialties because many of these social scientists compete for jobs with other workers, such as psychologists, statisticians, or market and survey researchers.

Nature of the Work

The major social science occupations covered in this statement include anthropologists, archaeologists, geographers, historians, political scientists, and sociologists. (Economists, market and survey researchers, psychologists, and urban and regional planners are covered elsewhere in the *Handbook*.)

Social scientists study all aspects of society—from past events and achievements to human behavior and relationships among groups. Their research provides insights that help us understand different ways in which individuals and groups make decisions, exercise power, and respond to change. Through their studies and analyses, social scientists suggest solutions to social, business, personal, governmental, and environmental problems.

Research is a major activity of many social scientists, who use various methods to assemble facts and construct theories. Applied research usually is designed to produce information that will enable people to make better decisions or manage their affairs more effectively. Interviews and surveys are widely used to collect facts, opinions, or other information. Information collection takes many forms, including living and working among the population being studied; performing field investigations; analyzing historical records and documents; experimenting with human or animal subjects in a laboratory; administering standardized tests and questionnaires; and preparing and interpreting maps and computer graphics. The work of specialists in social science varies greatly, although specialists in one field may find that their research overlaps work being conducted in another discipline.

Anthropologists study the origin and the physical, social, and cultural development and behavior of humans. They may study the way of life, archaeological remains, language, or physical characteristics of people in various parts of the world. Some compare the customs, values, and social patterns of different cultures. Anthropologists usually concentrate in sociocultural anthropology, archaeology, linguistics, or biophysical anthropology. Sociocultural anthropologists study the customs, cultures, and social lives of groups in settings that vary from unindustrialized societies to modern urban centers.

Archaeologists recover and examine material evidence, such as ruins, tools, and pottery remaining from past human cultures,

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in order to determine the history, customs, and living habits of earlier civilizations. Linguistic anthropologists study the role of, and changes in, language over time in various cultures. Biophysical anthropologists study the evolution of the human body, look for the earliest evidences of human life, and analyze how culture and biology influence one another. Most anthropologists specialize in a particular region of the world.

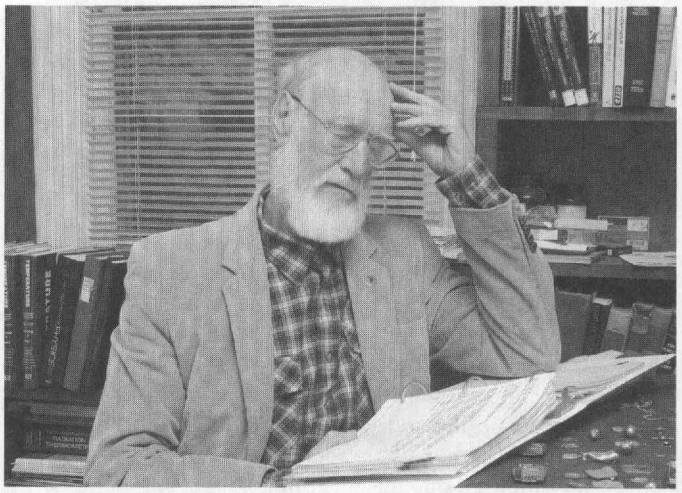
Geographers analyze distributions of physical and cultural phenomena on local, regional, continental, and global scales. Economic geographers study the distribution of resources and economic activities. Political geographers are concerned with the relationship of geography to political phenomena, whereas cultural geographers study the geography of cultural phenomena. Physical geographers study variations in climate, vegetation, soil, and landforms and their implications for human activity. Urban and transportation geographers study cities and metropolitan areas, while regional geographers study the physical, economic, political, and cultural characteristics of regions ranging in size from a congressional district to entire continents. Medical geographers study health-care delivery systems, epidemiology (the study of the causes and control of epidemics), and the effect of the environment on health. (Some occupational classification systems include geographers under physical scientists rather than social scientists.)

Increasingly, geographers are utilizing geographic information systems (GIS) technology to create computerized maps that can track information such as population growth, traffic patterns, environmental hazards, natural resources, and weather patterns. They then use the information to advise governments on the development of houses, roads, or landfills.

Historians research, analyze, and interpret the past. They use many sources of information in their research, including government and institutional records, newspapers and other periodicals, photographs, interviews, films, and unpublished manuscripts such as personal diaries and letters. Historians usually specialize in a country or region, a particular period, or a particular field, such as social, intellectual, cultural, political, or diplomatic history. Biographers collect detailed information on individuals. Other historians help study and preserve archival materials, artifacts, and historic buildings and sites.

Political scientists study the origin, development, and operation of political systems and public policy. They conduct research on a wide range of subjects, such as relations between the United States and other countries, the institutions and political life of nations, the politics of small towns or a major metropolis, and the decisions of the U.S. Supreme Court. Studying topics such as public opinion, political decisionmaking, ideology, and public policy, they analyze the structure and operation of governments, as well as various political entities. Depending on the topic, a political scientist might conduct a public-opinion survey, analyze election results, analyze public documents, or interview public officials.

Sociologists study society and social behavior by examining the groups and social institutions people form, as well as various social, religious, political, and business organizations. They also study the behavior of, and interaction among, groups, trace their origin and growth, and analyze the influence of group activities on individual members. Sociologists are concerned with the characteristics of social groups, organizations, and institutions; the ways individuals are affected by each other and by the groups to which they belong; and the effect of social traits such as sex, age, or race on a person's daily life. The results of sociological research aid educators, lawmakers, administrators, and others interested in resolving social problems and formulating public policy.



Many social scientists conduct research and write reports.

Most sociologists work in one or more specialties, such as social organization, stratification, and mobility; racial and ethnic relations; education; family; social psychology; urban, rural, political, and comparative sociology; sex roles and relations; demography; gerontology; criminology; and sociological practice.

Working Conditions

Most social scientists have regular hours. Generally working behind a desk, either alone or in collaboration with other social scientists, they read and write research articles or reports. Many experience the pressures of writing and publishing, as well as those associated with deadlines and tight schedules, and sometimes they must work overtime, for which they usually are not remunerated. Social scientists often work as an integral part of a research team, among whose members good communications skills are important. Travel may be necessary to collect information or attend meetings. Social scientists on foreign assignment must adjust to unfamiliar cultures, climates, and languages.

Some social scientists do fieldwork. For example, anthropologists, archaeologists, and geographers may travel to remote areas, live among the people they study, learn their languages, and stay for long periods at the site of their investigations. They may work under rugged conditions, and their work may involve strenuous physical exertion.

Social scientists employed by colleges and universities usually have flexible work schedules, often dividing their time among teaching, research, writing, consulting, or administrative responsibilities.

Employment

Social scientists held about 17,000 jobs in 2002. Many worked as researchers, administrators, and counselors for a wide range of employers, including Federal, State, and local governments; educational institutions; social assistance agencies; scientific research and development firms; and management, scientific, and technical consulting firms. Other employers included architectural, engineering, and related firms; civic and social associations; museums; and business, professional, labor, political, and similar organizations.

Many individuals with training in a social science discipline teach in colleges and universities and in secondary and elemen-

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tary schools. (For more information, see teachers—postsecondary and teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.) The proportion of social scientists who teach varies by specialty—for example, the academic world usually is a more important source of jobs for graduates in history than for graduates in most other social science fields.

Training, Other Qualifications, and Advancement

The educational attainment of social scientists is among the highest of all occupations. The Ph.D. or equivalent degree is a minimum requirement for most positions in colleges and universities and is important for advancement to many top-level nonacademic research and administrative posts. Graduates with master's degrees in applied specialties usually have better opportunities outside of colleges and universities, although the situation varies by field. Graduates with a master's degree in a social science may qualify for teaching positions in community colleges. Bachelor's degree holders have limited opportunities and, in most social science occupations, do not qualify for "professional" positions. The bachelor's degree does, however, provide a suitable background for many different kinds of entry-level jobs, such as research assistant, administrative aide, or management or sales trainee. With the addition of sufficient education courses, social science graduates also can qualify for teaching positions in secondary and elementary schools.

Training in statistics and mathematics is essential for many social scientists. Mathematical and quantitative research methods increasingly are being used in geography, political science, and other fields. The ability to utilize computers for research purposes is mandatory in most disciplines. Most geographers also will need to be familiar with GIS technology.

Many social science students find that internships or field experience is beneficial. Numerous local museums, historical societies, government agencies, and other organizations offer internships or volunteer research opportunities. A few archeological field schools instruct future anthropologists, archeologists, and historians in how to excavate historical sites.

Depending on their jobs, social scientists may need a wide range of personal characteristics. Because they constantly seek new information about people, things, and ideas, intellectual curiosity and creativity are fundamental personal traits. The ability to think logically and methodically is important to a political scientist comparing, for example, the merits of various forms of government. Objectivity, openmindedness, and systematic work habits are important in all kinds of social science research. Perseverance is essential for an anthropologist, who might spend years accumulating artifacts from an ancient civilization. Excellent written and oral communication skills are necessary for all these professionals.

Job Outlook

Overall employment of social scientists is expected to grow about as fast as the average for all occupations through 2012. However, growth rates will vary by specialty. Anthropologists and archaeologists, geographers, and sociologists will experience average employment growth. However, employment of historians and political scientists will grow more slowly than average because these workers enjoy fewer opportunities outside of government and academic settings.

Despite projected job growth, competition will remain keen for social science positions. Many jobs in policy, research, or marketing, for which social scientists qualify, are not advertised exclusively as social scientist positions. Because of the wide range of skills and knowledge possessed by social scientists discussed in this *Handbook* statement, many compete for jobs with other workers, such as market and survey researchers, psychologists, engineers, urban and regional planners, and statisticians.

A few social scientists will find opportunities as university faculty, although competition for these jobs also will remain keen. Usually, there are more graduates than available faculty positions, although retirements among faculty are expected to rise in the next few years. The growing importance and popularity of social science subjects in secondary schools is strengthening the demand for social science teachers at that level.

Anthropologists and sociologists will find opportunities performing policy research for consulting firms, nonprofit organizations, and social service agencies in such areas as crime, ethnic conflict, public health, and refugee policy. These social scientists also will be employed by various companies in product development, marketing, and advertising. Others are employed in human resources in conflict resolution and in issues relating to diverse workforces. As construction projects increase, archaeologists will be needed to perform preliminary excavations in order to preserve historical artifacts.

Geographers will have opportunities to utilize their skills to advise government, real-estate developers, utilities, and telecommunications firms on where to build new roads, buildings, power plants, and cable lines. Geographers also will advise on environmental matters, such as where to build a landfill or preserve wetland habitats. As the use of GIS technology expands, geographers will find numerous job opportunities applying GIS technology in non-traditional areas, such as emergency assistance, where GIS can track locations of ambulances, police, and fire rescue units and their proximity to the emergency. GIS technology will also be utilized in areas of growing importance, such as homeland security and defense.

Historians and political scientists also will find jobs in policy or research. Opportunities in government will be limited as government contracts out more work to the private sector or cuts research grants and funding for museums. Historians may find opportunities with historic preservation societies as public interest in preserving and restoring historical sites increases. Political scientists will be able to utilize their knowledge of political institutions to further the interests of nonprofit, political lobbying, and social organizations.

Earnings

Median annual earnings of social scientists (excluding economists, market and survey researchers, psychologists, and urban and regional planners) were $52,280 in 2002. Anthropologists and archeologists had median annual earnings of $38,620; geographers, $53,420; historians, $42,030; political scientists, $80,560; and sociologists, $53,160.

In the Federal Government, social scientists with a bachelor's degree and no experience could start at $23,442 or $29,307 a year in 2003, depending on their college records. Those with a master's degree could start at $35,519, and those with a Ph.D. degree could begin at $42,976, while some individuals with experience and an advanced degree could start at $51,508.

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Beginning salaries were slightly higher in selected areas of the country where the prevailing local pay level was higher.

Related Occupations

Social scientists' duties and training outlined in this statement are similar to those of other occupations covered elsewhere in the *Handbook*, including other social science occupations—economists, market and survey researchers, psychologists, and urban and regional planners. Many social scientists conduct surveys, study social problems, teach, and work in museums, performing tasks similar to those of statisticians; counselors; social workers; teachers—postsecondary; teachers—preschool, kindergarten, elementary, middle, and secondary; and archivists, curators, and museum technicians.

Political scientists are concerned with the function of government, including the legal system, as are lawyers; paralegals; and judges, magistrates, and other judicial workers. Many political scientists analyze and report on current events, much as do news analysts, reporters, and correspondents.

Along with conservation scientists and foresters, atmospheric scientists, and environmental scientists and geoscientists, geographers are concerned with the earth's environment and natural resources. Geographers also use GIS computer technology to make maps. Other occupations with similar duties are surveyors, cartographers, photogrammetrists, and surveying technicians; and computer systems analysts, database administrators, and computer scientists.

Sources of Additional Information

Detailed information about economists and market and survey researchers, psychologists, and urban and regional planners is presented elsewhere in the *Handbook*.

For information about careers in anthropology, contact
➤ American Anthropological Association, 2200 Wilson Blvd., Suite 600, Arlington, VA 22201. Internet: **http://www.aaanet.org**

For information about careers in archaeology, contact either of the following organizations:
➤ Society for American Archaeology, 900 2nd St. NE., Suite 12, Washington, DC 20002-3557. Internet: **http://www.saa.org**
➤ Archaeological Institute of America, 656 Beacon St., Boston, MA 02215-2006. Internet: **http://www.archaeological.org**

For information about careers in geography, contact
➤ Association of American Geographers, 1710 16th St. NW., Washington, DC 20009-3198. Internet: **http://www.aag.org**

Information on careers for historians is available from
➤ American Historical Association, 400 A St. SE., Washington, DC 20003-3889. Internet: **http://www.theaha.org**

For information about careers in political science, contact either of the following sources:
➤ American Political Science Association, 1527 New Hampshire Ave. NW., Washington, DC 20036-1206. Internet: **http://www.apsanet.org**
➤ National Association of Schools of Public Affairs and Administration, 1120 G St. NW., Suite 730, Washington, DC 20005-3869. Internet: **http://www.naspaa.org**

Information about careers in sociology is available from
➤ American Sociological Association, 1307 New York Ave. NW., Suite 700, Washington, DC 20005-4712. Internet: **http://www.asanet.org**

Science Technicians

(0*NET 19-4011.01, 19-4011.02, 19-4021.00, 19-4031.00, 19-4041.01, 19-4041.02, 19-4051.01, 19-4051.02, 19-4091.00, 19-4092.00, 19-4093.00)

Significant Points

- Science technicians in production jobs can be employed on day, evening, or night shifts.
- Many employers prefer applicants who have at least 2 years of specialized training or an associate degree.
- Job opportunities are expected to be best for graduates of applied science technology programs.
- Job growth will be concentrated in pharmaceutical manufacturing, chemical manufacturing, and biotechnological research and development firms.

Nature of the Work

Science technicians use the principles and theories of science and mathematics to solve problems in research and development and to help invent and improve products and processes. However, their jobs are more practically oriented than those of scientists. Technicians set up, operate, and maintain laboratory instruments, monitor experiments, make observations, calculate and record results, and often develop conclusions. They must keep detailed logs of all of their work-related activities. Those who work in production monitor manufacturing processes and may be involved in ensuring quality by testing products for proper proportions of ingredients, for purity, or for strength and durability.

As laboratory instrumentation and procedures have become more complex in recent years, the role of science technicians in research and development has expanded. In addition to performing routine tasks, many technicians also develop and adapt laboratory procedures to achieve the best results, interpret data, and devise solutions to problems, under the direction of scientists. Moreover, technicians must master the laboratory equipment so that they can adjust settings when necessary and recognize when equipment is malfunctioning.

The increasing use of robotics to perform many routine tasks has freed technicians to operate more sophisticated laboratory equipment. Science technicians make extensive use of computers, computer-interfaced equipment, robotics, and high-technology industrial applications, such as biological engineering.

Most science technicians specialize, learning skills and working in the same disciplines in which scientists work. Occupational titles, therefore, tend to follow the same structure as those for scientists. *Agricultural technicians* work with agricultural scientists in food, fiber, and animal research, production, and processing. Some conduct tests and experiments to improve the yield and quality of crops or to increase the resistance of plants and animals to disease, insects, or other hazards. Other agricultural technicians do animal breeding and nutrition work. *Food science technicians* assist food scientists and technologists in research and development, production technology, and quality control. For example, food science technicians may conduct

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tests on food additives and preservatives to ensure FDA compliance on factors such as color, texture, and nutrients. They analyze, record, and compile test results; order supplies to maintain laboratory inventory; and clean and sterilize laboratory equipment.

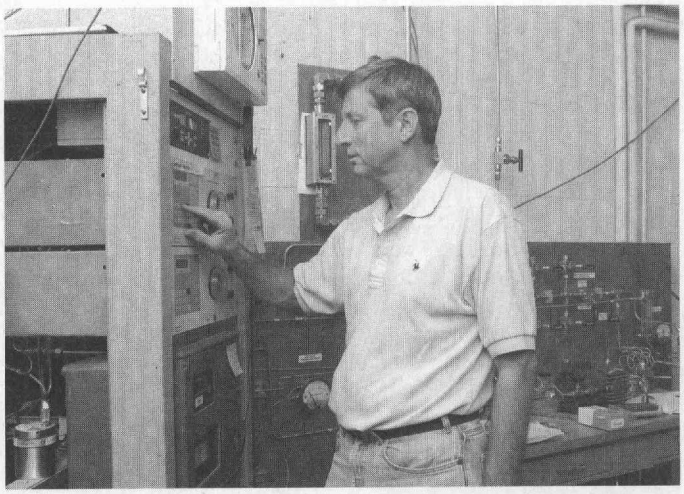
Biological technicians work with biologists studying living organisms. Many assist scientists who conduct medical research—helping to find a cure for cancer or AIDS, for example. Those who work in pharmaceutical companies help develop and manufacture medicinal and pharmaceutical preparations. Those working in the field of microbiology generally work as lab assistants, studying living organisms and infectious agents. Biological technicians also analyze organic substances, such as blood, food, and drugs, and some examine evidence in a forensic science laboratory. Biological technicians working in biotechnology labs use the knowledge and techniques gained from basic research by scientists, including gene splicing and recombinant DNA, and apply them in product development.

Chemical technicians work with chemists and chemical engineers, developing and using chemicals and related products and equipment. Generally, there are two types of chemical technicians—research and development technicians who work in experimental laboratories, and process control technicians who work in manufacturing or other industrial plants. Many research and development chemical technicians conduct a variety of laboratory procedures, from routine process control to complex research projects. For example, they may collect and analyze samples of air and water to monitor pollution levels or produce compounds through complex organic synthesis. Most process technicians work in manufacturing, where they test packaging for design, integrity of materials, and environmental acceptability. Often, process technicians who work in plants also focus on quality assurance: there, they monitor product quality or production processes and develop new production techniques. A few work in shipping to provide technical support and expertise for these functions.

Environmental science and protection technicians perform laboratory and field tests to monitor environmental resources and determine the contaminants and sources of pollution. They may collect samples for testing or be involved in abating, controlling, or remediating sources of environmental pollutants. Some are responsible for waste management operations, control and management of hazardous materials inventory, or general activities involving regulatory compliance.

Forensic science technicians investigate crimes by collecting and analyzing physical evidence. Often, they specialize in areas such as DNA analysis or firearm examination, performing tests on weapons or substances such as fiber, hair, tissue, or body fluids to determine significance to the investigation. They also prepare reports to document their findings and the laboratory techniques used, and may provide information and expert opinion to investigators. When criminal cases come to trial, forensic science technicians often provide testimony, as expert witnesses, on specific laboratory findings by identifying and classifying substances, materials, and other evidence collected at the crime scene.

Forest and conservation technicians compile data on the size, content, and condition of forest land tracts. These workers usually work in a forest under the supervision of a forester, conducting specific tasks such as measuring timber, supervising harvesting operations, assisting in roadbuilding operations, and locating property lines and features. They also may gather basic information, such as species and population of trees, disease and insect damage, tree seedling mortality, and conditions that may cause fire danger. Forest and conservation technicians also train and lead forest and conservation workers in seasonal activities, such as planting tree seedlings, putting out forest fires, and maintaining recreational facilities.



Many science technicians make extensive use of computers, computer-interfaced equipment, robotics, and high-technology industrial applications.

Geological and petroleum technicians measure and record physical and geologic conditions in oil or gas wells, using advanced instruments lowered into wells or by analysis of the mud from wells. In oil and gas exploration, these technicians collect and examine geological data or test geological samples to determine petroleum and mineral and element composition using scanning electron microscopes. Some petroleum technicians, called *scouts*, collect information about oil and gas well drilling operations, geological and geophysical prospecting, and land or lease contracts.

Nuclear technicians operate nuclear test and research equipment, monitor radiation, and assist nuclear engineers and physicists in research. Some also operate remote control equipment to manipulate radioactive materials or materials to be exposed to radioactivity.

Other science technicians collect weather information or assist oceanographers.

Working Conditions

Science technicians work under a wide variety of conditions. Most work indoors, usually in laboratories, and have regular hours. Some occasionally work irregular hours to monitor experiments that cannot be completed during regular working hours. Production technicians often work in 8-hour shifts around the clock. Others, such as agricultural, forest and conservation, geological and petroleum, and environmental science and protection technicians, perform much of their work outdoors, sometimes in remote locations.

Some science technicians may be exposed to hazards from equipment, chemicals, or toxic materials. Chemical technicians sometimes work with toxic chemicals or radioactive isotopes, nuclear technicians may be exposed to radiation, and biological technicians sometimes work with disease-causing organisms or radioactive agents. Forensic science technicians often are exposed to human body fluids and firearms. However, these working conditions pose little risk, if proper safety procedures are followed. For forensic science technicians, collecting evidence from crime scenes can be distressing and unpleasant.

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Employment

Science technicians held about 208,000 jobs in 2002. As indicated by the following tabulation, chemical and biological technicians accounted for over half of all jobs:

Chemical technicians	69,000
Biological technicians	48,000
Environmental science and protection technicians, including health	28,000
Agricultural and food science technicians	20,000
Forest and conservation technicians	19,000
Geological and petroleum technicians	11,000
Forensic science technicians	8,400
Nuclear technicians	5,700

Chemical technicians held jobs in a wide range of manufacturing and service industries, but were concentrated in chemical manufacturing, where they held 26,000 jobs. About 17,000 worked in professional, scientific, or technical services firms; about 17,000 biological technicians also worked in professional, scientific, or technical services firms. Most other biological technicians worked in pharmaceutical and medicine manufacturing or for Federal, State, or local governments. Significant numbers of environmental science and protection technicians also worked for State and local governments and professional, scientific, and technical services firms. Almost two-thirds of forest and conservation technicians held jobs in the Federal Government; another 20 percent worked for State governments. Around 22 percent of agricultural and food science technicians worked for food processing companies; most of the rest worked for scientific research and development services firms and State governments. Over one-fifth of all geological and petroleum technicians worked for oil and gas extraction companies, and forensic science technicians worked primarily for State and local governments.

Training, Other Qualifications, and Advancement

There are several ways to qualify for a job as a science technician. Many employers prefer applicants who have at least 2 years of specialized training or an associate degree in applied science or science-related technology. Because employers' preferences vary, however, some science technicians have a bachelor's degree in chemistry, biology, or forensic science, or have taken several science and math courses at 4-year colleges.

Many technical and community colleges offer associate degrees in a specific technology or a more general education in science and mathematics. A number of 2-year associate degree programs are designed to provide easy transfer to a 4-year college or university, if desired. Technical institutes usually offer technician training, but provide less theory and general education than do technical or community colleges. The length of programs at technical institutes varies, although 1-year certificate programs and 2-year associate degree programs are common.

More than 20 colleges or universities offer a bachelor's degree program in forensic science; more than 10 additional schools offer a bachelor's of science in chemistry, biochemistry, or genetic engineering with an emphasis on forensic science; a few additional schools offer a bachelor's of science degree with an emphasis in a specialty area, such as criminalistics, pathology, jurisprudence, odontology, toxicology, or forensic accounting. In contrast to some other science technician positions that require only a 2-year degree, a 4-year degree in forensics science is usually necessary to work in the field. Knowledge and understanding of legal procedures also can be helpful. Forestry and conservation technicians can choose from more than 20 associate degree programs in forest technology accredited by the Society of American Foresters.

Most chemical process technicians have a 2-year degree, usually an associate degree in process technology, although in some cases a high school diploma is sufficient. They usually receive additional on-the-job training. Entry-level workers whose college training encompasses extensive hands-on experience with a variety of diagnostic laboratory equipment usually require less on-the-job training. Those with a high school diploma typically begin work as trainees under the direct supervision of a more experienced process technician. Many with only a high school diploma eventually earn a 2-year degree in process technology, often paid for by their employer.

Some schools offer cooperative-education or internship programs, allowing students the opportunity to work at a local company or other workplace while attending classes in alternate terms. Participation in such programs can significantly enhance a student's employment prospects.

Persons interested in careers as science technicians should take as many high school science and math courses as possible. Science courses taken beyond high school, in an associate or bachelor's degree program, should be laboratory oriented, with an emphasis on bench skills. A solid background in applied basic chemistry, physics, and math is vital. Because computers often are used in research and development laboratories, technicians should have strong computer skills. Communication skills also are important; technicians often are required to report their findings both orally and in writing. Additionally, technicians should be able to work well with others, because teamwork is common. Organizational ability, an eye for detail, and skill in interpreting scientific results also are important. High mechanical aptitude, attention to detail, and analytical thinking are all important characteristics of science technicians.

Prospective science technicians can acquire good career preparation through 2-year formal training programs that combine the teaching of scientific principles and theory with practical hands-on application in a laboratory setting with up-to-date equipment. Graduates of 4-year bachelor's degree programs in science who have considerable experience in laboratory-based courses, have completed internships, or have held summer jobs in laboratories also are well qualified for science technician positions and are preferred by some employers. However, those with a bachelor's degree who accept technician jobs generally cannot find employment that uses their advanced academic education.

Technicians usually begin work as trainees in routine positions, under the direct supervision of a scientist or a more experienced technician. Job candidates whose training or educational background encompasses extensive hands-on experience with a variety of laboratory equipment, including computers and related equipment, usually require a short period of on-the-job training. As they gain experience, technicians take on more responsibility and carry out assignments under only general supervision, and some eventually become supervisors. However, technicians employed at universities often have their fortunes tied to those of particular professors; when professors retire or leave, these technicians face uncertain employment prospects.

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Job Outlook

Overall employment of science technicians is expected to increase about as fast as the average for all occupations through the year 2012. Continued growth of scientific and medical research, particularly research related to biotechnology, as well as the development and production of technical products, should stimulate demand for science technicians in many industries. The increase in the number of biological technicians will be about as fast as average, as the growing number of agricultural and medicinal products developed using biotechnology techniques will boost demand for these workers. Also, stronger competition among pharmaceutical companies and an aging population are expected to contribute to the need for innovative and improved drugs, further spurring demand for biological technicians. Fastest employment growth of biological technicians should occur in the pharmaceutical and medicine manufacturing industry and in scientific research and development services firms.

Job growth for chemical technicians is projected to grow more slowly than average. The chemical manufacturing industry, the major employer of chemical technicians, will experience a decline in overall employment as companies downsize and turn to outside contractors to provide specialized services. Job opportunities are expected to be more plentiful in pharmaceutical and medicine manufacturing as the public continues to demand newer and better pharmaceuticals. To meet this demand, pharmaceutical manufacturing firms are expected to continue to devote money to research and development, either through in-house teams, or, increasingly, by contracting to scientific research and development services firms, spurring employment growth of chemical technicians in that industry. An increasing focus on quality assurance will require a greater number of process technicians, further stimulating demand for these workers.

Employment of environmental science and protection technicians should grow much faster than average to help regulate waste products; to collect air, water, and soil samples for measuring levels of pollutants; to monitor compliance with environmental regulations; and to clean up contaminated sites.

There will be limited demand for forest and conservation technicians at the Federal and State government levels, leading to slower-than-average growth, due to general downsizing and reductions in timber harvesting on Federal lands. However, increased emphasis on specific conservation issues, such as environmental protection, water resources preservation, and control of exotic and invasive pests, may provide some employment opportunities.

Employment of agricultural and food science technicians should grow more slowly than average, mainly due to limited growth in agriculture and the food processing industry. However, research will still be necessary, particularly biotechnological research in the private sector, as it becomes increasingly important to balance greater agricultural output with protection and preservation of soil, water, and the ecosystem. Specifically, research will be needed to combat insects and diseases as they continue to adapt to pesticides and as soil fertility and water quality continue to need improvement.

Jobs for forensic science technicians are expected to increase about as fast as average. Crime scene technicians who work for State Public Safety Departments may experience favorable employment prospects if the number of qualified applicants remains low.

Little or no growth in employment of geological and petroleum technicians is expected because employment in the oil and gas extraction and mining industries, among the largest employers of geological and petroleum technicians, is expected to decline. Job opportunities will be more favorable in professional, scientific, and technical services firms, as geological and petroleum technicians will be needed to consult companies regarding environmental policy and Federal Government mandates, such as those requiring lower sulfur emissions.

Job opportunities are expected to be best for graduates of applied science technology programs who are well trained on equipment used in industrial and government laboratories and production facilities. As the instrumentation and techniques used in industrial research, development, and production become increasingly more complex, employers are seeking individuals with highly developed technical and communication skills.

Along with opportunities created by growth, many job openings should arise from the need to replace technicians who retire or leave the labor force for other reasons. During periods of economic recession, layoffs of science technicians may occur.

Earnings

Median hourly earnings of science technicians in 2002 were as follows:

Nuclear technicians	$28.84
Forensic science technicians	19.73
Geological and petroleum technicians	18.96
Chemical technicians	18.00
Environmental science and protection technicians, including health	16.98
Biological technicians	15.73
Forest and conservation technicians	14.90
Agricultural and food science technicians	13.74

In 2003, the average annual salary in nonsupervisory, supervisory, and managerial positions in the Federal Government was $30,440 for biological science technicians; $44,068 for physical science technicians; $55,374 for geodetic technicians; $40,781 for hydrologic technicians; and $52,585 for meteorological technicians.

Related Occupations

Other technicians who apply scientific principles at a level usually acquired in 2-year associate degree programs include engineering technicians, broadcast and sound engineering technicians and radio operators, drafters, and health technologists and technicians, especially clinical laboratory technologists and technicians, diagnostic medical sonographers, and radiologic technologists and technicians.

Sources of Additional Information

For information about a career as a chemical technician, contact:

➤ American Chemical Society, Education Division, Career Publications, 1155 16th St. NW., Washington, DC 20036. Internet: **http://www.acs.org**

For career information and a list of undergraduate, graduate, and doctoral programs in forensic sciences, contact:

➤ American Academy of Forensic Sciences, P.O. Box 669, Colorado Springs, CO, 80901. Internet: **http://www.aafs.org**

For general education information on forestry technicians and lists of schools offering education in forestry, send a self-addressed, stamped business envelope to:

➤ Society of American Foresters, 5400 Grosvenor Ln., Bethesda, MD 20814. Internet: **http://www.safnet.org**

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Community and Social Services Occupations

Clergy

(0*NET 21-2011.00)

Significant Points

- Many denominations require that clergy complete a bachelor's degree and a graduate-level program of theological study; others will admit anyone who has been "called" to the vocation.
- Individuals considering a career in the clergy should realize they are choosing not only a career but also a way of life; members of the clergy typically work irregular hours and many put in longer than average work days.
- Opportunities are expected in all faiths, but in some denominations competition is likely for positions leading large urban worship groups.

Nature of the Work

Religious beliefs—such as Buddhist, Christian, Jewish, or Moslem—are significant influences in the lives of millions of Americans, and prompt many to participate in organizations that reinforce their faith. Even within a religion many denominations may exist, with each group having unique traditions and responsibilities assigned to its clergy. For example, Christianity has more than 70 denominations, while Judaism has 4 major branches, as well as groups within each branch, with diverse customs.

Clergy are religious and spiritual leaders, and teachers and interpreters of their traditions and faith. Most members of the clergy serve in a pulpit. They organize and lead regular religious services and officiate at special ceremonies, including confirmations, weddings, and funerals. They may lead worshipers in prayer, administer the sacraments, deliver sermons, and read from sacred texts such as the Bible, Torah, or Koran. When not conducting worship services, clergy organize, supervise, and lead religious education programs for their congregations. Clergy visit the sick or bereaved to provide comfort and counsel persons who are seeking religious or moral guidance or who are troubled by family or personal problems. They also may work to expand the membership of their congregations and solicit donations to support their activities and facilities.

Clergy who serve large congregations often share their duties with associates or more junior clergy. Senior clergy may spend considerable time on administrative duties. They oversee the management of buildings, order supplies, contract for services and repairs, and supervise the work of staff and volunteers. Associate or assistant members of the clergy sometimes specialize in an area of religious service, such as music, education, or youth counseling. Clergy also work with committees and officials, elected by the congregation, who guide the management of the congregation's finances and real estate.

Other members of the clergy serve their religious communities in ways that do not call for them to hold positions in congregations. Some serve as chaplains in the U.S. Armed Forces and in hospitals, while others help to carry out the missions of religious community and social services agencies. A few members of the clergy serve in administrative or teaching posts in schools at all grade levels, including seminaries.

Working Conditions

Members of the clergy typically work irregular hours and many put in longer than average work days. Those who do not work in congregational settings may have more routine schedules. In 2002, almost one-fifth of full-time clergy worked 60 or more hours a week, more than 3 times that of all workers in professional occupations. Although many of their activities are sedentary and intellectual in nature, clergy frequently are called on short notice to visit the sick, comfort the dying and their families, and provide counseling to those in need. Involvement in community, administrative, and educational activities sometimes require clergy to work evenings, early mornings, holidays, and weekends.

Because of their roles as leaders regarding spiritual and morality issues, some members of the clergy often feel obligated to address and resolve both societal problems and the personal problems of their congregants, which can lead to stress.

Training, Other Qualifications, and Advancement

Educational requirements for entry into the clergy vary greatly. Similar to other professional occupations, about 3 out of 4 members of the clergy have completed at least a bachelor's degree. Many denominations require that clergy complete a bachelor's degree and a graduate-level program of theological study; others will admit anyone who has been "called" to the vocation. Some faiths do not allow women to become clergy; however, others, mainly in Protestant churches, do. Men and women considering careers in the clergy should consult their religious leaders to verify specific entrance requirements.

Individuals considering a career in the clergy should realize they are choosing not only a career but also a way of life. In fact, most members of the clergy remain in their chosen vocation throughout their lives; in 2002, almost 10 percent of clergy were 65 or older, compared with only 3 percent of workers in all occupations.

Religious leaders must exude confidence and motivation, while remaining tolerant and able to listen to the needs of others. They should be capable of making difficult decisions, working under pressure, and living up to the moral standards set by their faith and community.

The sections that follow provide more detailed information on the three largest groups of clergy: Protestant ministers, Rabbis, and Roman Catholic priests.

Sources of Additional Information

For more information on careers in the ministry, contact the association affiliated with a particular denomination.

The following website provides links to many of these denominations. Internet:
http://www.hirr.hartsem.edu/org/faith_denominations_homepages.html

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Protestant Ministers

(0*NET 21-2011.00)

Significant Points

- Entry requirements vary greatly; many denominations require a bachelor's degree followed by study at a theological seminary, whereas others have no formal educational requirements.
- Competition for positions will vary among denominations and geographic regions.

Nature of the Work

Protestant ministers lead their congregations in worship services and administer the various rites of the church, such as baptism, confirmation, and Holy Communion. The services that ministers conduct differ among the numerous Protestant denominations and even among congregations within a denomination. In many denominations, ministers follow a traditional order of worship; in others, they adapt the services to the needs of youth and other groups within the congregation. Most services include Bible readings, hymn singing, prayers, and a sermon. In some denominations, Bible readings by members of the congregation and individual testimonials constitute a large part of the service. In addition to these duties, ministers officiate at weddings, funerals, and other occasions.

Each Protestant denomination has its own hierarchical structure. Some ministers are responsible only to the congregation they serve, whereas others are assigned duties by elder ministers or by the bishops of the diocese they serve. In some denominations, ministers are reassigned to a new pastorate by a central governing body or diocese every few years.

Ministers who serve small congregations usually work personally with parishioners. Those who serve large congregations may share specific aspects of the ministry with one or more associates or assistants, such as a minister of education or a minister of music.

Employment

There are many denominations; however, most ministers are employed by the five largest Protestant bodies—Baptist, Episcopalian, Lutheran, Methodist, and Presbyterian.



Protestant ministers are trained to administer a particular denomination's unique expression of worship.

Although most ministers are located in urban areas, many serve two or more smaller congregations in less densely populated areas. Some small churches increasingly employ part-time ministers who are seminary students, retired ministers, or holders of secular jobs. Unpaid pastors serve other churches with meager funds. In addition, some churches employ specially trained members of the laity to conduct nonliturgical functions.

Training and Other Qualifications

Educational requirements for entry into the Protestant ministry vary greatly. Many denominations require, or at least strongly prefer, a bachelor's degree followed by study at a theological seminary. However, some denominations have no formal educational requirements, and others ordain persons having various types of training from Bible colleges or liberal arts colleges. Many denominations now allow women to be ordained, but some do not. Persons considering a career in the ministry should first verify the ministerial requirements with their particular denomination.

In general, each large denomination has its own schools of theology that reflect its particular doctrine, interests, and needs. However, many of these schools are open to students from other denominations. Several interdenominational schools associated with universities give both undergraduate and graduate training covering a wide range of theological points of view.

In 2002, the Association of Theological Schools in the United States and Canada accredited 216 Protestant denominational theological schools. These schools only admit students who have received a bachelor's degree or its equivalent from an accredited college. After college graduation, many denominations require a 3-year course of professional study in one of these accredited schools, or seminaries, for the degree of Master of Divinity.

The standard curriculum for accredited theological schools consists of four major categories: Biblical studies, church history, theology and ethics, and practical theology. Other subjects taught include sociology and anthropology, comparative religions, spiritual formation, religion and the arts, and speech, among others. Many accredited schools require that students work under the supervision of a faculty member or experienced minister. Some institutions offer Doctor of Ministry degrees to students who have completed additional study—usually 2 or more years—and served at least 2 years as a minister. Scholarships and loans often are available for students of theological institutions.

Persons who have denominational qualifications for the ministry usually are ordained after graduation from a seminary or after serving a probationary pastoral period. Denominations that do not require seminary training ordain clergy at various appointed times. Some churches ordain ministers with only a high school education.

Women and men entering the clergy often begin their careers as pastors of small congregations or as assistant pastors in large churches. Pastor positions in large metropolitan areas or in large congregations often require many years of experience.

Job Outlook

Job opportunities as Protestant ministers should be best for graduates of theological schools. The degree of competition for positions will vary among denominations and geographic regions. For example, relatively favorable prospects are expected for ministers in evangelical churches. Competition, however,

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will be keen for responsible positions serving large, urban congregations. Ministers willing to work part time or for small, rural congregations should have better opportunities. Many job openings will stem from the need to replace ministers who retire, die, or leave the ministry.

For newly ordained Protestant ministers who are unable to find parish positions, employment alternatives include working in youth counseling, family relations, and social welfare organizations; teaching in religious educational institutions; or serving as chaplains in the Armed Forces, hospitals, universities, and correctional institutions.

Earnings

Salaries of Protestant clergy vary substantially, depending on experience, denomination, size and wealth of the congregation, and geographic location. For example, some denominations tie a minister's pay to the average pay of the congregation or the community. As a result, ministers serving larger, wealthier congregations often earned significantly higher salaries than those in smaller, less affluent areas or congregations. Ministers with modest salaries sometimes earn additional income from employment in secular occupations.

Sources of Additional Information

Persons who are interested in entering the Protestant ministry should seek the counsel of a minister or church guidance worker. Theological schools can supply information on admission requirements. For information on special requirements for ordination, prospective ministers also should contact the ordination supervision body of their particular denomination.

Rabbis

(0*NET 21-2011.00)

Significant Points

- Ordination usually requires completion of a college degree followed by a 4- to 6-year program at a Jewish seminary.
- Job opportunities for rabbis are expected in all four major branches of Judaism through the year 2012.

Nature of the Work

Rabbis serve Orthodox, Conservative, Reform, Reconstructionist, and unaffiliated Jewish congregations. Regardless of the branch of Judaism they serve or their individual points of view, all rabbis preserve the substance of Jewish religious worship. Congregations differ in the extent to which they follow the traditional form of worship—for example, in the wearing of head coverings, in the use of Hebrew as the language of prayer, and in the use of instrumental music or a choir. Additionally, the format of the worship service and, therefore, the ritual that the rabbi uses may vary even among congregations belonging to the same branch of Judaism.

Rabbis have greater independence in religious expression than other clergy, because of the absence of a formal religious hierarchy in Judaism. Instead, rabbis are responsible directly to the board of trustees of the congregation they serve. Those serving large congregations may spend considerable time in administrative duties, working with their staffs and committees.



Newly ordained rabbis often begin as spiritual leaders of small congregations or as assistants to more experienced rabbis.

Large congregations frequently have associate or assistant rabbis, who often serve as educational directors. All rabbis play a role in community relations. For example, many rabbis serve on committees, alongside business and civic leaders in their communities to help find solutions to local problems.

Rabbis also may write for religious and lay publications and teach in theological seminaries, colleges, and universities.

Employment

Although the majority of rabbis served congregations representing the four main branches of Judaism, many rabbis functioned in other settings. Some taught in Jewish studies programs at colleges and universities, whereas others served as chaplains in hospitals, colleges, or the military. Additionally, some rabbis held positions in one of the many social service or Jewish community agencies.

Although rabbis serve Jewish communities throughout the Nation, they are concentrated in major metropolitan areas with large Jewish populations.

Training, Other Qualifications, and Advancement

To become eligible for ordination as a rabbi, a student must complete a course of study in a seminary. Entrance requirements and the curriculum depend upon the branch of Judaism with which the seminary is associated. Most seminaries require applicants to be college graduates.

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Jewish seminaries typically take 5 years for completion of studies, with an additional preparatory year required for students without sufficient grounding in Hebrew and Jewish studies. In addition to the core academic program, training generally includes fieldwork and internships providing hands-on experience and, in some cases, study in Jerusalem. Seminary graduates are awarded the title Rabbi and earn the Master of Arts in Hebrew Letters degree. After more advanced study, some earn the Doctor of Hebrew Letters degree.

In general, the curricula of Jewish theological seminaries provide students with a comprehensive knowledge of the Bible, the Torah, rabbinic literature, Jewish history, Hebrew, theology, and courses in education, pastoral psychology, and public speaking. Students receive extensive practical training in dealing with social problems in the community. Training for alternatives to the pulpit, such as leadership in community services and religious education, is increasingly stressed. Some seminaries grant advanced academic degrees in such fields as biblical and Talmudic research. All Jewish theological seminaries make scholarships and loans available.

Major rabbinical seminaries include the Jewish Theological Seminary of America, which educates rabbis for the Conservative branch; the Hebrew Union College—Jewish Institute of Religion, which educates rabbis for the Reform branch; and the Reconstructionist Rabbinical College, which educates rabbis in the newest branch of Judaism. Orthodox rabbis may be trained at The Rabbi Isaac Elchanan Theological Seminary and the Beth Medrash Govoha Seminary. The number of Orthodox seminaries is relatively high, but the number of students attending each seminary is low. In all cases, rabbinic training is rigorous. When students have become sufficiently learned in the Torah, the Bible, and other religious texts, they may be ordained with the approval of an authorized rabbi, acting either independently or as a representative of a rabbinical seminary.

Newly ordained rabbis usually begin as spiritual leaders of small congregations, assistants to experienced rabbis, directors of Hillel Foundations on college campuses, teachers in educational institutions, or chaplains in the U.S. Armed Forces. As a rule, experienced rabbis fill the pulpits of large, well-established Jewish congregations.

Job Outlook

Job opportunities for rabbis are expected in all four major branches of Judaism through the year 2012. Rabbis willing to work in small, underserved communities should have the best prospects.

Graduates of Orthodox seminaries who seek pulpits should have opportunities as growth in enrollments slows and as many graduates seek alternatives to the pulpit. Rapidly expanding membership is expected to create employment opportunities for Reconstructionist rabbis. Conservative and Reform rabbis should have job opportunities serving congregations or in other settings because of the large size of these two branches of Judaism.

Earnings

In addition to their annual salary, benefits received by rabbis may include housing, health insurance, and a retirement plan. Income varies widely, depending on the size and financial status of the congregation, as well as denominational branch and geographic location. Rabbis may earn additional income from gifts or fees for officiating at ceremonies such as bar or bat mitzvahs and weddings.

Sources of Additional Information

Persons who are interested in becoming rabbis should discuss their plans with a practicing rabbi. Information on the work of rabbis and allied occupations can be obtained from:

➤ Rabbinical Council of America, 305 7th Ave., New York, NY 10001. Internet: **http://www.rabbis.org** (Orthodox)

➤ The Jewish Theological Seminary of America, 3080 Broadway, New York, NY 10027. Internet: **http://www.jtsa.edu** (Conservative)

➤ Hebrew Union College-Jewish Institute of Religion, One West 4th St., New York, NY 10012. Internet: **http://www.huc.edu** (Reform)

➤ Reconstructionist Rabbinical College, 1299 Church Rd., Wyncote, PA 19095. Internet: **http://www.rrc.edu** (Reconstructionist)

Roman Catholic Priests

(0*NET 21-2011.00)

Significant Points

- Preparation generally requires 8 years of study beyond high school, usually including a college degree followed by 4 or more years of theology study at a seminary.
- The shortage of Roman Catholic priests is expected to continue, resulting in a very favorable outlook.

Nature of the Work

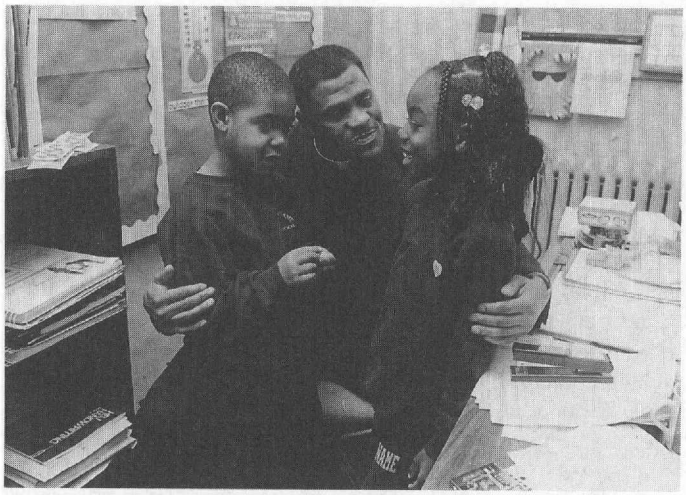
Priests in the Catholic Church may be categorized as either diocesan or religious. Both types of priests have the same priesthood faculties, acquired through ordination by a bishop. Differences lie in their way of life, type of work, and the Church authority to which they are responsible. *Diocesan priests* commit their lives to serving the people of a diocese, a church administrative region, and generally work in parishes, schools, or other Catholic institutions as assigned by the bishop of their diocese. Diocesan priests take oaths of celibacy and obedience. *Religious priests* belong to a religious order, such as the Jesuits, Dominicans, or Franciscans. In addition to the vows taken by diocesan priests, religious priests take a vow of poverty.

Diocesan priests attend to the spiritual, pastoral, moral, and educational needs of the members of their church. A priest's day usually begins with morning meditation and mass and may end with an individual counseling session or an evening visit to a hospital or home. Many priests direct and serve on church committees, work in civic and charitable organizations, and assist in community projects. Some counsel parishioners preparing for marriage or the birth of a child.

Religious priests receive duty assignments from their superiors in their respective religious orders. Some religious priests specialize in teaching, whereas others serve as missionaries in foreign countries, where they may live under difficult and primitive conditions. Other religious priests live a communal life in monasteries, where they devote their lives to prayer, study, and assigned work.

Both religious and diocesan priests hold teaching and administrative posts in Catholic seminaries, colleges and universities, and high schools. Priests attached to religious orders staff many of the Church's institutions of higher education and many high schools, whereas diocesan priests usually are concerned with the parochial schools attached to parish churches and with diocesan high schools. Members of religious orders do much of the missionary work conducted by the Catholic Church in this country and abroad.

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Many priests work with civic and charitable organizations and assist in community projects.

Employment

According to *The Official Catholic Directory*, there were approximately 45,000 priests in 2002; about 30,000 were diocesan priests. Priests are found in nearly every city and town and in many rural communities; however, the majority is in metropolitan areas, where most Catholics reside.

Training and Other Qualifications

Men exclusively are ordained as priests. Women may serve in church positions that do not require priestly ordination. Preparation for the priesthood generally requires 8 years of study beyond high school, usually including a college degree followed by 4 or more years of theology study at a seminary.

Preparatory study for the priesthood may begin in the first year of high school, at the college level, or in theological seminaries after college graduation. Seven high-school seminary programs—four free-standing high school seminaries and three programs within Catholic high schools—provided a college preparatory program in 2002. Programs emphasize and support religious formation in addition to a regular, college-preparatory curriculum. Latin may be required, and modern languages are encouraged. In Hispanic communities, knowledge of Spanish is mandatory.

Those who begin training for the priesthood in college do so in one of 39 priesthood formation programs offered either through Catholic colleges or universities or in freestanding college seminaries. Preparatory studies usually include training in philosophy, religious studies, and prayer.

Today, most candidates for the priesthood have a 4-year degree from an accredited college or university, then attend one of 46 theological seminaries (also called theologates) and earn either the Master of Divinity or the Master of Arts degree. Thirty-four theologates primarily train diocesan priests, whereas 12 theologates provide information mostly for priesthood candidates from religious orders. (Slight variations in training reflect the differences in their expected duties.) Theology coursework includes sacred scripture; dogmatic, moral, and pastoral theology; homiletics (art of preaching); church history; liturgy (sacraments); and canon (church) law. Fieldwork experience usually is required.

Young men are never denied entry into seminaries because of lack of funds. In seminaries for diocesan priests, scholarships or loans are available, and contributions of benefactors and the Catholic Church finance those in religious seminaries—who have taken a vow of poverty and are not expected to have personal resources.

Graduate work in theology beyond that required for ordination also is offered at a number of American Catholic universities or at ecclesiastical universities around the world, particularly in Rome. Also, many priests do graduate work in fields unrelated to theology. Priests are encouraged by the Catholic Church to continue their studies, at least informally, after ordination. In recent years, the Church has stressed continuing education for ordained priests in the social sciences, such as sociology and psychology.

A newly ordained diocesan priest usually works as an assistant pastor. Newly ordained priests of religious orders are assigned to the specialized duties for which they have been trained. Depending on the talents, interests, and experience of the individual, many opportunities for additional responsibility exist within the Church.

Job Outlook

The shortage of Roman Catholic priests is expected to continue, resulting in a very favorable job outlook through the year 2012. Many priests will be needed in the years ahead to provide for the spiritual, educational, and social needs of the increasing number of Catholics. In recent years, the number of ordained priests has been insufficient to fill the needs of newly established parishes and other Catholic institutions and to replace priests who retire, die, or leave the priesthood. This situation is likely to continue, as seminary enrollments remain below the levels needed to overcome the current shortfall of priests.

In response to the shortage of priests, permanent deacons and teams of clergy and laity increasingly are performing certain traditional functions within the Catholic Church. The number of ordained deacons has increased 30 percent over the past 20 years, and this trend should continue. Throughout most of the country, permanent deacons have been ordained to preach and perform liturgical functions, such as baptisms, marriages, and funerals, and to provide service to the community. Deacons are not authorized to celebrate Mass, nor are they allowed to administer the Sacraments of Reconciliation and the Anointing of the Sick. Teams of clergy and laity undertake some liturgical and nonliturgical functions, such as hospital visits and religious teaching.

Earnings

Salaries of diocesan priests vary from diocese to diocese. According to a biennial survey of the National Federation of Priests' Council, low-end salaries averaged $15,291 per year in 2002; high-end salaries averaged $18,478 per year. In addition to a salary, diocesan priests receive a package of benefits that may include a car allowance, room and board in the parish rectory, health insurance, and a retirement plan.

Diocesan priests who do special work related to the church, such as teaching, usually receive a salary which is less than a lay person in the same position would receive. The difference between the usual salary for these jobs and the salary that the priest receives is called "contributed service." In some situations, housing and related expenses may be provided; in other cases, the priest must make his own arrangements. Some priests doing special work receive the same compensation that a lay person would receive.

Religious priests take a vow of poverty and are supported by their religious order. Any personal earnings are given to the order. Their vow of poverty is recognized by the Internal Revenue Service, which exempts them from paying Federal income tax.

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Sources of Additional Information

Young men interested in entering the priesthood should seek the guidance and counsel of their parish priests and diocesan vocational office. For information regarding the different religious orders and the diocesan priesthood, as well as a list of the seminaries that prepare students for the priesthood, contact the diocesan director of vocations through the office of the local pastor or bishop.

Individuals seeking additional information about careers in the Catholic Ministry should contact their local diocese.

For information on training programs for the Catholic ministry, contact:

➤ Center for Applied Research in the Apostolate (CARA), Georgetown University, 2300 Wisconsin Ave. NW., Suite 400, Washington, DC 20007. Internet: **http://cara.georgetown.edu**

Counselors

(0*NET 21-1011.00, 21-1012.00, 21-1013.00, 21-1014.00, 21-1015.00))

Significant Points

- A master's degree is often required to be licensed or certified as a counselor.
- All but three States require some form of licensure or certification for practice outside of schools; all States require school counselors to hold a State school counseling certification.

Nature of the Work

Counselors assist people with personal, family, educational, mental health, and career decisions and problems. Their duties depend on the individuals they serve and on the settings in which they work.

Educational, vocational, and school counselors provide individuals and groups with career and educational counseling. In school settings—elementary through postsecondary—they are usually called school counselors and they work with students, including those considered to be at risk and those with special needs. They advocate for students and work with other individuals and organizations to promote the academic, career, and personal and social development of children and youths. School counselors help students evaluate their abilities, interests, talents, and personality characteristics in order to develop realistic academic and career goals. Counselors use interviews, counseling sessions, tests, or other methods in evaluating and advising students. They also operate career information centers and career education programs. High school counselors advise students regarding college majors, admission requirements, entrance exams, financial aid, trade or technical schools, and apprenticeship programs. They help students develop job search skills such as resume writing and interviewing techniques. College career planning and placement counselors assist alumni or students with career development and job-hunting techniques.

Elementary school counselors observe younger children during classroom and play activities and confer with their teachers and parents to evaluate the children's strengths, problems, or special needs. They also help students develop good study habits. Elementary school counselors do less vocational and academic counseling than do secondary school counselors.

School counselors at all levels help students understand and deal with social, behavioral, and personal problems. These counselors emphasize preventive and developmental counseling to provide students with the life skills needed to deal with problems before they occur and to enhance the student's personal, social, and academic growth. Counselors provide special services, including alcohol and drug prevention programs and conflict resolution classes. Counselors also try to identify cases of domestic abuse and other family problems that can affect a student's development. Counselors work with students individually, with small groups, or with entire classes. They consult and collaborate with parents, teachers, school administrators, school psychologists, medical professionals, and social workers in order to develop and implement strategies to help students be successful in the education system.

Vocational counselors who provide mainly career counseling outside the school setting are also referred to as *employment counselors* or *career counselors*. Their chief focus is helping individuals with their career decisions. Vocational counselors explore and evaluate the client's education, training, work history, interests, skills, and personality traits, and arrange for aptitude and achievement tests to assist in making career decisions. They also work with individuals to develop their job search skills, and they assist clients in locating and applying for jobs. In addition, career counselors provide support to persons experiencing job loss, job stress, or other career transition issues.

Rehabilitation counselors help people deal with the personal, social, and vocational effects of disabilities. They counsel people with disabilities resulting from birth defects, illness or disease, accidents, or the stress of daily life. They evaluate the strengths and limitations of individuals, provide personal and vocational counseling, and arrange for medical care, vocational training, and job placement. Rehabilitation counselors interview both individuals with disabilities and their families, evaluate school and medical reports, and confer and plan with physicians, psychologists, occupational therapists, and employers to determine the capabilities and skills of the individual. Conferring with the client, they develop a rehabilitation program that often includes training to help the person develop job skills. Rehabilitation counselors also work toward increasing the client's capacity to live independently.

Mental health counselors work with individuals, families, and groups to address and treat mental and emotional disorders and to promote optimum mental health. They are trained in a variety of therapeutic techniques used to address a wide range of issues, including depression, addiction and substance abuse, suicidal impulses, stress management, problems with self-esteem, issues associated with aging, job and career concerns, educational decisions, issues related to mental and emotional health, and family, parenting, and marital or other relationship problems. Mental health counselors often work closely with other mental health specialists, such as psychiatrists, psychologists, clinical social workers, psychiatric nurses, and school counselors. (Information on other mental health specialists appears in the *Handbook* statements on physicians and surgeons, psychologists, registered nurses, and social workers.)

Substance abuse and behavioral disorder counselors help people who have problems with alcohol, drugs, gambling, and eating disorders. They counsel individuals who are addicted to drugs, helping them identify behaviors and problems related to their addiction. These counselors hold sessions for one person, for families, or for groups of people.

Marriage and family therapists apply principles, methods, and therapeutic techniques to individuals, family groups, couples, or organizations for the purpose of resolving emotional conflicts. In doing so, they modify people's perceptions and

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behaviors, enhance communication and understanding among all family members, and help to prevent family and individual crises. Marriage and family therapists also may engage in psychotherapy of a nonmedical nature, with appropriate referrals to psychiatric resources, and in research and teaching in the overall field of human development and interpersonal relationships.

Other counseling specialties include gerontological, multicultural, and genetic counseling. A gerontological counselor provides services to elderly persons who face changing lifestyles because of health problems; the counselor helps families cope with the changes. A multicultural counselor helps employers adjust to an increasingly diverse workforce. Genetic counselors provide information and support to families who have members with birth defects or genetic disorders and to families who may be at risk for a variety of inherited conditions. These counselors identify families at risk, investigate the problem that is present in the family, interpret information about the disorder, analyze inheritance patterns and risks of recurrence, and review available options with the family.

Working Conditions

Most school counselors work the traditional 9- to 10-month school year with a 2- to 3-month vacation, although increasing numbers are employed on 10½- or 11-month contracts. They usually work the same hours that teachers do. College career planning and placement counselors work long and irregular hours during student recruiting periods.

Rehabilitation counselors usually work a standard 40-hour week. Self-employed counselors and those working in mental health and community agencies, such as substance abuse and behavioral disorder counselors, frequently work evenings to counsel clients who work during the day. Both mental health counselors and marriage and family therapists also often work flexible hours, to accommodate families in crisis or working couples who must have evening or weekend appointments.

Counselors must possess high physical and emotional energy to handle the array of problems they address. Dealing daily with these problems can cause stress. Because privacy is essential for confidential and frank discussions with clients, counselors usually have private offices.

Employment

Counselors held about 526,000 jobs in 2002. Employment was distributed among the counseling specialties as follows:

Educational, vocational, and school counselors	228,000
Rehabilitation counselors	122,000
Mental health counselors	85,000
Substance abuse and behavioral disorder counselors	67,000
Marriage and family therapists	23,000

Educational, vocational, and school counselors work primarily in elementary and secondary schools and colleges and universities. Other types of counselors work in a wide variety of public and private establishments, including health care facilities; job training, career development, and vocational rehabilitation centers; social agencies; correctional institutions; and residential care facilities, such as halfway houses for criminal offenders and group homes for children, the elderly, and the disabled. Some substance abuse and behavioral disorder counselors work in therapeutic communities where addicts live while undergoing treatment. Counselors also work in organizations engaged in community improvement and social change and work as well in drug and alcohol rehabilitation programs and State and local government agencies. A growing number of counselors are self-employed and working in group practices or private practice. This growth has been helped by laws allowing counselors to receive payments from insurance companies and the growing recognition that counselors are well-trained professionals.



Counselors must be able to inspire respect, trust, and confidence in order to assist people with their problems.

Training, Other Qualifications, and Advancement

All States require school counselors to hold State school counseling certification and to have completed at least some graduate course work; most require the completion of a master's degree. Some States require public school counselors to have both counseling and teaching certificates and to have had some teaching experience before receiving certification. For counselors based outside of schools, 47 States and the District of Columbia had some form of counselor credentialing, licensure, certification, or registration that governed their practice of counseling. Requirements typically include the completion of a master's degree in counseling, the accumulation of 2 years or 3,000 hours of supervised clinical experience beyond the master's degree level, the passage of a State-recognized exam, adherence to ethical codes and standards, and the satisfaction of annual continuing education requirements.

Counselors must be aware of educational and training requirements that are often very detailed and that vary by area and by counseling specialty. Prospective counselors should check with State and local governments, employers, and national voluntary certification organizations in order to determine which requirements apply.

As mentioned, a master's degree is typically required to be licensed or certified as a counselor. A bachelor's degree often qualifies a person to work as a counseling aide, rehabilitation aide, or social service worker. Some States require counselors in public employment to have a master's degree; others accept a bachelor's degree with appropriate counseling courses. Counselor education programs in colleges and universities usually are in departments of education or psychology. Fields of study include college student affairs, elementary or secondary school counseling, education, gerontological counseling, marriage and family counseling, substance abuse counseling, rehabilitation counseling, agency or community counseling, clinical mental health counseling, counseling psychology, career counseling, and related fields. Courses are grouped into eight core areas: Human growth and development, social and cultural diversity, relationships, group work, career development, assessment, research and program evaluation, and professional identity. In an accredited master's degree program, 48 to 60 semester hours of

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graduate study, including a period of supervised clinical experience in counseling, are required for a master's degree.

In 2003, 176 institutions offered programs in counselor education—including career, community, gerontological, mental health, school, student affairs, and marriage and family counseling—that were accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP). CACREP also recognizes many counselor education programs, apart from those in the 176 accredited institutions, that use alternative instruction methods, such as distance learning. Programs that use such alternative instruction methods are evaluated on the basis of the same standards for accreditation that CACREP applies to programs that employ the more traditional methods. Another organization, the Council on Rehabilitation Education (CORE), accredits graduate programs in rehabilitation counseling. Accredited master's degree programs include a minimum of 2 years of full-time study, including 600 hours of supervised clinical internship experience.

Many counselors elect to be nationally certified by the National Board for Certified Counselors, Inc. (NBCC), which grants the general practice credential "National Certified Counselor." To be certified, a counselor must hold a master's or higher degree, with a concentration in counseling, from a regionally accredited college or university; must have at least 2 years of supervised field experience in a counseling setting (graduates from counselor education programs accredited by CACREP are exempted); must provide two professional endorsements, one of which must be from a recent supervisor; and must have a passing score on the NBCC's National Counselor Examination for Licensure and Certification (NCE). This national certification is voluntary and is distinct from State certification. However, in some States, those who pass the national exam are exempted from taking a State certification exam. NBCC also offers specialty certification in school, clinical mental health, and addiction counseling. Beginning January 1, 2004, new candidates for NBCC's National Certified School counselor (NCSC) credential must pass a practical simulation examination in addition to fulfilling the current requirements. To maintain their certification, counselors retake and pass the NCE or complete 100 hours of acceptable continuing education credit every 5 years.

Another organization, the Commission on Rehabilitation Counselor Certification, offers voluntary national certification for rehabilitation counselors. Many employers require rehabilitation counselors to be nationally certified. To become certified, rehabilitation counselors usually must graduate from an accredited educational program, complete an internship, and pass a written examination. (Certification requirements vary according to an applicant's educational history. Employment experience, for example, is required for those with a counseling degree in a specialty other than rehabilitation.) After meeting these requirements, candidates are designated "Certified Rehabilitation Counselors." To maintain their certification, counselors must successfully retake the certification exam or complete 100 hours of acceptable continuing education credit every 5 years.

Other counseling organizations also offer certification in particular counseling specialties. Usually these are voluntary, but having one may enhance one's job prospects.

Some employers provide training for newly hired counselors. Others may offer time off or provide help with tuition if it is needed to complete a graduate degree. Counselors must participate in graduate studies, workshops, and personal studies to maintain their certificates and licenses.

Persons interested in counseling should have a strong interest in helping others and should possess the ability to inspire respect, trust, and confidence. They should be able to work independently or as part of a team. Counselors must follow the code of ethics associated with their respective certifications and licenses.

Prospects for advancement vary by counseling field. School counselors can move to a larger school; become directors or supervisors of counseling, guidance, or pupil personnel services; or, usually with further graduate education, become counselor educators, counseling psychologists, or school administrators. (See the statements on psychologists and education administrators elsewhere in the *Handbook*.) Some counselors choose to work for a State's department of education. For marriage and family therapists, doctoral education in family therapy emphasizes the training of supervisors, teachers, researchers, and clinicians in the discipline.

Counselors can become supervisors or administrators in their agencies. Some counselors move into research, consulting, or college teaching or go into private or group practice.

Job Outlook

Overall employment of counselors is expected to grow faster than the average for all occupations through 2012, and job opportunities should be very good because there are usually more job openings than graduates of counseling programs. In addition, numerous job openings will occur as many counselors retire or leave the profession.

Employment of educational, vocational, and school counselors is expected to grow as fast as the average for all occupations as a result of: increasing student enrollments, particularly in secondary and postsecondary schools; State legislation requiring counselors in elementary schools; and an expansion in the responsibilities of counselors. For example, counselors are becoming more involved in crisis and preventive counseling, helping students deal with issues ranging from drug and alcohol abuse to death and suicide. Although schools and governments realize the value of counselors in achieving academic success in their students, budget constraints at every school level will dampen job growth of school counselors. However, Federal grants and subsidies may fill in the gaps and allow the current ongoing reduction in student-to-counselor ratios to continue.

Demand for vocational or career counselors should grow as the notion of staying in one job over a lifetime continues to be rejected and replaced by the concept of managing one's own career and taking responsibility for it. In addition, changes in welfare laws that require beneficiaries to work will continue to create demand for counselors by State and local governments. Other opportunities for employment counselors will arise in private job-training centers that provide training and other services to laid-off workers, as well as to those seeking a new or second career or wanting to upgrade their skills.

Demand is expected to be strong for substance abuse and behavioral, mental health, and marriage and family therapists and for rehabilitation counselors, for a variety of reasons. For one, California and a few other States have recently passed laws requiring substance abuse treatment instead of jail for people caught possessing a drug. This shift will require more substance abuse counselors in those States. Second, the increasing availability of funds to build statewide networks to improve services for children and adolescents with serious emotional disturbances and for their family members should increase employment opportunities for counselors. Under managed care systems, insurance companies are increasingly providing for reimbursement of counselors as a less costly alternative to psychiatrists and psychologists. Also, legislation is pending that may provide counseling services to Medicare recipients.

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The number of people who will need rehabilitation counseling is expected to grow as the population continues to age and as advances in medical technology continue to save lives that only a few years ago would have been lost. In addition, legislation requiring equal employment rights for people with disabilities will spur demand for counselors, who not only will help these people make a transition into the workforce, but also will help companies comply with the law.

Employment of mental health counselors and marriage and family therapists will grow as the Nation becomes more comfortable seeking professional help for a variety of health and personal and family problems. Employers also are increasingly offering employee assistance programs that provide mental health and alcohol and drug abuse services. More people are expected to use these services as society focuses on ways of developing mental well-being, such as controlling stress associated with job and family responsibilities.

Earnings

Median annual earnings of educational, vocational, and school counselors in 2002 were $44,100. The middle 50 percent earned between $33,160 and $56,770. The lowest 10 percent earned less than $24,930, and the highest 10 percent earned more than $70,320. School counselors can earn additional income working summers in the school system or in other jobs. Median annual earnings in the industries employing the largest numbers of educational, vocational, and school counselors in 2002 were as follows:

Educational, vocational, and school counselors	228,000
Rehabilitation counselors	122,000
Mental health counselors	85,000
Substance abuse and behavioral disorder counselors	67,000
Marriage and family therapists	23,000

Median annual earnings of substance abuse and behavioral disorder counselors in 2002 were $30,180. The middle 50 percent earned between $24,350 and $37,520. The lowest 10 percent earned less than $19,540, and the highest 10 percent earned more than $45,570.

Median annual earnings of mental health counselors in 2002 were $29,940. The middle 50 percent earned between $23,950 and $39,160. The lowest 10 percent earned less than $19,760, and the highest 10 percent earned more than 50,170.

Median annual earnings of rehabilitation counselors in 2002 were $25,840. The middle 50 percent earned between $20,350 and $34,000. The lowest 10 percent earned less than $16,840, and the highest 10 percent earned more than $44,940.

For substance abuse, mental health, and rehabilitation counselors, government employers generally pay the highest wages, followed by hospitals and social service agencies. Residential care facilities often pay the lowest wages.

Median annual earnings of marriage and family therapists in 2002 were $35,580. The middle 50 percent earned between $26,790 and $44,620. The lowest 10 percent earned less than 20,960, and the highest 10 percent earned more than $59,030. Median annual earnings in 2002 were $29,160 in individual and family social services, the industry employing the largest numbers of marriage and family therapists.

Self-employed counselors who have well-established practices, as well as counselors employed in group practices, usually have the highest earnings.

Related Occupations

Counselors help people evaluate their interests, abilities, and disabilities and deal with personal, social, academic, and career problems. Others who help people in similar ways include teachers, social and human service assistants, social workers, psychologists, physicians and surgeons, registered nurses, members of the clergy, occupational therapists, and human resources, training, and labor relations managers and specialists.

Sources of Additional Information

For general information about counseling, as well as information on specialties such as school, college, mental health, rehabilitation, multicultural, career, marriage and family, and gerontological counseling, contact:

➤ American Counseling Association, 5999 Stevenson Ave., Alexandria, VA 22304-3300. Internet: **http://www.counseling.org**

For information on accredited counseling and related training programs, contact:

➤ Council for Accreditation of Counseling and Related Educational Programs, American Counseling Association, 5999 Stevenson Ave., 4th floor, Alexandria, VA 22304. Internet: **http://www.counseling.org/cacrep**

For information on national certification requirements for counselors, contact:

➤ National Board for Certified Counselors, Inc., 3 Terrace Way, Suite D, Greensboro, NC 27403-3660. Internet: **http://www.nbcc.org**

State departments of education can supply information on those colleges and universities which offer guidance and counseling training that meets State certification and licensure requirements.

State employment service offices have information about job opportunities and about entrance requirements for counselors.

Probation Officers and Correctional Treatment Specialists

(0*NET 21-1092.00)

Significant Points

- State and local governments employ most workers.
- A bachelor's degree in social work, criminal justice, or a related field usually is required.
- Employment growth, which is projected to be about as fast as average, depends on government funding.

Nature of the Work

Many people who are convicted of crimes are placed on probation, instead of being sent to prison. During probation, offenders must stay out of trouble and meet various other requirements. *Probation officers*, who are called community supervision officers in some States, supervise people who have been placed on probation. *Correctional treatment specialists*, who may also be known as case managers, counsel prison inmates and help them plan for their release from incarceration.

Parole officers and *pretrial services officers* perform many of the same duties that probation officers perform. However, parole officers supervise offenders who have been released from prison on parole to ensure that they comply with the conditions of their parole. In some States, the job of parole and probation officer is combined. Pretrial services officers conduct pretrial investigations of criminal suspects when they are arrested by police. Their findings help to determine whether a suspect should be released before their trial. When suspects are released before their trial, pretrial services officers have the responsibility of supervising them to make sure they adhere to the terms of their release and that they show up for their trial. Occasionally,

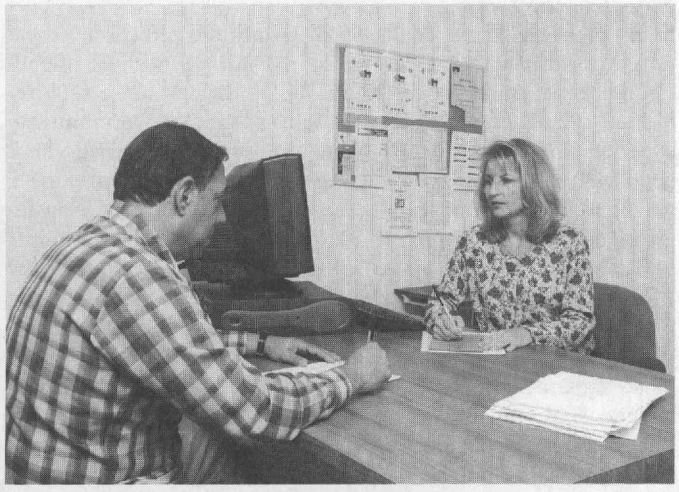
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in the Federal courts system, probation officers perform the functions of pretrial services officers.

Probation officers supervise offenders on probation or parole through personal contact with the offenders and their families. Instead of requiring offenders to meet officers in their offices, many officers meet offenders in their homes and at their places of employment or therapy. Probation and parole agencies also seek the assistance of community organizations, such as religious institutions, neighborhood groups, and local residents, to monitor the behavior of many offenders. Some offenders are required to wear an electronic device so that probation officers can monitor their location and movements. Officers may arrange for offenders to get substance abuse rehabilitation or job training. Probation officers usually work with either adults or juveniles exclusively. Only in small, usually rural, jurisdictions do probation officers counsel both adults and juveniles.

Probation officers also spend much of their time working for the courts. They investigate the background of offenders brought before the court, write presentence reports, and make sentencing recommendations for each offender. Officers review sentencing recommendations with offenders and their families before submitting them to the court. Officers may be required to testify in court as to their findings and recommendations. They also attend court hearings to update the court on the offender's compliance with the terms of his or her sentence and on the offender's efforts at rehabilitation.

Correctional treatment specialists work in correctional institutions (jails and prisons) or in parole or probation agencies. In jails and prisons, they evaluate the progress of inmates. They also work with inmates, probation officers, and other agencies to develop parole and release plans. Their case reports are provided to the appropriate parole board when their clients are eligible for release. In addition, they plan education and training programs to improve offenders' job skills and provide them with coping, anger management, and drug or sexual abuse counseling either individually or in groups. They usually write treatment plans and summaries for each client. Correctional treatment specialists working in parole and probation agencies perform many of the same duties as their counterparts who work in correctional institutions.



Through personal contact with offenders and their families, probation officers supervise offenders who are on probation or parole.

The number of cases a probation officer or correctional treatment specialist handles at one time depends on the needs of offenders and the risks they pose. Higher risk offenders and those who need more counseling usually command more of the officer's time and resources. Caseload size also varies by agency jurisdiction. Consequently, officers may handle from 20 to more than 100 active cases at a time.

Computers, telephones, and fax machines enable the officers to handle the caseload. Probation officers may telecommute from their own homes. Other technological advancements, such as electronic monitoring devices and drug screening, also have assisted probation officers and correctional treatment specialists in supervising and counseling offenders.

Working Conditions

Probation officers and correctional treatment specialists work with criminal offenders, some of whom may be dangerous. In the course of supervising offenders, they usually interact with many other individuals, such as family members and friends of their clients, who may be angry, upset, or difficult to work with. Workers may be assigned to fieldwork in high crime areas or in institutions where there is a risk of violence or communicable disease. Probation officers and correctional treatment specialists are required to meet many deadlines, most of which are imposed by courts, which contributes to their heavy workloads.

In addition, extensive travel and fieldwork may be required to meet with offenders who are on probation or parole. Workers may be required to carry a firearm or other weapon for protection. They generally work a 40-hour workweek, but some may work longer. They may be on call 24 hours a day to supervise and assist offenders at any time. They also may be required to collect and transport urine samples of offenders for drug testing. All of these factors make for a stressful work environment. Although the high stress levels can make these jobs very difficult at times, this work also can be very rewarding. Many workers obtain personal satisfaction from counseling members of their community and helping them become productive citizens.

Employment

Probation officers and correctional treatment specialists held about 84,000 jobs in 2002. Most jobs are found in State or local governments. In some States, the State government employs all probation officers and correctional treatment specialists; in other States, local governments are the only employers. In still other States, both levels of government employ these workers. Jobs are more plentiful in urban areas. Probation officers and correctional treatment specialists who work for the Federal Government are employed by the U.S. courts and the U.S. Department of Justice's Bureau of Prisons.

Training, Other Qualifications, and Advancement

Background qualifications for probation officers and correctional treatment specialists vary by State, but a bachelor's degree in social work, criminal justice, or a related field from a 4-year college or university is usually required. Some employers require previous experience or a master's degree in criminal justice, social work, psychology, or a related field.

Applicants usually are administered written, oral, psychological, and physical examinations. Most probation officers and some correctional treatment specialists are required to complete a training program sponsored by their State government or the Federal Government, after which a certification test may be required.

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Prospective probation officers or correctional treatment specialists should be in good physical and emotional condition. Most agencies require applicants to be at least 21 years old and, for Federal employment, not older than 37. Those convicted of felonies may not be eligible for employment in this occupation. Familiarity with the use of computers often is required due to the increasing use of computer technology in probation and parole work. Candidates also should be knowledgeable about laws and regulations pertaining to corrections. Probation officers and correctional treatment specialists should possess strong writing skills due to the large numbers of reports they are required to prepare.

Most probation officers and correctional treatment specialists work as trainees or on a probationary period for up to a year. After successfully completing the training period, workers obtain a permanent position. A typical agency has several levels of probation and parole officers and correctional treatment specialists, as well as supervisors. A graduate degree, such as a master's degree in criminal justice, social work, or psychology, may be helpful for advancement.

Job Outlook

Employment of probation officers and correctional treatment specialists is projected to grow about as fast as the average for all occupations through 2012. In addition to openings due to growth, many openings will be created by replacement needs, especially openings due to the large number of these workers who are expected to retire over the 2002-12 projection period. This occupation is not attractive to some potential entrants due to relatively low earnings, heavy workloads, and high stress.

Vigorous law enforcement is expected to result in a continuing increase in the prison population. Overcrowding in prisons also has increased the probation population, as judges and prosecutors search for alternate forms of punishment, such as electronic monitoring and day reporting centers. The number of offenders released on parole also is expected to increase to create room in prison for other offenders. The increasing prison, parole, and probation populations should spur demand for probation and parole officers and correctional treatment specialists. However, the job outlook depends primarily on the amount of government funding that is allocated to corrections, and especially to probation systems. Although community supervision is far less expensive than keeping offenders in prison, a change in political trends toward more imprisonment and away from community supervision could result in reduced employment opportunities.

Earnings

Median annual earnings of probation officers and correctional treatment specialists in 2002 were $38,360. The middle 50 percent earned between $30,770 and $50,550. The lowest 10 percent earned less than $25,810, and the highest 10 percent earned more than $62,520. In 2002, median annual earnings for probation officers and correctional treatment specialists employed in State government were $38,720; those employed in local government earned $39,450. Higher wages tend to be found in urban areas.

Related Occupations

Probation officers and correctional treatment specialists counsel criminal offenders as they reenter society. Other occupations that involve similar responsibilities include social workers, social and human service assistants, and counselors.

Probation officers and correctional treatment also play a major role in maintaining public safety. Other occupations related to corrections and law enforcement include police and detectives, correctional officers, and firefighting occupations.

Sources of Additional Information

For information about criminal justice job opportunities in your area, contact your State's Department of Corrections, Criminal Justice, or Probation.

Further information about probation officers and correctional treatment specialists is available from:

➤ American Probation and Parole Association, P.O. Box 11910, Lexington, KY 40578. Internet: **http://www.appa-net.org**

➤ American Correctional Association, 4380 Forbes Blvd., Lanham, MD 20706. Internet: **http://www.aca.org**

Social and Human Service Assistants

(0*NET 21-1093.00)

Significant Points

- While a bachelor's degree usually is not required, employers increasingly seek individuals with relevant work experience or education beyond high school.
- Employment is projected to grow much faster than average.
- Job opportunities should be excellent, particularly for applicants with appropriate postsecondary education, but pay is low.

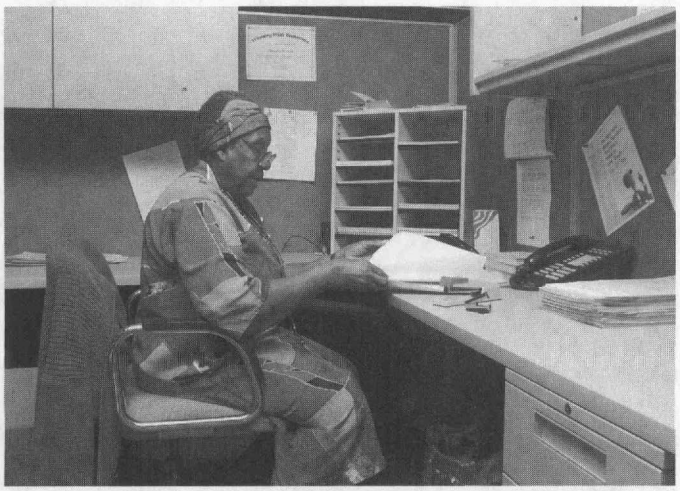
Nature of the Work

Social and human service assistant is a generic term for people with a wide array of job titles, including human service worker, case management aide, social work assistant, community support worker, mental health aide, community outreach worker, life skill counselor, or gerontology aide. They usually work under the direction of professionals from a variety of fields, such as nursing, psychiatry, psychology, rehabilitative or physical therapy, or social work. The amount of responsibility and supervision they are given varies a great deal. Some have little direct supervision; others work under close direction.

Social and human service assistants provide direct and indirect client services to ensure that individuals in their care reach their maximum level of functioning. They assess clients' needs, establish their eligibility for benefits and services such as food stamps, Medicaid, or welfare, and help to obtain them. They also arrange for transportation and escorts, if necessary, and provide emotional support. Social and human service assistants monitor and keep case records on clients and report progress to supervisors and case managers.

Social and human service assistants play a variety of roles in a community. They may organize and lead group activities, assist clients in need of counseling or crisis intervention, or administer a food bank or emergency fuel program. In halfway houses, group homes, and government-supported housing programs, they assist adults who need supervision with personal hygiene and daily living skills. They review clients' records, ensure that they take correct doses of medication, talk with family members, and confer with medical personnel and other

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Social and human service assistants provide direct and indirect client services to ensure that individuals in their care reach their maximum level of functioning.

caregivers to gain better insight into clients' backgrounds and needs. Social and human service assistants also provide emotional support and help clients become involved in their own well-being, in community recreation programs, and in other activities.

In psychiatric hospitals, rehabilitation programs, and outpatient clinics, social and human service assistants work with professional care providers, such as psychiatrists, psychologists, and social workers, to help clients master everyday living skills, communicate more effectively, and get along better with others. They support the client's participation in a treatment plan, such as individual or group counseling or occupational therapy.

Working Conditions

Working conditions of social and human service assistants vary. Some work in offices, clinics, and hospitals, while others work in group homes, shelters, sheltered workshops, and day programs. Many spend their time in the field visiting clients. Most work a 40-hour week, although some work in the evening and on weekends.

The work, while satisfying, can be emotionally draining. Understaffing and relatively low pay may add to the pressure. Turnover is reported to be high, especially among workers without academic preparation for this field.

Employment

Social and human service assistants held about 305,000 jobs in 2002. More than half worked in the health care and social assistance industries. Almost one third were employed by State and local governments, primarily in public welfare agencies and facilities for mentally disabled and developmentally challenged individuals.

Training, Other Qualifications, and Advancement

While a bachelor's degree usually is not required for entry into this occupation, employers increasingly seek individuals with relevant work experience or education beyond high school. Certificates or associate degrees in subjects such as social work, human services, gerontology, or one of the social or behavioral sciences meet most employers' requirements. Some jobs may require a bachelor's or master's degree in human services or a related field such as counseling, rehabilitation, or social work.

Human services degree programs have a core curriculum that trains students to observe patients and record information, conduct patient interviews, implement treatment plans, employ problem-solving techniques, handle crisis intervention matters, and use proper case management and referral procedures. General education courses in liberal arts, sciences, and the humanities also are part of the curriculum. Many degree programs require completion of a supervised internship.

Educational attainment often influences the kind of work employees may be assigned and the degree of responsibility that may be entrusted to them. For example, workers with no more than a high school education are likely to receive extensive on-the-job training to work in direct-care services, while employees with a college degree might be assigned to do supportive counseling, coordinate program activities, or manage a group home. Social and human service assistants with proven leadership ability, either from previous experience or as a volunteer in the field, often have greater autonomy in their work. Regardless of the academic or work background of employees, most employers provide some form of inservice training, such as seminars and workshops, to their employees.

There may be additional hiring requirements in group homes. For example, employers may require employees to have a valid driver's license or to submit to a criminal background investigation.

Employers try to select applicants who have effective communication skills, a strong sense of responsibility, and the ability to manage time effectively. Many human services jobs involve direct contact with people who are vulnerable to exploitation or mistreatment; therefore, patience, understanding, and a strong desire to help others are highly valued characteristics.

Formal education almost always is necessary for advancement. In general, advancement requires a bachelor's or master's degree in human services, counseling, rehabilitation, social work, or a related field.

Job Outlook

Job opportunities for social and human service assistants are expected to be excellent, particularly for applicants with appropriate postsecondary education. The number of social and human service assistants is projected to grow much faster than the average for all occupations between 2002 and 2012—ranking the occupation among the most rapidly growing. Many additional job opportunities will arise from the need to replace workers who advance into new positions, retire, or leave the workforce for other reasons. There will be more competition for jobs in urban areas than in rural areas, but qualified applicants should have little difficulty finding employment. Faced with rapid growth in the demand for social and human services many employers increasingly rely on social and human service assistants to undertake greater responsibility for delivering services to clients.

Opportunities are expected to be good in private social service agencies, which provide such services as adult daycare and meal delivery programs. Employment in private agencies will grow as State and local governments continue to contract out services to the private sector in an effort to cut costs. Demand for social services will expand with the growing elderly population, who are more likely to need these services. In addition, more social and human service assistants will be needed to provide services to pregnant teenagers, the homeless, the mentally disabled and developmentally challenged, and substance

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abusers. Some private agencies have been employing more social and human service assistants in place of social workers, who are more educated and, thus, more highly paid.

Job training programs also are expected to require additional social and human service assistants. As social welfare policies shift focus from benefit-based programs to work-based initiatives, there will be more demand for people to teach job skills to the people who are new to, or returning to, the workforce.

Residential care establishments should face increased pressures to respond to the needs of the mentally and physically disabled. Many of these patients have been deinstitutionalized and lack the knowledge or the ability to care for themselves. Also, more community-based programs, supported independent-living sites, and group residences are expected to be established to house and assist the homeless and the mentally and physically disabled. As substance abusers are increasingly being sent to treatment programs instead of prison, employment of social and human service assistants in substance abuse treatment programs also will grow.

The number of jobs for social and human service assistants in State and local governments will grow but not as fast as employment for social and human service assistants in other industries. Employment in the public sector may fluctuate with the level of funding provided by State and local governments. Also, some State and local governments are contracting out selected social services to private agencies in order to save money.

Earnings

Median annual earnings of social and human service assistants were $23,370 in 2002. The middle 50 percent earned between $18,670 and $29,520. The top 10 percent earned more than $37,550, while the lowest 10 percent earned less than $15,420.

Median annual earnings in the industries employing the largest numbers of social and human service assistants in 2002 were:

State government	$31,280
Local government	26,570
Individual and family services	22,210
Community food and housing, and emergency and other relief services	21,840
Residential mental retardation, mental health and substance abuse facilities	20,010

Related Occupations

Workers in other occupations that require skills similar to those of social and human service assistants include social workers; clergy; counselors; childcare workers; occupational therapist assistants and aides; physical therapist assistants and aides; and nursing, psychiatric, and home health aides.

Sources of Additional Information

Information on academic programs in human services may be found in most directories of 2- and 4-year colleges, available at libraries or career counseling centers.

For information on programs and careers in human services, contact:

➤ National Organization for Human Service Education, 375 Myrtle Ave., Brooklyn, NY 11205. Internet: **http://www.nohse.org**

➤ Council for Standards in Human Services Education, Harrisburg Area Community College, Human Services Program, One HACC Dr., Harrisburg, PA 17110-2999. Internet: **http://www.cshse.org**

Information on job openings may be available from State employment service offices or directly from city, county, or State departments of health, mental health and mental retardation, and human resources.

Social Workers

(0*NET 21-1021.00, 21-1022.00, 21-1023.00)

Significant Points

- While a bachelor's degree is the minimum requirement, a master's degree in social work or a related field has become the standard for many positions.
- Employment is projected to grow faster than average.
- Competition for jobs is expected in cities, but opportunities should be good in rural areas.

Nature of the Work

Social work is a profession for those with a strong desire to help improve people's lives. Social workers help people function the best way they can in their environment, deal with their relationships, and solve personal and family problems. Social workers often see clients who face a life-threatening disease or a social problem. These problems may include inadequate housing, unemployment, serious illness, disability, or substance abuse. Social workers also assist families that have serious domestic conflicts, including those involving child or spousal abuse.

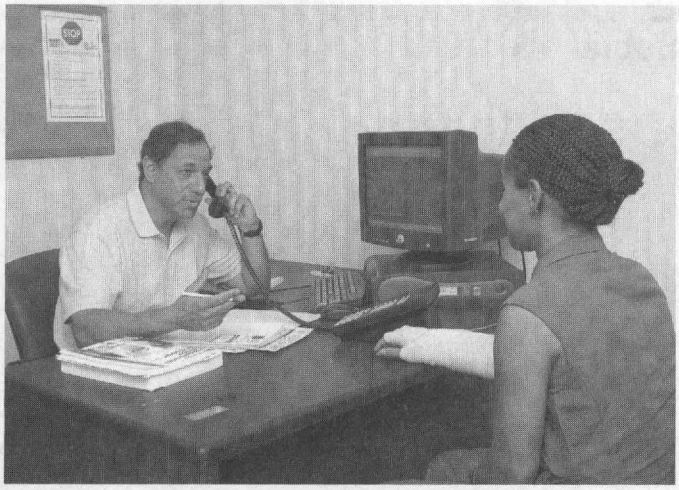
Social workers often provide social services in health-related settings that now are governed by managed care organizations. To contain costs, these organizations are emphasizing short-term intervention, ambulatory and community-based care, and greater decentralization of services.

Most social workers specialize. Although some conduct research or are involved in planning or policy development, most social workers prefer an area of practice in which they interact with clients.

Child, family, and school social workers provide social services and assistance to improve the social and psychological functioning of children and their families and to maximize the family well-being and academic functioning of children. Some social workers assist single parents; arrange adoptions; and help find foster homes for neglected, abandoned, or abused children. In schools, they address such problems as teenage pregnancy, misbehavior, and truancy. They also advise teachers on how to cope with problem students. Some social workers may specialize in services for senior citizens. They run support groups for family caregivers or for the adult children of aging parents. Some advise elderly people or family members about choices in areas such as housing, transportation, and long-term care; they also coordinate and monitor services. Through employee assistance programs, they may help workers cope with job-related pressures or with personal problems that affect the quality of their work. Child, family, and school social workers typically work in individual and family services agencies, schools, or State or local governments. These social workers may be known as child welfare social workers, family services social workers, child protective services social workers, occupational social workers, or gerontology social workers.

Medical and public health social workers provide persons, families, or vulnerable populations with the psychosocial support needed to cope with chronic, acute, or terminal illnesses, such as Alzheimer's disease, cancer, or AIDS. They also advise family caregivers, counsel patients, and help plan for patients' needs after discharge by arranging for at-home services—from meals-on-wheels to oxygen equipment. Some work on interdis-

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Social workers often see clients who face inadequate housing, unemployment, serious illness, disability, or substance abuse.

ciplinary teams that evaluate certain kinds of patients—geriatric or organ transplant patients, for example. Medical and public health social workers may work for hospitals, nursing and personal care facilities, individual and family services agencies, or local governments.

Mental health and substance abuse social workers assess and treat individuals with mental illness, or substance abuse problems, including abuse of alcohol, tobacco, or other drugs. Such services include individual and group therapy, outreach, crisis intervention, social rehabilitation, and training in skills of everyday living. They may also help plan for supportive services to ease patients' return to the community. Mental health and substance abuse social workers are likely to work in hospitals, substance abuse treatment centers, individual and family services agencies, or local governments. These social workers may be known as clinical social workers. (Counselors and psychologists, who may provide similar services, are discussed elsewhere in the *Handbook*.)

Other types of social workers include social work planners and policymakers, who develop programs to address such issues as child abuse, homelessness, substance abuse, poverty, and violence. These workers research and analyze policies, programs, and regulations. They identify social problems and suggest legislative and other solutions. They may help raise funds or write grants to support these programs.

Working Conditions

Full-time social workers usually work a standard 40-hour week; however, some occasionally work evenings and weekends to meet with clients, attend community meetings, and handle emergencies. Some, particularly in voluntary nonprofit agencies, work part time. Social workers usually spend most of their time in an office or residential facility, but also may travel locally to visit clients, meet with service providers, or attend meetings. Some may use one of several offices within a local area in which to meet with clients. The work, while satisfying, can be emotionally draining. Understaffing and large caseloads add to the pressure in some agencies. To tend to patient care or client needs, many hospitals and long-term care facilities are employing social workers on teams with a broad mix of occupations—including clinical specialists, registered nurses, and health aides.

Employment

Social workers held about 477,000 jobs in 2002. About 4 out of 10 jobs were in State or local government agencies, primarily in departments of health and human services. Most private sector jobs were in the health care and social assistance industry. Although most social workers are employed in cities or suburbs, some work in rural areas. The following tabulation shows 2002 employment by type of social worker.

Child, family, and school social workers	274,000
Medical and public health social workers	107,000
Mental health and substance abuse social workers	95,000

Training, Other Qualifications, and Advancement

A bachelor's degree in social work (BSW) degree is the most common minimum requirement to qualify for a job as a social worker; however, majors in psychology, sociology, and related fields may be adequate to qualify for some entry-level jobs, especially in small community agencies. Although a bachelor's degree is sufficient for entry into the field, an advanced degree has become the standard for many positions. A master's degree in social work (MSW) is typically required for positions in health settings and is required for clinical work. Some jobs in public and private agencies also may require an advanced degree, such as a master's degree in social services policy or administration. Supervisory, administrative, and staff training positions usually require an advanced degree. College and university teaching positions and most research appointments normally require a doctorate in social work (DSW or Ph.D.).

As of 2002, the Council on Social Work Education (CSWE) accredited 436 BSW programs and 149 MSW programs. The Group for the Advancement of Doctoral Education (GADE) listed 78 doctoral programs in social work (DSW or Ph.D.). BSW programs prepare graduates for direct service positions such as caseworker. They include courses in social work values and ethics, dealing with a culturally diverse clientele, at-risk-populations, promotion of social and economic justice, human behavior and the social environment, social welfare policy and services, social work practice, social research methods, and field education. Accredited BSW programs require a minimum of 400 hours of supervised field experience.

Master's degree programs prepare graduates for work in their chosen field of concentration and continue to develop the skills required to perform clinical assessments, manage large caseloads, and explore new ways of drawing upon social services to meet the needs of clients. Master's programs last 2 years and include a minimum of 900 hours of supervised field instruction, or internship. A part-time program may take 4 years. Entry into a master's program does not require a bachelor's in social work, but courses in psychology, biology, sociology, economics, political science, and social work are recommended. In addition, a second language can be very helpful. Most master's programs offer advanced standing for those with a bachelor's degree from an accredited social work program.

All States and the District of Columbia have licensing, certification, or registration requirements regarding social work practice and the use of professional titles. Although standards for licensing vary by State, a growing number of States are placing greater emphasis on communications skills, professional ethics, and sensitivity to cultural diversity issues. Additionally, the National Association of Social Workers (NASW) offers voluntary credentials. Social workers with an MSW may be eligible for the Academy of Certified Social Workers (ACSW),

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the Qualified Clinical Social Worker (QCSW), or the Diplomate in Clinical Social Work (DCSW) credential based on their professional experience. Credentials are particularly important for those in private practice; some health insurance providers require social workers to have them in order to be reimbursed for services.

Social workers should be emotionally mature, objective, and sensitive to people and their problems. They must be able to handle responsibility, work independently, and maintain good working relationships with clients and coworkers. Volunteer or paid jobs as a social work aide offer ways of testing one's interest in this field.

Advancement to supervisor, program manager, assistant director, or executive director of a social service agency or department is possible, but usually requires an advanced degree and related work experience. Other career options for social workers include teaching, research, and consulting. Some of these workers also help formulate government policies by analyzing and advocating policy positions in government agencies, in research institutions, and on legislators' staffs.

Some social workers go into private practice. Most private practitioners are clinical social workers who provide psychotherapy, usually paid for through health insurance or by the client themselves. Private practitioners must have at least a master's degree and a period of supervised work experience. A network of contacts for referrals also is essential. Many private practitioners work part time while they work full time elsewhere.

Job Outlook

Competition for social worker jobs is stronger in cities, where demand for services often is highest and training programs for social workers are prevalent. However, opportunities should be good in rural areas, which often find it difficult to attract and retain qualified staff. By specialty, job prospects may be best for those social workers with a background in gerontology and substance abuse treatment.

Employment of social workers is expected to increase faster than the average for all occupations through 2012. The rapidly growing elderly population and the aging baby boom generation will create greater demand for health and social services, resulting in particularly rapid job growth among gerontology social workers. Many job openings also will stem from the need to replace social workers who leave the occupation.

As hospitals continue to limit the length of patient stays, the demand for social workers in hospitals will grow more slowly than in other areas. Because hospitals are releasing patients earlier than in the past, social worker employment in home healthcare services is growing. However, the expanding senior population is an even larger factor. Employment opportunities for social workers with backgrounds in gerontology should be good in the growing numbers of assisted-living and senior-living communities. The expanding senior population will also spur demand for social workers in nursing homes, long-term care facilities, and hospices.

Employment of substance abuse social workers will grow rapidly over the 2002-12 projection period. Substance abusers are increasingly being placed into treatment programs instead of being sentenced to prison. As this trend grows, demand will increase for treatment programs and social workers to assist abusers on the road to recovery.

Employment of social workers in private social service agencies will increase. However, agencies increasingly will restructure services and hire more lower-paid social and human service assistants instead of social workers. Employment in State and local government agencies may grow somewhat in response to increasing needs for public welfare, family services, and child protection services; however, many of these services will be contracted out to private agencies. Employment levels in public and private social services agencies may fluctuate, depending on need and government funding levels.

Employment of school social workers also is expected to steadily grow. Expanded efforts to respond to rising student enrollments and continued emphasis on integrating disabled children into the general school population may lead to more jobs. Availability of State and local funding will be a major factor in determining the actual job growth in schools.

Opportunities for social workers in private practice will expand but growth may be somewhat hindered by restrictions that managed care organizations put on mental health services. The growing popularity of employee assistance programs is expected to spur some demand for private practitioners, some of whom provide social work services to corporations on a contractual basis. However, the popularity of employee assistance programs will fluctuate with the business cycle, as businesses are not likely to offer these services during recessions.

Earnings

Median annual earnings of child, family, and school social workers were $33,150 in 2002. The middle 50 percent earned between $26,310 and $42,940. The lowest 10 percent earned less than $21,270, and the top 10 percent earned more than $54,250. Median annual earnings in the industries employing the largest numbers of child, family, and school social workers in 2002 were:

Elementary and secondary schools	$44,100
Local government	38,140
State government	34,000
Individual and family services	29,150
Other residential care facilities	28,470

Median annual earnings of medical and public health social workers were $37,380 in 2002. The middle 50 percent earned between $29,700 and $46,540. The lowest 10 percent earned less than $23,840, and the top 10 percent earned more than $56,320. Median annual earnings in the industries employing the largest numbers of medical and public health social workers in 2002 were:

General medical and surgical hospitals	$42,730
Local government	37,620
State government	35,250
Nursing care facilities	33,330
Individual and family services	31,000

Median annual earnings of mental health and substance abuse social workers were $32,850 in 2002. The middle 50 percent earned between $25,940 and $42,160. The lowest 10 percent earned less than $21,050, and the top 10 percent earned more than $52,240. Median annual earnings in the industries employing the largest numbers of mental health and substance abuse social workers in 2002 were:

State government	$38,430
Local government	35,700
Psychiatric and substance abuse hospitals	34,610
Outpatient care centers	31,370
Individual and family services	31,300

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Related Occupations
Through direct counseling or referral to other services, social workers help people solve a range of personal problems. Workers in occupations with similar duties include the clergy, counselors, probation officers and correctional treatment specialists, psychologists, and social and human services assistants.

Sources of Additional Information
For information about career opportunities in social work and voluntary credentials for social workers, contact:

➤ National Association of Social Workers, 750 First St. NE., Suite 700, Washington, DC 20002-4241. Internet: **http://www.socialworkers.org**

For a listing of accredited social work programs, contact:

➤ Council on Social Work Education, 1725 Duke St., Suite 500, Alexandria, VA 22314-3457. Internet: **http://www.cswe.org**

Information on licensing requirements and testing procedures for each State may be obtained from State licensing authorities, or from:

➤ Association of Social Work Boards, 400 South Ridge Pkwy., Suite B, Culpeper, VA 22701. Internet: **http://www.aswb.org**

Legal Occupations

Court Reporters

(0*NET 23-2091.00)

Significant Points

- Court reporters usually need a 2- or 4- year postsecondary school degree.
- Demand for realtime and broadcast captioning and translating will result in employment growth in the occupation.
- Job opportunities should be best for those with certification.

Nature of the Work
Court reporters typically take verbatim reports of speeches, conversations, legal proceedings, meetings, and other events when written accounts of spoken words are necessary for correspondence, records, or legal proof. Court reporters play a critical role not only in judicial proceedings, but at every meeting where the spoken word must be preserved as a written transcript. They are responsible for ensuring a complete, accurate, and secure legal record. In addition to preparing and protecting the legal record, many court reporters assist judges and trial attorneys in a variety of ways, such as organizing and searching for information in the official record or making suggestions to judges and attorneys regarding courtroom administration and procedure. Increasingly, court reporters are providing closed-captioning and realtime translating services to the deaf and hard-of-hearing community.

There are two main methods of court reporting: Stenotyping and voice writing. Using a stenotype machine, stenotypists document all statements made in official proceedings. The machine allows them to press multiple keys at a time to record combinations of letters representing sounds, words, or phrases. These symbols are then recorded on computer disks or CD-ROM, which are then translated and displayed as text in a process called computer-aided transcription. In all cases, accuracy is crucial because there is only one person creating an official transcript. In a judicial setting, for example, appeals often depend on the court reporter's transcript. Stenotype machines used for realtime captioning are linked directly to the computer. As the reporter keys in the symbols, they instantly appear as text on the screen. This process, called communications access realtime translation (CART), is used in courts, in classrooms, at meetings, and for closed captioning for the hearing-impaired on television.

The other method of court reporting is called voice writing. Using the voice-writing method, a court reporter speaks directly into a stenomask—a hand-held mask containing a microphone with a voice silencer. As the reporter repeats the testimony into the recorder, the mask and silencer prevent the reporter from being heard during testimony. Voice writers record everything that is said by judges, witnesses, attorneys, and other parties to a proceeding, including gestures and emotional reactions.

Some voice writers produce a transcript in real time, using computer speech recognition technology. Other voice writers prefer to translate their voice files after the proceeding is over, or they transcribe the files manually, without using speech recognition at all. In any event, speech recognition technology is allowing voice writers to pursue not only court reporting careers, but also careers as closed captioners, CART reporters for hearing-impaired individuals, and Internet streaming text or caption providers.

Court reporters that use either method are responsible for a number of duties both before and after transcribing events. First, they must create and maintain the computer dictionary that they use to translate stenographic strokes or voice record files into written text. They may customize the dictionary with parts of words, entire words, or terminology specific to the proceeding, program, or event—such as a religious service—they plan to transcribe. After documenting proceedings, court reporters must edit their CART translation for correct grammar, for accurate identification of proper names and places, and to ensure that the record or testimony is discernible. They usually prepare written transcripts, make copies, and provide information from the transcript to courts, counsels, parties, and the public upon request. Court reporters also develop procedures for easy storage and retrieval of all stenographic notes and files in paper or digital format.

Although many court reporters record official proceedings in the courtroom, others work outside the courtroom. For example, they may take depositions for attorneys in offices and document proceedings of meetings, conventions, and other private activities. Still others capture the proceedings taking place in government agencies at all levels, from the U.S. Congress to State and local governing bodies. Court reporters, both stenotypists and voice writers, who specialize in captioning live television programming for people with hearing loss are commonly known as *stenocaptioners*. They work for television networks or cable stations, captioning news, emergency broadcasts, sporting events, and other programming. With CART and broadcast captioning, the level of understanding gained by a person with

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Court reporters play a critical role in courtrooms and at meetings in which every word spoken must be documented.

hearing loss depends entirely on the skill of the stenocaptioner. In an emergency, such as a tornado or a hurricane, people's safety may depend entirely on the accuracy of information provided in the form of captioning.

Medical transcriptionists, discussed elsewhere in the *Handbook,* have similar duties, but with a different focus. They translate and edit recorded dictation by physicians and other health-care providers regarding their assessment and treatment of patients.

Working Conditions

The majority of court reporters work in comfortable settings, such as offices of attorneys, courtrooms, legislatures, and conventions. An increasing number of court reporters work from home-based offices as independent contractors, or freelancers.

Work in this occupation presents few hazards, although sitting in the same position for long periods can be tiring, and workers can suffer wrist, back, neck, or eye problems due to strain. Workers also risk repetitive motion injuries such as carpal tunnel syndrome. In addition, the pressure to be accurate and fast can be stressful.

Many official court reporters work a standard 40-hour week. Self-employed court reporters, or freelancers, usually work flexible hours, including part time, evenings, and weekends, or they can work on an on-call basis.

Employment

Court reporters held about 18,000 jobs in 2002. About 60 percent worked for State and local governments, a reflection of the large number of court reporters working in courts, legislatures, and various agencies. Most of the remaining wage and salary workers worked for court reporting agencies. Eleven percent of court reporters were self-employed.

Training, Other Qualifications, and Advancement

The amount of training required to become a court reporter varies with the type of reporting chosen. It usually takes less than a year to become a voice writer. In contrast, the average length of time it takes to become a stenotypist is 33 months. Training is offered by about 160 postsecondary vocational and technical schools and colleges. The National Court Reporters Association (NCRA) has approved about 82 programs, all of which offer courses in stenotype computer-aided transcription and realtime reporting. NCRA-approved programs require students to capture a minimum of 225 words per minute, a Federal Government requirement as well.

Some States require court reporters to be notary publics. Others require the certified court reporter (CCR) designation, for which a reporter must pass a State certification test administered by a board of examiners. The NCRA confers the entry-level designation "registered professional reporter" (RPR) upon those who pass a four-part examination and participate in mandatory continuing education programs. Although voluntary, the designation is recognized as a mark of distinction in the field. A reporter may obtain additional certifications that demonstrate higher levels of competency, such as "registered merit reporter" (RMR) or "registered diplomate reporter" (RDR). The RDR is the highest level of certification available to court reporters. In order to receive the designation, a court reporter must either have 5 consecutive years of experience as an RMR or be an RMR and hold a 4-year baccalaureate degree.

The NCRA also offers the designations "certified realtime reporter"(CRR), "certified broadcast captioner" (CBC), and "certified CART provider" (CCP). These designations promote and recognize competence in the specialized skill of converting the spoken word into the written word instantaneously.

Some States require voice writers to pass a test and to earn State licensure. As a substitute for State certification, the National Verbatim Reporters Association offers three national certifications to voice writers: "certified verbatim reporter" (CVR), the certificate of merit (CM), and "real-time verbatim reporter" (RVR). Earning these certifications may be sufficient to get licensed in the State. In order to get the CM or RVR, one must first earn the CVR. Candidates for the CVR must pass a written test covering punctuation, spelling, grammar, legal terminology, definitions, and more and also must pass, three five-minute dictation and transcription examinations that test for speed as well as accuracy. Passing the CM exam requires a higher level of speed and accuracy. The RVR measures the candidate's skill at realtime transcription. In order to retain these certifications, the voice writer must obtain continuing education credits. Credits are given for voice writer education courses, continuing legal education courses, and college courses.

In addition to possessing speed and accuracy, court reporters must have excellent listening skills, as well as good English grammar, vocabulary, and punctuation skills. Voice writers must learn to listen and speak simultaneously and very quickly, while also identifying speakers and describing peripheral activities in the courtroom or deposition room. They must be aware of busi-

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ness practices and current events as well as the correct spelling of names of people, places, and events that may be mentioned in a broadcast or in court proceedings. For those who work in courtrooms, an expert knowledge of legal terminology and criminal and appellate procedure is essential. Because capturing proceedings requires the use of computerized stenography or speech recognition equipment, court reporters must be knowledgeable about computer hardware and software applications.

With experience and education, court reporters can advance to administrative and management positions, consulting, or teaching.

Job Outlook

Employment of court reporters is projected to grow about as fast as the average for all occupations through 2012. Demand for court reporter services will be spurred by the continuing need for accurate transcription of proceedings in courts and in pretrial depositions and by the growing need to create captions for live or prerecorded television and to provide other realtime translating services for the deaf and hard-of-hearing community. Despite the good job prospects, fewer people are going into this profession, creating a shortage of court reporters—particularly stenographic typists—and making job opportunities very good to excellent. Because of this shortage, voice writers have become more widely accepted as speech recognition technology improves and error rates decline. Still, many courts hire only stenotypists to perform court reporting duties, and because of this practice, demand for these highly skilled reporters will remain high.

Federal legislation mandates that, by 2006, all new television programming must be captioned for the deaf and hard-of-hearing. In addition, the Americans with Disabilities Act gives deaf and hard-of-hearing students in colleges and universities the right to request access to realtime translation in their classes. Both of these factors are expected to increase demand for court reporters to provide realtime captioning and CART services. Although these services forgo transcripts and differ from traditional court reporting, which uses computer-aided transcription to turn spoken words into permanent text, they require the same skills that court reporters learn in their training.

Despite increasing numbers of civil and criminal cases, budget constraints are expected to limit the ability of Federal, State, and local courts to expand, thereby also limiting the demand for traditional court reporting services in courtrooms and other legal venues. Further, in efforts to keep costs down, many courtrooms have installed tape recorders to maintain records of proceedings. Some jurisdictions have found the error rates associated with tape recorders to be unacceptable, bringing court reporters back to their courtrooms despite budgetary issues. Still, despite the use of audiotape and videotape technology, court reporters can quickly turn spoken words into readable, searchable, permanent text, so they will continue to be needed to produce written legal transcripts and proceedings for publication.

Earnings

Court reporters had median annual earnings of $41,550 in 2002. The middle 50 percent earned between $29,770 and $55,360. The lowest paid 10 percent earned less than $23,120, and the highest paid 10 percent earned more than $73,440. Median annual earnings in 2002 were $40,720 for court reporters working in local government.

Both compensation and compensation methods for court reporters vary with the type of reporting job, the experience of the individual reporter, the level of certification achieved, and the region of the country the reporter works in. Official court reporters earn a salary and a per-page fee for transcripts. Many salaried court reporters supplement their income by doing additional freelance work. Freelance court reporters are paid per job and receive a per-page fee for transcripts. Communication access realtime translation providers are paid hourly. Stenocaptioners receive a salary and benefits if they work as employees of a captioning company; stenocaptioners working as independent contractors are paid hourly.

Related Occupations

A number of other workers type, record information, and process paperwork. Among these are secretaries and administrative assistants, medical transcriptionists, receptionists and information clerks, and human resources assistants, except payroll and timekeeping. Other workers who provide legal support include paralegals and legal assistants.

Sources of Additional Information

State employment service offices can provide information about job openings for court reporters. For information about careers, training, and certification in court reporting, contact any of the following sources:

➤ National Court Reporters Association, 8224 Old Courthouse Rd., Vienna, VA 22182. Internet: **http://www.ncraonline.org**

➤ United States Court Reporters Association, P.O. Box 465, Chicago, Il 60690-0465. Internet: **http://www.uscra.org**

➤ National Verbatim Reporters Association, 207 Third Avenue, Hattiesburg, MS 39401. Internet: **http://www.nvra.org**

Judges, Magistrates, and Other Judicial Workers

(0*NET 23-1021.00, 23-1022.00, 23-1023.00)

Significant Points

- A bachelor's degree and work experience are the minimum requirements for a judgeship or magistrate position, but most workers filling these positions also have law degrees.
- Judges and magistrates should encounter some competition for jobs.
- Demand for arbitrators, mediators, and conciliators is growing because of the high cost and long delays associated with litigation.

Nature of the Work

Judges, magistrates, and other judicial workers apply the law and oversee the legal process in courts according to local, State, and Federal statutes. They preside over cases concerning every aspect of society, from traffic offenses, to disputes over the management of professional sports, to issues concerning the rights of huge corporations, to questions over disconnecting life-support equipment connected to terminally ill persons. All judicial workers must ensure that trials and hearings are conducted fairly and that the court administers justice in a manner which safeguards the legal rights of all parties involved.

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The most visible responsibility of judges is presiding over trials or hearings and listening as attorneys represent the parties present. Judges rule on the admissibility of evidence and the methods of conducting testimony, and they may be called upon to settle disputes between opposing attorneys. Also, they ensure that rules and procedures are followed, and if unusual circumstances arise for which standard procedures have not been established, they determine the manner in which the trial will proceed, on the basis of their interpretation of the law.

Judges often hold pretrial hearings for cases. They listen to allegations and determine whether the evidence presented merits a trial. In criminal cases, judges may decide that persons charged with crimes should be held in jail pending their trial, or they may set conditions for their release. In civil cases, they occasionally impose restrictions upon the parties until a trial is held.

In many trials, juries are selected to decide guilt or innocence in criminal cases or liability and compensation in civil cases. Judges instruct juries on applicable laws, direct them to deduce the facts from the evidence presented, and hear their verdict. When the law does not require a jury trial or when the parties waive their right to a jury, judges decide the cases. In such instances, in a criminal case, the judge determines guilt and imposes sentences; in civil cases, the judge awards relief—such as compensation for damages—to the parties to the lawsuit (called litigants). Judges also work outside the courtroom, "in chambers." In these, their private offices, judges read documents on pleadings and motions, research legal issues, write opinions, and oversee the court's operations. In some jurisdictions, judges also manage the courts' administrative and clerical staff.

Judges' duties vary according to the extent of their jurisdictions and powers. *General trial court judges* of the Federal and State court systems have jurisdiction over any case in their system. They usually try civil cases transcending the jurisdiction of lower courts and all cases involving felony offenses. Federal and State *appellate court judges*, although few in number, have the power to overrule decisions made by trial court or administrative law judges if they determine that legal errors were made in a case or if legal precedent does not support the judgment of the lower court. Appellate court judges rule on a small number of cases and rarely have direct contacts with litigants. Instead, they usually base their decisions on lower court records and lawyers' written and oral arguments.

Many State court judges preside in courts whose jurisdiction is limited by law to certain types of cases. A variety of titles are assigned to these judges; among the most common are *municipal court judge*, *county court judge*, *magistrate*, and *justice of the peace*. Traffic violations, misdemeanors, small-claims cases, and pretrial hearings constitute the bulk of the work of State court judges, but some States allow them to handle cases involving domestic relations, probate, contracts, and other selected areas of the law.

Administrative law judges, sometimes called *hearing officers* or *adjudicators*, are employed by government agencies to make determinations for administrative agencies. These judges make decisions, for example, on a person's eligibility for various Social Security or worker's compensation benefits, on protection of the environment, on the enforcement of health and safety regulations, on employment discrimination, and on compliance with economic regulatory requirements.

Arbitration, mediation, and conciliation—called appropriate dispute resolution (ADR)—are alternative processes that can be used to settle disputes between parties. All ADR hearings are private and confidential, and the processes are less formal than a court trial. If no settlement is reached through ADR, any statements made during the proceedings are inadmissible as evidence in any subsequent litigation.

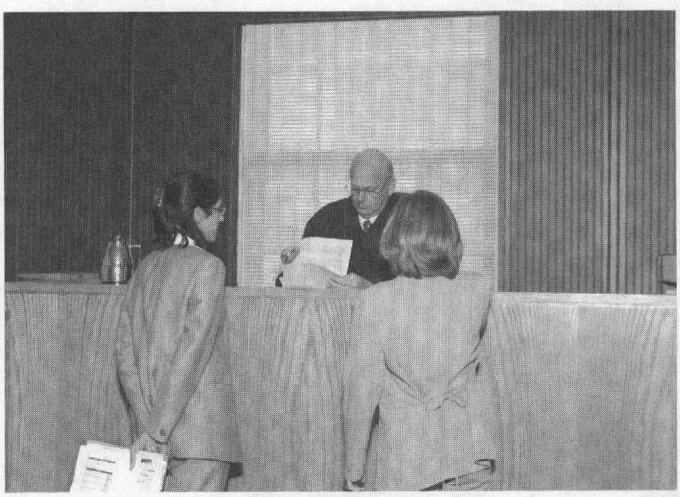
During arbitration, opposing parties submit their dispute to one or more impartial persons, called arbitrators, for a final and binding decision. Arbitrators usually are attorneys or businesspersons with expertise in a particular field. The parties identify beforehand the issues to be resolved by arbitration, the scope of the relief to be awarded, and many of the procedural aspects of the process. Few awards are reviewed by the courts, because the parties have agreed to be bound by the decision of their arbitrator, although in some cases, it is prearranged that the award will be only advisory. Mediation involves an attempt by the parties to resolve their dispute with the aid of a neutral third party and generally is used when the parties wish to preserve their relationship. A mediator may offer suggestions, but resolution of the dispute rests with the parties themselves. Mediation proceedings are also confidential and private. If the parties are unable to reach a settlement, they are free to pursue other options. The parties usually decide in advance how they will contribute to the cost of mediation.

Conciliation is similar to mediation. The conciliator's role is to guide the parties to a settlement. The parties must decide in advance whether they will be bound by the conciliator's recommendations; they generally share equally in the cost of the conciliation.

Working Conditions

Judges, magistrates, and other judicial workers do most of their work in offices, law libraries, and courtrooms. Work in these occupations presents few hazards, although sitting in the same position in the courtroom for long periods can be tiring. Most judges wear robes when they are in a courtroom. Judges typically work a standard 40-hour week, but many work more than 50 hours per week. Some judges with limited jurisdiction are employed part time and divide their time between their judicial responsibilities and other careers.

Arbitrators, mediators, and conciliators usually work in private offices or meeting rooms; no public record is made of the proceedings.



Judges may be called upon to settle disputes between opposing attorneys.

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Employment

Judges, magistrates, and magistrate judges held 27,000 jobs in 2002, primarily in State and local government. Administrative law judges, adjudicators, and hearing officers held about 19,000 jobs; 57 percent worked in State governments, 24 percent in the Federal Government, and 16 percent in local governments. Arbitrators, mediators, and conciliators held another 6,100 jobs. Approximately half worked for State and local governments. The remainder worked for labor organizations, law offices, insurance carriers, and other private companies and for organizations that specialize in providing dispute resolution services.

Training, Other Qualifications, and Advancement

A bachelor's degree and work experience usually constitute the minimum requirement for a judgeship or magistrate position. A number of lawyers become judges, and most judges have first been lawyers. In fact, Federal and State judges usually are required to be lawyers. About 40 States allow nonlawyers to hold limited-jurisdiction judgeships, but opportunities are better for those with law experience. Federal administrative law judges must be lawyers and pass a competitive examination administered by the U.S. Office of Personnel Management. Some State administrative law judges and other hearing officials are not required to be lawyers.

Federal administrative law judges are appointed by various Federal agencies, with virtually lifetime tenure. Federal magistrate judges are appointed by district judges—the life-tenured Federal judges of a district court—to serve in a United States district court for a period of 8 years. A part-time federal magistrate judge's term of office is 4 years. Some State judges are appointed, but the remainder are elected in partisan or nonpartisan State elections. Many State and local judges serve fixed renewable terms ranging from 4 or 6 years for some trial court judgeships to as long as 14 years or even life for other trial or appellate court judges. Judicial nominating commissions, composed of members of the bar and the public, are used to screen candidates for judgeships in many States and for some Federal judgeships.

All States have some type of orientation for newly elected or appointed judges. The Federal Judicial Center, American Bar Association, National Judicial College, and National Center for State Courts provide judicial education and training for judges and other judicial-branch personnel. General and continuing education courses usually last from a couple of days to 3 weeks in length. More than half of all States, as well as Puerto Rico, require judges to enroll in continuing education courses while serving on the bench.

Training and education requirements for arbitrators, mediators, and conciliators differ from those for judges. Mediators who practice in State- or court-funded mediation programs usually must meet specific training or experience standards, which vary by State and court. In most States, individuals who offer private mediation services do not need a license, certification, or specific course work; however, many private mediators and most of those affiliated with mediation organizations and programs have completed mediation training and agreed to comply with certain ethical standards. For example, the American Arbitration Association (AAA) requires mediators listed on its mediation panel to complete an AAA training course, receive recommendations from the trainers, and complete an apprenticeship.

Training for arbitrators, mediators, and conciliators is available through independent mediation programs, national and local mediation membership organizations, and postsecondary schools. In 2002, 16 colleges or universities in the United States offered master's degrees in dispute resolution or conflict management, and 2 offered doctoral degrees. Many more schools offer conflict-management specializations within other degree programs. Degrees in public policy, law, and related fields also provide good background for prospective arbitrators, mediators, and conciliators.

Job Outlook

Employment of judges and magistrates is expected to grow more slowly than the average through 2012. Budgetary pressures at all levels of government will hold down the hiring of judges, despite rising caseloads, particularly in Federal courts. Most job openings will arise as judges retire. However, additional openings occur when new judgeships positions are authorized by law or when judges are elevated to a higher judicial office.

Public concerns about crime and safety, as well as a public increasingly willing to go to court to settle disputes, should spur demand for judges. Not only has the quantity of a judge's work increased, but many cases have become more complex because of developments in information technology, medical science, e-commerce, and globalization. The prestige associated with serving on the bench should ensure competition for judge and magistrate positions. However, a growing number of judges and candidates for judgeships are choosing to forgo the bench and work in the private sector, where pay is significantly higher. This movement may lessen the competition somewhat. Becoming a judge also is often difficult because, not only must judicial candidates compete with other qualified people, but also, they frequently must also gain political support in order to be elected or appointed, and getting that support can be expensive.

Employment of arbitrators, mediators, and conciliators is expected to grow as fast as the average for all occupations through 2012. Many individuals and businesses try to avoid litigation, which can involve lengthy delays, high costs, unwanted publicity, and ill will. Arbitration and other alternatives to litigation usually are faster, less expensive, and more conclusive, spurring demand for the services of arbitrators, mediators, and conciliators. Administrative law judges are expected to experience little to no change in employment, due to a slowing of growth in the Federal sector.

Earnings

Judges, magistrate judges, and magistrates had median annual earnings of $94,070 in 2002. The middle 50 percent earned between $44,970 and $120,390. The top 10 percent earned more than $138,300, while the bottom 10 percent earned less than $24,250. Median annual earnings in the industries employing the largest numbers of judges, magistrate judges, and magistrates in 2002 were $112,720 in State government and $54,750 in local government. Administrative law judges, adjudicators, and hearing officers earned a median of $64,540, and arbitrators, mediators, and conciliators earned a median of $47,320.

In Federal courts, the following salaries apply: the Chief Justice of the United States Supreme Court earned $198,600, and the Associate Justices earned $190,100. Federal court of appeals judges earned $164,100 a year in 2001 while district court judges had salaries of $154,700, as did judges in the Court of Federal Claims and the Court of International Trade. Federal

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judges with limited jurisdiction, such as magistrates and bankruptcy court judges, had salaries of $142,324.

According to a survey by the National Center for State Courts, annual salaries of associate justices of States' highest courts averaged $120,100 in 2002 and ranged from about $89,381 to $170,319. Salaries of State intermediate appellate court judges averaged $116,064 and ranged from $91,469 to $159,657. Salaries of State judges of general jurisdiction trial courts averaged $109,811 and ranged from $82,600 to $150,000.

Most salaried judges are provided health and life insurance, and contributions to retirement plans are made on their behalf.

Related Occupations

Legal training and mediation skills are useful in many other occupations, including counselors; lawyers; paralegals and legal assistants; title examiners, abstractors, and searchers; law clerks; and detectives and criminal investigators.

Sources of Additional Information

Information on judges, magistrates, and other judicial workers may be obtained from

➤ National Center for State Courts, 300 Newport Ave., Williamsburg, VA 23185. Internet: **http://www.ncsconline.org**

Information on arbitrators, mediators, and conciliators may be obtained from

➤ American Arbitration Association, 335 Madison Ave., Floor 10, New York, NY 10017. Internet: **http://www.adr.org**

Lawyers

(0*NET 23-1011.00)

Significant Points

- Formal educational requirements for lawyers include a 4-year college degree, 3 years in law school, and the passing of a written bar examination.
- Competition for admission to most law schools is intense.
- Demand for lawyers will be spurred by the growth of legal action in such areas as health care, intellectual property, international law, elder law, environmental law, and sexual harassment.

Nature of the Work

The legal system affects nearly every aspect of our society, from buying a home to crossing the street. Lawyers form the backbone of this vital system, linking it to society in myriad ways. For that reason, they hold positions of great responsibility and are obligated to adhere to a strict code of ethics.

Lawyers, also called *attorneys*, act as both advocates and advisors in our society. As advocates, they represent one of the parties in criminal and civil trials by presenting evidence and arguing in court to support their client. As advisors, lawyers counsel their clients concerning their legal rights and obligations and suggest particular courses of action in business and personal matters. Whether acting as an advocate or an advisor, all attorneys research the intent of laws and judicial decisions and apply the law to the specific circumstances faced by their client.

The more detailed aspects of a lawyer's job depend upon his or her field of specialization and position. Although all lawyers are licensed to represent parties in court, some appear in court more frequently than others. Trial lawyers, who specialize in trial work, must be able to think quickly and speak with ease and authority. In addition, familiarity with courtroom rules and strategy is particularly important in trial work. Still, trial lawyers spend the majority of their time outside the courtroom, conducting research, interviewing clients and witnesses, and handling other details in preparation for trial.

Lawyers may specialize in a number of different areas, such as bankruptcy, probate, international, or elder law. Those specializing in environmental law, for example, may represent public-interest groups, waste disposal companies, or construction firms in their dealings with the U.S. Environmental Protection Agency (EPA) and other Federal and State agencies. These lawyers help clients prepare and file for licenses and applications for approval before certain activities may occur. In addition, they represent clients' interests in administrative adjudications.

Some lawyers concentrate in the growing field of intellectual property, helping to protect clients' claims to copyrights, artwork under contract, product designs, and computer programs. Still other lawyers advise insurance companies about the legality of insurance transactions, writing insurance policies to conform with the law and to protect companies from unwarranted claims. When claims are filed against insurance companies, these attorneys review the claims and represent the companies in court.

Most lawyers are found in private practice, where they concentrate on criminal or civil law. In criminal law, lawyers represent individuals who have been charged with crimes and argue their cases in courts of law. Attorneys dealing with civil law assist clients with litigation, wills, trusts, contracts, mortgages, titles, and leases. Other lawyers handle only public-interest cases—civil or criminal—which may have an impact extending well beyond the individual client.

Lawyers are sometimes employed full time by a single client. If the client is a corporation, the lawyer is known as "house counsel" and usually advises the company concerning legal issues related to its business activities. These issues might in-



Lawyers spend most of their time outside the courtroom, conducting research, interviewing clients and witnesses, and preparing paperwork.

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volve patents, government regulations, contracts with other companies, property interests, or collective-bargaining agreements with unions.

A significant number of attorneys are employed at the various levels of government. Lawyers who work for State attorneys general, prosecutors, public defenders, and courts play a key role in the criminal justice system. At the Federal level, attorneys investigate cases for the U.S. Department of Justice and other agencies. Government lawyers also help develop programs, draft and interpret laws and legislation, establish enforcement procedures, and argue civil and criminal cases on behalf of the government.

Other lawyers work for legal-aid societies—private, nonprofit organizations established to serve disadvantaged people. These lawyers generally handle civil, rather than criminal, cases. A relatively small number of trained attorneys work in law schools. Most are faculty members who specialize in one or more subjects; however, some serve as administrators. Others work full time in nonacademic settings and teach part time. (For additional information, see the *Handbook* section on teachers—postsecondary.)

Lawyers are increasingly using various forms of technology to perform their varied tasks more efficiently. While all lawyers continue to use law libraries to prepare cases, some supplement their search of conventional printed sources with computer sources, such as the Internet and legal databases. Software is used to search this legal literature automatically and to identify legal texts relevant to a specific case. In litigation involving many supporting documents, lawyers may use computers to organize and index material. Lawyers also utilize electronic filing, videoconferencing, and voice-recognition technology to share information more effectively with other parties involved in a case.

Working Conditions

Lawyers do most of their work in offices, law libraries, and courtrooms. They sometimes meet in clients' homes or places of business and, when necessary, in hospitals or prisons. They may travel to attend meetings, gather evidence, and appear before courts, legislative bodies, and other authorities.

Salaried lawyers usually have structured work schedules. Lawyers who are in private practice may work irregular hours while conducting research, conferring with clients, or preparing briefs during nonoffice hours. Lawyers often work long hours, and of those who regularly work full time, about half work 50 hours or more per week. They may face particularly heavy pressure, especially when a case is being tried. Preparation for court includes keeping abreast of the latest laws and judicial decisions.

Although legal work generally is not seasonal, the work of tax lawyers and other specialists may be an exception. Because lawyers in private practice often can determine their own workload and the point at which they will retire, many stay in practice well beyond the usual retirement age.

Employment

Lawyers held about 695,000 jobs in 2002. About 3 out of 4 lawyers practiced privately, either in law firms or in solo practices. Most of the remaining lawyers held positions in government and with corporations and nonprofit organizations. For those working in government, the greatest number were employed at the local level. In the Federal Government, lawyers work for many different agencies, but are concentrated in the Departments of Justice, Treasury, and Defense. For those working outside of government, lawyers are employed as house counsel by public utilities, banks, insurance companies, real-estate agencies, manufacturing firms, and other business firms and nonprofit organizations. Some salaried lawyers also have part-time independent practices; others work part time as lawyers and full time in another occupation.

Training, Other Qualifications, and Advancement

To practice law in the courts of any State or other jurisdiction, a person must be licensed, or admitted to its bar, under rules established by the jurisdiction's highest court. All States require that applicants for admission to the bar pass a written bar examination; most jurisdictions also require applicants to pass a separate written ethics examination. Lawyers who have been admitted to the bar in one jurisdiction occasionally may be admitted to the bar in another without taking an examination if they meet the latter jurisdiction's standards of good moral character and have a specified period of legal experience. Federal courts and agencies set their own qualifications for those practicing before or in them.

To qualify for the bar examination in most States, an applicant usually must earn a college degree and graduate from a law school accredited by the American Bar Association (ABA) or the proper State authorities. ABA accreditation signifies that the law school—particularly its library and faculty—meets certain standards developed to promote quality legal education. ABA currently accredits 188 law schools; others are approved by State authorities only. With certain exceptions, graduates of schools not approved by the ABA are restricted to taking the bar examination and practicing in the State or other jurisdiction in which the school is located; most of these schools are in California. In 2002, eight States accepted the study of law in a law office as qualification for taking the bar examination; three jurisdictions—California, the District of Columbia, and New Mexico—now accept the study of law by correspondence. Several States require registration and approval of students by the State Board of Law Examiners, either before the students enter law school or during their early years of legal study.

Although there is no nationwide bar examination, 48 States, the District of Columbia, Guam, the Northern Mariana Islands, Puerto Rico, and the Virgin Islands require the 6-hour Multistate Bar Examination (MBE) as part of the overall bar examination; the MBE is not required in Louisiana and Washington. The MBE covers issues of broad interest, and sometimes a locally prepared State bar examination is given in addition to the MBE. The 3-hour Multistate Essay Examination (MEE) is used as part of the bar examination in several States. States vary in their use of MBE and MEE scores.

Many States have begun to require Multistate Performance Testing (MPT) to test the practical skills of beginning lawyers. This program has been well received, and many more States are expected to require performance testing in the future. Requirements vary by State, although the test usually is taken at the same time as the bar exam and is a one-time requirement.

The required college and law school education usually takes 7 years of full-time study after high school—4 years of undergraduate study, followed by 3 years of law school. Law school applicants must have a bachelor's degree to qualify for admis-

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sion. To meet the needs of students who can attend only part time, a number of law schools have night or part-time divisions, which usually require 4 years of study; about 1 in 10 graduates from ABA-approved schools attended part time.

Although there is no recommended "prelaw" major, prospective lawyers should develop proficiency in writing and speaking, reading, researching, analyzing, and thinking logically—skills needed to succeed both in law school and in the profession. Regardless of major, a multidisciplinary background is recommended. Courses in English, foreign languages, public speaking, government, philosophy, history, economics, mathematics, and computer science, among others, are useful. Students interested in a particular aspect of law may find related courses helpful. For example, prospective patent lawyers need a strong background in engineering or science, and future tax lawyers must have extensive knowledge of accounting.

Acceptance by most law schools depends on the applicant's ability to demonstrate an aptitude for the study of law, usually through good undergraduate grades, the Law School Admission Test (LSAT), the quality of the applicant's undergraduate school, any prior work experience, and, sometimes, a personal interview. However, law schools vary in the weight they place on each of these and other factors.

All law schools approved by the ABA, except those in Puerto Rico, require applicants to take the LSAT. Nearly all law schools require applicants to have certified transcripts sent to the Law School Data Assembly Service, which then submits applicants' LSAT scores and their standardized records of college grades to the law schools of their choice. Both this service and the LSAT are administered by the Law School Admission Council. Competition for admission to many law schools—especially the most prestigious ones—generally is intense, with the number of applicants to most law schools greatly exceeding the number that can be admitted.

During the first year or year and a half of law school, students usually study core courses, such as constitutional law, contracts, property law, torts, civil procedure, and legal writing. In the remaining time, they may elect specialized courses in fields such as tax, labor, or corporate law. Law students often acquire practical experience by participating in school-sponsored legal clinic activities; in the school's moot court competitions, in which students conduct appellate arguments; in practice trials under the supervision of experienced lawyers and judges; and through research and writing on legal issues for the school's law journal.

A number of law schools have clinical programs in which students gain legal experience through practice trials and projects under the supervision of practicing lawyers and law school faculty. Law school clinical programs might include work in legal-aid clinics, for example, or on the staff of legislative committees. Part-time or summer clerkships in law firms, government agencies, and corporate legal departments also provide valuable experience. Such training can lead directly to a job after graduation and can help students decide what kind of practice best suits them. Clerkships may also be an important source of financial aid.

In 2001, law students in 52 jurisdictions were required to pass the Multistate Professional Responsibility Examination (MPRE), which tests their knowledge of the ABA codes on professional responsibility and judicial conduct. In some States, the MPRE may be taken during law school, usually after completing a course on legal ethics.

Law school graduates receive the degree of *juris doctor* (J.D.) as the first professional degree. Advanced law degrees may be desirable for those planning to specialize, research, or teach. Some law students pursue joint degree programs, which usually require an additional semester or year of study. Joint degree programs are offered in a number of areas, including law and business administration or public administration.

After graduation, lawyers must keep informed about legal and nonlegal developments that affect their practice. Currently, 40 States and jurisdictions mandate continuing legal education (CLE). Many law schools and State and local bar associations provide continuing education courses that help lawyers stay abreast of recent developments. Some States allow CLE credits to be obtained through participation in seminars on the Internet.

The practice of law involves a great deal of responsibility. Individuals planning careers in law should like to work with people and be able to win the respect and confidence of their clients, associates, and the public. Perseverance, creativity, and reasoning ability also are essential to lawyers, who often analyze complex cases and handle new and unique legal problems.

Most beginning lawyers start in salaried positions. Newly hired salaried attorneys usually start as associates and work with more experienced lawyers or judges. After several years of gaining more responsibilities, some lawyers are admitted to partnership in their firm or go into practice for themselves. Some experienced lawyers are nominated or elected to judgeships. (See the section on judges, magistrates, and other judicial workers elsewhere in the *Handbook*.) Others become full-time law school faculty or administrators; a growing number of these lawyers have advanced degrees in other fields as well.

Some attorneys use their legal training in administrative or managerial positions in various departments of large corporations. A transfer from a corporation's legal department to another department often is viewed as a way to gain administrative experience and rise in the ranks of management.

Job Outlook

Employment of lawyers is expected to grow about as fast as the average through 2012, primarily as a result of growth in the population and in the general level of business activities. Employment growth of lawyers also will result from growth in demand for legal services in such areas as elder, antitrust, environmental, and intellectual-property law. In addition, the wider availability and affordability of legal clinics and prepaid legal service programs should result in increased use of legal services by middle-income people.

Growth in demand will be somewhat mitigated, because, in an effort to reduce money spent on legal fees, many businesses increasingly are using large accounting firms and paralegals to perform some of the same functions that lawyers do. For example, accounting firms may provide employee-benefit counseling, process documents, or handle various other services previously performed by a law firm. Also, mediation and dispute resolution increasingly are being used as alternatives to litigation.

Competition for job openings should continue to be keen because of the large number of students graduating from law school each year. Graduates with superior academic records from well-regarded law schools will have the best job opportunities.

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Perhaps as a result of competition for attorney positions, lawyers are increasingly finding work in nontraditional areas for which legal training is an asset, but not normally a requirement—for example, administrative, managerial, and business positions in banks, insurance firms, real-estate companies, government agencies, and other organizations. Employment opportunities are expected to continue to arise in these organizations at a growing rate.

As in the past, some graduates may have to accept positions in areas outside of their field of interest or for which they feel overqualified. Some recent law school graduates who have been unable to find permanent positions are turning to the growing number of temporary staffing firms that place attorneys in short-term jobs until they are able to secure full-time positions. This service allows companies to hire lawyers on an "as-needed" basis and permits beginning lawyers to develop practical skills while looking for permanent positions.

Due to the competition for jobs, a law graduate's geographic mobility and work experience assume greater importance. The willingness to relocate may be an advantage in getting a job, but, to be licensed in another State, a lawyer may have to take an additional State bar examination. In addition, employers are increasingly seeking graduates who have advanced law degrees and experience in a specialty, such as tax, patent, or admiralty law.

Employment growth for lawyers will continue to be concentrated in salaried jobs, as businesses and all levels of government employ a growing number of staff attorneys and as employment in the legal services industry grows. Most salaried positions are in urban areas where government agencies, law firms, and big corporations are concentrated. The number of self-employed lawyers is expected to decrease slowly, reflecting the difficulty of establishing a profitable new practice in the face of competition from larger, established law firms. Moreover, the growing complexity of law, which encourages specialization, along with the cost of maintaining up-to-date legal research materials, favors larger firms.

For lawyers who wish to work independently, establishing a new practice will probably be easiest in small towns and expanding suburban areas. In such communities, competition from larger, established law firms is likely to be less keen than in big cities, and new lawyers may find it easier to become known to potential clients.

Some lawyers are adversely affected by cyclical swings in the economy. During recessions, demand declines for some discretionary legal services, such as planning estates, drafting wills, and handling real-estate transactions. Also, corporations are less likely to litigate cases when declining sales and profits result in budgetary restrictions. Some corporations and law firms will not hire new attorneys until business improves, and these establishments may even cut staff to contain costs. Several factors, however, mitigate the overall impact of recessions on lawyers; during recessions, for example, individuals and corporations face other legal problems, such as bankruptcies, foreclosures, and divorces requiring legal action.

Earnings

In 2002, the median annual earnings of all lawyers was $90,290. The middle half of the occupation earned between $61,060 and $136,810. The lowest paid 10 percent earned less than $44,490; at least 10 percent earned more than $145,600. Median annual earnings in the industries employing the largest numbers of lawyers in 2002 are given in the following tabulation:

Management of companies and enterprises	$131,970
Federal government	98,790
Legal services	93,970
Local government	69,710
State government	67,910

Median salaries of lawyers 6 months after graduation from law school in 2001 varied by type of work, as indicated by table 1.

Table 1. Median salaries of lawyers 6 months after graduation, 2001

All graduates	$60,000
Type of work	
Private practice	90,000
Business/industry	60,000
Judicial clerkship and government	40,300
Academe	40,000

Source: *National Association of Law Placement*

Salaries of experienced attorneys vary widely according to the type, size, and location of their employer. Lawyers who own their own practices usually earn less than do those who are partners in law firms. Lawyers starting their own practice may need to work part time in other occupations to supplement their income until their practice is well established.

Most salaried lawyers are provided health and life insurance, and contributions are made on their behalf to retirement plans. Lawyers who practice independently are covered only if they arrange and pay for such benefits themselves.

Related Occupations

Legal training is necessary in many other occupations, including paralegal and legal assistant; law clerk; title examiner, abstractor, and searcher; arbitrator, mediator, and conciliator; judge, magistrate judge, and magistrate; and administrative law judge, adjudicator, and hearing officer.

Sources of Additional Information

Information on law schools and a career in law may be obtained from

➤ American Bar Association, 750 North Lake Shore Dr., Chicago, IL 60611. Internet: **http://www.abanet.org**

Information on the LSAT, the Law School Data Assembly Service, the law school application process, and the financial aid available to law students may be obtained from

➤ Law School Admission Council, P.O. Box 40, Newtown, PA 18940. Internet: **http://www.lsac.org**

Information on obtaining a job as a lawyer with the Federal Government is available from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under "U.S. Government" for a local number, or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not toll free, and charges may accrue. Information also is available from the Internet site **http://www.usajobs.opm.gov**.

The requirements for admission to the bar in a particular State or other jurisdiction also may be obtained at the State capital, from the clerk of the Supreme Court, or from the administrator of the State Board of Bar Examiners.

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Paralegals and Legal Assistants

(0*NET 23-2011.00)

Significant Points

- While some paralegals train on the job, employers increasingly prefer graduates of postsecondary paralegal education programs; college graduates who have taken some paralegal courses are especially in demand in some markets.
- Paralegals are projected to grow faster than average, as law offices try to reduce costs by assigning them tasks formerly carried out by lawyers.
- Paralegals are employed by law firms, corporate legal departments, and various government offices and they may specialize in many different areas of the law.

Nature of the Work

While lawyers assume ultimate responsibility for legal work, they often delegate many of their tasks to paralegals. In fact, paralegals—also called legal assistants—continue to assume a growing range of tasks in the Nation's legal offices and perform many of the same tasks as lawyers. Nevertheless, they are still explicitly prohibited from carrying out duties which are considered to be the practice of law, such as setting legal fees, giving legal advice, and presenting cases in court.

One of a paralegal's most important tasks is helping lawyers prepare for closings, hearings, trials, and corporate meetings. Paralegals investigate the facts of cases and ensure that all relevant information is considered. They also identify appropriate laws, judicial decisions, legal articles, and other materials that are relevant to assigned cases. After they analyze and organize the information, paralegals may prepare written reports that attorneys use in determining how cases should be handled. Should attorneys decide to file lawsuits on behalf of clients, paralegals may help prepare the legal arguments, draft pleadings and motions to be filed with the court, obtain affidavits, and assist attorneys during trials. Paralegals also organize and track files of all important case documents and make them available and easily accessible to attorneys.

In addition to this preparatory work, paralegals also perform a number of other vital functions. For example, they help draft contracts, mortgages, separation agreements, and trust instruments. They also may assist in preparing tax returns and planning estates. Some paralegals coordinate the activities of other law office employees and maintain financial office records. Various additional tasks may differ, depending on the employer.

Paralegals are found in all types of organizations, but most are employed by law firms, corporate legal departments, and various government offices. In these organizations, they can work in many different areas of the law, including litigation, personal injury, corporate law, criminal law, employee benefits, intellectual property, labor law, bankruptcy, immigration, family law, and real estate. As the law has become more complex, paralegals have responded by becoming more specialized. Within specialties, functions often are broken down further so that paralegals may deal with a specific area. For example, paralegals specializing in labor law may deal exclusively with employee benefits.

The duties of paralegals also differ widely based on the type of organization in which they are employed. Paralegals who work for corporations often assist attorneys with employee contracts, shareholder agreements, stock-option plans, and employee benefit plans. They also may help prepare and file annual financial reports, maintain corporate minute books and record resolutions, and prepare forms to secure loans for the corporation. Paralegals often monitor and review government regulations to ensure that the corporation is aware of new requirements and it operates within the law.

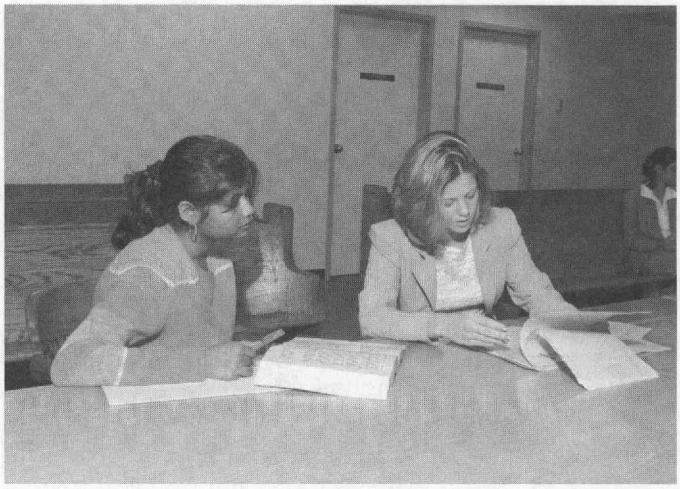
The duties of paralegals who work in the public sector usually vary within each agency. In general, they analyze legal material for internal use, maintain reference files, conduct research for attorneys, and collect and analyze evidence for agency hearings. They may then prepare informative or explanatory material on laws, agency regulations, and agency policy for general use by the agency and the public. Paralegals employed in community legal-service projects help the poor, the aged, and others in need of legal assistance. They file forms, conduct research, prepare documents, and when authorized by law, may represent clients at administrative hearings.

Paralegals in small and medium-sized law firms usually perform a variety of duties that require a general knowledge of the law. For example, they may research judicial decisions on improper police arrests or help prepare a mortgage contract. Paralegals employed by large law firms, government agencies, and corporations, however, are more likely to specialize in one aspect of the law.

Computer use and technical knowledge has become essential to paralegal work. Computer software packages and the Internet are increasingly used to search legal literature stored in computer databases and on CD-ROM. In litigation involving many supporting documents, paralegals may use computer databases to retrieve, organize, and index various materials. Imaging software allows paralegals to scan documents directly into a database, while billing programs help them to track hours billed to clients. Computer software packages also may be used to perform tax computations and explore the consequences of possible tax strategies for clients.

Working Conditions

Paralegals employed by corporations and government usually work a standard 40-hour week. Although most paralegals work



Paralegals help lawyers to prepare for closings, hearings, trials, and corporate meetings.

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year round, some are temporarily employed during busy times of the year, then released when the workload diminishes. Paralegals who work for law firms sometimes work very long hours when they are under pressure to meet deadlines. Some law firms reward such loyalty with bonuses and additional time off.

These workers handle many routine assignments, particularly when they are inexperienced. As they gain experience, paralegals usually assume more varied tasks with additional responsibility. Paralegals do most of their work at desks in offices and law libraries. Occasionally, they travel to gather information and perform other duties.

Employment

Paralegals and legal assistants held about 200,000 jobs in 2002. Private law firms employed 7 out of 10 paralegals and legal assistants; most of the remainder worked for corporate legal departments and various levels of government. Within the Federal Government, the U.S. Department of Justice is the largest employer, followed by the Social Security Administration and the U.S. Department of Treasury. A small number of paralegals own their own businesses and work as freelance legal assistants, contracting their services to attorneys or corporate legal departments.

Training, Other Qualifications, and Advancement

There are several ways to become a paralegal. The most common is through a community college paralegal program that leads to an associate's degree. The other common method of entry, mainly for those who have a college degree, is through a certification program that leads to a certification in paralegal studies. A small number of schools also offer bachelor's and master's degrees in paralegal studies. Some employers train paralegals on the job, hiring college graduates with no legal experience or promoting experienced legal secretaries. Other entrants have experience in a technical field that is useful to law firms, such as a background in tax preparation for tax and estate practice, criminal justice, or nursing or health administration for personal injury practice.

Formal paralegal training programs are offered by an estimated 600 colleges and universities, law schools, and proprietary schools. Approximately 250 paralegal programs are approved by the American Bar Association (ABA). Although this approval is neither required nor sought by many programs, graduation from an ABA-approved program can enhance one's employment opportunities. The requirements for admission to these programs vary. Some require certain college courses or a bachelor's degree; others accept high school graduates or those with legal experience; and a few schools require standardized tests and personal interviews.

Paralegal programs include 2-year associate's degree programs, 4-year bachelor's degree programs, and certificate programs that can take only a few months to complete. Most certificate programs provide intensive paralegal training for individuals who already hold college degrees, while associate's and bachelor's degree programs usually combine paralegal training with courses in other academic subjects. The quality of paralegal training programs varies; the better programs usually include job placement. Programs increasingly include courses introducing students to the legal applications of computers, including how to perform legal research using the Internet. Many paralegal training programs include an internship in which students gain practical experience by working for several months in a private law firm, office of a public defender or attorney general, bank, corporate legal department, legal-aid organization, or government agency. Experience gained in internships is an asset when seeking a job after graduation. Prospective students should examine the experiences of recent graduates before enrolling in those programs.

Although most employers do not require certification, earning a voluntary certificate from a professional society may offer advantages in the labor market. The National Association of Legal Assistants, for example, has established standards for certification requiring various combinations of education and experience. Paralegals who meet these standards are eligible to take a 2-day examination, given three times each year at several regional testing centers. Those who pass this examination may use the designation Certified Legal Assistant (CLA). In addition, the Paralegal Advanced Competency Exam, established in 1996 and administered through the National Federation of Paralegal Associations, offers professional recognition to paralegals with a bachelor's degree and at least 2 years of experience. Those who pass this examination may use the designation Registered Paralegal (RP).

Paralegals must be able to document and present their findings and opinions to their supervising attorney. They need to understand legal terminology and have good research and investigative skills. Familiarity with the operation and applications of computers in legal research and litigation support also is increasingly important. Paralegals should stay informed of new developments in the laws that affect their area of practice. Participation in continuing legal education seminars allows paralegals to maintain and expand their legal knowledge.

Because paralegals frequently deal with the public, they should be courteous and uphold the ethical standards of the legal profession. The National Association of Legal Assistants, the National Federation of Paralegal Associations, and a few States have established ethical guidelines for paralegals to follow.

Paralegals usually are given more responsibilities and less supervision as they gain work experience. Experienced paralegals who work in large law firms, corporate legal departments, and government agencies may supervise and delegate assignments to other paralegals and clerical staff. Advancement opportunities also include promotion to managerial and other law-related positions within the firm or corporate legal department. However, some paralegals find it easier to move to another law firm when seeking increased responsibility or advancement.

Job Outlook

Paralegals and legal assistants are projected to grow faster than the average for all occupations through 2012. Some employment growth stems from law firms and other employers with legal staffs increasingly hiring paralegals to lower the cost and increase the availability and efficiency of legal services. The majority of job openings for paralegals in the future will be new jobs created by employment growth, but additional job openings will arise as people leave the occupation. Despite projections of fast employment growth, competition for jobs should continue as many people seek to go into this profession; however, highly skilled, formally trained paralegals have excellent employment potential.

Private law firms will continue to be the largest employers of paralegals, but a growing array of other organizations, such as corporate legal departments, insurance companies, real estate and title insurance firms, and banks hire paralegals. Corporations, in particular, are boosting their in-house legal departments

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to cut costs. Demand for paralegals also is expected to grow as an increasing population requires legal services, especially in areas such as intellectual property, healthcare, international, elder issues, criminal, and environmental law. The growth of prepaid legal plans also should contribute to the demand for legal services. Paralegal employment is expected to increase as organizations presently employing paralegals assign them a growing range of tasks, and as paralegals are increasingly employed in small and medium-sized establishments. A growing number of experienced paralegals are expected to establish their own businesses.

Job opportunities for paralegals will expand in the public sector as well. Community legal-service programs, which provide assistance to the poor, aged, minorities, and middle-income families, will employ additional paralegals to minimize expenses and serve the most people. Federal, State, and local government agencies, consumer organizations, and the courts also should continue to hire paralegals in increasing numbers.

To a limited extent, paralegal jobs are affected by the business cycle. During recessions, demand declines for some discretionary legal services, such as planning estates, drafting wills, and handling real estate transactions. Corporations are less inclined to initiate certain types of litigation when falling sales and profits lead to fiscal belt tightening. As a result, full-time paralegals employed in offices adversely affected by a recession may be laid off or have their work hours reduced. On the other hand, during recessions, corporations and individuals are more likely to face other problems that require legal assistance, such as bankruptcies, foreclosures, and divorces. Paralegals, who provide many of the same legal services as lawyers at a lower cost, tend to fare relatively better in difficult economic conditions.

Earnings

Earnings of paralegals and legal assistants vary greatly. Salaries depend on education, training, experience, type and size of employer, and geographic location of the job. In general, paralegals who work for large law firms or in large metropolitan areas earn more than those who work for smaller firms or in less populated regions. In addition to a salary, many paralegals receive bonuses. In 2002, full-time, wage and salary paralegals and legal assistants had median annual earnings, including bonuses of $37,950. The middle 50 percent earned between $30,020 and $48,760. The top 10 percent earned more than $61,150, while the bottom 10 percent earned less than $24,470. Median annual earnings in the industries employing the largest numbers of paralegals in 2002 were as follows:

Federal government	$53,770
Legal services	36,780
Local government	36,030
State government	34,750

Related Occupations

Several other occupations call for a specialized understanding of the law and the legal system, but do not require the extensive training of a lawyer. These include law clerks; title examiners, abstractors, and searchers; claims adjusters, appraisers, examiners, and investigators; and occupational health and safety specialists and technicians.

Sources of Additional Information

General information on a career as a paralegal can be obtained from:

➤ Standing Committee on Legal Assistants, American Bar Association, 541 N. Fairbanks Ct,., Chicago, IL 60611. Internet: **http://www.abanet.org**

For information on the Certified Legal Assistant exam, schools that offer training programs in a specific State, and standards and guidelines for paralegals, contact:

➤ National Association of Legal Assistants, Inc., 1516 South Boston St., Suite 200, Tulsa, OK 74119. Internet: **http://www.nala.org**

Information on a career as a paralegal, schools that offer training programs, job postings for paralegals, the Paralegal Advanced Competency Exam, and local paralegal associations can be obtained from:

➤ National Federation of Paralegal Associations, P.O. Box 33108, Kansas City, MO 64114. Internet: **http://www.paralegals.org**

Information on paralegal training programs, including the pamphlet "How to Choose a Paralegal Education Program," may be obtained from:

➤ American Association for Paralegal Education, 407 Wekiva Springs Road, Suite 241, Longwood, FL 32779.. Internet: **http://www.aafpe.org**

Information on obtaining a position as a paralegal specialist with the Federal Government is available from the Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov.**

Education, Training, Library, and Museum Occupations

Archivists, Curators, and Museum Technicians

(0*NET 25-4011.00, 25-4012.00, 25-4013.00)

Significant Points

- Employment in this occupation usually requires graduate education and related work experience.
- Keen competition is expected for the most desirable job openings, which generally attract a large number of applicants.

Nature of the Work

Archivists, curators, and museum technicians acquire and preserve important documents and other valuable items for permanent storage or display. They work for museums, governments, zoos, colleges and universities, corporations, and other institutions that require experts to preserve important records. They also describe, catalogue, analyze, exhibit, and maintain valuable objects and collections for the benefit of researchers and the public. These documents and collections may include works of art, transcripts of meetings, coins and stamps, living and preserved plants and animals, and historic buildings and sites.

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Archivists and curators plan and oversee the arrangement, cataloguing, and exhibition of collections and, along with technicians and conservators, maintain collections. Archivists and curators may coordinate educational and public outreach programs, such as tours, workshops, lectures, and classes, and may work with the boards of institutions to administer plans and policies. They also may research topics or items relevant to their collections. Although some duties of archivists and curators are similar, the types of items they deal with differ: curators usually handle objects with cultural, biological, or historical significance, such as sculptures, textiles, and paintings, while archivists handle mainly records and documents that are retained because of their importance and potential value in the future.

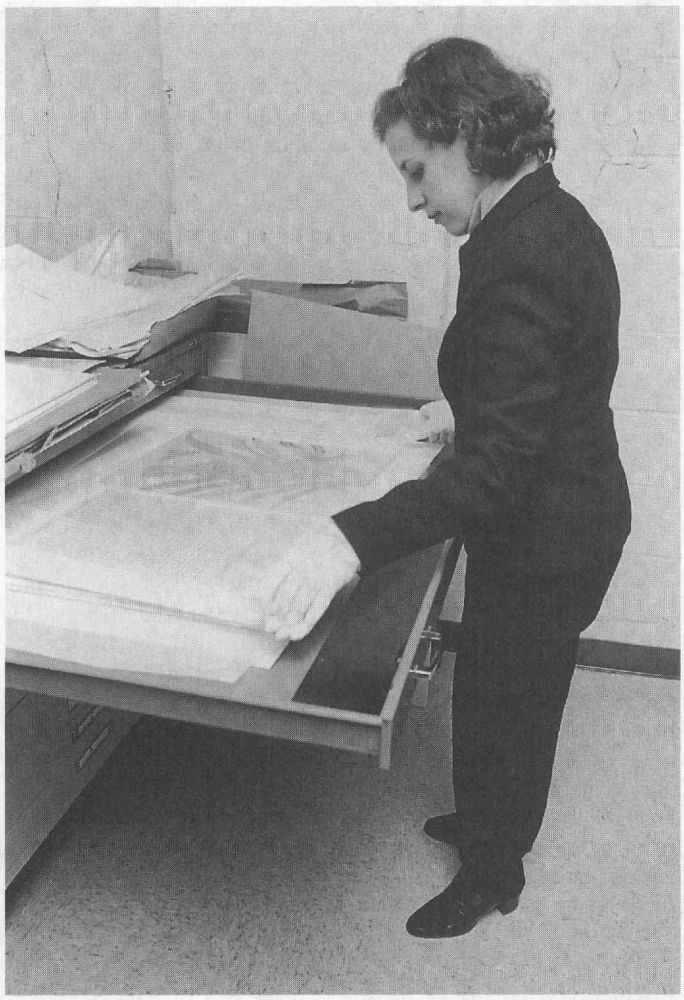
Archivists collect, organize, and maintain control over a wide range of information deemed important enough for permanent safekeeping. This information takes many forms: photographs, films, video and sound recordings, computer tapes, and video and optical disks, as well as more traditional paper records, letters, and documents. Archivists work for a variety of organizations, including government agencies, museums, historical societies, corporations, and educational institutions that use or generate records of great potential value to researchers, exhibitors, genealogists, and others who would benefit from having access to original source material.

Archivists maintain records in accordance with accepted standards and practices, that ensure the long-term preservation and easy retrieval of the documents. Records may be saved on any medium, including paper, film, videotape, audiotape, electronic disk, or computer. They also may be copied onto some other format to protect the original and to make them more accessible to researchers who use the records. As various storage media evolve, archivists must keep abreast of technological advances in electronic information storage.

Archivists often specialize in an area of history or technology so they can more accurately determine what records in that area qualify for retention and should become part of the archives. Archivists also may work with specialized forms of records, such as manuscripts, electronic records, photographs, cartographic records, motion pictures, and sound recordings.

Computers are increasingly being used to generate and maintain archival records. Professional standards for the use of computers in handling archival records are still evolving. However, computers are expected to transform many aspects of archival collections as computer capabilities and the use of multimedia and the Internet expand and allow more records to be stored and exhibited electronically.

Curators administer the affairs of museums, zoos, aquariums, botanical gardens, nature centers, and historic sites. The head curator of the museum is usually called the *museum director*. Curators direct the acquisition, storage, and exhibition of collections, including negotiating and authorizing the purchase, sale, exchange, or loan of collections. They are also responsible for authenticating, evaluating, and categorizing the specimens in a collection. Curators oversee and help conduct the institution's research projects and related educational programs. However, an increasing part of a curator's duties involves fundraising and promotion, which may include the writing and reviewing of grant proposals, journal articles, and publicity materials, as well as attendance at meetings, conventions, and civic events.



Archivists and curators oversee the cataloguing and display of collections of artwork, documents, and other valuable items.

Most curators specialize in a particular field, such as botany, art, paleontology, or history. Those working in large institutions may be highly specialized. A large natural-history museum, for example, would employ separate curators for its collections of birds, fishes, insects, and mammals. Some curators maintain their collections, others do research, and others perform administrative tasks. In small institutions, with only one or a few curators, one curator may be responsible for multiple tasks, from maintaining collections to directing the affairs of the museum.

Conservators manage, care for, preserve, treat, and document works of art, artifacts, and specimens, work that may require substantial historical, scientific, and archaeological research. They use x rays, chemical testing, microscopes, special lights, and other laboratory equipment and techniques to examine objects and determine their condition, their need for treatment or restoration, and the appropriate method for preserving them. Conservators document their findings and treat items to minimize their deterioration or to restore them to their original state. Conservators usually specialize in a particular material or group of objects, such as documents and books, paintings, decorative arts, textiles, metals, or architectural material.

Museum technicians assist curators by performing various preparatory and maintenance tasks on museum items. Some

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museum technicians also may assist curators with research. Archives technicians help archivists organize, maintain, and provide access to historical documentary materials.

Working Conditions

The working conditions of archivists and curators vary. Some spend most of their time working with the public, providing reference assistance and educational services. Others perform research or process records, which often means working alone or in offices with only a few people. Those who restore and install exhibits or work with bulky, heavy record containers may climb, stretch, or lift. Those in zoos, botanical gardens, and other outdoor museums or historic sites frequently walk great distances.

Curators who work in large institutions may travel extensively to evaluate potential additions to the collection, organize exhibitions, and conduct research in their area of expertise. However, travel is rare for curators employed in small institutions.

Employment

Archivists, curators, and museum technicians held about 22,000 jobs in 2002. About 35 percent were employed in museums, historical sites, and similar institutions, and 15 percent worked for State and private educational institutions, mainly college and university libraries. Nearly 40 percent worked in Federal, State, and local government. Most Federal archivists work for the National Archives and Records Administration; others manage military archives in the U.S. Department of Defense. Most Federal Government curators work at the Smithsonian Institution, in the military museums of the Department of Defense, and in archaeological and other museums and historic sites managed by the U.S. Department of the Interior. All State governments have archival or historical-record sections employing archivists. State and local governments also have numerous historical museums, parks, libraries, and zoos employing curators.

Some large corporations that have archives or record centers employ archivists to manage the growing volume of records created or maintained as required by law or necessary to the firms' operations. Religious and fraternal organizations, professional associations, conservation organizations, major private collectors, and research firms also employ archivists and curators.

Conservators may work under contract to treat particular items, rather than as regular employees of a museum or other institution. These conservators may work on their own as private contractors, or they may work as an employee of a conservation laboratory or regional conservation center that contracts their services to museums.

Training, Other Qualifications, and Advancement

Employment as an archivist, conservator, or curator usually requires graduate education and related work experience. While completing their formal education, many archivists and curators work in archives or museums to gain the "hands-on" experience that many employers seek.

Although most archivists have a variety of undergraduate degrees, a graduate degree in history or library science, with courses in archival science, is preferred by most employers. Some positions may require knowledge of the discipline related to the collection, such as business or medicine. Currently, no programs offer bachelor's or master's degrees in archival science. However, approximately 65 colleges and universities offer courses or practical training in archival science as part of their history, library science, or other curriculum. The Academy of Certified Archivists offers voluntary certification for archivists. The designation "Certified Archivist" is obtained by those with at least a master's degree and a year of appropriate archival experience. The certification process requires candidates to pass a written examination, and they must renew their certification periodically.

Archivists need research and analytical ability to understand the content of documents and the context in which they were created and to decipher deteriorated or poor-quality printed matter, handwritten manuscripts, or photographs and films. A background in preservation management is often required of archivists because they are responsible for taking proper care of their records. Archivists also must be able to organize large amounts of information and write clear instructions for its retrieval and use. In addition, computer skills and the ability to work with electronic records and databases are becoming increasingly important.

Many archives, including one-person shops, are very small and have limited opportunities for promotion. Archivists typically advance by transferring to a larger unit with supervisory positions. A doctorate in history, library science, or a related field may be needed for some advanced positions, such as director of a State archive.

For employment as a curator, most museums require a master's degree in an appropriate discipline of the museum's specialty—art, history, or archaeology—or museum studies. Many employers prefer a doctoral degree, particularly for curators in natural history or science museums. Earning two graduate degrees—in museum studies (museology) and a specialized subject—gives a candidate a distinct advantage in this competitive job market. In small museums, curatorial positions may be available to individuals with a bachelor's degree. For some positions, an internship of full-time museum work supplemented by courses in museum practices is needed.

Curatorial positions often require knowledge in a number of fields. For historic and artistic conservation, courses in chemistry, physics, and art are desirable. Since curators—particularly those in small museums—may have administrative and managerial responsibilities, courses in business administration, public relations, marketing, and fundraising also are recommended. Like archivists, curators need computer skills and the ability to work with electronic databases. Many curators are responsible for posting information on the Internet, so they also need to be familiar with digital imaging, scanning technology, and copyright law.

Curators must be flexible because of their wide variety of duties, among which are the design and presentation of exhibits. In small museums, curators need manual dexterity, to build exhibits or restore objects. Leadership ability and business skills are important for museum directors, while marketing skills are valuable in increasing museum attendance and fundraising.

In large museums, curators may advance through several levels of responsibility, eventually becoming the museum director. Curators in smaller museums often advance to larger ones. Individual research and publications are important for advancement in larger institutions.

When hiring conservators, employers look for a master's degree in conservation or in a closely related field, together with

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substantial experience. There are only a few graduate programs in museum conservation techniques in the United States. Competition for entry to these programs is keen; to qualify, a student must have a background in chemistry, archaeology or studio art, and art history, as well as work experience. For some programs, knowledge of a foreign language is also helpful. Conservation apprenticeships or internships as an undergraduate can enhance one's admission prospects. Graduate programs last 2 to 4 years, the latter years of which include internship training. A few individuals enter conservation through apprenticeships with museums, nonprofit organizations, and conservators in private practice. Apprenticeships should be supplemented with courses in chemistry, studio art, and history. Apprenticeship training, although accepted, usually is a more difficult route into the conservation profession.

Museum technicians usually need a bachelor's degree in an appropriate discipline of the museum's specialty, training in museum studies, or previous experience working in museums, particularly in the design of exhibits. Similarly, archives technicians usually need a bachelor's degree in library science or history, or relevant work experience. Technician positions often serve as a steppingstone for individuals interested in archival and curatorial work. Except in small museums, a master's degree is needed for advancement.

Relatively few schools grant a bachelor's degree in museum studies. More common are undergraduate minors or tracks of study that are part of an undergraduate degree in a related field, such as art history, history, or archaeology. Students interested in further study may obtain a master's degree in museum studies, offered in colleges and universities throughout the country. However, many employers feel that, while museum studies are helpful, a thorough knowledge of the museum's specialty and museum work experience are more important.

Continuing education, which enables archivists, curators, and museum technicians to keep up with developments in the field, is available through meetings, conferences, and workshops sponsored by archival, historical, and museum associations. Some larger organizations, such as the National Archives, offer such training in-house.

Job Outlook

Competition for jobs as archivists, curators, and museum technicians is expected to be keen because qualified applicants outnumber job openings. Graduates with highly specialized training, such as master's degrees in both library science and history, with a concentration in archives or records management and extensive computer skills should have the best opportunities for jobs as archivists. A curator job also is attractive to many people, and many applicants have the necessary training and knowledge of the subject, but there are only a few openings. Consequently, candidates may have to work part time, as an intern, or even as a volunteer assistant curator or research associate after completing their formal education. Substantial work experience in collection management, exhibit design, or restoration, as well as database management skills, will be necessary for permanent status. Job opportunities for curators should be best in art and history museums, since these are the largest employers in the museum industry.

The job outlook for conservators may be more favorable, particularly for graduates of conservation programs. However, competition is stiff for the limited number of openings in these programs, and applicants need a technical background. Students who qualify and successfully complete the program, have knowledge of a foreign language, and are willing to relocate will have an advantage over less qualified candidates.

Employment of archivists, curators, and museum technicians is expected to increase about as fast as the average for all occupations through 2012. Jobs are expected to grow as public and private organizations emphasize establishing archives and organizing records and information and as public interest in science, art, history, and technology increases. Museum and zoo attendance has been on the rise and is expected to continue increasing, which will generate demand for curators and museum technicians and conservators. However, museums and other cultural institutions can be subject to cuts in funding during recessions or periods of budget tightening, reducing demand for archivists and curators. Although the rate of turnover among archivists and curators is relatively low, the need to replace workers who leave the occupation or stop working will create some additional job openings.

Earnings

Median annual earnings of archivists, curators, and museum technicians in 2002 were $35,270. The middle 50 percent earned between $26,400 and $48,460. The lowest 10 percent earned less than $20,010, and the highest 10 percent earned more than $66,050.

Earnings of archivists and curators vary considerably by type and size of employer and often by specialty. Median annual earnings of archivists, curators, and museum technicians in 2002 were $33,720 in museums, historical sites, and similar institutions.. Salaries, though, of curators in large, well-funded museums can be several times higher than those in small ones. The average annual salary for archivists in the Federal Government in nonsupervisory, supervisory, and managerial positions was $69,706 in 2003; for museum curators, $70,100; museum specialists and technicians, $48,414; and for archives technicians, $37,067.

Related Occupations

The skills that archivists, curators, and museum technicians use in preserving, organizing, and displaying objects or information of historical interest are shared by artists and related workers; librarians; and anthropologists and archeologists, historians, and other social scientists.

Sources of Additional Information

For information on archivists and on schools offering courses in archival studies, contact

➤ Society of American Archivists, 527 South Wells St., 5th floor, Chicago, IL 60607-3922. Internet: **http://www.archivists.org**

For general information about careers as a curator and schools offering courses in museum studies, contact

➤ American Association of Museums, 1575 Eye St. NW., Suite 400, Washington, DC 20005. Internet: **http://www.aam-us.org**

For information about careers and education programs in conservation and preservation, contact

➤ American Institute for Conservation of Historic and Artistic Works, 1717 K St. NW., Suite 200, Washington, DC 20006. Internet: **http://aic.stanford.edu**

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Instructional Coordinators

(0*NET 25-9031.00)

Significant Points

- Many instructional coordinators are former teachers or principals.
- A bachelor's degree is the minimum educational requirement, but a graduate degree is preferred.
- The need to meet new educational standards will create more demand for instructional coordinators to train teachers and develop new materials.

Nature of the Work

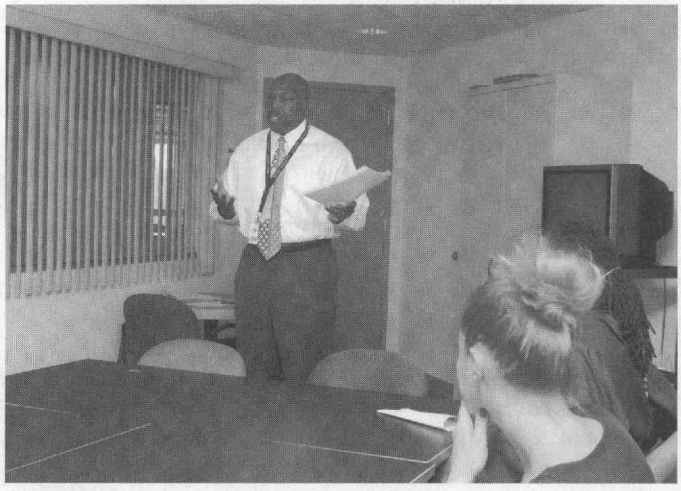
Instructional coordinators, also known as curriculum specialists, staff development specialists, or directors of instructional material, play a large role in improving the quality of education in the classroom. They develop instructional materials, train teachers, and assess educational programs in terms of quality and adherence to regulations and standards. They also assist in implementing new technology in the classroom. Instructional coordinators often specialize in specific subjects, such as reading, language arts, mathematics, or social studies.

Instructional coordinators evaluate how well a school's curriculum, or plan of study, meets students' needs. They research teaching methods and techniques and develop procedures to determine whether program goals are being met. To aid in their evaluation, they may meet with members of educational committees and advisory groups to learn about subjects—English, history, or mathematics, for example—and to relate curriculum materials to these subjects, to students' needs, and to occupations for which these subjects are good preparation. They also may develop questionnaires and interview school staff about the curriculum. Based on their research and observations of instructional practice, they recommend instruction and curriculum improvements.

Another duty instructional coordinators have is to review textbooks, software, and other educational materials and make recommendations on purchases. They monitor materials ordered and the ways in which teachers use them in the classroom. They also supervise workers who catalogue, distribute, and maintain a school's educational materials and equipment.

Instructional coordinators develop effective ways to use technology to enhance student learning. They monitor the introduction of new technology, including the Internet, into a school's curriculum. In addition, instructional coordinators might recommend installing educational computer software, such as interactive books and exercises designed to enhance student literacy and develop math skills. Instructional coordinators may invite experts—such as computer hardware, software, and library or media specialists—into the classroom to help integrate technological materials into a school's curriculum.

Many instructional coordinators plan and provide onsite education for teachers and administrators. They may train teachers about the use of materials and equipment or help them to improve their skills. Instructional coordinators also mentor new teachers and train experienced ones in the latest instructional methods. This role becomes especially important when a school district introduces new content, program innovations, or a different organizational structure. For example, when a State or school district introduces standards or tests that must be met by students in order to pass to the next grade, instructional coordinators often must advise teachers on the content of the standards and provide instruction on implementing the standards in the classroom.



Instructional coordinators train teachers in the use of materials and equipment.

Working Conditions

Instructional coordinators, including those employed by school districts, often work year round, usually in offices or classrooms. Some spend much of their time traveling between schools meeting with teachers and administrators. The opportunity to shape and improve instructional curricula and work in an academic environment can be satisfying. However, some instructional coordinators find the work stressful because the occupation requires continual accountability to school administrators and it is not uncommon for people in this occupation to work long hours.

Employment

Instructional coordinators held about 98,000 jobs in 2002. More than 1 in 3 worked in local government education. About 1 in 5 worked in private education, and about 1 in 10 worked in State government education. The remainder worked mostly in the following industries: individual and family services; child daycare services; scientific research and development services; and management, scientific, and technical consulting services.

Training, Other Qualifications, and Advancement

The minimum educational requirement for instructional coordinators is a bachelor's degree, usually in education. Most employers, however, prefer candidates with a master's or higher degree. Many instructional coordinators have training in curriculum development and instruction, or in a specific academic field, such as mathematics or history. Instructional coordinators must have a good understanding of how to teach specific groups of students, in addition to expertise in developing educational materials. As a result, many persons transfer into instructional coordinator jobs after working for several years as teachers. Work experience in an education administrator position, such as principal or assistant principal, also is beneficial. Specific requirements for instructional coordinator jobs vary depending on the particular position or school district. They may also vary by State.

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Helpful college courses may include those in curriculum development and evaluation, instructional approaches, or research design, which teaches how to create and implement research studies to determine the effectiveness of a given method of curriculum or instruction, or to measure and improve student performance. Moreover, instructional coordinators usually are required to take continuing education courses to keep their skills current. Topics for continuing education courses may include teacher evaluation techniques, curriculum training, new teacher induction, consulting and teacher support, and observation and analysis of teaching.

Instructional coordinators must be able to make sound decisions about curriculum options and to organize and coordinate work efficiently. They should have strong interpersonal and communication skills. Familiarity with computer technology also is important for instructional coordinators, who are increasingly involved in gathering and coordinating technical information for students and teachers.

Depending on experience and educational attainment, instructional coordinators may advance to higher positions in a school system, or to management or executive positions in private industry.

Job Outlook

Employment of instructional coordinators is expected to grow faster than the average for all occupations through the year 2012. Over the next decade, instructional coordinators will be instrumental in developing new curricula to meet the demands of a changing society and in training the teacher workforce. Although budget cuts, particularly in the near term, may negatively impact employment to some extent, a continuing emphasis on improving the quality of education is expected to result in a relatively steady and increasing demand for these workers. As increasing Federal, State and local standards impel more schools to focus on improving educational quality and student performance, growing numbers of coordinators will be needed to incorporate the standards into curriculums and make sure teachers and administrators are informed of the changes. Opportunities are expected to be best for those who specialize in subject areas that have been targeted for improvement by the No Child Left Behind Act—namely, reading, math, and science.

Instructional coordinators also will be needed to provide classes on using technology in the classroom, to keep teachers up-to-date on changes in their fields, and to demonstrate new teaching techniques. Additional job growth for instructional coordinators will stem from the increasing emphasis on lifelong learning and on programs for students with special needs, including those for whom English is a second language. These students often require more educational resources and consolidated planning and management within the educational system.

Earnings

Median annual earnings of instructional coordinators in 2002 were $47,350. The middle 50 percent earned between $34,450 and $62,460. The lowest 10 percent earned less than $25,880, and the highest 10 percent earned more than $76,820.

Related Occupations

Instructional coordinators are professionals involved in education and training and development, which requires organizational, administrative, teaching, research, and communication skills. Occupations with similar characteristics include preschool, kindergarten, elementary, middle, and secondary school teachers; postsecondary teachers; education administrators; counselors; and human resources, training, and labor relations managers and specialists.

Sources of Additional Information

Information on requirements and job opportunities for instructional coordinators is available from local school systems and State departments of education.

Librarians

(0*NET 25-4021.00)

Significant Points

- A master's degree in library science usually is required; special librarians often need an additional graduate or professional degree.
- A large number of retirements in the next decade is expected to result in many job openings for librarians to replace those who leave.
- Librarians increasingly use information technology to perform research, classify materials, and help students and library patrons seek information.

Nature of the Work

The traditional concept of a library is being redefined from a place to access paper records or books to one that also houses the most advanced media, including CD-ROM, the Internet, virtual libraries, and remote access to a wide range of resources. Consequently, librarians, or information professionals, increasingly are combining traditional duties with tasks involving quickly changing technology. Librarians assist people in finding information and using it effectively for personal and professional purposes. Librarians must have knowledge of a wide variety of scholarly and public information sources and must follow trends related to publishing, computers, and the media in order to oversee the selection and organization of library materials. Librarians manage staff and develop and direct information programs and systems for the public, to ensure that information is organized in a manner that meets users' needs.

Most librarian positions incorporate three aspects of library work: User services, technical services, and administrative services. Still, even librarians specializing in one of these areas have other responsibilities. Librarians in user services, such as reference and children's librarians, work with patrons to help them find the information they need. The job involves analyzing users' needs to determine what information is appropriate, as well as searching for, acquiring, and providing the information. The job also includes an instructional role, such as showing users how to access information. For example, librarians commonly help users navigate the Internet so they can search for relevant information efficiently. Librarians in technical services, such as acquisitions and cataloguing, acquire and prepare materials for use and often do not deal directly with the public. Librarians in administrative services oversee the man-

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agement and planning of libraries: negotiate contracts for services, materials, and equipment; supervise library employees; perform public-relations and fundraising duties: prepare budgets; and direct activities to ensure that everything functions properly.

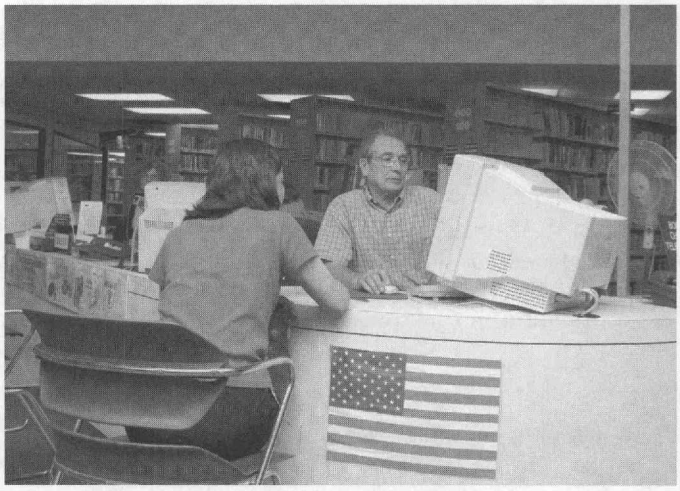
In small libraries or information centers, librarians usually handle all aspects of the work. They read book reviews, publishers' announcements, and catalogues to keep up with current literature and other available resources, and they select and purchase materials from publishers, wholesalers, and distributors. Librarians prepare new materials by classifying them by subject matter and describe books and other library materials to make them easy to find. Librarians supervise assistants, who prepare cards, computer records, or other access tools that direct users to resources. In large libraries, librarians often specialize in a single area, such as acquisitions, cataloguing, bibliography, reference, special collections, or administration. Teamwork is increasingly important to ensure quality service to the public.

Librarians also compile lists of books, periodicals, articles, and audiovisual materials on particular subjects; analyze collections; and recommend materials. They collect and organize books, pamphlets, manuscripts, and other materials in a specific field, such as rare books, genealogy, or music. In addition, they coordinate programs such as storytelling for children and literacy skills and book talks for adults; conduct classes; publicize services; provide reference help; write grants; and oversee other administrative matters.

Librarians are classified according to the type of library in which they work: A public library; school library media center; college, university, or other academic library; or special library. Some librarians work with specific groups, such as children, young adults, adults, or the disadvantaged. In school library media centers, librarians—often called school media specialists—help teachers develop curricula, acquire materials for classroom instruction, and sometimes team teach.

Librarians also work in information centers or libraries maintained by government agencies, corporations, law firms, advertising agencies, museums, professional associations, medical centers, hospitals, religious organizations, and research laboratories. They acquire and arrange an organization's information resources, which usually are limited to subjects of special interest to the organization. These special librarians can provide vital information services by preparing abstracts and indexes of current periodicals, organizing bibliographies, or analyzing background information and preparing reports on areas of particular interest. For example, a special librarian working for a corporation could provide the sales department with information on competitors or new developments affecting the field. A medical librarian may provide information about new medical treatments, clinical trials, and standard procedures to health professionals, patients, consumers, and corporations. Government document librarians, who work for government agencies and depository libraries in each of the States, preserve government publications, records, and other documents that make up a historical record of government actions and decisionmaking.

Many libraries have access to remote databases and maintain their own computerized databases. The widespread use of automation in libraries makes database-searching skills important to librarians. Librarians develop and index databases and help train users to develop searching skills for the information they need. Some libraries are forming consortiums with other libraries through electronic mail. This practice allows patrons to submit information requests to several libraries simultaneously. The Internet also is expanding the amount of available reference information. Librarians must be aware of how to use these resources in order to locate information.



Librarians assist people in finding information and using it effectively.

Librarians with computer and information systems skills can work as automated-systems librarians, planning and operating computer systems, and information architect librarians, designing information storage and retrieval systems and developing procedures for collecting, organizing, interpreting, and classifying information. These librarians analyze and plan for future information needs. (See the statements on computer support specialists and systems administrators; and systems analysts, computer scientists, and database administrators elsewhere in the *Handbook*.) The increasing use of automated information systems is enabling librarians to focus on administrative and budgeting responsibilities, grant writing, and specialized research requests, while delegating more technical and user services responsibilities to technicians. (See the statement on library technicians elsewhere in the *Handbook*.)

More and more, librarians are applying their information management and research skills to arenas outside of libraries—for example, database development, reference tool development, information systems, publishing, Internet coordination, marketing, web content management and design, and training of database users. Entrepreneurial librarians sometimes start their own consulting practices, acting as freelance librarians or information brokers and providing services to other libraries, businesses, or government agencies.

Working Conditions

Librarians spend a significant portion of time at their desks or in front of computer terminals; extended work at video display terminals can cause eyestrain and headaches. Assisting users in obtaining information or books for their jobs, homework, or recreational reading can be challenging and satisfying, but working with users under deadlines can be demanding and stressful. Some librarians lift and carry books, and some climb ladders to reach high stacks. Librarians in small organizations sometimes shelve books themselves.

More than 2 out of 10 librarians work part time. Public and college librarians often work weekends and evenings, as well as

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some holidays. School librarians usually have the same workday and vacation schedules as classroom teachers. Special librarians usually work normal business hours, but in fast-paced industries—such as advertising or legal services—they can work longer hours when needed.

Employment

Librarians held about 167,000 jobs in 2002. Most worked in school and academic libraries, but nearly a third worked in public libraries. The remainder worked in special libraries or as information professionals for companies and other organizations.

Training, Other Qualifications, and Advancement

A master's degree in library science (MLS) is necessary for librarian positions in most public, academic, and special libraries and in some school libraries. The Federal Government requires an MLS or the equivalent in education and experience. Many colleges and universities offer MLS programs, but employers often prefer graduates of the approximately 56 schools accredited by the American Library Association. Most MLS programs require a bachelor's degree; any liberal arts major is appropriate.

Most MLS programs take 1 year to complete; some take 2. A typical graduate program includes courses in the foundations of library and information science, including the history of books and printing, intellectual freedom and censorship, and the role of libraries and information in society. Other basic courses cover the selection and processing of materials, the organization of information, reference tools and strategies, and user services. Courses are adapted to educate librarians to use new resources brought about by advancing technology, such as online reference systems, Internet search methods, and automated circulation systems. Course options can include resources for children or young adults; classification, cataloguing, indexing, and abstracting; library administration; and library automation. Computer-related course work is an increasingly important part of an MLS degree. Some programs offer interdisciplinary degrees combining technical courses in information science with traditional training in library science.

The MLS degree provides general preparation for library work, but some individuals specialize in a particular area, such as reference, technical services, or children's services. A Ph.D. degree in library and information science is advantageous for a college teaching position or for a top administrative job in a college or university library or large library system.

Usually, an MLS also is required of librarians working in special libraries. In addition, most special librarians supplement their education with knowledge of the subject in which they are specializing, sometimes earning a master's, doctoral, or professional degree in the subject. Areas of specialization include medicine, law, business, engineering, and the natural and social sciences. For example, a librarian working for a law firm may also be a licensed attorney, holding both library science and law degrees. In some jobs, knowledge of a foreign language is needed.

State certification requirements for public school librarians vary widely. Most States require school librarians, often called library media specialists, to be certified as teachers and to have had courses in library science. An MLS is needed in some cases, perhaps with a library media specialization, or a master's in education with a specialty in school library media or educational media. Some States require certification of public librarians employed in municipal, county, or regional library systems.

Librarians participate in continuing education and training once they are on the job, in order to keep abreast of new information systems brought about by changing technology.

Experienced librarians can advance to administrative positions, such as department head, library director, or chief information officer.

Job Outlook

Employment of librarians is expected to grow about as fast as the average for all occupations over the 2002-12 period. However, job opportunities are expected to be very good because a large number of librarians are expected to retire in the coming decade, creating many job openings. Also, the number of people going into this profession has fallen in recent years, resulting in more jobs than applicants in some cases. Colleges and universities report the greatest difficulty in hiring librarians, because the pay is often less than the prospective employees can get elsewhere.

Offsetting the need for librarians are government budget cuts and the increasing use of computerized information storage and retrieval systems. Both will result in the hiring of fewer librarians and the replacement of librarians with less costly library technicians. Computerized systems make cataloguing easier, allowing library technicians to perform the work. In addition, many libraries are equipped for users to access library computers directly from their homes or offices. That way, users can bypass librarians altogether and conduct research on their own. However, librarians will still be needed to manage staff, help users develop database-searching techniques, address complicated reference requests, and define users' needs.

Jobs for librarians outside traditional settings will grow the fastest over the decade. Nontraditional librarian jobs include working as information brokers and working for private corporations, nonprofit organizations, and consulting firms. Many companies are turning to librarians because of their research and organizational skills and their knowledge of computer databases and library automation systems. Librarians can review vast amounts of information and analyze, evaluate, and organize it according to a company's specific needs. Librarians also are hired by organizations to set up information on the Internet. Librarians working in these settings may be classified as systems analysts, database specialists and trainers, webmasters or web developers, or local area network (LAN) coordinators.

Earnings

Salaries of librarians vary according to the individual's qualifications and the type, size, and location of the library. Librarians with primarily administrative duties often have greater earnings. Median annual earnings of librarians in 2002 were $43,090. The middle 50 percent earned between $33,560 and $54,250. The lowest 10 percent earned less than $24,510, and the highest 10 percent earned more than $66,590. Median annual earnings in the industries employing the largest numbers of librarians in 2002 were as follows:

Elementary and secondary schools	$45,660
Colleges, universities, and professional schools	45,600
Local government	37,970
Other information services	37,770

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The average annual salary for all librarians in the Federal Government in nonsupervisory, supervisory, and managerial positions was $70,238 in 2003.

Nearly one in three librarians is a member of a union or is covered under a union contract.

Related Occupations

Librarians play an important role in the transfer of knowledge and ideas by providing people with access to the information they need and want. Jobs requiring similar analytical, organizational, and communicative skills include archivists, curators, and museum technicians; and computer and information scientists, research. School librarians have many duties similar to those of schoolteachers. Librarians are increasingly storing, cataloguing, and accessing information with computers. Other jobs that use similar computer skills include systems analysts, computer scientists, and database administrators.

Sources of Additional Information

For information on a career as a librarian and information on accredited library education programs and scholarships, contact

➤ American Library Association, Office for Human Resource Development and Recruitment, 50 East Huron St., Chicago, IL 60611. Internet: **http://www.ala.org**

For information on a career as a special librarian, write to

➤ Special Libraries Association, 1700 18th St. NW., Washington, DC 20009. Internet: **http://www.sla.org**

Information on graduate schools of library and information science can be obtained from

➤ Association for Library and Information Science Education, 1009 Commerce Park Dr., Suite 150, PO Box 4219, Oak Ridge, TN 37839. Internet: **http://www.alise.org**

For information on a career as a law librarian, scholarship information, and a list of ALA-accredited schools offering programs in law librarianship, contact

➤ American Association of Law Libraries, 53 West Jackson Blvd., Suite 940, Chicago, IL 60604. Internet: **http://www.aallnet.org**

For information on employment opportunities for health sciences librarians and for scholarship information, credentialing information, and a list of MLA-accredited schools offering programs in health sciences librarianship, contact

➤ Medical Library Association, 65 E Wacker Place , Suite 1900, Chicago, IL 60601. Internet: **http://www.mlanet.org**

Information on acquiring a job as a librarian with the Federal Government may be obtained from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under "U.S. Government" for a local number, or call (703) 724-1850 (Federal Relay Service (800) 877-8339). The first number is not toll free, and charges may result. Information also is available on the Internet at **http://www.usajobs.opm.gov**.

Information concerning requirements and application procedures for positions in the Library of Congress can be obtained directly from

➤ Human Resources Office, Library of Congress, 101 Independence Ave. SE., Washington, DC 20540-2231.

State library agencies can furnish information on scholarships available through their offices, requirements for certification, and general information about career prospects in the particular State of interest. Several of these agencies maintain job hot lines reporting openings for librarians.

State departments of education can furnish information on certification requirements and job opportunities for school librarians.

Library Technicians

(0*NET 25-4031.00)

Significant Points

- Training requirements range from a high school diploma to an associate's or bachelor's degree, but computer skills are needed for many jobs.
- Increasing use of computerized circulation and information systems should continue to spur job growth, but many libraries' budget constraints should moderate growth.
- Employment should grow rapidly in special libraries because growing numbers of professionals and other workers use those libraries.

Nature of the Work

Library technicians both help librarians acquire, prepare, and organize material and assist users in finding information. Library technicians usually work under the supervision of a librarian, although they work independently in certain situations. Technicians in small libraries handle a range of duties; those in large libraries usually specialize. As libraries increasingly use new technologies—such as CD-ROM, the Internet, virtual libraries, and automated databases—the duties of library technicians will expand and evolve accordingly. Library technicians are assuming greater responsibilities, in some cases taking on tasks previously performed by librarians. (See the statement on librarians elsewhere in the *Handbook.*)

Depending on the employer, library technicians can have other titles, such as library technical assistant or media aide. Library technicians direct library users to standard references, organize and maintain periodicals, prepare volumes for binding, handle interlibrary loan requests, prepare invoices, perform routine cataloguing and coding of library materials, retrieve information from computer databases, and supervise support staff.

The widespread use of computerized information storage and retrieval systems has resulted in technicians handling technical services—such as entering catalogue information into the library's computer—that were once performed by librarians. Technicians assist with customizing databases. In addition, technicians instruct patrons in how to use computer systems to access data. The increased automation of recordkeeping has reduced the amount of clerical work performed by library technicians. Many libraries now offer self-service registration and circulation areas with computers, decreasing the time library technicians spend manually recording and inputting records.

Some library technicians operate and maintain audiovisual equipment, such as projectors, tape recorders, and videocassette recorders, and assist users with microfilm or microfiche readers. They also design posters, bulletin boards, or displays.

Library technicians in school libraries encourage and teach students to use the library and media center. They also help teachers obtain instructional materials, and they assist students with special assignments. Some work in special libraries maintained by government agencies, corporations, law firms, advertising agencies, museums, professional societies, medical centers, and research laboratories, where they conduct

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literature searches, compile bibliographies, and prepare abstracts, usually on subjects of particular interest to the organization.

To extend library services to more patrons, many libraries operate bookmobiles, often run by library technicians. The technicians take trucks stocked with books, or bookmobiles, to designated sites on a regular schedule, frequently stopping at shopping centers, apartment complexes, schools, and nursing homes. Bookmobiles also may be used to extend library service to patrons living in remote areas. Depending on local conditions, the technicians may operate a bookmobile alone or may be accompanied by another library employee.

Library technicians who drive bookmobiles, answer patrons' questions, receive and check out books, collect fines, maintain the book collection, shelve materials, and occasionally operate audiovisual equipment to show slides or films. They participate, and may assist, in planning programs sponsored by the library, such as reader advisory programs, used-book sales, or outreach programs. Technicians who drive the bookmobile keep track of their mileage, the materials lent out, and the amount of fines collected. In some areas, they are responsible for maintenance of the vehicle and any photocopiers or other equipment in it. They record statistics on circulation and the number of people visiting the bookmobile. Technicians also may record requests for special items from the main library and arrange for the materials to be mailed or delivered to a patron during the next scheduled visit. Many bookmobiles are equipped with personal computers and CD-ROM systems linked to the main library system, allowing technicians to reserve or locate books immediately. Some bookmobiles now offer Internet access to users.

Working Conditions

Technicians answer questions and provide assistance to library users. Those who prepare library materials sit at desks or computer terminals for long periods and can develop headaches or eyestrain from working with the terminals. Some duties, like calculating circulation statistics, can be repetitive and boring. Others, such as performing computer searches with the use of local and regional library networks and cooperatives, can be interesting and challenging. Library technicians may lift and carry books climb ladders to reach high stacks, and bend low to shelve books on bottom shelves.



Library technicians direct library users to standard references, organize and maintain periodicals, and perform routine cataloguing and coding of library materials.

Library technicians in school libraries work regular school hours. Those in public libraries and college and university (academic) libraries also work weekends, evenings and some holidays. Library technicians in special libraries usually work normal business hours, although they often work overtime as well.

The schedules of library technicians who drive bookmobiles depend on the size of the area being served. Some bookmobiles operate every day, while others go only on certain days. Some bookmobiles operate in the evenings and weekends, to give patrons as much access to the library as possible. Because library technicians who operate bookmobiles may be the only link some people have to the library, much of their work consists of helping the public. They may assist handicapped or elderly patrons to the bookmobile or shovel snow to ensure their safety. They may enter hospitals or nursing homes to deliver books to patrons who are bedridden.

Employment

Library technicians held about 119,000 jobs in 2002. Most worked in school, academic, or public libraries. Some worked in hospitals and for religious organizations, mainly parochial schools. The Federal Government—primarily the U.S. Department of Defense and the U.S. Library of Congress—and State and local governments also employed library technicians.

Training, Other Qualifications, and Advancement

Training requirements for library technicians vary widely, ranging from a high school diploma to specialized postsecondary training. Some employers hire individuals with work experience or other training; others train inexperienced workers on the job. Still other employers require that technicians have an associate's or bachelor's degree. Given the rapid spread of automation in libraries, computer skills are needed for many jobs. Knowledge of databases, library automation systems, online library systems, online public access systems, and circulation systems is valuable. Many bookmobile drivers are required to have a commercial driver's license.

Some 2-year colleges offer an associate-of-arts degree in library technology. Programs include both liberal arts and library-related study. Students learn about library and media organization and operation, as well as how to order, process, catalogue, locate, and circulate library materials and work with library automation. Libraries and associations offer continuing education courses to keep technicians abreast of new developments in the field.

Library technicians usually advance by assuming added responsibilities. For example, technicians often start at the circulation desk, checking books in and out. After gaining experience, they may become responsible for storing and verifying information. As they advance, they may become involved in budget and personnel matters in their departments. Some library technicians advance to supervisory positions and are in charge of the day-to-day operation of their departments.

Job Outlook

Employment of library technicians is expected to grow about as fast as the average for all occupations through 2012. In addition to jobs opening up through employment growth, some job openings will result from the need to replace library technicians who transfer to other fields or leave the labor force.

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The increasing use of library automation is expected to continue to spur job growth among library technicians. Computerized information systems have simplified certain tasks, such as descriptive cataloguing, which can now be handled by technicians instead of librarians. For example, nowadays technicians can easily retrieve information from a central database and store it in the library's computer. Although efforts to contain costs could dampen employment growth of library technicians in school, public, and college and university libraries, cost containment efforts could also result in more hiring of library technicians than librarians. Growth in the number of professionals and other workers who use special libraries should result in good job opportunities for library technicians in those settings.

Earnings

Median annual earnings of library technicians in 2002 were $24,090. The middle 50 percent earned between $18,150 and $31,140. The lowest 10 percent earned less than $14,410, and the highest 10 percent earned more than $38,000. Median annual earnings in the industries employing the largest numbers of library technicians in 2002 were as follows:

Colleges, universities, and professional schools	$27,280
Local government	23,310
Elementary and secondary schools	21,770
Other information services	20,950

Salaries of library technicians in the Federal Government averaged $36,788 in 2003.

Related Occupations

Library technicians perform organizational and administrative duties. Workers in other occupations with similar duties include library assistants, clerical; information and record clerks; and medical records and health information technicians.

Sources of Additional Information

For information on training programs for library/media technical assistants, write to

➤ American Library Association, Office for Human Resource Development and Recruitment, 50 East Huron St., Chicago, IL 60611. Internet: **http://www.ala.org**

Information on acquiring a job as a library technician with the Federal Government may be obtained from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under "U.S. Government" for a local number, or call (703) 724-1850 (Federal Relay Service (800) 877-8339). The first number is not toll free, and charges may result. Information also is available on the Internet at **http://www.usajobs.opm.gov**.

Information concerning requirements and application procedures for positions in the Library of Congress can be obtained directly from

➤ Human Resources Office, Library of Congress, 101 Independence Ave. SE., Washington, DC 20540-2231.

State library agencies can furnish information on requirements for technicians and general information about career prospects in the State. Several of these agencies maintain job hot lines reporting openings for library technicians.

State departments of education can furnish information on requirements and job opportunities for school library technicians.

Teacher Assistants

(0*NET 25-9041.00)

Significant Points

- About 4 in 10 teacher assistants work part time.
- Educational requirements range from a high school diploma to some college training.
- Workers with experience in special education, or who can speak a foreign language, will be especially in demand.

Nature of the Work

Teacher assistants provide instructional and clerical support for classroom teachers, allowing teachers more time for lesson planning and teaching. Teacher assistants tutor and assist children in learning class material using the teacher's lesson plans, providing students with individualized attention. Teacher assistants also supervise students in the cafeteria, schoolyard, and hallways, or on field trips. They record grades, set up equipment, and help prepare materials for instruction. Teacher assistants also are called teacher aides or instructional aides. Some assistants refer to themselves as paraeducators or paraprofessionals.

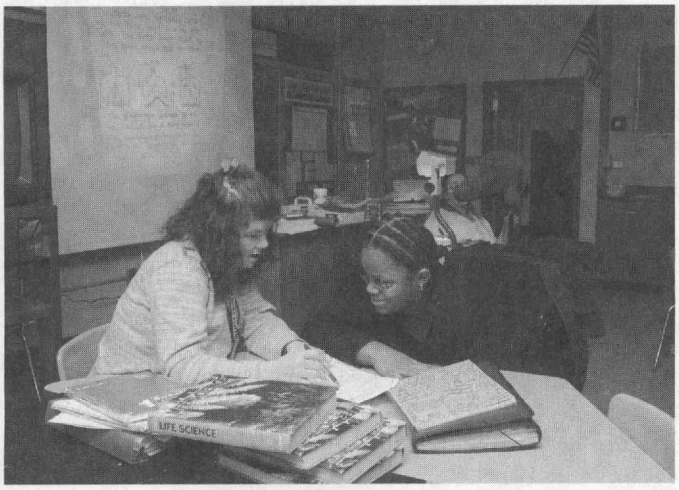
Some teacher assistants perform exclusively noninstructional or clerical tasks, such as monitoring nonacademic settings. Playground and lunchroom attendants are examples of such assistants. Most teacher assistants, however, perform a combination of instructional and clerical duties. They generally provide instructional reinforcement to children, under the direction and guidance of teachers. They work with students individually or in small groups—listening while students read, reviewing or reinforcing class lessons, or helping them find information for reports. At the secondary school level, teacher assistants often specialize in a certain subject, such as math or science. Teacher assistants often take charge of special projects and prepare equipment or exhibits, such as for a science demonstration. Some assistants work in computer laboratories, helping students using computers and educational software programs.

In addition to instructing, assisting, and supervising students, teacher assistants grade tests and papers, check homework, keep health and attendance records, do typing and filing, and duplicate materials. They also stock supplies, operate audiovisual equipment, and keep classroom equipment in order.

Many teacher assistants work extensively with special education students. As schools become more inclusive, integrating special education students into general education classrooms, teacher assistants in general education and special education classrooms increasingly assist students with disabilities. Teacher assistants attend to a disabled student's physical needs, including feeding, teaching good grooming habits, or assisting students riding the schoolbus. They also provide personal attention to students with other special needs, such as those from disadvantaged families, those who speak English as a second language, or those who need remedial education. Teacher assistants help assess a student's progress by observing performance and recording relevant data.

Teacher assistants also work with infants and toddlers who have developmental delays or other disabilities. Under the guidance of a teacher or therapist, teacher assistants perform exercises or play games to help the child develop physically and

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Teacher assistants provide students with individual attention.

behaviorally. Some teacher assistants work with young adults to help them obtain a job or to apply for community services for the disabled.

Working Conditions

Approximately 4 in 10 teacher assistants work part time. However, even among full-time workers, nearly 40 percent work less than 8 hours per day. Most assistants who provide educational instruction work the traditional 9- to 10-month school year. Teacher assistants work in a variety of settings—including private homes and preschools, and local government offices, where they would deal with young adults—but most work in classrooms in elementary, middle, and secondary schools. They also work outdoors supervising recess when weather allows, and they spend much of their time standing, walking, or kneeling.

Seeing students develop and gain appreciation of the joy of learning can be very rewarding. However, working closely with students can be both physically and emotionally tiring. Teacher assistants who work with special education students often perform more strenuous tasks, including lifting, as they help students with their daily routine. Those who perform clerical work may tire of administrative duties, such as copying materials or typing.

Employment

Teacher assistants held almost 1.3 million jobs in 2002. Nearly 3 in 4 work for State and local government education institutions; mostly at the preschool and elementary school level. Private schools, daycare centers, and religious organizations hire most of the rest.

Training, Other Qualifications, and Advancement

Educational requirements for teacher assistants vary by State or school district and range from a high school diploma to some college training, although employers increasingly prefer applicants with some college training. Teacher assistants with instructional responsibilities usually require more training than do those who do not perform teaching tasks. In addition, as a result of the No Child Left Behind Act of 2001, teacher assistants in Title 1 schools—those with a large proportion of students from low-income households—will be required to meet one of three requirements: have a minimum of 2 years of college, hold a 2-year or higher degree, or pass a rigorous state and local assessment. Many schools also require previous experience in working with children and a valid driver's license. Some schools may require the applicant to pass a background check.

A number of 2-year and community colleges offer associate degree programs that prepare graduates to work as teacher assistants. However, most teacher assistants receive on-the-job training. Those who tutor and review lessons with students must have a thorough understanding of class materials and instructional methods, and should be familiar with the organization and operation of a school. Teacher assistants also must know how to operate audiovisual equipment, keep records, and prepare instructional materials, as well as have adequate computer skills.

Teacher assistants should enjoy working with children from a wide range of cultural backgrounds, and be able to handle classroom situations with fairness and patience. Teacher assistants also must demonstrate initiative and a willingness to follow a teacher's directions. They must have good writing skills and be able to communicate effectively with students and teachers. Teacher assistants who speak a second language, especially Spanish, are in great demand for communicating with growing numbers of students and parents whose primary language is not English.

Advancement for teacher assistants—usually in the form of higher earnings or increased responsibility—comes primarily with experience or additional education. Some school districts provide time away from the job or tuition reimbursement so that teacher assistants can earn their bachelor's degrees and pursue licensed teaching positions. In return for tuition reimbursement, assistants are often required to teach a certain length of time for the school district.

Job Outlook

Employment of teacher assistants is expected to grow somewhat faster than the average for all occupations through 2012. Although school enrollments are projected to increase only slowly over the next decade, the student population for which teacher assistants are most needed—special education students and students for whom English is not their first language—is expected to increase more rapidly than the general school-age population. Legislation that requires students with disabilities and non-native English speakers to receive an education "equal" to that of other students, will generate jobs for teacher assistants to accommodate these students' special needs. Children with special needs require much personal attention, and special education teachers, as well as general education teachers with special education students, rely heavily on teacher assistants.

Additionally, a greater focus on educational quality and accountability, as required by the No Child Left Behind Act, is likely to lead to an increased demand for teacher assistants. Growing numbers of teacher assistants will be needed to help teachers prepare students for standardized testing and to pro-

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vide extra assistance to students who perform poorly on standardized tests. An increasing number of afterschool programs and summer programs also will create new opportunities for teacher assistants. In addition to those stemming from employment growth, numerous job openings will arise as assistants transfer to other occupations or leave the labor force to assume family responsibilities, to return to school, or for other reasons characteristic of occupations that require limited formal education and offer relatively low pay.

Opportunities for teacher assistant jobs are expected to be best for persons with at least 2 years of formal education after high school. Persons who can speak a foreign language should be in particular demand in school systems with large numbers of students whose families do not speak English at home. Demand is expected to vary by region of the country. Areas in which the population and school enrollments are expanding rapidly, such as many communities in the South and West, should have rapid growth in the demand for teacher assistants.

Earnings

Median annual earnings of teacher assistants in 2002 were $18,660. The middle 50 percent earned between $14,880 and $23,600. The lowest 10 percent earned less than $12,900, and the highest 10 percent earned more than $29,050.

Teacher assistants who work part time ordinarily do not receive benefits. Full-time workers usually receive health coverage and other benefits.

In 2002, about 3 out of 10 teacher assistants belonged to unions—mainly the American Federation of Teachers and the National Education Association—which bargain with school systems over wages, hours, and the terms and conditions of employment.

Related Occupations

Teacher assistants who instruct children have duties similar to those of preschool, kindergarten, elementary, middle, and secondary school teachers, special education teachers, and school librarians. However, teacher assistants do not have the same level of responsibility or training. The support activities of teacher assistants and their educational backgrounds are similar to those of childcare workers, library technicians, and library assistants. Teacher assistants who work with children with disabilities perform many of the same functions as occupational therapy assistants and aides.

Sources of Additional Information

For information on teacher assistants, including training and certification, contact:

➤ American Federation of Teachers, Paraprofessional and School Related Personnel Division, 555 New Jersey Ave. NW., Washington, DC 20001.

➤ National Education Association, Educational Support Personnel division, 1201 16th Street, NW | Washington, DC 20036.

For information on a career as a teacher assistant, contact:

➤ National Resource Center for Paraprofessionals, 6526 Old Main Hill, Utah State University, Logan, UT 84322. Internet: **http://www.nrcpara.org**

Human resource departments of school systems, school administrators, and State departments of education also can provide details about employment opportunities and required qualifications for teacher assistant jobs.

Teachers—Adult Literacy and Remedial and Self-Enrichment Education

(0*NET 25-3011.00, 25-3021.00)

Significant Points

- Many adult literacy and remedial and self-enrichment teachers work part time and receive no benefits; unpaid volunteers also teach these subjects.
- Opportunities for teachers of English as a second language are expected to be very good, due to the expected increase in the number of residents with limited English skills who seek classes.
- Demand for self-enrichment courses is expected to rise with growing numbers of people who embrace lifelong learning and of retirees who have more free time to take classes.

Nature of the Work

Self-enrichment teachers teach courses that students take for pleasure or personal enrichment; these classes are not usually intended to lead to a particular degree or vocation. Self-enrichment teachers may instruct children or adults in a wide variety of areas, such as cooking, dancing, creative writing, photography, or personal finance. In contrast, *adult literacy and remedial education teachers* provide adults and out-of-school youths with the education they need to read, write, and speak English and to perform elementary mathematical calculations—basic skills that equip them to solve problems well enough to become active participants in our society, to hold a job, and to further their education. The instruction provided by these teachers can be divided into three principle categories: *remedial or adult basic education (ABE)*, which is geared toward adults whose skills are either at or below an eighth-grade level; *adult secondary education (ASE)*, which is geared towards students who wish to obtain their General Educational Development (GED) certificate or other high school equivalency credential; and *English literacy*, which provides instruction for adults with limited proficiency in English. Traditionally, the students in adult literacy and remedial (basic) education classes were made up primarily of those who did not graduate high school or who passed through school without the knowledge needed to meet their educational goals or to participate fully in today's high-skill society. Increasingly, however, students in these classes are immigrants or other people whose native language is not English. Educators who work with adult English-language learners are usually called *teachers of English as a second language (ESL)* or *teachers of English to speakers of other languages (ESOL)*.

Self-enrichment teachers, due to the wide range of classes and subjects they teach, may have styles and methods of instruction that differ greatly. The majority of self-enrichment classes are relatively informal and nonintensive in terms of instructional demands. Some classes, such as pottery or sewing, may be largely hands-on, requiring students to practice doing things themselves in order to learn. In that case, teachers may demonstrate methods or techniques for their class and subsequently supervise students' progress as they attempt to carry out the same or similar tasks or actions. Other classes, such as those

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involving financial planning or religion and spirituality, may be somewhat more academic in nature. Teachers of these classes are likely to rely more heavily on lectures and group discussions as methods of instruction. Classes offered through religious institutions, such as marriage preparation or classes in religion for children, may also be taught by self-enrichment teachers.

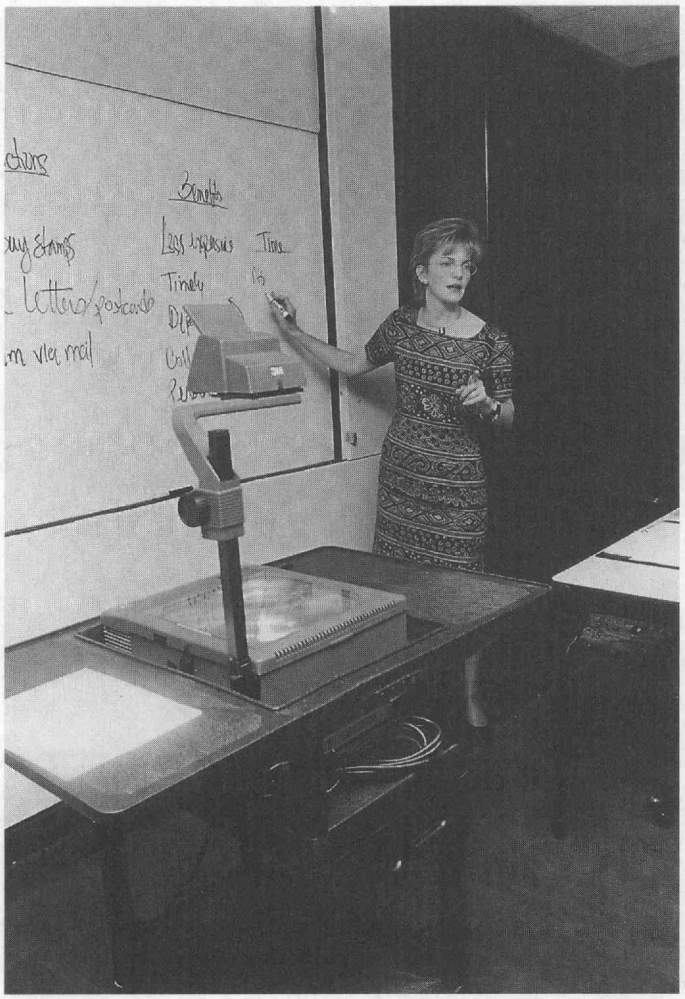
Many of the classes that self-enrichment educators teach are shorter in duration than classes taken for academic credit; some finish in 1 or 2 days to several weeks. These brief classes tend to be introductory in nature and generally focus on only one topic—for example, a cooking class that teaches students how to make bread. Some self-enrichment classes introduce children and youths to activities such as piano or drama, and may be designed to last anywhere from 1 week to several months. These and other self-enrichment classes may be scheduled to occur after school or during school vacations.

Remedial education teachers, more commonly called adult basic education teachers, teach basic academic courses in mathematics, languages, history, reading, writing, science, and other areas, using instructional methods geared toward adult learning. They teach these subjects to students 16 years of age and older who demonstrate the need to increase their skills in one or more of the subject areas mentioned. Classes are taught to appeal to a variety of learning styles and usually include large-group, small-group, and one-on-one instruction. Because the students often are at different proficiency levels for different subjects, adult basic education teachers must make individual assessments of each student's abilities beforehand. In many programs, the assessment is used to develop an individualized education plan for each student. Teachers are required to evaluate students periodically to determine their progress and potential for advancement to the next level.

Teachers in remedial or adult basic education may have to assist students in acquiring effective study skills and the self-confidence they need to reenter an academic environment. Teachers also may encounter students with a learning or physical disability that requires additional expertise. Teachers should possess an understanding of how to help these students achieve their goals, but they also may need to have the knowledge to detect challenges their students may have and provide them with access to a broader system of additional services that are required to address their challenges.

For students who wish to get a GED credential in order to get a job or qualify for postsecondary education, adult secondary education or GED teachers provide help in acquiring the necessary knowledge and skills to pass the test. The GED tests students in subject areas such as reading, writing, mathematics, science, and social studies, while at the same time measuring students' communication, information-processing, problem-solving, and critical-thinking skills. The emphasis in class is on acquiring the knowledge needed to pass the GED test, as well as preparing students for success in further educational endeavors.

ESOL teachers help adults to speak, listen, read, and write in English, often in the context of real-life situations to promote learning. More advanced students may concentrate on writing and conversational skills or focus on learning more academic or job-related communication skills. ESOL teachers teach adults who possess a wide range of cultures and abilities and who speak a variety of languages. Some of their students have a college degree and many advance quickly through the program owing to a variety of factors, such as their age, previous language experience, educational background, and native language. Others may need additional time due to these same factors. Because the teacher and students often do not share a common language, creativity is an important part of fostering communication in the classroom and achieving learning goals.



English literacy teachers often use real-life situations to promote learning.

All adult literacy, remedial, and self-enrichment teachers must prepare lessons beforehand, do any related paperwork, and stay current in their fields. Attendance for students is mostly voluntary and course work is rarely graded. Many teachers also must learn the latest uses for computers in the classroom, as computers are increasingly being used to supplement instruction in basic skills and in teaching ESOL.

Working Conditions

A large number of adult literacy and remedial and self-enrichment education teachers work part time. Some have several part-time teaching assignments or work full time in addition to their part-time teaching job. Classes for adults are held on days and at times that best accommodate students who may have a job or family responsibilities. Similarly, self-enrichment classes for children are usually held after school or during school vacation periods.

Because many of these teachers work with adult students, they do not encounter some of the behavioral or social problems sometimes found with younger students. Adults attend by choice, are highly motivated, and bring years of experience to

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the classroom—attributes that can make teaching these students rewarding and satisfying. Self-enrichment teachers must have a great deal of patience, particularly when working with young children.

Employment

Teachers of adult literacy, remedial, and self-enrichment education held about 280,000 jobs in 2002. About 1 in 5 was self-employed. Many additional teachers worked as unpaid volunteers.

Nearly three-quarters, or 200,000, of the jobs were held by self-enrichment teachers. The largest numbers of these workers were employed by public and private educational institutions, religious organizations, and providers of social assistance and amusement and recreation services.

Adult literacy, basic education, and GED teachers and instructors held about 80,000 jobs. Many of the jobs are federally funded, with additional funds coming from State and local governments. The education industry employs the majority of these teachers, who work in adult learning centers, libraries, or community colleges. Others work for social service organizations such as job-training or residential care facilities. Still others work for State and local governments, providing basic education at juvenile detention and corrections institutions, among other places.

Training, Other Qualifications, and Advancement

The main qualification for self-enrichment teachers is expertise in their subject area; however, requirements may vary greatly with both the type of class taught and the place of employment. In some cases, a portfolio of one's work may be required. For example, to secure a job teaching a photography course, an applicant would need to show examples of previous work. Special certification may be required to teach some subjects, such as a Red Cross water safety instructor certificate to teach swimming. Some self-enrichment teachers are trained educators or other professionals who teach enrichment classes in their spare time. In some disciplines, such as art or music, specific teacher training programs are available. Prospective dance teachers, for example, may complete programs that prepare them to instruct any number of types of dance—from ballroom dancing to ballet. Self-enrichment teachers also should have good speaking skills and a talent for making the subject interesting. Patience and the ability to explain and instruct students at a basic level are important as well, particularly when one is working with children.

Requirements for teaching adult literacy and basic and secondary education vary by State and by program. Federally funded programs run by State and local governments require high accountability and student achievement standards. Those programs run by religious, community, or volunteer organizations, rather than State-run, federally funded programs, generally develop standards based on their own needs and organizational goals. Most State and local governments and educational institutions require that adult teachers have at least a bachelor's degree and, preferably, a master's degree. Some—especially school districts that hire adult education teachers—require an elementary or secondary school teaching certificate. A few have begun requiring a special certificate in ESOL or adult education. Teaching experience, especially with adults, also is preferred or required. Volunteers usually do not need a bachelor's degree, but often must attend a training program before they are allowed to work with students.

Most programs recommend that adult literacy and basic and secondary education teachers take classes or workshops on teaching adults, using technology to teach, working with learners from a variety of cultures, and teaching adults with learning disabilities. ESOL teachers also should have courses or training in second-language acquisition theory and linguistics. In addition, knowledge of the citizenship and naturalization process may be useful. Knowledge of a second language is not necessary to teach ESOL students, but can be helpful in understanding the students' perspectives. GED teachers should know what is required to pass the GED and be able to instruct students in the subject matter. Training for literacy volunteers usually consists of instruction on effective teaching practices, needs assessment, lesson planning, the selection of appropriate instructional materials, characteristics of adult learners, and cross-cultural awareness.

Adult education and literacy teachers must have the ability to work with a variety of cultures, languages, and educational and economic backgrounds. They must be understanding and respectful of their students' circumstances and be familiar with their concerns. All teachers, both paid and volunteer, should be able to communicate well and motivate their students.

Professional development among adult education and literacy teachers varies widely. Both part-time and full-time teachers are expected to participate in ongoing professional development activities in order to keep current on new developments in the field and to enhance skills already acquired. Each State's professional development system reflects the unique needs and organizational structure of that State. Attendance by teachers at professional development workshops and other activities is often outlined in State or local policy. Some teachers are able to access professional development activities through alternative delivery systems such as the Internet or distance learning.

Opportunities for advancement in these professions, particularly for adult education and literacy teachers, again vary from State to State and program to program. Some part-time teachers are able to move into full-time teaching positions or program administrator positions, such as coordinator or director, when such vacancies occur. Others may decide to use their classroom experience to move into policy work at a nonprofit organization or with the local, State, or Federal government or to perform research. Self-enrichment teachers also may advance to administrative positions or may even go on to start their own school or program. Experienced self-enrichment teachers may mentor new instructors and volunteers.

Job Outlook

Opportunities for jobs as adult literacy, remedial, and self-enrichment education teachers are expected to be favorable. Employment is expected to grow faster than the average for all occupations through 2012, and a large number of job openings is expected, due to the need to replace people who leave the occupation or retire.

Self-enrichment education teachers account for the largest proportion of jobs in these occupations. The need for self-enrichment teachers is expected to grow as more people embrace lifelong learning and as the baby boomers begin to retire and have more time to take classes. Subjects that are not easily researched on the Internet and those that provide hands-on experiences, such as cooking, crafts, and the arts, will be in greater demand. Also, classes on spirituality and self-improvement are expected to be popular.

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As employers increasingly require a more literate workforce, workers' demand for adult literacy, basic education, and secondary education classes is expected to grow. Significant employment growth is anticipated especially for ESOL teachers, who will be needed by the increasing number of immigrants and other residents living in this country who need to learn, or enhance their skills in, English. In addition, a greater proportion of these groups is expected to take ESOL classes. Demand for ESOL teachers will be greatest in States such as California, Florida, Texas, and New York, due to their large populations of residents who have limited English skills. However, parts of the Midwest and Plains States have begun to attract large numbers of immigrants, making for especially good opportunities in those areas as well.

The demand for adult literacy and basic and secondary education often fluctuates with the economy. When the economy is good and workers are hard to find, employers relax their standards and hire workers without a degree or GED or those with limited proficiency in English. As the economy softens, more students find that they need additional education to get a job. However, adult education classes often are subject to changes in funding levels, which can cause the number of teaching jobs to fluctuate from year to year. In addition, factors such as immigration policies and the relative prosperity of the United States compared with other countries may have an impact on the number of immigrants entering this country and, consequently, on the demand for ESOL teachers.

Earnings

Median hourly earnings of self-enrichment teachers were $14.09 in 2002. The middle 50 percent earned between $9.86 and $19.69. The lowest 10 percent earned less than $7.37, and the highest 10 percent earned more than $26.49. Self-enrichment teachers are generally paid by the hour or for each class that they teach.

Median hourly earnings of adult literacy, remedial education, and GED teachers and instructors were $17.50 in 2002. The middle 50 percent earned between $13.21 and $24.00. The lowest 10 percent earned less than $10.08, and the highest 10 percent earned more than $34.30. Part-time adult literacy and remedial education and GED instructors are usually paid by the hour or for each class that they teach, and receive few benefits or none at all. Full-time teachers are generally paid a salary and receive health insurance and other benefits if they work for a school system or government.

Related Occupations

The work of adult literacy, remedial, and self-enrichment teachers is closely related to that of other types of teachers, especially preschool, kindergarten, elementary school, middle school, and secondary school teachers. In addition, adult literacy and basic and secondary education teachers require a wide variety of skills and aptitudes. Not only must they be able to teach and motivate students (including, at times, those with learning disabilities), but they also must often take on roles as advisers and mentors. Workers in other occupations that require these aptitudes include special-education teachers, counselors, and social workers. Self-enrichment teachers teach a wide variety of subjects that may be related to the work done by those in many other occupations, such as dancers and choreographers; artists and related workers; musicians, singers, and related workers; recreation and fitness workers; and athletes, coaches, umpires, and related workers.

Sources of Additional Information

Information on adult literacy, basic and secondary education programs, and teacher certification requirements is available from State departments of education, local school districts, and literacy resource centers. Information also may be obtained through local religious and charitable organizations.

For information on adult education and family literacy programs, contact

➤ The U.S. Department of Education, Office of Vocational and Adult Education, 4090 MES, 400 Maryland Ave. SW., Washington, DC 20202. Internet: **http://www.ed.gov/offices/OVAE**

For information on teaching English as a second language, contact

➤ The National Center for ESL Literacy Education, 4646 40th St. NW., Washington, DC 20016. Internet: **http://www.cal.org/ncle**

Teachers—Postsecondary

(0*NET 25-1011.00, 25-1021.00, 25-1022.00, 25-1031.00, 25-1032.00, 25-1041.00, 25-1042.00, 25-1043.00, 25-1051.00, 25-1052.00, 25-1053.00, 25-1054.00, 25-1061.00, 25-1062.00, 25-1063.00, 25-1064.00, 25-1065.00, 25-1066.00, 25-1067.00, 25-1069.99, 25-1071.00, 25-1072.00, 25-1081.00, 25-1082.00, 25-1111.00, 25-1112.00, 25-1113.00, 25-1121.00, 25-1122.00, 25-1123.00, 25-1124.00, 25-1125.00, 25-1126.00, 25-1191.00, 25-1192.00, 25-1193.00, 25-1194.00, 25-1199.99)

Significant Points

- Opportunities for college and university teaching jobs are expected to improve, but many new openings will be for part-time or non-tenure-track positions.
- Prospects for teaching jobs will continue to be better in academic fields that offer attractive alternative nonacademic job opportunities—health specialties, business, and computer science, for example—which attract fewer applicants for academic positions.
- Educational qualifications for postsecondary teacher jobs range from expertise in a particular field to a Ph.D, depending on the subject being taught and the type of educational institution.
- One out of eight postsecondary teachers is a graduate teaching assistant—and one out of ten is a vocational or career and technical education teacher.

Nature of the Work

Postsecondary teachers instruct students in a wide variety of academic and vocational subjects beyond the high school level that may lead to a degree or simply to improvement in one's knowledge or skills. These teachers include college and university faculty, postsecondary career and technical education teachers, and graduate teaching assistants.

College and university faculty make up the majority of postsecondary teachers. They teach and advise more than 15 million full- and part-time college students and perform a significant part of our Nation's research. Faculty also keep up with new developments in their field and may consult with government, business, nonprofit, and community organizations.

Faculty usually are organized into departments or divisions, based on academic subject or field. They usually teach several different related courses in their subject—algebra, calculus, and

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statistics, for example. They may instruct undergraduate or graduate students, or both. College and university faculty may give lectures to several hundred students in large halls, lead small seminars, or supervise students in laboratories. They prepare lectures, exercises, and laboratory experiments; grade exams and papers; and advise and work with students individually. In universities, they also supervise graduate students' teaching and research. College faculty work with an increasingly varied student population made up of growing shares of part-time, older, and culturally and racially diverse students.

Faculty keep abreast of developments in their field by reading current literature, talking with colleagues, and participating in professional conferences. They may also do their own research to expand knowledge in their field. They may perform experiments; collect and analyze data; and examine original documents, literature, and other source material. From this process, they arrive at conclusions, and publish their findings in scholarly journals, books, and electronic media.

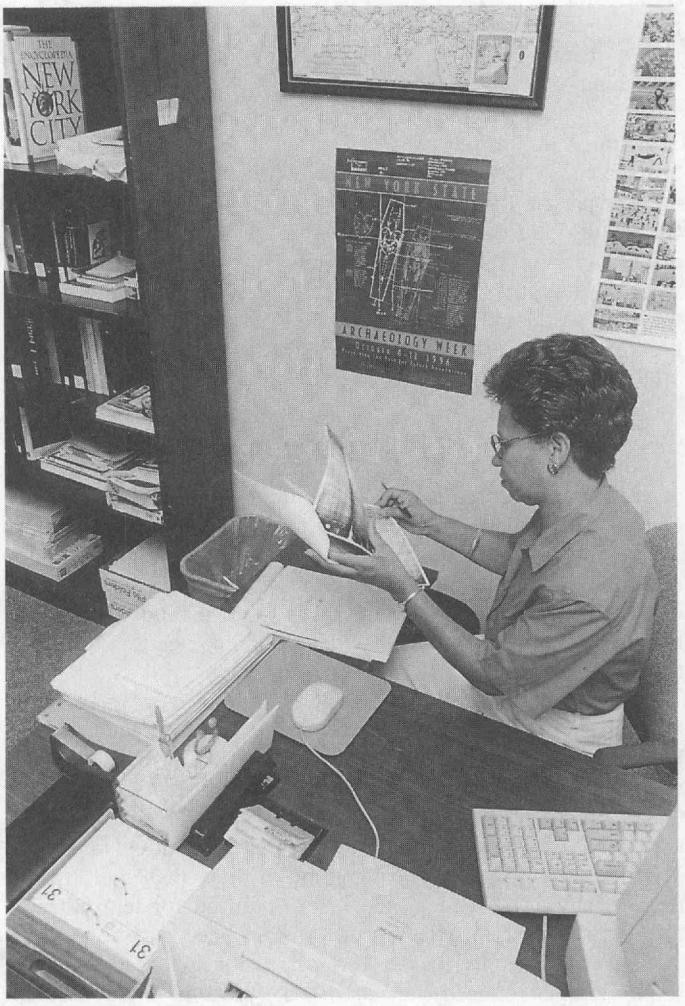
Most college and university faculty extensively use computer technology, including the Internet; electronic mail; software programs, such as statistical packages; and CD-ROMs. They may use computers in the classroom as teaching aids and may post course content, class notes, class schedules, and other information on the Internet. Some faculty are increasingly using sophisticated telecommunications and videoconferencing equipment and the Internet to teach courses to students at remote sites. The use of e-mail, chat rooms, and other techniques has greatly improved communications between students and teachers and among students.

Most faculty members serve on academic or administrative committees that deal with the policies of their institution, departmental matters, academic issues, curricula, budgets, equipment purchases, and hiring. Some work with student and community organizations. Department chairpersons are faculty members who usually teach some courses but have heavier administrative responsibilities.

The proportion of time spent on research, teaching, administrative, and other duties varies by individual circumstance and type of institution. Faculty members at universities normally spend a significant part of their time doing research; those in 4-year colleges, somewhat less; and those in 2-year colleges, relatively little. The teaching load, however, often is heavier in 2-year colleges and somewhat lighter at 4-year institutions. Full professors at all types of institutions usually spend a larger portion of their time conducting research than do assistant professors, instructors, and lecturers.

Postsecondary vocational education teachers, also known as *postsecondary career and technical education teachers,* provide instruction for occupations that require specialized training, but may not require a 4-year degree, such as welder, dental hygienist, x-ray technician, auto mechanic, and cosmetologist. Classes often are taught in an industrial or laboratory setting where students are provided hands-on experience. For example, welding instructors show students various welding techniques and essential safety practices, watch them use tools and equipment, and have them repeat procedures until they meet the specific standards required by the trade. Increasingly, career and technical education teachers are integrating academic and vocational curriculums so that students obtain a variety of skills that can be applied to the "real world."

Career and technical education teachers have many of the same responsibilities that other college and university faculty have. They must prepare lessons, grade papers, attend faculty meetings, and keep abreast of developments in their field. Career and technical education teachers at community colleges and career and technical schools also often play a key role in students' transition from school to work by helping to establish internship programs for students and by providing information about prospective employers.



Postsecondary teachers review current research to keep abreast of developments in their field.

Graduate teaching assistants, often referred to as *graduate TAs*, assist faculty, department chairs, or other professional staff at colleges and universities by performing teaching or teaching-related duties. In addition to their work responsibilities, assistants have their own school commitments, as they are also students who are working towards earning a graduate degree, such as a Ph.D. Some teaching assistants have full responsibility for teaching a course—usually one that is introductory in nature—which can include preparation of lectures and exams, and assigning final grades to students. Others provide assistance to faculty members, which may consist of a variety of tasks such as grading papers, monitoring exams, holding office hours or help-sessions for students, conducting laboratory sessions, or administering quizzes to the class. Teaching assistants generally meet initially with the faculty member whom they are going to assist in order to determine exactly what is expected of them, as each faculty member may have his or her own needs. For example, some faculty members prefer assistants to sit in on classes, while others assign them other tasks to do during class

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time. Graduate teaching assistants may work one-on-one with a faculty member or, for large classes, they may be one of several assistants.

Working Conditions

Postsecondary teachers usually have flexible schedules. They must be present for classes, usually 12 to 16 hours per week, and for faculty and committee meetings. Most establish regular office hours for student consultations, usually 3 to 6 hours per week. Otherwise, teachers are free to decide when and where they will work, and how much time to devote to course preparation, grading, study, research, graduate student supervision, and other activities.

Some teach night and weekend classes. This is particularly true for teachers at 2-year community colleges or institutions with large enrollments of older students who have full-time jobs or family responsibilities. Most colleges and universities require teachers to work 9 months of the year, which allows them the time to teach additional courses, do research, travel, or pursue nonacademic interests during the summer and school holidays. Colleges and universities usually have funds to support research or other professional development needs, including travel to conferences and research sites.

About 3 out of 10 college and university faculty worked part time in 2002. Some part-timers, known as "adjunct faculty," have primary jobs outside of academia—in government, private industry, or nonprofit research—and teach "on the side." Others prefer to work part-time hours or seek full-time jobs but are unable to obtain them due to intense competition for available openings. Some work part time in more than one institution. Many adjunct faculty are not qualified for tenure-track positions because they lack a doctoral degree.

University faculty may experience a conflict between their responsibilities to teach students and the pressure to do research and publish their findings. This may be a particular problem for young faculty seeking advancement in 4-year research universities. Also, recent cutbacks and the hiring of more part-time faculty have put a greater administrative burden on full-time faculty. Requirements to teach online classes also have added greatly to the workloads of postsecondary teachers. Many find that developing the courses to put online, plus learning how to operate the technology and answering large amounts of e-mail, is very time-consuming.

Like college and university faculty, there is usually a great deal of flexibility in graduate TAs' work schedules, which allows them the time to pursue their own academic coursework and studies. The number of hours that TAs work varies depending on their assignments. Work may be stressful, particularly when assistants are given full responsibility for teaching a class; however, these types of positions allow graduate students the opportunity to gain valuable teaching experience. This experience is especially helpful for those graduate teaching assistants who seek to become faculty members at colleges and universities after completing their degree.

Employment

Postsecondary teachers held nearly 1.6 million jobs in 2002. Most were employed in public and private 4-year colleges and universities and in 2-year community colleges. Postsecondary career and technical education teachers also are employed by schools and institutes that specialize in training people in a specific field, such as technology centers or culinary schools. Some career and technical education teachers work for State and local governments and job training facilities. The following tabulation shows postsecondary teaching jobs in specialties having 20,000 or more jobs in 2002:

Graduate teaching assistants	128,000
Vocational education teachers	119,000
Health specialties teachers	86,000
Business teachers	67,000
Art, drama, and music teachers	58,000
English language and literature teachers	55,000
Education teachers	42,000
Biological science teachers	47,000
Mathematical science teachers	41,000
Nursing instructors and teachers	37,000
Computer science teachers	33,000
Engineering teachers	29,000
Psychology teachers	26,000

Training, Other Qualifications, and Advancement

The education and training required of postsecondary teachers varies widely, depending on the subject taught and educational institution employing them. Educational requirements for teachers are generally the highest at 4-year research universities but, at career and technical institutes, experience and expertise in a related occupation is the most valuable qualification.

Postsecondary teachers should communicate and relate well with students, enjoy working with them, and be able to motivate them. They should have inquiring and analytical minds, and a strong desire to pursue and disseminate knowledge. Additionally, they must be self-motivated and able to work in an environment in which they receive little direct supervision.

Training requirements for postsecondary career and technical education teachers vary by State and by subject. In general, teachers need a bachelor's or higher degree, plus work or other experience in their field. In some fields, a license or certificate that demonstrates one's qualifications may be all that is required. Teachers update their skills through continuing education, in order to maintain certification. They must also maintain ongoing dialogue with businesses to determine the most current skills needed in the workplace.

Four-year colleges and universities usually consider doctoral degree holders for full-time, tenure-track positions, but may hire master's degree holders or doctoral candidates for certain disciplines, such as the arts, or for part-time and temporary jobs. Most college and university faculty are in four academic ranks—professor, associate professor, assistant professor, and instructor. These positions usually are considered to be tenure-track positions. Most faculty members are hired as instructors or assistant professors. A smaller number of additional faculty members, called lecturers, are usually employed on contracts for a single academic term and are not on the tenure track.

In 2-year colleges, master's degree holders fill most full-time positions. However, with increasing competition for available jobs, institutions can be more selective in their hiring practices. Many 2-year institutions increasingly prefer job applicants to have some teaching experience or experience with distance learning. Preference also may be given to those holding dual master's degrees, because they can teach more subjects. In addition, with greater competition for jobs, master's degree holders may find it increasingly difficult to obtain employment as they are passed over in favor of candidates holding a Ph.D.

Doctoral programs take an average of 6 to 8 years of full-time study beyond the bachelor's degree, including time spent completing a master's degree and a dissertation. Some programs,

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such as those in the humanities, take longer to complete; others, such as those in engineering, usually are shorter. Candidates specialize in a subfield of a discipline—for example, organic chemistry, counseling psychology, or European history—but also take courses covering the entire discipline. Programs include 20 or more increasingly specialized courses and seminars plus comprehensive examinations on all major areas of the field. Candidates also must complete a dissertation—a written report on original research in the candidate's major field of study. The dissertation sets forth an original hypothesis or proposes a model and tests it. Students in the natural sciences and engineering usually do laboratory work; in the humanities, they study original documents and other published material. The dissertation is done under the guidance of one or more faculty advisors and usually takes 1 or 2 years of full-time work.

In some fields, particularly the natural sciences, some students spend an additional 2 years on postdoctoral research and study before taking a faculty position. Some Ph.D.s extend postdoctoral appointments, or take new ones, if they are unable to find a faculty job. Most of these appointments offer a nominal salary.

Obtaining a position as a graduate teaching assistant is a good way to gain college teaching experience. To qualify, candidates must be enrolled in a graduate school program. In addition, some colleges and universities require teaching assistants to attend classes or take some training prior to being given responsibility for a course.

Although graduate teaching assistants usually work at the institution and in the department where they are earning their degree, teaching or internship positions for graduate students at institutions that do not grant a graduate degree have become more common in recent years. For example, a program called Preparing Future Faculty, administered by the Association of American Colleges and Universities and the Council of Graduate Schools, has led to the creation of many now-independent programs that offer graduate students at research universities the opportunity to work as teaching assistants at other types of institutions, such as liberal arts or community colleges. Working with a mentor, the graduate students teach classes and learn how to improve their teaching techniques. They may attend faculty and committee meetings, develop a curriculum, and learn how to balance the teaching, research, and administrative roles that faculty play. These programs provide valuable learning opportunities for graduate students interested in teaching at the postsecondary level, and also help to make these students aware of the differences among the various types of institutions at which they may someday work.

For faculty, a major step in the traditional academic career is attaining tenure. New tenure-track faculty usually are hired as instructors or assistant professors, and must serve a period—usually 7 years—under term contracts. At the end of the period, their record of teaching, research, and overall contribution to the institution is reviewed; tenure is granted if the review is favorable. Those denied tenure usually must leave the institution. Tenured professors cannot be fired without just cause and due process. Tenure protects the faculty's academic freedom—the ability to teach and conduct research without fear of being fired for advocating unpopular ideas. It also gives both faculty and institutions the stability needed for effective research and teaching, and provides financial security for faculty. Some institutions have adopted post-tenure review policies to encourage ongoing evaluation of tenured faculty.

The number of tenure-track positions is expected to decline as institutions seek flexibility in dealing with financial matters and changing student interests. Institutions will rely more heavily on limited term contracts and part-time, or adjunct, faculty, thus shrinking the total pool of tenured faculty. In a trend that is expected to continue, some institutions now offer limited-term contracts to prospective faculty—typically 2-, 3-, or 5-year, full-time contracts. These contracts may be terminated or extended when they expire. Institutions are not obligated to grant tenure to the contract holders. In addition, some institutions have limited the percentage of faculty who can be tenured.

For most postsecondary teachers, advancement involves a move into administrative and managerial positions, such as departmental chairperson, dean, and president. At 4-year institutions, such advancement requires a doctoral degree. At 2-year colleges, a doctorate is helpful but not usually required, except for advancement to some top administrative positions. (Deans and departmental chairpersons are covered in the *Handbook* statement on education administrators, while college presidents are included in the *Handbook* statement on top executives.)

Job Outlook

Overall, employment of postsecondary teachers is expected to grow much faster than the average for all occupations through 2012. A significant proportion of these new jobs will be part-time positions. Good job opportunities are expected as retirements of current postsecondary teachers and continued increases in student enrollments create numerous openings for teachers at all types of postsecondary institutions.

Projected growth in college and university enrollment over the next decade stems largely from the expected increase in the population of 18- to 24-year-olds. Adults returning to college and an increase in foreign-born students also will add to the number of students, particularly in the fastest growing States of California, Texas, Florida, New York, and Arizona. In addition, workers' growing need to regularly update their skills will continue to create new opportunities for postsecondary teachers, particularly at community colleges and for-profit institutions that cater to working adults. However, many postsecondary educational institutions receive a significant portion of their funding from State and local governments, and, over the early years of the projection period, tight State and local budgets will limit the ability of many schools to expand. Nevertheless, a significant number of openings also is expected to arise due to the need to replace the large numbers of postsecondary teachers who are likely to retire over the next decade. Many postsecondary teachers were hired in the late 1960s and 1970s to teach the baby boomers, and they are expected to retire in growing numbers in the years ahead.

Postsecondary institutions are a major employer of workers holding doctoral degrees, and opportunities for Ph.D. recipients seeking jobs as postsecondary teachers are expected to be somewhat better than in previous decades. The number of earned doctorate degrees is projected to rise by only 4 percent over the 2002-12 period, sharply lower than the 10-percent increase over the previous decade. In spite of this positive trend, competition will remain tight for those seeking tenure-track positions at 4-year colleges and universities, as many of the job openings are expected to be either part-time or renewable, term appointments.

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Opportunities for graduate teaching assistants are expected to be very good. Graduate enrollments over the 2002-12 period are projected to increase at a rate that is somewhat slower than that of the previous decade, while total undergraduate enrollments in degree-granting institutions are expected to increase at nearly twice the rate of the preceding decade, creating many teaching opportunities. Constituting more than 12 percent of all postsecondary teachers, graduate teaching assistants play an integral role in the postsecondary education system, and they are expected to continue to do so in the future.

Because one of the main reasons why students attend postsecondary institutions is to obtain a job, the best job prospects for postsecondary teachers are likely to be in fields where job growth is expected to be strong over the next decade. These will include fields such as business, health specialties, nursing, and computer and biological sciences. Community colleges and other institutions offering career and technical education have been among the most rapidly growing, and these institutions are expected to offer some of the best opportunities for postsecondary teachers.

Earnings

Median annual earnings of all postsecondary teachers in 2002 were $49,040. The middle 50 percent earned between $34,310 and $69,580. The lowest 10 percent earned less than $23,080, and the highest 10 percent earned more than $92,430.

Earnings for college faculty vary according to rank and type of institution, geographic area, and field. According to a 2002-03 survey by the American Association of University Professors, salaries for full-time faculty averaged $64,455. By rank, the average was $86,437 for professors, $61,732 for associate professors, $51,545 for assistant professors, $37,737 for instructors, and $43,914 for lecturers. Faculty in 4-year institutions earn higher salaries, on average, than do those in 2-year schools. In 2002-03, average faculty salaries in public institutions—$63,974—were lower than those in private independent institutions—$74,359—but higher than those in religiously affiliated private colleges and universities—$57,564. In fields with high-paying nonacademic alternatives-medicine, law, engineering, and business, among others—earnings exceed these averages. In others—such as the humanities and education—they are lower.

Many faculty members have significant earnings, in addition to their base salary, from consulting, teaching additional courses, research, writing for publication, or other employment. In addition, many college and university faculty enjoy some unique benefits, including access to campus facilities, tuition waivers for dependents, housing and travel allowances, and paid sabbatical leaves. Part-time faculty usually have fewer benefits than do full-time faculty.

Earnings for postsecondary career and technical education teachers vary widely by subject, academic credentials, experience, and region of the country. Part-time instructors usually receive few benefits.

Related Occupations

Postsecondary teaching requires the ability to communicate ideas well, motivate students, and be creative. Workers in other occupations that require these skills are teachers—preschool, kindergarten, elementary, middle, and secondary; education administrators; librarians; counselors; writers and editors; public relations specialists; and management analysts. Faculty research activities often are similar to those of scientists, as well as to those of managers and administrators in industry, government, and nonprofit research organizations.

Sources of Additional Information

Professional societies related to a field of study often provide information on academic and nonacademic employment opportunities. Names and addresses of many of these societies appear in statements elsewhere in the *Handbook*.

Special publications on higher education, such as *The Chronicle of Higher Education*, list specific employment opportunities for faculty. These publications are available in libraries.

For information on the Preparing Future Faculty program, contact:

➤ Association of American Colleges and Universities, 1818 R St. NW., Washington, DC 20009. Internet: **http://www.aacu-edu.org**

For information on postsecondary career and technical education teaching positions, contact State departments of career and technical education.

General information on adult and career and technical education is available from:

➤ Association for Career and Technical Education, 1410 King St., Alexandria, VA 22314. Internet: **http://www.acteonline.org**

Teachers—Preschool, Kindergarten, Elementary, Middle, and Secondary

(0*NET 25-2011.00, 25-2012.00, 25-2021.00, 25-2022.00, 25-2023.00, 25-2031.00, 25-2032.00)

Significant Points

- Public school teachers must have at least a bachelor's degree, complete an approved teacher education program, and be licensed.
- Many States offer alternative licensing programs to attract people into teaching, especially for hard-to-fill positions.
- Excellent job opportunities are expected as a large number of teachers retire over the next 10 years, particularly at the secondary school level; opportunities will vary somewhat by geographic area and subject taught.

Nature of the Work

Teachers act as facilitators or coaches, using interactive discussions and "hands-on" approaches to help students learn and apply concepts in subjects such as science, mathematics, or English. They utilize "props" or "manipulatives" to help children understand abstract concepts, solve problems, and develop critical thought processes. For example, they teach the concepts of numbers or of addition and subtraction by playing board games. As the children get older, the teachers use more sophisticated materials, such as science apparatus, cameras, or computers.

To encourage collaboration in solving problems, students are increasingly working in groups to discuss and solve problems together. Preparing students for the future workforce is the major stimulus generating the changes in education. To be prepared, students must be able to interact with others, adapt to new technology, and think through problems logically.

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Teachers provide the tools and the environment for their students to develop these skills.

Preschool, kindergarten, and elementary school teachers play a vital role in the development of children. What children learn and experience during their early years can shape their views of themselves and the world and can affect their later success or failure in school, work, and their personal lives. Preschool, kindergarten, and elementary school teachers introduce children to mathematics, language, science, and social studies. They use games, music, artwork, films, books, computers, and other tools to teach basic skills.

Preschool children learn mainly through play and interactive activities. *Preschool teachers* capitalize on children's play to further language and vocabulary development (using storytelling, rhyming games, and acting games), improve social skills (having the children work together to build a neighborhood in a sandbox), and introduce scientific and mathematical concepts (showing the children how to balance and count blocks when building a bridge or how to mix colors when painting). Thus, a less structured approach, including small-group lessons, one-on-one instruction, and learning through creative activities such as art, dance, and music, is adopted to teach preschool children. Play and hands-on teaching also are used in kindergarten classrooms, but there academics begin to take priority. Letter recognition, phonics, numbers, and awareness of nature and science, introduced at the preschool level, are taught primarily by *kindergarten teachers*.

Most *elementary school teachers* instruct one class of children in several subjects. In some schools, two or more teachers work as a team and are jointly responsible for a group of students in at least one subject. In other schools, a teacher may teach one special subject—usually music, art, reading, science, arithmetic, or physical education—to a number of classes. A small but growing number of teachers instruct multilevel classrooms, with students at several different learning levels.

Middle school teachers and *secondary school teachers* help students delve more deeply into subjects introduced in elementary school and expose them to more information about the world. Middle and secondary school teachers specialize in a specific subject, such as English, Spanish, mathematics, history, or biology. They also can teach subjects that are career oriented. *Vocational education teachers*, also referred to as career and technical or career-technology teachers, instruct and train students to work in a wide variety of fields, such as healthcare, business, auto repair, communications, and, increasingly, technology. They often teach courses that are in high demand by area employers, who may provide input into the curriculum and offer internships to students. Many vocational teachers play an active role in building and overseeing these partnerships. Additional responsibilities of middle and secondary school teachers may include career guidance and job placement, as well as followups with students after graduation. (Special education teachers—who instruct elementary and secondary school students who have a variety of disabilities—are discussed separately in this section of the *Handbook*.)

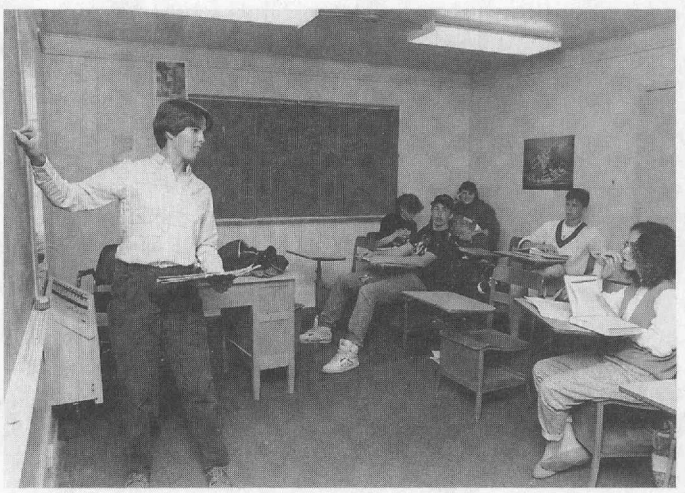
Teachers may use films, slides, overhead projectors, and the latest technology in teaching, including computers, telecommunication systems, and video discs. The use of computer resources, such as educational software and the Internet, exposes students to a vast range of experiences and promotes interactive learning. Through the Internet, students can communicate with students in other countries. Students also use the Internet for individual research projects and to gather information. Computers are used in other classroom activities as well, from solving math problems to learning English as a second language. Teachers also may use computers to record grades and perform other administrative and clerical duties. They must continually update their skills so that they can instruct and use the latest technology in the classroom.

Teachers often work with students from varied ethnic, racial, and religious backgrounds. With growing minority populations in most parts of the country, it is important for teachers to work effectively with a diverse student population. Accordingly, some schools offer training to help teachers enhance their awareness and understanding of different cultures. Teachers may also include multicultural programming in their lesson plans, to address the needs of all students, regardless of their cultural background.

Teachers design classroom presentations to meet students' needs and abilities. They also work with students individually. Teachers plan, evaluate, and assign lessons; prepare, administer, and grade tests; listen to oral presentations; and maintain classroom discipline. They observe and evaluate a student's performance and potential and increasingly are asked to use new assessment methods. For example, teachers may examine a portfolio of a student's artwork or writing in order to judge the student's overall progress. They then can provide additional assistance in areas in which a student needs help. Teachers also grade papers, prepare report cards, and meet with parents and school staff to discuss a student's academic progress or personal problems.

In addition to conducting classroom activities, teachers oversee study halls and homerooms, supervise extracurricular activities, and accompany students on field trips. They may identify students with physical or mental problems and refer the students to the proper authorities. Secondary school teachers occasionally assist students in choosing courses, colleges, and careers. Teachers also participate in education conferences and workshops.

In recent years, site-based management, which allows teachers and parents to participate actively in management decisions regarding school operations, has gained popularity. In many schools, teachers are increasingly involved in making decisions regarding the budget, personnel, textbooks, curriculum design, and teaching methods.



Teachers find that helping students to gain an appreciation of knowledge and learning can be very rewarding.

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Working Conditions

Seeing students develop new skills and gain an appreciation of knowledge and learning can be very rewarding. However, teaching may be frustrating when one is dealing with unmotivated or disrespectful students. Occasionally, teachers must cope with unruly behavior and violence in the schools. Teachers may experience stress in dealing with large classes, students from disadvantaged or multicultural backgrounds, or heavy workloads. Inner-city schools in particular, may be run down and lack the amenities of schools in wealthier communities. Accountability standards also may increase stress levels, with teachers expected to produce students who are able to exhibit satisfactory performance on standardized tests in core subjects.

Teachers are sometimes isolated from their colleagues because they work alone in a classroom of students. However, some schools allow teachers to work in teams and with mentors to enhance their professional development.

Including school duties performed outside the classroom, many teachers work more than 40 hours a week. Part-time schedules are more common among preschool and kindergarten teachers. Although some school districts have gone to all-day kindergartens, most kindergarten teachers still teach two kindergarten classes a day. Most teachers work the traditional 10-month school year with a 2-month vacation during the summer. During the vacation break, those on the 10-month schedule may teach in summer sessions, take other jobs, travel, or pursue personal interests. Many enroll in college courses or workshops to continue their education. Teachers in districts with a year-round schedule typically work 8 weeks, are on vacation for 1 week, and have a 5-week midwinter break. Preschool teachers working in daycare settings often work year round.

Most States have tenure laws that prevent teachers from being fired without just cause and due process. Teachers may obtain tenure after they have satisfactorily completed a probationary period of teaching, normally 3 years. Tenure does not absolutely guarantee a job, but it does provide some security.

Employment

Preschool, kindergarten, elementary school, middle school, and secondary school teachers, except special education, held about 3.8 million jobs in 2002. Of the teachers in those jobs, about 1.5 million were elementary school teachers, 1.1 million were secondary school teachers, 602,000 were middle school teachers, 424,000 were preschool teachers, and 168,000 were kindergarten teachers. The majority of kindergarten, elementary school, middle school, and secondary school teachers, except special education worked in local government educational services. About 10 percent worked for private schools. Preschool teachers, except special education were most often employed in child daycare services (63 percent), religious organizations (9 percent), local government educational services (9 percent), and private educational services (7 percent). Employment of teachers is geographically distributed much the same as the population is.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public school teachers to be licensed. Licensure is not required for teachers in private schools. Usually licensure is granted by the State Board of Education or a licensure advisory committee. Teachers may be licensed to teach the early childhood grades (usually preschool through grade 3); the elementary grades (grades 1 through 6 or 8); the middle grades (grades 5 through 8); a secondary-education subject area (usually grades 7 through 12); or a special subject, such as reading or music (usually grades kindergarten through 12).

Requirements for regular licenses to teach kindergarten through grade 12 vary by State. However, all States require general education teachers to have a bachelor's degree and to have completed an approved teacher training program with a prescribed number of subject and education credits, as well as supervised practice teaching. Some States also require technology training and the attainment of a minimum grade point average. A number of States require that teachers obtain a master's degree in education within a specified period after they begin teaching.

Almost all States require applicants for a teacher's license to be tested for competency in basic skills, such as reading and writing, and in teaching. Almost all also require the teacher to exhibit proficiency in his or her subject. Nowadays, school systems are moving toward implementing performance-based systems for licensure, which usually require the teacher to demonstrate satisfactory teaching performance over an extended period in order to obtain a provisional license, in addition to passing an examination in one's subject. Most States require continuing education for renewal of the teacher's license. Many States have reciprocity agreements that make it easier for teachers licensed in one State to become licensed in another.

Many States offer alternative licensure programs for teachers who have bachelor's degrees in the subject they will teach, but who lack the necessary education courses required for a regular license. Alternative licensure programs originally were designed to ease shortages of teachers of certain subjects, such as mathematics and science. The programs have expanded to attract other people into teaching, including recent college graduates and those changing from another career to teaching. In some programs, individuals begin teaching quickly under provisional licensure. After working under the close supervision of experienced educators for 1 or 2 years while taking education courses outside school hours, they receive regular licensure if they have progressed satisfactorily. In other programs, college graduates who do not meet licensure requirements take only those courses that they lack and then become licensed. This approach may take 1 or 2 semesters of full-time study. States may issue emergency licenses to individuals who do not meet the requirements for a regular license when schools cannot attract enough qualified teachers to fill positions. Teachers who need to be licensed may enter programs that grant a master's degree in education, as well as a license.

In many States, vocational teachers have many of the same requirements for teaching as their academic counterparts. However, because knowledge and experience in a particular field are important criteria for the job, some States will license vocational education teachers without a bachelor's degree, provided they can demonstrate expertise in their field. A minimum number of hours in education courses may also be required.

Licensing requirements for preschool teachers also vary by State. Requirements for public preschool teachers are generally higher than those for private preschool teachers. Some States require a bachelor's degree in early childhood education, others require an associate's degree, and still others require certification by a nationally recognized authority. The Child Development Associate (CDA) credential, the most common type of certification, requires a mix of classroom training and experience working with children, along with an independent assessment of an individual's competence.

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In some cases, teachers of kindergarten through high school may attain professional certification in order to demonstrate competency beyond that required for a license. The National Board for Professional Teaching Standards offers a voluntary national certification. To become nationally accredited, experienced teachers must prove their aptitude by compiling a portfolio showing their work in the classroom and by passing a written assessment and evaluation of their teaching knowledge. Currently, teachers may become certified in a variety of areas, on the basis of the age of the students and, in some cases, the subject taught. For example, teachers may obtain a certificate for teaching English language arts to early adolescents (aged 11 to 15), or they may become certified as early childhood generalists. All States recognize national certification, and many States and school districts provide special benefits to teachers holding such certification. Benefits typically include higher salaries and reimbursement for continuing education and certification fees. In addition, many States allow nationally certified teachers to carry a license from one State to another.

The National Council for Accreditation of Teacher Education currently accredits more than 550 teacher education programs across the United States. Generally, 4-year colleges require students to wait until their sophomore year before applying for admission to teacher education programs. Traditional education programs for kindergarten and elementary school teachers include courses—designed specifically for those preparing to teach—in mathematics, physical science, social science, music, art, and literature, as well as prescribed professional education courses, such as philosophy of education, psychology of learning, and teaching methods. Aspiring secondary school teachers most often major in the subject they plan to teach while also taking a program of study in teacher preparation. Teacher education programs are now required to include classes in the use of computers and other technologies in order to maintain their accreditation. Most programs require students to perform a student-teaching internship.

Many States now offer professional development schools—partnerships between universities and elementary or secondary schools. Students enter these 1-year programs after completion of their bachelor's degree. Professional development schools merge theory with practice and allow the student to experience a year of teaching firsthand, under professional guidance.

In addition to being knowledgeable in their subject, teachers must have the ability to communicate, inspire trust and confidence, and motivate students, as well as understand the students' educational and emotional needs. Teachers must be able to recognize and respond to individual and cultural differences in students and employ different teaching methods that will result in higher student achievement. They should be organized, dependable, patient, and creative. Teachers also must be able to work cooperatively and communicate effectively with other teachers, support staff, parents, and members of the community.

With additional preparation, teachers may move into positions as school librarians, reading specialists, curriculum specialists, or guidance counselors. Teachers may become administrators or supervisors, although the number of these positions is limited and competition can be intense. In some systems, highly qualified, experienced teachers can become senior or mentor teachers, with higher pay and additional responsibilities. They guide and assist less experienced teachers while keeping most of their own teaching responsibilities. Preschool teachers usually work their way up from assistant teacher, to teacher, to lead teacher—who may be responsible for the instruction of several classes—and, finally, to director of the center. Preschool teachers with a bachelor's degree frequently are qualified to teach kindergarten through grade 3 as well. Teaching at these higher grades often results in higher pay.

Job Outlook

Job opportunities for teachers over the next 10 years will vary from good to excellent, depending on the locality, grade level, and subject taught. Most job openings will be attributable to the expected retirement of a large number of teachers. In addition, relatively high rates of turnover, especially among beginning teachers employed in poor, urban schools, also will lead to numerous job openings for teachers. Competition for qualified teachers among some localities will likely continue, with schools luring teachers from other States and districts with bonuses and higher pay.

Through 2012, overall student enrollments, a key factor in the demand for teachers, are expected to rise more slowly than in the past. As the children of the baby-boom generation get older, smaller numbers of young children will enter school behind them, resulting in average employment growth for all teachers, from preschool through secondary grades. Projected enrollments will vary by region. Fast-growing States in the South and West—particularly California, Texas, Georgia, Idaho, Hawaii, Alaska, and New Mexico—will experience the largest enrollment increases. Enrollments in the Northeast and Midwest are expected to hold relatively steady or decline. The job market for teachers also continues to vary by school location and by subject taught. Many inner cities—often characterized by overcrowded, ill-equipped schools and higher-than-average poverty rates—and rural areas—characterized by their remote location and relatively low salaries—have difficulty attracting and retaining enough teachers, so job prospects should be better in these areas than in suburban districts. Currently, many school districts have difficulty hiring qualified teachers in some subject areas—mathematics, science (especially chemistry and physics), bilingual education, and foreign languages. Qualified vocational teachers, at both the middle school and secondary school levels, also are currently in demand in a variety of fields. Specialties that have an adequate number of qualified teachers include general elementary education, physical education, and social studies. Teachers who are geographically mobile and who obtain licensure in more than one subject should have a distinct advantage in finding a job. Increasing enrollments of minorities, coupled with a shortage of minority teachers, should cause efforts to recruit minority teachers to intensify. Also, the number of non-English-speaking students has grown dramatically, creating demand for bilingual teachers and for those who teach English as a second language. The number of teachers employed is dependent as well on State and local expenditures for education and on the enactment of legislation to increase the quality of education. A number of initiatives, such as reduced class size (primarily in the early elementary grades), mandatory preschool for 4-year-olds, and all-day kindergarten, have been implemented in a few States, but not nationwide. Additional teachers—particularly preschool and early elementary school teachers—will be needed if States or localities implement any of these measures. At the Federal level, legislation that is likely to affect teachers recently was put into place with the enactment of the No Child Left Behind Act. Although the full impact of this act is not yet known, its emphasis on ensuring that all schools hire and retain only qualified teachers, may lead

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to an increase in funding for schools that currently lack such teachers.

The supply of teachers is expected to increase in response to reports of improved job prospects, better pay, more teacher involvement in school policy, and greater public interest in education. In recent years, the total number of bachelor's and master's degrees granted in education has increased steadily. Because of a shortage of teachers in certain locations, and in anticipation of the loss of a number of teachers to retirement, many States have implemented policies that will encourage more students to become teachers. In addition, more teachers may be drawn from a reserve pool of career changers, substitute teachers, and teachers completing alternative certification programs.

Earnings

Median annual earnings of kindergarten, elementary, middle, and secondary school teachers ranged from $39,810 to $44,340 in 2002; the lowest 10 percent earned $24,960 to $29,850; the top 10 percent earned $62,890 to $68,530. Median earnings for preschool teachers were $19,270.

According to the American Federation of Teachers, beginning teachers with a bachelor's degree earned an average of $30,719 in the 2001-02 school year. The estimated average salary of all public elementary and secondary school teachers in the 2001-02 school year was $44,367. Private school teachers generally earn less than public school teachers.

In 2002, more than half of all elementary, middle, and secondary school teachers belonged to unions—mainly the American Federation of Teachers and the National Education Association—that bargain with school systems over wages, hours, and other terms and conditions of employment. Fewer preschool and kindergarten teachers were union members—about 15 percent in 2002.

Teachers can boost their salary in a number of ways. In some schools, teachers receive extra pay for coaching sports and working with students in extracurricular activities. Getting a master's degree or national certification often results in a raise in pay, as does acting as a mentor. Some teachers earn extra income during the summer by teaching summer school or performing other jobs in the school system.

Related Occupations

Preschool, kindergarten, elementary school, middle school, and secondary school teaching requires a variety of skills and aptitudes, including a talent for working with children; organizational, administrative, and recordkeeping abilities; research and communication skills; the power to influence, motivate, and train others; patience; and creativity. Workers in other occupations requiring some of these aptitudes include teachers—postsecondary; counselors; teacher assistants; education administrators; librarians; child care workers; public relations specialists; social workers; and athletes, coaches, umpires, and related workers.

Sources of Additional Information

Information on licensure or certification requirements and approved teacher training institutions is available from local school systems and State departments of education.

Information on the teaching profession and on how to become a teacher can be obtained from

➤ Recruiting New Teachers, Inc., 385 Concord Ave., Suite 103, Belmont, MA 02478. Internet: **http://www.rnt.org**

This organization also sponsors another Internet site that provides helpful information on becoming a teacher: Internet: **http://www.recruitingteachers.org**

Information on teachers' unions and education-related issues may be obtained from any of the following sources:

➤ American Federation of Teachers, 555 New Jersey Ave. NW., Washington, DC 20001.

➤ National Education Association, 1201 16th St. NW., Washington, DC 20036.

A list of institutions with accredited teacher education programs can be obtained from:

➤ National Council for Accreditation of Teacher Education, 2010 Massachusetts Ave. NW., Suite 500, Washington, DC 20036-1023. Internet: **http://www.ncate.org**

For information on vocational education and vocational education teachers, contact

➤ Association for Career and Technical Education, 1410 King St., Alexandria, VA 22314. Internet: **http://www.acteonline.org**

For information on careers in educating children and issues affecting preschool teachers, contact either of the following organizations:

➤ National Association for the Education of Young Children, 1509 16th St. NW., Washington, DC 20036. Internet: **http://www.naeyc.org**

➤ Council for Professional Recognition, 2460 16th St. NW., Washington, DC 20009-3575. Internet: **http://www.cdacouncil.org**

For information on teachers and the No Child Left Behind Act, contact

➤ U.S. Department of Education, 400 Maryland Avenue, SW., Washington, DC, 20202. Internet: **http://www.ed.gov**

Teachers—Special Education

(0*NET 25-2041.00, 25-2042.00, 25-2043.00)

Significant Points

- Excellent job prospects are expected due to rising enrollments of special education students and reported shortages of qualified teachers.
- A bachelor's degree, completion of an approved teacher preparation program, and a license are required to qualify; many States require a master's degree.
- Many States offer alternative licensure programs to attract people into these jobs.

Nature of the Work

Special education teachers work with children and youths who have a variety of disabilities. A small number of special education teachers work with students with mental retardation or autism, primarily teaching them life skills and basic literacy. However, the majority of special education teachers work with children with mild to moderate disabilities, using the general education curriculum, or modifying it, to meet the child's individual needs. Most special education teachers instruct students at the elementary, middle, and secondary school level, although some teachers work with infants and toddlers.

The various types of disabilities that qualify individuals for special education programs include specific learning disabilities, speech or language impairments, mental retardation, emotional disturbance, multiple disabilities, hearing impairments, orthopedic impairments, visual impairments, autism, combined deafness and blindness, traumatic brain injury, and other health impairments. Students are classified under one of the categories,

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and special education teachers are prepared to work with specific groups. Early identification of a child with special needs is an important part of a special education teacher's job. Early intervention is essential in educating children with disabilities.

Special education teachers use various techniques to promote learning. Depending on the disability, teaching methods can include individualized instruction, problem-solving assignments, and small-group work. When students need special accommodations in order to take a test, special education teachers see that appropriate ones are provided, such as having the questions read orally or lengthening the time allowed to take the test.

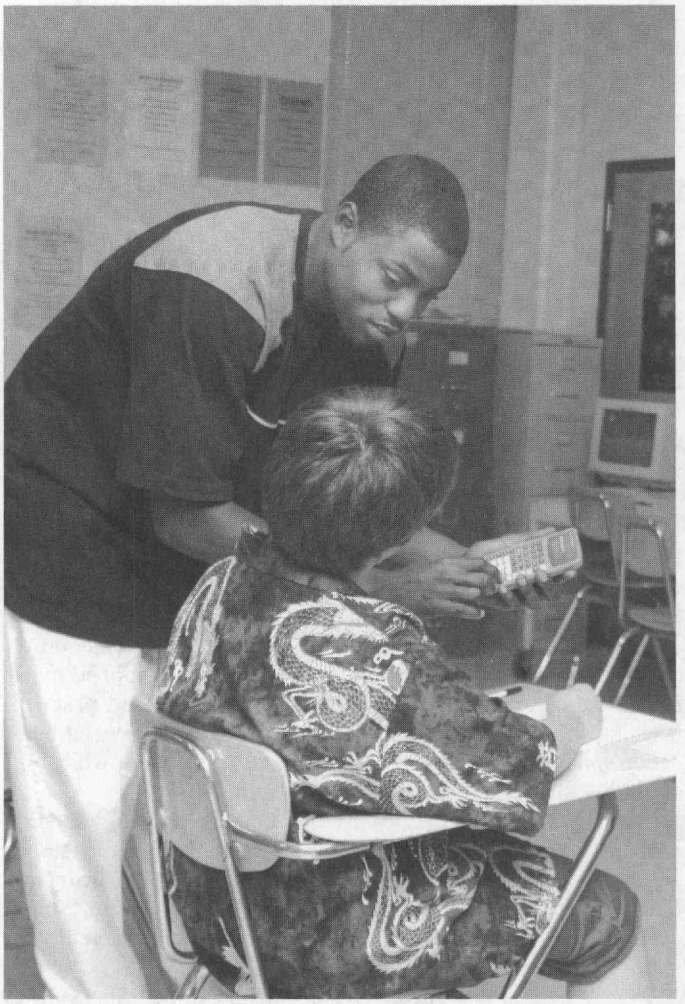
Special education teachers help to develop an Individualized Education Program (IEP) for each special education student. The IEP sets personalized goals for each student and is tailored to the student's individual learning style and ability. The program includes a transition plan outlining specific steps to prepare special education students for middle school or high school or, in the case of older students, a job or postsecondary study. Teachers review the IEP with the student's parents, school administrators, and, often, the student's general education teacher. Teachers work closely with parents to inform them of their child's progress and suggest techniques to promote learning at home.

Special education teachers design and teach appropriate curricula, assign work geared toward each student's ability, and grade papers and homework assignments. They are involved in the students' behavioral and academic development, helping the students develop emotionally, feel comfortable in social situations, and be aware of socially acceptable behavior. Preparing special education students for daily life after graduation also is an important aspect of the job. Teachers provide students with career counseling or help them learn routine skills, such as balancing a checkbook.

As schools become more inclusive, special education teachers and general education teachers are increasingly working together in general education classrooms. Special education teachers help general educators adapt curriculum materials and teaching techniques to meet the needs of students with disabilities. They coordinate the work of teachers, teacher assistants, and related personnel, such as therapists and social workers, to meet the requirements of inclusive special education programs. A large part of a special education teacher's job involves interacting with others. Special education teachers communicate frequently with parents, social workers, school psychologists, occupational and physical therapists, school administrators, and other teachers.

Special education teachers work in a variety of settings. Some have their own classrooms and teach only special education students; others work as special education resource teachers and offer individualized help to students in general education classrooms; still others teach together with general education teachers in classes composed of both general and special education students. Some teachers work with special education students for several hours a day in a resource room, separate from their general education classroom. Considerably fewer special education teachers work in residential facilities or tutor students in homebound or hospital environments.

Special education teachers who work with infants usually travel to the child's home to work with the child and his or her parents. Many of these infants have medical problems that slow or preclude normal development. Special education teachers show parents techniques and activities designed to stimulate the infant and encourage the growth of the child's skills. Toddlers usually receive their services at a preschool where special education teachers help them develop social, self-help, motor, language, and cognitive skills, often through the use of play.



Special education teachers usually modify the general education curriculum to meet an individual student's needs.

Technology is playing an increasingly important role in special education. Teachers use specialized equipment such as computers with synthesized speech, interactive educational software programs, and audiotapes to assist children.

Working Conditions

Special education teachers enjoy the challenge of working with students with disabilities and the opportunity to establish meaningful relationships with them. Although helping these students can be highly rewarding, the work also can be emotionally and physically draining. Many special education teachers are under considerable stress due to heavy workloads and administrative tasks. They must produce a substantial amount of paperwork documenting each student's progress, and they work under the threat of litigation by students' parents if correct procedures are not followed or if the parents feel that their child is not receiving an adequate education. The physical and emotional demands of the job cause some special education teachers to leave the occupation.

Some schools offer year-round education for special education students, but most special education teachers work only the traditional 10-month school year.

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Employment

Special education teachers held a total of about 433,000 jobs in 2002. A great majority, almost 90 percent, work in public schools. Another 7 percent work at private schools. About half work in elementary schools. A few worked for individual and social assistance agencies or residential facilities, or in homebound or hospital environments.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require special education teachers to be licensed. The State board of education or a licensure advisory committee usually grants licenses, and licensure varies by State. In many States, special education teachers receive a general education credential to teach kindergarten through grade 12. These teachers then train in a specialty, such as learning disabilities or behavioral disorders. Some States offer general special education licenses, while others license several different specialties within special education, and still others require teachers to obtain a general education license first and an additional license in special education afterwards.

All States require a bachelor's degree and the completion of an approved teacher preparation program with a prescribed number of subject and education credits and supervised practice teaching. Many States require a master's degree in special education, involving at least 1 year of additional course work, including a specialization, beyond the bachelor's degree.

Some States have reciprocity agreements allowing special education teachers to transfer their licenses from one State to another, but many still require that the teacher pass licensing requirements for the State in which they work. In the future, employers may recognize certification or standards offered by a national organization.

Many colleges and universities across the United States offer programs in special education, at the undergraduate, master's, and doctoral degree levels. Special education teachers usually undergo longer periods of training than do general education teachers. Most bachelor's degree programs are 4-year programs that include general and specialized courses in special education. However, an increasing number of institutions are requiring a 5th year or other postbaccalaureate preparation. Among the courses offered are educational psychology, legal issues of special education, and child growth and development; courses imparting knowledge and skills needed for teaching students with disabilities also are given. Some programs require specialization, while others offer generalized special education degrees or a course of study in several specialized areas. The last year of the program usually is spent student teaching in a classroom supervised by a certified teacher.

Alternative and emergency licenses are available in many States, due to the need to fill special education teaching positions. Alternative licenses are designed to bring college graduates and those changing careers into teaching more quickly. Requirements for an alternative license may be less stringent than for a regular license. Requirements vary by State. In some programs, individuals begin teaching quickly under a provisional license and can obtain a regular license by teaching under the supervision of licensed teachers for a period of 1 to 2 years while taking education courses. Emergency licenses are granted when States have difficulty finding licensed special education teachers to fill positions.

Special education teachers must be patient, able to motivate students, understanding of their students' special needs, and accepting of differences in others. Teachers must be creative and apply different types of teaching methods to reach students who are having difficulty learning. Communication and cooperation are essential traits, because special education teachers spend a great deal of time interacting with others, including students, parents, and school faculty and administrators.

Special education teachers can advance to become supervisors or administrators. They may also earn advanced degrees and become instructors in colleges that prepare others to teach special education. In some school systems, highly experienced teachers can become mentors to less experienced ones, providing guidance to those teachers while maintaining a light teaching load.

Job Outlook

Employment of special education teachers is expected to increase faster than the average for all occupations through 2012. Although slowdowns in student enrollments may constrain employment growth somewhat, additional positions for these workers will be created by continued increases in the number of special education students needing services, by legislation emphasizing training and employment for individuals with disabilities, and by educational reforms requiring higher standards for graduation. The need to replace special education teachers who switch to general education, change careers altogether, or retire will lead to additional job openings. At the same time, many school districts report shortages of qualified teachers. As a result, special education teachers should have excellent job prospects.

The job outlook varies by geographic area and specialty. Although many areas of the country report difficulty finding qualified applicants, positions in inner cities and rural areas usually are more plentiful than job openings in suburban or wealthy urban areas. Student populations, in general, also are expected to increase significantly in several States in the West and South, resulting in increased demand for special education teachers in those regions. In addition, job opportunities may be better in certain specialties—such as speech or language impairments and learning disabilities—because of large increases in the enrollment of special education students classified under those categories. Legislation encouraging early intervention and special education for infants, toddlers, and preschoolers has created a need for early childhood special education teachers. Bilingual special education teachers and those with multicultural experience also are needed to work with an increasingly diverse student population.

The number of students requiring special education services has grown steadily in recent years, a trend that is expected to continue. Learning disabilities will continue to be identified and diagnosed at earlier ages. In addition, medical advances have resulted in more children surviving serious accidents or illnesses, but with impairments that require special accommodations. The percentage of foreign-born special education students also is expected to grow, as teachers begin to recognize learning disabilities in that population. Finally, more parents are expected to seek special services for those of their children who have difficulty meeting the new, higher standards required of students.

Earnings

Median annual earnings in 2002 of special education teachers who worked primarily in preschools, kindergartens, and elementary schools were $42,690. The middle 50 percent earned

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between $34,160 and $54,340. The lowest 10 percent earned less than $28,680, and the highest 10 percent earned more than $67,810.

Median annual earnings in 2002 of middle school special education teachers were $41,350. The middle 50 percent earned between $33,460 and $52,370. The lowest 10 percent earned less than $28,560, and the highest 10 percent earned more than $65,070.

Median annual earnings in 2002 of special education teachers who worked primarily in secondary schools were $44,130. The middle 50 percent earned between $35,320 and $56,850. The lowest 10 percent earned less than $29,630, and the highest 10 percent earned more than $71,020.

In 2002, about 62 percent of special education teachers belonged to unions—mainly the American Federation of Teachers and the National Education Association—that bargain with school systems over wages, hours, and the terms and conditions of employment.

In most schools, teachers receive extra pay for coaching sports and working with students in extracurricular activities. Some teachers earn extra income during the summer, working in the school system or in other jobs.

Related Occupations

Special education teachers work with students who have disabilities and special needs. Other occupations involved with the identification, evaluation, and development of students with disabilities include psychologists, social workers, speech-language pathologists and audiologists, counselors, teacher assistants, occupational therapists, recreational therapists, and teachers—preschool, kindergarten, elementary, middle, and secondary.

Sources of Additional Information

For information on professions related to early intervention and education for children with disabilities, a list of accredited schools, information on teacher certification and financial aid, and general information on related personnel issues—including recruitment, retention, and the supply of, and demand for, special education professionals—contact

➤ National Clearinghouse for Professions in Special Education, Council for Exceptional Children, 1110 N. Glebe Rd., Suite 300, Arlington, VA 22201. Internet: **http://www.special-ed-careers.org**

To learn more about the special education teacher certification and licensing requirements in your State, contact your State's department of education.

Art and Design Occupations

Artists and Related Workers

(0*NET 27-1011.00, 27-1013.01, 27-1013.02, 27-1013.03, 27-1013.04, 27-1014.00)

Significant Points

- More than half of all artists and related workers were self-employed—almost eight times the proportion for all professional and related occupations.
- Artists usually develop their skills through a bachelor's degree program or other postsecondary training in art or design.
- Keen competition is expected for both salaried jobs and freelance work, because many talented people are attracted to the visual arts.

Nature of the Work

Artists create art to communicate ideas, thoughts, or feelings. They use a variety of methods—painting, sculpting, or illustration—and an assortment of materials, including oils, watercolors, acrylics, pastels, pencils, pen and ink, plaster, clay, and computers. Artists' works may be realistic, stylized, or abstract and may depict objects, people, nature, or events.

Artists generally fall into one of three categories. *Art directors* formulate design concepts and presentation approaches for visual communications media. *Fine artists, including painters, sculptors, and illustrators* create original artwork, using a variety of media and techniques. *Multi-media artists and animators* create special effects, animation, or other visual images on film, on video, or with computers or other electronic media. (Designers, including graphic designers, are discussed elsewhere in the *Handbook*.)

Art directors develop design concepts and review material that is to appear in periodicals, newspapers, and other printed or digital media. They decide how best to present the information visually, so that it is eye catching, appealing, and organized. Art directors decide which photographs or artwork to use and oversee the layout design and production of the printed material. They may direct workers engaged in artwork, layout design, and copywriting.

Fine artists typically display their work in museums, commercial art galleries, corporate collections, and private homes. Some of their artwork may be commissioned (done on request from clients), but most is sold by the artist or through private art galleries or dealers. The gallery and the artist predetermine how much each will earn from the sale. Only the most successful fine artists are able to support themselves solely through the sale of their works. Most fine artists must work in an unrelated field to support their art careers. Some work in museums or art galleries as fine-arts directors or as curators, planning and setting up art exhibits. Others work as art critics for newspapers or magazines or as consultants to foundations or institutional collectors.

Usually, fine artists specialize in one or two art forms, such as painting, illustrating, sketching, sculpting, printmaking, and restoring. *Painters, illustrators, cartoonists, and sketch artists* work with two-dimensional art forms, using shading, perspective, and color to produce realistic scenes or abstractions.

Illustrators typically create pictures for books, magazines, and other publications, and for commercial products such as textiles, wrapping paper, stationery, greeting cards, and calendars. Increasingly, illustrators work in digital format, preparing work directly on a computer.

Medical and *scientific illustrators* combine drawing skills with knowledge of biology or other sciences. Medical illustrators draw illustrations of human anatomy and surgical procedures. Scientific illustrators draw illustrations of animal and

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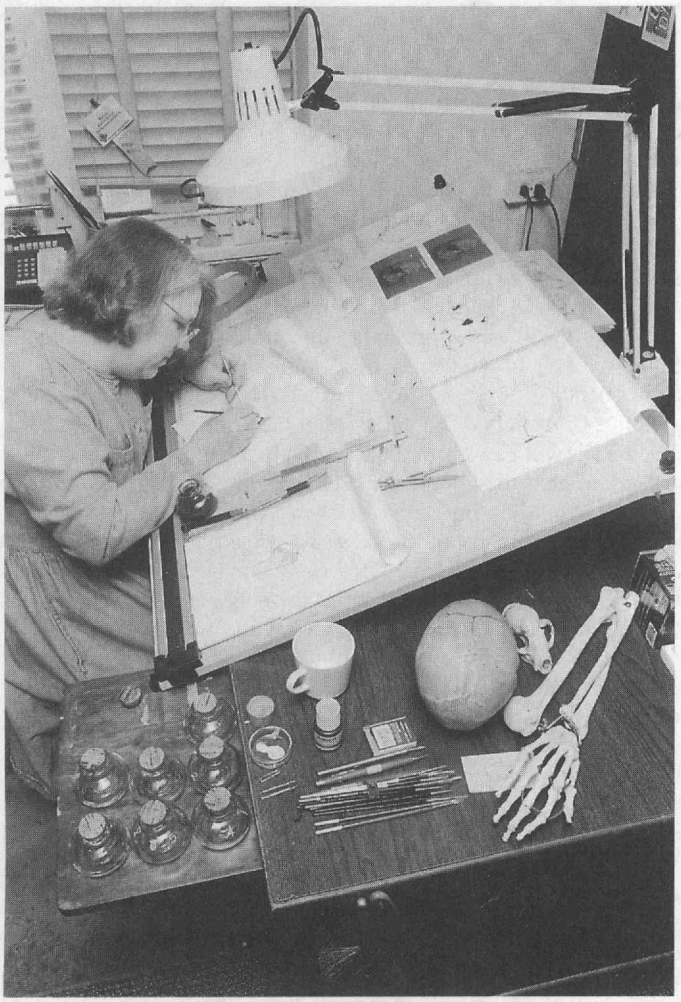
plant life, atomic and molecular structures, and geologic and planetary formations. The illustrations are used in medical and scientific publications and in audiovisual presentations for teaching purposes. Medical illustrators also work for lawyers, producing exhibits for court cases.

Cartoonists draw political, advertising, social, and sports cartoons. Some cartoonists work with others who create the idea or story and write the captions. Most cartoonists have comic, critical, or dramatic talents in addition to drawing skills.

Sketch artists create likenesses of subjects using pencil, charcoal, or pastels. Sketches are used by law enforcement agencies to assist in identifying suspects, by the news media to depict courtroom scenes, and by individual patrons for their own enjoyment.

Sculptors design three-dimensional artworks, either by molding and joining materials such as clay, glass, wire, plastic, fabric, or metal or by cutting and carving forms from a block of plaster, wood, or stone. Some sculptors combine various materials to create mixed-media installations. Some incorporate light, sound, and motion into their works.

Printmakers create printed images from designs cut or etched into wood, stone, or metal. After creating the design, the artist inks the surface of the woodblock, stone, or plate and uses a printing press to roll the image onto paper or fabric. Some make prints by pressing the inked surface onto paper by hand or by graphically encoding and processing data, using a computer.



Medical illustrators combine drawing skills with knowledge of the biological sciences.

The digitized images are then printed on paper with the use of a computer printer.

Painting restorers preserve and restore damaged and faded paintings. They apply solvents and cleaning agents to clean the surfaces of the paintings, they reconstruct or retouch damaged areas, and they apply preservatives to protect the paintings. All this is highly detailed work and usually is reserved for experts in the field.

Multi-media artists and animators work primarily in motion picture and video industries, advertising, and computer systems design services. They draw by hand and use computers to create the large series of pictures that form the animated images or special effects seen in movies, television programs, and computer games. Some draw storyboards for television commercials, movies, and animated features. Storyboards present television commercials in a series of scenes similar to a comic strip and allow an advertising agency to evaluate proposed commercials with the company doing the advertising. Storyboards also serve as guides to placing actors and cameras on the television or motion picture set and to other details that need to be taken care of during the production of commercials.

Working Conditions

Many artists work in fine- or commercial-art studios located in office buildings, warehouses, or lofts. Others work in private studios in their homes. Some fine artists share studio space, where they also may exhibit their work. Studio surroundings usually are well lighted and ventilated; however, fine artists may be exposed to fumes from glue, paint, ink, and other materials and to dust or other residue from filings, splattered paint, or spilled fluids. Artists who sit at drafting tables or who use computers for extended periods may experience back pain, eyestrain, or fatigue.

Artists employed by publishing companies, advertising agencies, and design firms generally work a standard workweek. During busy periods, they may work overtime to meet deadlines. Self-employed artists can set their own hours, but may spend much time and effort selling their artwork to potential customers or clients and building a reputation.

Employment

Artists held about 149,000 jobs in 2002. More than half were self-employed. Of the artists who were not self-employed, many worked in advertising and related services; newspaper, periodical, book, and software publishers; motion picture and video industries; specialized design services; and computer systems design and related services. Some self-employed artists offered their services to advertising agencies, design firms, publishing houses, and other businesses on a contract or freelance basis.

Training, Other Qualifications, and Advancement

Training requirements for artists vary by specialty. Although formal training is not strictly necessary for fine artists, it is very difficult to become skilled enough to make a living without some training. Many colleges and universities offer programs leading to the Bachelor in Fine Arts (BFA) and Master in Fine Arts (MFA) degrees. Course work usually includes core subjects, such as English, social science, and natural science, in addition to art history and studio art.

Independent schools of art and design also offer postsecondary studio training in the fine arts leading to an Associate in Art or Bachelor in Fine Arts degree. Typically, these programs focus more intensively on studio work than do the academic programs

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in a university setting. The National Association of Schools of Art and Design accredits more than 200 postsecondary institutions with programs in art and design; most award a degree in art.

Formal educational programs in art also provide training in computer techniques. Computers are used widely in the visual arts, and knowledge and training in computer graphics and other visual display software are critical elements of many jobs in these fields.

Those who want to teach fine arts at public elementary or secondary schools must have a teaching certificate in addition to a bachelor's degree. An advanced degree in fine arts or arts administration is necessary for management or administrative positions in government or in foundations or for teaching in colleges and universities. (See the statements for teachers-postsecondary; and teachers-preschool, kindergarten, elementary, middle, and secondary school teachers elsewhere in the *Handbook*.)

Illustrators learn drawing and sketching skills through training in art programs and through extensive practice. Most employers prefer candidates with a bachelor's degree; however, some illustrators are contracted on the basis of portfolios of their past work.

Medical illustrators must have both a demonstrated artistic ability and a detailed knowledge of living organisms, surgical and medical procedures, and human and animal anatomy. A 4-year bachelor's degree combining art and premedical courses usually is preferred; a master's degree in medical illustration is recommended. This degree is offered in only five accredited schools in the United States.

Evidence of appropriate talent and skill, displayed in an artist's portfolio, is an important factor used by art directors, clients, and others in deciding whether to hire an individual or to contract out work. The portfolio is a collection of handmade, computer-generated, photographic, or printed samples of the artist's best work. Assembling a successful portfolio requires skills usually developed in a bachelor's degree program or through other postsecondary training in art or visual communications. Internships also provide excellent opportunities for artists to develop and enhance their portfolios.

Artists hired by advertising agencies often start with relatively routine work. While doing this work, however, they may observe and practice their skills on the side. Many artists freelance on a part-time basis while continuing to hold a full-time job until they are established. Others freelance part time while still in school, to develop experience and to build a portfolio of published work.

Freelance artists try to develop a set of clients who regularly contract for work. Some freelance artists are widely recognized for their skill in specialties such as magazine or children's book illustration. These artists may earn high incomes and can choose the type of work they do.

Fine artists advance professionally as their work circulates and as they establish a reputation for a particular style. Many of the most successful artists continually develop new ideas, and their work often evolves over time.

Job Outlook

Employment of artists and related workers is expected to grow about as fast as the average through the year 2012. Because the arts attract many talented people with creative ability, the number of aspiring artists continues to grow. Consequently, competition for both salaried jobs and freelance work in some areas is expected to be keen.

Art directors work in a variety of industries, such as advertising, public relations, publishing, and design firms. Despite an expanding number of opportunities, they should experience keen competition for the available openings.

Fine artists mostly work on a freelance, or commission, basis and may find it difficult to earn a living solely by selling their artwork. Only the most successful fine artists receive major commissions for their work. Competition among artists for the privilege of being shown in galleries is expected to remain acute, and grants from sponsors such as private foundations, State and local arts councils, and the National Endowment for the Arts should remain competitive. Nonetheless, studios, galleries, and individual clients are always on the lookout for artists who display outstanding talent, creativity, and style. Talented fine artists who have developed a mastery of artistic techniques and skills, including computer skills, will have the best job prospects.

The need for artists to illustrate and animate materials for magazines, journals, and other printed or electronic media will spur demand for illustrators and animators of all types. Growth in motion picture and video industries will provide new job opportunities for illustrators, cartoonists, and animators. Competition for most jobs, however, will be strong, because job opportunities are relatively few and the number of people interested in these positions usually exceeds the number of available openings. Employers should be able to choose from among the most qualified candidates.

Earnings

Median annual earnings of salaried art directors were $61,850 in 2002. The middle 50 percent earned between $44,740 and $85,010. The lowest 10 percent earned less than $32,410, and the highest 10 percent earned more than $115,570. Median annual earnings were $67,340 in advertising and related services.

Median annual earnings of salaried fine artists, including painters, sculptors, and illustrators, were $35,260 in 2002. The middle 50 percent earned between $23,970 and $48,040. The lowest 10 percent earned less than $16,900, and the highest 10 percent earned more than $73,560.

Median annual earnings of salaried multi-media artists and animators were $43,980 in 2002. The middle 50 percent earned between $33,970 and $61,120. The lowest 10 percent earned less than $25,830, and the highest 10 percent earned more than $85,160. Median annual earnings were $58,840 in motion picture and video industries.

Earnings for self-employed artists vary widely. Some charge only a nominal fee while they gain experience and build a reputation for their work. Others, such as well-established freelance fine artists and illustrators, can earn more than salaried artists. Many, however, find it difficult to rely solely on income earned from selling paintings or other works of art. Like other self-employed workers, freelance artists must provide their own benefits.

Related Occupations

Other workers who apply art skills include architects, except landscape and naval; archivists, curators, and museum technicians; designers; landscape architects; and photographers. Some computer-related occupations, including computer software engineers and desktop publishers, may require art skills.

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Sources of Additional Information

For general information about art and design and a list of accredited college-level programs, contact:

➤ National Association of Schools of Art and Design, 11250 Roger Bacon Dr., Suite 21, Reston, VA 20190. Internet: **http://nasad.arts-accredit.org**

For information on careers in medical illustration, contact:

➤ Association of Medical Illustrators, 5475 Mark Dabling Blvd., Suite 108, Colorado Springs, CO 80918. Internet: **http://www.ami.org**

Designers

(0*NET 27-1021.00, 27-1022.00, 27-1023.00, 27-1024.00, 27-1025.00, 27-1026.00, 27-1027.01, 27-1027.02)

Significant Points

- Nearly one-third of designers were self-employed—almost five times the proportion for all professional and related occupations.
- Creativity is crucial in all design occupations; most designers need a bachelor's degree, and candidates with a master's degree hold an advantage.
- Keen competition is expected for most jobs, despite average projected employment growth, because many talented individuals are attracted to careers as designers.

Nature of the Work

Designers are people with a desire to create. They combine practical knowledge with artistic ability to turn abstract ideas into formal designs for the merchandise we buy, the clothes we wear, the Web sites we use, the publications we read, and the living and office space we inhabit. Designers usually specialize in a particular area of design, such as automobiles, industrial or medical equipment, home appliances, clothing and textiles, floral arrangements, publications, Web sites, logos, signage, movie or TV credits, interiors of homes or office buildings, merchandise displays, or movie, television, and theater sets.

The first step in developing a new design or altering an existing one is to determine the needs of the client, the ultimate function for which the design is intended, and its appeal to customers or users. When creating a design, designers often begin by researching the desired design characteristics, such as size, shape, weight, color, materials used, cost, ease of use, fit, and safety.

Designers then prepare sketches or diagrams—by hand or with the aid of a computer—to illustrate the vision for the design. After consulting with the client, a creative director, or a product development team, designers create detailed designs, using drawings, a structural model, computer simulations, or a full-scale prototype. Many designers use computer-aided design (CAD) tools to create and better visualize the final product. Computer models allow ease and flexibility in exploring a greater number of design alternatives, thus reducing design costs and cutting the time it takes to deliver a product to market. Industrial designers use computer-aided industrial design (CAID) tools to create designs and machine-readable instructions that communicate with automated production tools.

Designers sometimes supervise assistants who carry out their creations. Designers who run their own businesses also may devote a considerable amount of time to developing new business contacts, examining equipment and space needs, and performing administrative tasks, such as reviewing catalogues and ordering samples. The need for up-to-date computer and communications equipment is an ongoing consideration for many designers, especially those in industrial and graphic design.

Design encompasses a number of different fields. Many designers specialize in a particular area of design, whereas others work in more than one area.

Commercial and industrial designers develop countless manufactured products, including airplanes; cars; children's toys; computer equipment; furniture; home appliances; and medical, office, and recreational equipment. They combine artistic talent with research on the use of a product, on customer needs, and on marketing, materials, and production methods to create the most functional and appealing design that will be competitive with others in the marketplace. Industrial designers typically concentrate in a subspecialty such as kitchen appliances, auto interiors, or plastic-molding machinery.

Fashion designers design clothing and accessories. Some high-fashion designers are self-employed and design for individual clients. Other high-fashion designers cater to specialty stores or high-fashion department stores. These designers create original garments, as well as clothing that follows established fashion trends. Most fashion designers, however, work for apparel manufacturers, creating designs of men's, women's, and children's fashions for the mass market.

Floral designers cut and arrange live, dried, or artificial flowers and foliage into designs, according to the customer's order. They design arrangements by trimming flowers and arranging bouquets, sprays, wreaths, dish gardens, and terrariums. They may either meet with customers to discuss the arrangement or work from a written order. Floral designers make note of the occasion, the customer's preference with regard to the color and type of flower involved, the price of the completed order, the time at which the floral arrangement or plant is to be ready, and the place to which it is to be delivered. The variety of duties performed by floral designers depends on the size of the shop and the number of designers employed. In a small operation, floral designers may own their shops and do almost everything, from growing and purchasing flowers to keeping financial records.

Graphic designers plan, analyze, and create visual solutions to communications problems. They use a variety of print, electronic, and film media and technologies to execute a design that meet clients' communication needs. They consider cognitive, cultural, physical, and social factors in planning and executing designs appropriate for a given context. Graphic designers use computer software to develop the overall layout and production design of magazines, newspapers, journals, corporate reports, and other publications. They also produce promotional displays and marketing brochures for products and services, design distinctive logos for products and businesses, and develop signs and signage systems—called environmental graphics—for business and government. An increasing number of graphic designers are developing material for Internet Web pages, computer interfaces, and multimedia projects. Graphic designers also produce the credits that appear before and after television programs and movies.

Interior designers enhance the function, safety, and quality of interior spaces of private homes, public buildings, and business or institutional facilities, such as offices, restaurants, retail establishments, hospitals, hotels, and theaters. They also plan the interiors of existing structures that are undergoing

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renovation or expansion. Most interior designers specialize. For example, some may concentrate on residential design, while others focus on business design. Still others may specialize further by focusing on particular rooms, such as kitchens or baths. With a client's tastes, needs, and budget in mind, interior designers prepare drawings and specifications for non-load-bearing interior construction, furnishings, lighting, and finishes. Increasingly, designers are using computers to plan layouts, because computers make it easy to change plans to include ideas received from the client. Interior designers also design lighting and architectural details—such as crown molding, built-in bookshelves, or cabinets—coordinate colors, and select furniture, floor coverings, and window treatments. Interior designers must design space to conform to Federal, State, and local laws, including building codes. Designs for public areas also must meet accessibility standards for the disabled and the elderly.

Merchandise displayers and window dressers, or *visual merchandisers*, plan and erect commercial displays, such as those in windows and interiors of retail stores or at trade exhibitions. Those who work on building exteriors erect major store decorations, including building and window displays and lights. Those who design store interiors outfit store departments, arrange table displays, and dress mannequins. In large retail chains, store layouts typically are designed corporately, through a central design department. To retain the chain's visual identity and ensure that a particular image or theme is promoted in each store, designs are distributed to individual stores by e-mail, downloaded to computers equipped with the appropriate design software, and adapted to meet the size and dimension requirements of each individual store.

Set and exhibit designers create sets for movie, television, and theater productions and design special exhibition displays. Set designers study scripts, confer with directors and other designers, and conduct research to determine the historical period, fashion, and architectural styles appropriate for the production on which they work. They then produce sketches or scale models to guide in the construction of the actual sets or exhibit spaces. Exhibit designers work with curators, art and museum directors, and trade-show sponsors to determine the most effective use of available space.



Interior designers refer to swatches from sample books to plan the space and furnish the interiors of buildings.

Working Conditions

Working conditions and places of employment vary. Designers employed by manufacturing establishments, large corporations, or design firms generally work regular hours in well-lighted and comfortable settings. Designers in smaller design consulting firms, or those who freelance, generally work on a contract, or job, basis. They frequently adjust their workday to suit their clients' schedules and deadlines, meeting with the clients during evening or weekend hours when necessary. Consultants and self-employed designers tend to work longer hours and in smaller, more congested, environments.

Designers may transact business in their own offices or studios or in clients' homes or offices. They also may travel to other locations, such as showrooms, design centers, clients' exhibit sites, and manufacturing facilities. Designers who are paid by the assignment are under pressure to please clients and to find new ones in order to maintain a steady income. All designers sometimes face frustration when their designs are rejected or when their work is not as creative as they wish. With the increased speed and sophistication of computers and advanced communications networks, designers may form international design teams, serve a geographically more dispersed clientele, research design alternatives by using information on the Internet, and purchase supplies electronically, all with the aid of a computer in their workplace or studio.

Occasionally, industrial designers may work additional hours to meet deadlines. Similarly, graphic designers usually work regular hours, but may work evenings or weekends to meet production schedules. In contrast, set and exhibit designers work long and irregular hours; often, they are under pressure to make rapid changes. Merchandise displayers and window trimmers may spend much of their time designing displays in their office or studio, but those who also construct and install the displays may have to move lumber and heavy materials and perform some carpentry and painting. Fashion designers may work long hours to meet production deadlines or prepare for fashion shows. In addition, fashion designers may be required to travel to production sites across the United States and overseas. Interior designers generally work under deadlines and may put in extra hours to finish a job. Also, they typically carry heavy, bulky sample books to meetings with clients. Floral designers generally work regular hours in a pleasant work environment, but holiday, wedding, and funeral orders often require overtime.

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Employment

Designers held about 532,000 jobs in 2002. Approximately one-third were self-employed. Employment was distributed as follows:

Graphic designers	212,000
Floral designers	104,000
Merchandise displayers and window trimmers	77,000
Interior designers	60,000
Commercial and industrial designers	52,000
Fashion designers	15,000
Set and exhibit designers	12,000

Salaried designers worked in a number of different industries, depending on their design specialty. Graphic designers, for example, worked primarily in specialized design services; newspaper, periodical, book, and directory publishers; and advertising and related services. Floral designers were concentrated in retail florists or floral departments of grocery stores. Merchandise displayers and window trimmers were dispersed across a variety of retailers and wholesalers. Interior designers generally worked in specialized design services or in retail furniture stores. Most commercial and industrial designers were employed in manufacturing or architectural, engineering, and related services. Fashion designers generally worked in apparel manufacturing or wholesale distribution of apparel, piece goods, and notions. Set and exhibit designers worked primarily for performing arts companies, movie and video industries, and radio and television broadcasting.

In 2002, a large proportion of designers were self-employed and did freelance work—full time or part time—in addition to holding a salaried job in design or in another occupation.

Training, Other Qualifications, and Advancement

Creativity is crucial in all design occupations. People in this field must have a strong sense of the esthetic—an eye for color and detail, a sense of balance and proportion, and an appreciation for beauty. Designers also need excellent communication and problem-solving skills. Despite the advancement of computer-aided design, sketching ability remains an important advantage in most types of design, especially fashion design. A good portfolio—a collection of examples of a person's best work—often is the deciding factor in getting a job.

A bachelor's degree is required for most entry-level design positions, except for floral design and visual merchandising. Esthetic ability is important in floral design and visual merchandising, but formal preparation typically is not necessary. Many candidates in industrial design pursue a master's degree to increase their chances of selection for open positions.

Interior design is the only design field subject to government regulation. According to the American Society of Interior Designers, 22 States and the District of Columbia register or license interior designers. Passing the National Council for Interior Design Qualification examination is required for registration or licensure in these jurisdictions. To be eligible to take the exam, an applicant must have at least 6 years of combined education and experience in interior design, of which at least 2 years constitute postsecondary education in design. Because registration or licensure is not mandatory in all States, membership in a professional association is an indication of an interior designer's qualifications and professional standing, and can aid in obtaining clients.

In fashion design, employers seek individuals with a 2- or 4-year degree who are knowledgeable in the areas of textiles, fabrics, and ornamentation, and about trends in the fashion world. Set and exhibit designers typically have college degrees in design. A Master of Fine Arts degree from an accredited university program further establishes one's design credentials. For set designers, membership in the United Scenic Artists, Local 829, is recognized nationally as the attainment of professional standing in the field.

Most floral designers learn their skills on the job. When employers hire trainees, they generally look for high school graduates who have a flair for arranging and a desire to learn. The completion of formal design training, however, is an asset for floral designers, particularly those interested in advancing to chief floral designer or in opening their own businesses. Vocational and technical schools offer programs in floral design, usually lasting less than a year, while 2- and 4-year programs in floriculture, horticulture, floral design, or ornamental horticulture are offered by community and junior colleges, colleges, and universities. The American Institute of Floral Designers offers an accreditation examination to its members as an indication of professional achievement in floral design.

Formal training for some design professions also is available in 2- and 3-year professional schools that award certificates or associate degrees in design. Graduates of 2-year programs normally qualify as assistants to designers, or they may enter a formal bachelor's degree program. The Bachelor of Fine Arts degree is granted at 4-year colleges and universities. The curriculum in these schools includes art and art history, principles of design, designing and sketching, and specialized studies for each of the individual design disciplines, such as garment construction, textiles, mechanical and architectural drawing, computerized design, sculpture, architecture, and basic engineering. A liberal arts education or a program that includes training in business or project management, together with courses in merchandising, marketing, and psychology, along with training in art, is recommended for designers who want to freelance. In addition, persons with training or experience in architecture qualify for some design occupations, particularly interior design.

Employers increasingly expect new designers to be familiar with computer-aided design software as a design tool. For example, industrial designers use computers extensively in the aerospace, automotive, and electronics industries. Interior designers use computers to create numerous versions of interior space designs—images can be inserted, edited, and replaced easily and without added cost—making it possible for a client to see and choose among several designs.

The National Association of Schools of Art and Design accredits more than 200 postsecondary institutions with programs in art and design. Most of these schools award a degree in art, and some award degrees in industrial, interior, textile, graphic, or fashion design. Many schools do not allow formal entry into a bachelor's degree program until a student has successfully finished a year of basic art and design courses. Applicants may be required to submit sketches and other examples of their artistic ability.

The Foundation for Interior Design Education Research also accredits interior design programs that lead to a bachelor's degree. There are about 120 accredited professional programs in the United States, located primarily in schools of art, architecture, and home economics.

Individuals in the design field must be creative, imaginative, and persistent and must be able to communicate their ideas in writing, visually, and verbally. Because tastes in style and fashion

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can change quickly, designers need to be well read, open to new ideas and influences, and quick to react to changing trends. Problem-solving skills and the ability to work independently and under pressure are important traits. People in this field need self-discipline to start projects on their own, to budget their time, and to meet deadlines and production schedules. Good business sense and sales ability also are important, especially for those who freelance or run their own business.

Beginning designers usually receive on-the-job training and normally need 1 to 3 years of training before they can advance to higher level positions. Experienced designers in large firms may advance to chief designer, design department head, or other supervisory positions. Some designers leave the occupation to become teachers in design schools or in colleges and universities. Many faculty members continue to consult privately or operate small design studios to complement their classroom activities. Some experienced designers open their own firms.

Job Outlook

Overall employment of designers is expected to grow about as fast as the average for all occupations through the year 2012 as the economy expands and consumers, businesses, and manufacturers continue to rely on the services provided by designers. However, designers in most fields—with the exception of floral design—are expected to face keen competition for available positions. Many talented individuals are attracted to careers as designers. Individuals with little or no formal education in design, as well as those who lack creativity and perseverance, will find it very difficult to establish and maintain a career in the occupation.

Among the design specialties, graphic designers are projected to provide the most new jobs. Demand for graphic designers should increase because of the rapidly expanding market for Web-based information and expansion of the video entertainment market, including television, movies, video, and made-for-Internet outlets.

Rising demand for interior design of private homes, offices, restaurants and other retail establishments, and institutions that care for the rapidly growing elderly population should spur employment growth of interior designers. New jobs for floral designers are expected to stem mostly from the relatively high replacement needs in retail florists that result from comparatively low starting pay and limited opportunities for advancement. The majority of new jobs for merchandise displayers and window trimmers will also result from the need to replace workers who retire, transfer to other occupations, or leave the labor force for other reasons.

Increased demand for industrial designers will stem from continued emphasis on the quality and safety of products, demand for new products that are easy and comfortable to use, and the development of high-technology products in medicine, transportation, and other fields. Demand for fashion designers should remain strong, because many consumers continue to seek new fashions and fresh styles of apparel. Employment growth for fashion designers will be slowed, however, by declines in the apparel manufacturing industries. Despite faster-than-average growth for set and exhibit designers, few job openings will result because the occupation is small.

Earnings

Median annual earnings for commercial and industrial designers were $52,260 in 2002. The middle 50 percent earned between $39,240 and $67,430. The lowest 10 percent earned less than $28,820, and the highest 10 percent earned more than $82,130. Median annual earnings were $61,530 in architectural, engineering, and related services.

Median annual earnings for fashion designers were $51,290 in 2002. The middle 50 percent earned between $35,550 and $75,970. The lowest 10 percent earned less than $25,350, and the highest 10 percent earned more than $105,280.

Median annual earnings for floral designers were $19,480 in 2002. The middle 50 percent earned between $15,880 and $23,560. The lowest 10 percent earned less than $13,440, and the highest 10 percent earned more than $29,830. Median annual earnings were $21,610 in grocery stores and $18,950 in florists.

Median annual earnings for graphic designers were $36,680 in 2002. The middle 50 percent earned between $28,140 and $48,820. The lowest 10 percent earned less than $21,860, and the highest 10 percent earned more than $64,160. Median annual earnings in the industries employing the largest numbers of graphic designers were as follows:

Advertising and related services	$39,510
Specialized design services	38,710
Printing and related support activities	31,800
Newspaper, periodical, book, and directory publishers	31,670

Median annual earnings for interior designers were $39,180 in 2002. The middle 50 percent earned between $29,070 and $53,060. The lowest 10 percent earned less than $21,240, and the highest 10 percent earned more than $69,640. Median annual earnings in the industries employing the largest numbers of interior designers were as follows:

Architectural, engineering, and related services	$41,680
Specialized design services	39,870
Furniture stores	36,320

Median annual earnings of merchandise displayers and window dressers were $22,550 in 2002. The middle 50 percent earned between $18,320 and $29,070. The lowest 10 percent earned less than $15,100, and the highest 10 percent earned more than $40,020. Median annual earnings were $22,130 in department stores.

Median annual earnings for set and exhibit designers were $33,870 in 2002. The middle 50 percent earned between $24,780 and $46,350. The lowest 10 percent earned less than $17,830, and the highest 10 percent earned more than $63,280.

The American Institute of Graphic Arts reported 2002 median annual earnings for graphic designers with increasing levels of responsibility. Staff-level graphic designers earned $40,000, while senior designers, who may supervise junior staff or have some decisionmaking authority that reflects their knowledge of graphic design, earned $55,000. Solo designers, who freelanced or worked under contract to another company, reported median earnings of $55,000. Design directors, the creative heads of design firms or in-house corporate design departments, earned $85,000. Graphic designers with ownership or partnership interests in a firm or who were principals of the firm in some other capacity earned $93,000.

Related Occupations

Workers in other occupations who design or arrange objects, materials, or interiors to enhance their appearance and function include artists and related workers; architects, except landscape and naval; engineers; landscape architects; and photographers. Some computer-related occupations, including computer software engineers and desktop publishers, require design skills.

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Sources of Additional Information

For general information about art and design and a list of accredited college-level programs, contact:

➤ National Association of Schools of Art and Design, 11250 Roger Bacon Dr., Suite 21, Reston, VA 20190. Internet: **http://nasad.arts-accredit.org**

For information about graphic, communication, or interaction design careers, contact:

➤ American Institute of Graphic Arts, 164 Fifth Ave., New York, NY 10010. Internet: **http://www.aiga.org**

For information on degree, continuing education, and licensure programs in interior design and interior design research, contact:

➤ American Society for Interior Designers, 608 Massachusetts Ave. NE., Washington, DC 20002-6006. Internet: **http://www.asid.org**

For a list of schools with accredited programs in interior design, contact:

➤ Foundation for Interior Design Education Research, 146 Monroe Center NW., Suite 1318, Grand Rapids, MI 49503. Internet: **http://www.fider.org**

For information on careers, continuing education, and certification programs in the interior design specialty of residential kitchen and bath design, contact:

➤ National Kitchen and Bath Association, 687 Willow Grove St., Hackettstown, NJ 07840. Internet: **http://www.nkba.org/student**

For information about careers in floral design, contact:

➤ Society of American Florists, 1601 Duke St., Alexandria, VA 22314. Internet: **http://www.safnow.org**

Entertainers and Performers, Sports and Related Occupations

Actors, Producers, and Directors

(0*NET 27-2011.00, 27-2012.01, 27-2012.02, 27-2012.03, 27-2012.04, 27-2012.05)

Significant Points

- Actors endure long periods of unemployment, intense competition for roles, and frequent rejections in auditions.
- Formal training through a university or acting conservatory is typical; however, many actors, producers, and directors find work on the basis of their experience and talent alone.
- Because earnings for actors are erratic, many supplement their incomes by holding jobs in other fields.

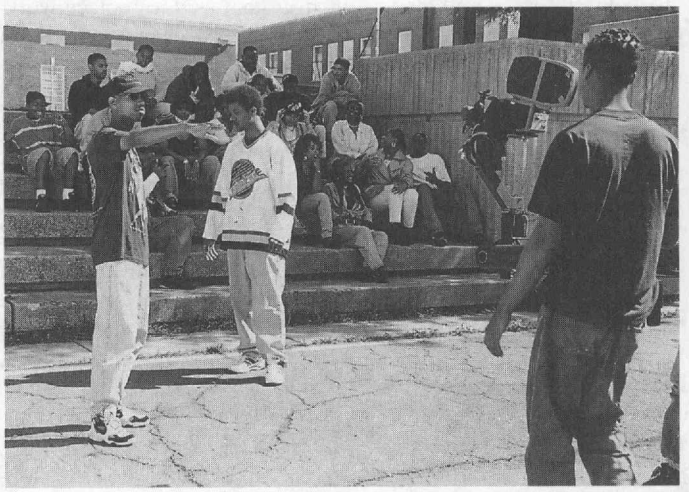
Nature of the Work

Actors, producers, and directors express ideas and create images in theater, film, radio, television, and other performing arts media. They interpret a writer's script to entertain, inform, or instruct an audience. Although the most famous actors, producers, and directors work in film, network television, or theater in New York or Los Angeles, far more work in local or regional television studios, theaters, or film production companies, preparing advertising, public-relations, or independent, small-scale movie productions.

Actors perform in stage, radio, television, video, or motion picture productions. They also work in cabarets, nightclubs, theme parks, commercials, and "industrial" films produced for training and educational purposes. Most actors struggle to find steady work; only a few ever achieve recognition as stars. Some well-known, experienced performers may be cast in supporting roles. Others work as "extras," with no lines to deliver, or make brief, cameo appearances, speaking only one or two lines. Some actors do voiceover and narration work for advertisements, animated features, books on tape, and other electronic media. They also teach in high school or university drama departments, acting conservatories, or public programs.

Producers are entrepreneurs, overseeing the business and financial decisions of a motion picture, made-for-television feature, or stage production. They select scripts, approve the development of ideas for the production, arrange financing, and determine the size and cost of the endeavor. Producers hire or approve the selection of directors, principal cast members, and key production staff members. They also negotiate contracts with artistic and design personnel in accordance with collective bargaining agreements and guarantee payment of salaries, rent, and other expenses. Television and radio producers determine which programs, episodes, or news segments get aired. They may research material, write scripts, and oversee the production of individual pieces. Producers in any medium coordinate the activities of writers, directors, managers, and agents to ensure that each project stays on schedule and within budget.

Directors are responsible for the creative decisions of a production. They interpret scripts, express concepts to set and costume designers, audition and select cast members, conduct rehearsals, and direct the work of cast and crew. Directors cue



Directors, who are responsible for creative decisions, instruct actors and technicians on how to play a scene.

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the performers and technicians to make entrances or to make light, sound, or set changes. They approve the design elements of a production, including the sets, costumes, choreography, and music.

Working Conditions

Actors, producers, and directors work under constant pressure. Many face stress from the continual need to find their next job. To succeed, actors, producers, and directors need patience and commitment to their craft. Actors strive to deliver flawless performances, often while working under undesirable and unpleasant conditions. Producers and directors organize rehearsals; meet with writers, designers, financial backers, and production technicians. They experience stress not only from these activities, but also from the need to adhere to budgets, union work rules, and production schedules.

Acting assignments typically are short term—ranging from 1 day to a few months—which means that actors frequently experience long periods of unemployment between jobs. The uncertain nature of the work results in unpredictable earnings and intense competition for even the lowest-paid jobs. Often, actors, producers, and directors must hold other jobs in order to sustain a living.

When performing, actors typically work long, irregular hours. For example, stage actors may perform one show at night while rehearsing another during the day. They also might travel with a show when it tours the country. Movie actors may work on location, sometimes under adverse weather conditions, and may spend considerable time in their trailers or dressing rooms waiting to perform their scenes. Actors who perform in a television series often appear on camera with little preparation time, because scripts tend to be revised frequently or even written moments before taping. Those who appear live or before a studio audience must be able to handle impromptu situations and calmly ad lib, or substitute, lines when necessary.

Evening and weekend work is a regular part of a stage actor's life. On weekends, more than one performance may be held per day. Actors and directors working on movies or television programs—especially those who shoot on location—may work in the early morning or late evening hours to film night scenes or tape scenes inside public facilities outside of normal business hours.

Actors should be in good physical condition and have the necessary stamina and coordination to move about theater stages and large movie and television studio lots. They also need to maneuver about complex technical sets while staying in character and projecting their voices audibly. Actors must be fit to endure heat from stage or studio lights and the weight of heavy costumes. Producers and directors ensure the safety of actors by conducting extra rehearsals on the set so that the actors can learn the layout of set pieces and props, by allowing time for warmups and stretching exercises to guard against physical and vocal injuries, and by providing an adequate number of breaks to prevent heat exhaustion and dehydration.

Employment

In 2002, actors, producers, and directors held about 139,000 jobs, primarily in motion picture and video, performing arts, and broadcast industries. Because many others were between jobs, the total number of actors, producers, and directors available for work was higher. Employment in the theater, and other performing arts companies, is cyclical—higher in the fall and spring seasons—and concentrated in New York and other major cities with large commercial houses for musicals and touring productions. Also, many cities support established professional regional theaters that operate on a seasonal or year-round basis. About one fourth of actors, producers, and directors are self-employed.

Actors, producers, and directors may find work in summer festivals, on cruise lines, and in theme parks. Many smaller, nonprofit professional companies, such as repertory companies, dinner theaters, and theaters affiliated with drama schools, acting conservatories, and universities, provide employment opportunities for local amateur talent and professional entertainers. Auditions typically are held in New York for many productions across the country and for shows that go on the road.

Employment in motion pictures and in films for television is centered in New York and Hollywood. However, small studios are located throughout the country. Many films are shot on location and may employ local professional and nonprofessional actors. In television, opportunities are concentrated in the network centers of New York and Los Angeles, but cable television services and local television stations around the country also employ many actors, producers, and directors.

Training, Other Qualifications, and Advancement

Persons who become actors, producers, and directors follow many paths. Employers generally look for people with the creative instincts, innate talent, and intellectual capacity to perform. Actors should possess a passion for performing and enjoy entertaining others. Most aspiring actors participate in high school and college plays, work in college radio stations, or perform with local community theater groups. Local and regional theater experience and work in summer stock, on cruise lines, or in theme parks helps many young actors hone their skills and earn qualifying credits toward membership in one of the actors' unions. Union membership and work experience in smaller communities may lead to work in larger cities, notably New York or Los Angeles. In television and film, actors and directors typically start in smaller television markets or with independent movie production companies and then work their way up to larger media markets and major studio productions. Intense competition, however, ensures that only a few actors reach star billing.

Formal dramatic training, either through an acting conservatory or a university program, generally is necessary; however, some people successfully enter the field without it. Most people studying for a bachelor's degree take courses in radio and television broadcasting, communications, film, theater, drama, or dramatic literature. Many continue their academic training and receive a Master of Fine Arts (MFA) degree. Advanced curricula may include courses in stage speech and movement, directing, playwriting, and design, as well as intensive acting workshops. The National Association of Schools of Theatre accredits 128 programs in theater arts.

Actors, regardless of experience level, may pursue workshop training through acting conservatories or by being mentored by a drama coach. Actors also research roles so that they can grasp concepts quickly during rehearsals and understand the story's setting and background. Sometimes actors learn a foreign language or train with a dialect coach to develop an accent to make their characters more realistic.

Actors need talent, creative ability, and training that will enable them to portray different characters. Because competition for parts is fierce, versatility and a wide range of related performance skills, such as singing, dancing, skating, juggling,

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or miming are especially useful. Experience in horseback riding, fencing, or stage combat also can lift some actors above the average and get them noticed by producers and directors. Actors must have poise, stage presence, the capability to affect an audience, and the ability to follow direction. Modeling experience also may be helpful. Physical appearance, such as possessing the right size, weight, or features, often is a deciding factor in being selected for particular roles.

Many professional actors rely on agents or managers to find work, negotiate contracts, and plan their careers. Agents generally earn a percentage of the pay specified in an actor's contract. Other actors rely solely on attending open auditions for parts. Trade publications list the times, dates, and locations of these auditions.

To become a movie extra, one usually must be listed by a casting agency, such as Central Casting, a no-fee agency that supplies extras to the major movie studios in Hollywood. Applicants are accepted only when the number of persons of a particular type on the list—for example, athletic young women, old men, or small children—falls below the foreseeable need. In recent years, only a very small proportion of applicants have succeeded in being listed.

There are no specific training requirements for producers. They come from many different backgrounds. Talent, experience, and business acumen are important determinants of success for producers. Actors, writers, film editors, and business managers commonly enter the field. Also, many people who start out as actors move into directing, while some directors might try their hand at acting. Producers often start in a theatrical management office, working for a press agent, managing director, or business manager. Some start in a performing arts union or service organization. Others work behind the scenes with successful directors, serve on boards of directors, or promote their own projects. No formal training exists for producers; however, a growing number of colleges and universities now offer degree programs in arts management and in managing nonprofits.

As the reputations and box-office draw of actors, producers, and directors grow, they might work on bigger budget productions, on network or syndicated broadcasts, or in more prestigious theaters. Actors may advance to lead roles and receive star billing. A few actors move into acting-related jobs, such as drama coaches or directors of stage, television, radio, or motion picture productions. Some teach drama privately or in colleges and universities.

Job Outlook

Employment of actors, producers, and directors is expected to grow about as fast as the average for all occupations through 2012. Although a growing number of people will aspire to enter these professions, many will leave the field early because the work—when it is available—is hard, the hours are long, and the pay is low. Competition for jobs will be stiff, in part because the large number of highly trained and talented actors auditioning for roles generally exceeds the number of parts that become available. Only performers with the most stamina and talent will find regular employment.

Expanding cable and satellite television operations, increasing production and distribution of major studio and independent films, and continued growth and development of interactive media, such as direct-for-Web movies and videos, should increase demand for actors, producers, and directors. However, greater emphasis on national, rather than local, entertainment productions may restrict employment opportunities in the broadcasting industry.

Venues for live entertainment, such as Broadway and Off-Broadway theaters, touring productions and repertory theaters in many major metropolitan areas, theme parks, and resorts, are expected to offer many job opportunities; however, prospects in these venues are more variable, because they fluctuate with economic conditions.

Earnings

Median annual earnings of salaried actors were $23,470 in 2002. The middle 50 percent earned between $15,320 and $53,320. The lowest 10 percent earned less than $13,330, and the highest 10 percent earned more than $106,360. Median annual earnings in the industries employing the largest numbers of actors were as follows:

Accounting, tax preparation, bookkeeping, and payroll services	$29,590
Performing arts companies	28,850
Motion picture and video industries	17,610

Minimum salaries, hours of work, and other conditions of employment are covered in collective bargaining agreements between the producers and the unions representing workers. The Actors' Equity Association (Equity) represents stage actors; the Screen Actors Guild (SAG) covers actors in motion pictures, including television, commercials, and films; and the American Federation of Television and Radio Artists (AFTRA) represents television and radio studio performers. While these unions generally determine minimum salaries, any actor or director may negotiate for a salary higher than the minimum.

Under terms of a joint SAG and AFTRA contract covering all unionized workers, motion picture and television actors with speaking parts earned a minimum daily rate of $678 or $2,352 for a 5-day week as of July 1, 2003. Actors also receive contributions to their health and pension plans and additional compensation for reruns and foreign telecasts of the productions in which they appear.

According to Equity, the minimum weekly salary for actors in Broadway productions as of June 30, 2003 was $1,354. Actors in Off-Broadway theaters received minimums ranging from $479 to $557 a week as of October 27, 2003, depending on the seating capacity of the theater. Regional theaters that operate under an Equity agreement pay actors $531 to $800 per week. For touring productions, actors receive an additional $111 per day for living expenses ($117 per day in larger, higher cost cities).

Some well-known actors—stars—earn well above the minimum; their salaries are many times the figures cited, creating the false impression that all actors are highly paid. For example, of the nearly 100,000 SAG members, only about 50 might be considered stars. The average income that SAG members earn from acting—less than $5,000 a year—is low because employment is erratic. Therefore, most actors must supplement their incomes by holding jobs in other occupations.

Many actors who work more than a set number of weeks per year are covered by a union health, welfare, and pension fund, which includes hospitalization insurance and to which employers contribute. Under some employment conditions, Equity and AFTRA members receive paid vacations and sick leave.

Median annual earnings of salaried producers and directors were $46,240 in 2002. The middle 50 percent earned between $31,990 and $70,910. The lowest 10 percent earned less than $23,300, and the highest 10 percent earned more than $119,760. Median annual earnings were $56,090 in motion picture and

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video industries and $38,480 in radio and television broadcasting.

Many stage directors belong to the Society of Stage Directors and Choreographers (SSDC), and film and television directors belong to the Directors Guild of America. Earnings of stage directors vary greatly. According to the SSDC, summer theaters offer compensation, including "royalties" (based on the number of performances), usually ranging from $2,500 to $8,000 for a 3- to 4-week run. Directing a production at a dinner theater generally will pay less than directing one at a summer theater, but has more potential for generating income from royalties. Regional theaters may hire directors for longer periods, increasing compensation accordingly. The highest-paid directors work on Broadway and commonly earn $50,000 per show. However, they also receive payment in the form of royalties—a negotiated percentage of gross box office receipts—that can exceed their contract fee for long-running box office successes.

Stage producers seldom get a set fee; instead, they get a percentage of a show's earnings or ticket sales.

Related Occupations

People who work in performing arts occupations that may require acting skills include announcers; dancers and choreographers; and musicians, singers, and related workers. Others working in film- and theater-related occupations are makeup artists, theatrical and performance; fashion designers; set and exhibit designers; and writers and authors. Producers share many responsibilities with those who work as top executives.

Sources of Additional Information

For general information about theater arts and a list of accredited college-level programs, contact:

➤ National Association of Schools of Theater, 11250 Roger Bacon Dr., Suite 21, Reston, VA 20190. Internet: **http://nast.arts-accredit.org**

For general information on actors, producers, and directors, contact any of the following organizations:

➤ Actors Equity Association, 165 West 46th St., New York, NY 10036. Internet: **http://www.actorsequity.org**

➤ Screen Actors Guild, 5757 Wilshire Blvd., Los Angeles, CA 90036-3600. Internet: **http://www.sag.org**

➤ American Federation of Television and Radio Artists—Screen Actors Guild, 4340 East-West Hwy., Suite 204, Bethesda, MD 20814-4411. Internet: **http://www.aftra.org** or **http://www.sag.org**

Athletes, Coaches, Umpires, and Related Workers

(0*NET 27-2021.00, 27-2022.00, 27-2023.00)

Significant Points

- Work hours are often irregular; travel may be extensive.
- Career-ending injuries are always a risk for athletes.
- Job opportunities for coaches, sports instructors, umpires, referees, and sports officials will be best in high school and other amateur sports.
- Competition for professional athlete jobs will continue to be extremely intense; athletes who seek to compete professionally must have extraordinary talent, desire, and dedication to training.

Nature of the Work

We are a nation of sports fans and sports players. Interest in watching sports continues at a high level and recreational participation in sports continues to grow. Some of those who participate in amateur sports dream of becoming paid professional athletes, coaches, or sports officials but very few beat the long and daunting odds of making a full-time living from professional athletics. Those athletes who do make it to professional levels find that careers are short and jobs are insecure. Even though the chances of employment as a professional athlete are slim, there are many opportunities for at least a part-time job related to athletics as a coach, instructor, referee, or umpire in amateur athletics and in high schools, colleges, and universities.

Athletes and *sports competitors* compete in organized, officiated sports events to entertain spectators. When playing a game, athletes are required to understand the strategies of their game while obeying the rules and regulations of the sport. The events in which they compete include both team sports—such as baseball, basketball, football, hockey, and soccer—and individual sports—such as golf, tennis, and bowling. As the type of sport varies, so does the level of play, ranging from unpaid high school athletics to professional sports, in which the best from around the world compete before international television audiences.

In addition to competing in athletic events, athletes spend many hours practicing skills and teamwork under the guidance of a coach or sports instructor. Most athletes spend hours in hard practices every day. They also spend additional hours viewing video tapes, in order to critique their own performances and techniques and to scout their opponents' tendencies and weaknesses to gain a competitive advantage. Some athletes may also be advised by *strength trainers* in an effort to gain muscle and stamina, while also preventing injury. Competition at all levels is extremely intense and job security is always precarious. As a result, many athletes train year round to maintain excellent form, technique, and peak physical condition. Very little downtime from the sport exists at the professional level. Athletes also must conform to regimented diets during the height of their sports season to supplement any physical training program. Many athletes push their bodies to the limit during both practice and play, so career-ending injury always is a risk. Even minor injuries to an athlete may put the player at risk of replacement.

Coaches organize, instruct, and teach amateur and professional athletes in fundamentals of individual and team sports. In individual sports, *instructors* may sometimes fill this role. Coaches train athletes for competition by holding practice sessions to perform drills and improve the athlete's skills and stamina. Using their expertise in the sport, coaches instruct the athlete on proper form and technique in beginning and, later, in advanced exercises attempting to maximize the players' physical potential. Along with overseeing athletes as they refine their individual skills, coaches also are responsible for managing the team during both practice sessions and competitions, and for instilling good sportsmanship, a competitive spirit, and teamwork. They may also select, store, issue, and inventory equipment, materials, and supplies. During competitions, for example, coaches substitute players for optimum team chemistry and success. In addition, coaches direct team strategy and may call specific plays during competition to surprise or overpower the opponent. To choose the best plays, coaches evaluate or "scout" the opposing team prior to the competition,

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allowing them to determine game strategies and practice specific plays.

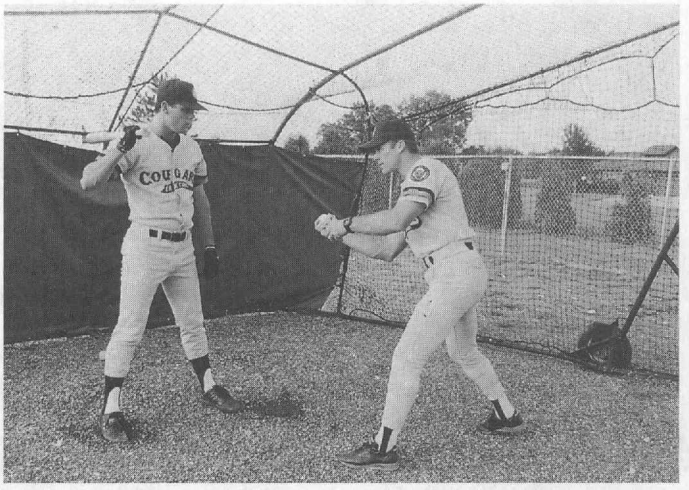
Many coaches in high schools are primarily teachers of academic subjects who supplement their income by coaching part time. College coaches consider coaching a full-time discipline and may be away from home frequently as they travel to scout and recruit prospective players.

Sports instructors teach professional and nonprofessional athletes on an individual basis. They organize, instruct, train, and lead athletes of indoor and outdoor sports such as bowling, tennis, golf, and swimming. Because activities are as diverse as weight lifting, gymnastics, and scuba diving, and may include self-defense training such as karate, instructors tend to specialize in one or a few types of activities. Like coaches, sports instructors also may hold daily practice sessions and be responsible for any needed equipment and supplies. Using their knowledge of their sport, physiology, and corrective techniques, they determine the type and level of difficulty of exercises, prescribe specific drills, and correct the athlete's techniques. Some instructors also teach and demonstrate use of training apparatus, such as trampolines or weights, while correcting athletes' weaknesses and enhancing their conditioning. Using their expertise in the sport, sports instructors evaluate the athlete and the athlete's opponents to devise a competitive game strategy.

Coaches and sports instructors sometimes differ in their approach to athletes because of the focus of their work. For example, while coaches manage the team during a game to optimize its chance for victory, sports instructors—such as those who work for professional tennis players—often are not permitted to instruct their athletes during competition. Sports instructors spend more of their time with athletes working one-on-one, which permits them to design customized training programs for each individual. Motivating athletes to play hard challenges most coaches and sports instructors but is vital for the athlete's success. Many coaches and instructors derive great satisfaction working with children or young adults, helping them to learn new physical and social skills and to improve their physical condition, as well as helping them to achieve success in their sport.

Umpires, referees, and other sports officials officiate at competitive athletic and sporting events. They observe the play, detect infractions of rules, and impose penalties established by the sports' rules and regulations. Umpires, referees, and sports officials anticipate play and position themselves to best see the action, assess the situation, and determine any violations. Some sports officials, such as boxing referees, may work independently, while others such as umpires—the sports officials of baseball—work in groups. Regardless of the sport, the job is highly stressful because officials are often required to make a decision in a matter of a split second, sometimes resulting in strong disagreement among competitors, coaches, or spectators.

Professional *scouts* evaluate the skills of both amateur and professional athletes to determine talent and potential. As a sports intelligence agent, the scout's primary duty is to seek out top athletic candidates for the team he or she represents, ultimately contributing to team success. At the professional level, scouts typically work for scouting organizations, or as freelance scouts. In locating new talent, scouts perform their work in secrecy so as to not "tip off" their opponents about their interest in certain players. At the college level, the head scout is often an assistant coach, although freelance scouts may aid colleges by providing reports about exceptional players to coaches.



Athletes spend many hours practicing skills under the guidance of a coach or sports instructor.

Scouts at this level seek talented high school athletes by reading newspapers, contacting high school coaches and alumni, attending high school games, and studying videotapes of prospects' performances.

Working Conditions

Irregular work hours are the trademark of the athlete. They also are common for the coach, as well as umpires, referees, and other sports officials. Athletes, coaches, umpires, and related workers often work Saturdays, Sundays, evenings, and holidays. Athletes and full-time coaches usually work more than 40 hours a week for several months during the sports season, if not most of the year. Some coaches in educational institutions may coach more than one sport, particularly at the high school level.

Athletes, coaches, and sports officials who participate in competitions that are held outdoors may be exposed to all weather conditions of the season; those involved in events that are held indoors tend to work in climate-controlled comfort, often in arenas, enclosed stadiums, or gymnasiums. Athletes, coaches, and some sports officials frequently travel to sporting events by bus or airplane. Scouts also travel extensively in locating talent, often by automobile.

Employment

Athletes, coaches, umpires, and related workers held about 158,000 jobs in 2002. Coaches and scouts held 130,000 jobs; athletes, 15,000; and umpires, referees, and other sports officials, 14,000. Large proportions of athletes, coaches, umpires, and related workers worked part time—about 37 percent, while 17 percent maintained variable schedules. Many sports officials and coaches receive such a small and irregular payment for their services (occasional officiating at club games, for example) that they may not consider themselves employed in these occupations, even part time.

About 27 percent of workers in this occupation were self-employed, earning prize money or fees for lessons, scouting, or officiating assignments, and many other coaches and sports officials, although technically not self-employed, have such irregular or tenuous working arrangements that their working conditions resemble self-employment.

Among those employed in wage and salary jobs, 20 percent held jobs in private educational services. About 12 percent worked in amusement, gambling, and recreation industries,

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including golf and tennis clubs, gymnasiums, health clubs, judo and karate schools, riding stables, swim clubs, and other sports and recreation-related facilities. Another 7 percent worked in the spectator sports industry.

Training, Other Qualifications, and Advancement

Education and training requirements for athletes, coaches, umpires, and related workers vary greatly by the level and type of sport. Regardless of the sport or occupation, jobs require immense overall knowledge of the game, usually acquired through years of experience at lower levels. Athletes usually begin competing in their sports while in elementary or middle school and continue through high school and sometimes college. They play in amateur tournaments and on high school and college teams, where the best attract the attention of professional scouts. Most schools require that participating athletes maintain specific academic standards to remain eligible to play. Becoming a professional athlete is the culmination of years of effort. Athletes who seek to compete professionally must have extraordinary talent, desire, and dedication to training.

For high school coach and sports instructor jobs, schools usually prefer to hire teachers willing to take on the jobs part time. If no one suitable is found, they hire someone from outside. Some entry-level positions for coaches or instructors require only experience derived as a participant in the sport or activity. Many coaches begin their careers as assistant coaches to gain the necessary knowledge and experience needed to become a head coach. Head coaches at larger schools that strive to compete at the highest levels of a sport require substantial experience as a head coach at another school or as an assistant coach. To reach the ranks of professional coaching, it usually takes years of coaching experience and a winning record in the lower ranks.

Public secondary school head coaches and sports instructors at all levels usually must have a bachelor's degree. (For information on teachers, including those specializing in physical education, see the section on teachers—preschool, kindergarten, elementary, middle, and secondary elsewhere in the *Handbook.)* Those who are not teachers must meet State requirements for certification in order to become a head coach. Certification, however, may not be required for coach and sports instructor jobs in private schools. Degree programs specifically related to coaching include exercise and sports science, physiology, kinesiology, nutrition and fitness, physical education, and sports medicine.

For sports instructors, certification is highly desirable for those interested in becoming a tennis, golf, karate, or any other kind of instructor. Often, one must be at least 18 years old and CPR certified. There are many certifying organizations specific to the various sports, and their training requirements vary depending on their standards. Participation in a clinic, camp, or school usually is required for certification. Part-time workers and those in smaller facilities are less likely to need formal education or training.

Each sport has specific requirements for umpires, referees, and other sports officials. Referees, umpires, and other sports officials often begin their careers by volunteering for intramural, community, and recreational league competitions. For college refereeing, candidates must be certified by an officiating school and be evaluated during a probationary period. Some larger college conferences require officials to have certification and other qualifications, such as residence in or near the conference boundaries along with previous experience that typically includes several years officiating at high school, community college, or other college conference games.

Standards are even more stringent for officials in professional sports. For umpire jobs in professional baseball, for example, a high school diploma or equivalent is usually sufficient, plus 20/20 vision and quick reflexes. To qualify for the professional ranks, however, prospective candidates must attend professional umpire training school. Currently, there are two schools whose curriculums have been approved by the Professional Baseball Umpires Corporation (PBUC) for training. Top graduates are selected for further evaluation while officiating in a rookie minor league. Umpires then usually need 8 to 10 years of experience in various minor leagues before being considered for major league jobs. Football also is competitive, as candidates must have at least 10 years of officiating experience, with 5 of them at a collegiate varsity or minor professional level. For the National Football League (NFL), prospects are interviewed by clinical psychologists to determine levels of intelligence and ability to handle extremely stressful situations. In addition, the NFL's security department conducts thorough background checks. Potential candidates are likely to be interviewed by a panel from the NFL officiating department and are given a comprehensive examination on the rules of the sport.

Jobs as scouts require experience playing a sport at the college or professional level that enables them to spot young players who possess extraordinary athletic abilities and skills. Most beginning scout jobs are as part-time talent spotters in a particular area or region. Hard work and a record of success often lead to full-time jobs responsible for bigger territories. Some scouts advance to scouting director jobs or various administrative positions in sports.

Athletes, coaches, umpires, and related workers must relate well to others and possess good communication and leadership skills. Coaches also must be resourceful and flexible to successfully instruct and motivate individuals or groups of athletes.

Job Outlook

Employment of athletes, coaches, umpires, and related workers is expected to increase about as fast as the average for all occupations through the year 2012. Employment will grow as the general public continues to increasingly participate in organized sports as a form of entertainment, recreation, and physical conditioning. Job growth also will be driven by the increasing numbers of baby boomers approaching retirement, during which they are expected to become more active participants of leisure-time activities, such as golf and tennis, and require instruction. The large numbers of the children of baby boomers in high schools and colleges also will be active participants in athletics and require coaches and instructors.

Expanding opportunities are expected for coaches and instructors, as a higher value is being placed upon physical fitness in our society. Americans of all ages are engaging in more physical fitness activities, such as participating in amateur athletic competition and joining athletic clubs, and are being encouraged to participate in physical education. Employment of coaches and instructors also will increase with expansion of school and college athletic programs and growing demand for private sports instruction. Sports-related job growth within education also will be driven by the decisions of local school boards. Population growth dictates the construction of additional schools, particularly in the expanding suburbs. However, fund-

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ing for athletic programs is often one of the first areas to be cut when budgets become tight, but the popularity of team sports often enables shortfalls to be offset somewhat by assistance from fundraisers, booster clubs, and parents. Persons who are State-certified to teach academic subjects in addition to physical education are likely to have the best prospects for obtaining coach and instructor jobs. The need to replace many high school coaches also will provide some coaching opportunities.

Competition for professional athlete jobs will continue to be extremely intense. Opportunities to make a living as a professional in individual sports such as golf or tennis may grow as new tournaments are established and prize money distributed to participants increases. Most professional athletes' careers last only several years due to debilitating injuries and age, so a large proportion of the athletes in these jobs is replaced every year, creating some job opportunities. However, a far greater number of talented young men and women dream of becoming a sports superstar and will be competing for a very limited number of job openings.

Opportunities should be best for persons seeking part-time umpire, referee, and other sports official jobs at the high school level, but competition is expected for higher paying jobs at the college level, and even greater competition for jobs in professional sports. Competition should be very keen for jobs as scouts, particularly for professional teams, as the number of available positions is limited.

Earnings

Median annual earnings of athletes were $45,320 in 2002. The lowest 10 percent earned less than $14,090, and the highest 10 percent earned more than $145,600. However, the highest paid professional athletes earn salaries far in excess of these estimates.

Median annual earnings of umpires and related workers were $20,540 in 2002. The middle 50 percent earned between $16,210 and $29,490. The lowest 10 percent earned less than $13,760, and the highest 10 percent earned more than $40,350.

Median annual earnings of coaches and scouts were $27,880 in 2002. The middle 50 percent earned between $17,890 and $42,250. The lowest 10 percent earned less than $13,370, and the highest 10 percent earned more than $60,230. Median annual earnings in the industries employing the largest numbers of coaches and scouts in 2002 were as follows:

Colleges, universities, and professional schools	$36,170
Other amusement and recreation industries	25,900
Elementary and secondary schools	24,740
Other schools and instruction	22,570

Earnings vary by education level, certification, and geographic region. Some instructors and coaches are paid a salary, while others may be paid by the hour, per session, or based on the number of participants.

Related Occupations

Athletes and coaches have extensive knowledge of physiology and sports, and instruct, inform, and encourage participants. Other workers with similar duties include dietitians and nutritionists; physical therapists; recreation and fitness workers; recreational therapists; and teachers—preschool, kindergarten, elementary, middle, and secondary.

Sources of Additional Information

For general information on coaching, contact:

➤ National High School Athletic Coaches Association, P.O. Box 4342, Hamden, CT 06514. Internet: **http://www.hscoaches.org**

For information about sports officiating for team and individual sports, contact:

➤ National Association of Sports Officials, 2017 Lathrop Ave., Racine, WI 53405. Internet: **http://www.naso.org**

Dancers and Choreographers

(0*NET 27-2031.00, 27-2032.00)

Significant Points

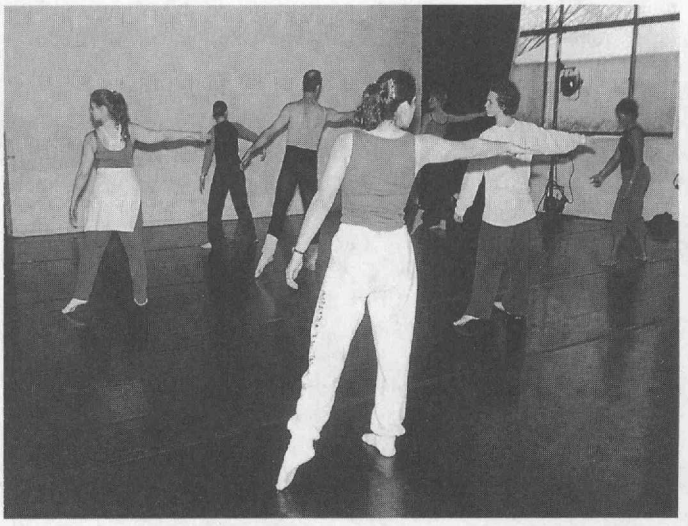
- Many dancers stop performing by their late thirties; however, some remain in the field as choreographers, dance teachers, or artistic directors.
- Most dancers begin formal training at an early age—between 5 and 15—and many have their first professional audition by age 17 or 18.
- Dancers and choreographers face intense competition—only the most talented find regular work.

Nature of the Work

From ancient times to the present, dancers have expressed ideas, stories, and rhythm with their bodies. They use a variety of dance forms that allow free movement and self-expression, including classical ballet, modern dance, and culturally specific dance styles. Many dancers combine performance work with teaching or choreography.

Dancers perform in a variety of settings, such as musical productions, and may present folk, ethnic, tap, jazz, and other popular kinds of dance. They also perform in opera, musical theater, television, movies, music videos, and commercials, in which they also may sing and act. Dancers most often perform as part of a group, although a few top artists perform solo.

Many dancers work with choreographers, who create original dances and develop new interpretations of existing dances.



Dancers spend considerable time warming up and practicing in rehearsal halls or dance studios.

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Because few dance routines are written down, choreographers instruct performers at rehearsals to achieve the desired effect. In addition, choreographers often are involved in auditioning performers.

Working Conditions

Dance is strenuous. Many dancers stop performing by their late thirties because of the physical demands on the body. However, some continue to work in the field as choreographers, dance teachers and coaches, or artistic directors. Others move into administrative positions, such as company managers. A few celebrated dancers, however, continue performing beyond the age of 50.

Daily rehearsals require very long hours. Many dance companies tour for part of the year to supplement a limited performance schedule at home. Dancers who perform in musical productions and other family entertainment spend much of their time on the road; others work in nightclubs or on cruise ships. Most dance performances are in the evening, whereas rehearsals and practice take place during the day. As a result, dancers often work very long and late hours. Generally, dancers and choreographers work in modern and temperature-controlled facilities; however, some studios may be older and less comfortable.

Employment

Professional dancers and choreographers held about 37,000 jobs in 2002. Many others were between engagements, so that the total number of people available for work as dancers over the course of the year was greater. Dancers and choreographers worked in a variety of industries, such as private educational services, which includes dance studios and schools, as well as colleges and universities; food services and drinking establishments; performing arts companies, which includes dance, theater, and opera companies; and amusement and recreation venues, such as casinos and theme parks. Almost one fifth of dancers and choreographers are self-employed.

New York City is home to many major dance companies; however, full-time professional dance companies operate in most major cities.

Training, Other Qualifications, and Advancement

Training varies with the type of dance and is a continuous part of all dancers' careers. Many dancers and dance instructors believe that dancers should start with a good foundation in classical dance before selecting a particular dance style. Ballet training for women usually begins at 5 to 8 years of age with a private teacher or through an independent ballet school. Serious training traditionally begins between the ages of 10 and 12. Men often begin their ballet training between the ages of 10 and 15. Students who demonstrate potential in their early teens receive more intensive and advanced professional training. At about this time, students should begin to focus their training on a particular style and decide whether to pursue additional training through a dance company's school or a college dance program. Leading dance school companies often have summer training programs from which they select candidates for admission to their regular full-time training programs. Formal training for modern and culturally specific dancers often begins later than training in ballet; however, many folk dance forms are taught to very young children.

Many dancers have their first professional auditions by age 17 or 18. Training is an important component of professional dancers' careers. Dancers normally spend 8 hours a day in class and rehearsal, keeping their bodies in shape and preparing for performances. Their daily training period includes time to warm up and cool down before and after classes and rehearsals.

Because of the strenuous and time-consuming dance training required, some dancers view formal education as secondary. However, a broad, general education including music, literature, history, and the visual arts is helpful in the interpretation of dramatic episodes, ideas, and feelings. Dancers sometimes conduct research to learn more about the part they are playing.

Many colleges and universities award bachelor's or master's degrees in dance, typically through departments of music, theater, or fine arts. The National Association of Schools of Dance accredits 57 programs in dance. Many programs concentrate on modern dance, but some also offer courses in jazz, culturally specific, ballet, or classical techniques; dance composition, history, and criticism; and movement analysis.

A college education is not essential to obtaining employment as a professional dancer; however, many dancers obtain degrees in unrelated fields to prepare themselves for careers after dance. The completion of a college program in dance and education is essential in order to qualify to teach dance in college, high school, or elementary school. Colleges and conservatories sometimes require graduate degrees, but may accept performance experience. A college background is not necessary, however, for teaching dance or choreography in local recreational programs. Studio schools usually require teachers to have experience as performers.

Because of the rigorous practice schedules of most dancers, self-discipline, patience, perseverance, and a devotion to dance are essential for success in the field. Dancers also must possess good problem-solving skills and an ability to work with people. Good health and physical stamina also are necessary attributes. Above all, dancers must have flexibility, agility, coordination, grace, a sense of rhythm, a feeling for music, and a creative ability to express themselves through movement.

Dancers seldom perform unaccompanied, so they must be able to function as part of a team. They should also be highly motivated and prepared to face the anxiety of intermittent employment and rejections when auditioning for work. For dancers, advancement takes the form of a growing reputation, more frequent work, bigger and better roles, and higher pay.

Choreographers typically are older dancers with years of experience in the theater. Through their performance as dancers, they develop reputations that often lead to opportunities to choreograph productions.

Job Outlook

Dancers and choreographers face intense competition for jobs. Only the most talented find regular employment.

Employment of dancers and choreographers is expected to grow about as fast as the average for all occupations through 2012. The public's continued interest in dance will sustain larger dance companies; however, funding from public and private organizations is not expected to keep pace with rising production costs. For many small and midsize organizations, the result will be fewer performances and more limited employment opportunities. Although job openings will arise each year because dancers and choreographers retire or leave the occupation for other reasons, the number of applicants will continue to vastly exceed the number of job openings.

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National dance companies should continue to provide jobs in this field. Opera companies and dance groups affiliated with colleges and universities and with television and motion pictures also will offer some opportunities. Moreover, the growing popularity of dance in recent years has resulted in increased opportunities to teach dance. Finally, music video channels will provide some opportunities for both dancers and choreographers.

Earnings

Median annual earnings of salaried dancers were $21,100 in 2002. The middle 50 percent earned between $14,570 and $34,660. The lowest 10 percent earned less than $12,880, and the highest 10 percent earned more than $53,350.

Median annual earnings of salaried choreographers were $29,470 in 2002. The middle 50 percent earned between $19,590 and $43,720. The lowest 10 percent earned less than $14,000, and the highest 10 percent earned more than $57,590. Median annual earnings were $29,820 in other schools and instruction, which includes dance studios and schools.

Dancers who were on tour received an additional allowance for room and board, as well as extra compensation for overtime. Earnings from dancing are usually low, because employment is part year and irregular. Dancers often supplement their income by working as guest artists with other dance companies, teaching dance, or taking jobs unrelated to the field.

Earnings of many professional dancers are governed by union contracts. Dancers in the major opera ballet, classical ballet, and modern dance corps belong to the American Guild of Musical Artists, Inc. of the AFL-CIO; those who appear on live or videotaped television programs belong to the American Federation of Television and Radio Artists; those who perform in films and on television belong to the Screen Actors Guild; and those in musical theater are members of the Actors' Equity Association. The unions and producers sign basic agreements specifying minimum salary rates, hours of work, benefits, and other conditions of employment. However, the contract each dancer signs with the producer of the show may be more favorable than the basic agreement.

Dancers and choreographers covered by union contracts are entitled to some paid sick leave, paid vacations, and various health and pension benefits, including extended sick pay and family-leave benefits provided by their unions. Employers contribute toward these benefits. Those not covered by union contracts usually do not enjoy such benefits.

Related Occupations

People who work in other performing arts occupations include actors, producers, and directors; and musicians, singers, and related workers. Those directly involved in the production of dance programs include set and exhibit designers; fashion designers; and barbers, cosmetologists, and other personal appearance workers. Like dancers, athletes, coaches, umpires, and related workers need strength, flexibility, and agility.

Sources of Additional Information

For general information about dance and a list of accredited college-level programs, contact:

➤ National Association of Schools of Dance, 11250 Roger Bacon Dr., Suite 21, Reston, VA 20190. Internet: **http://nasd.arts-accredit.org**

For information about dance and dance companies, contact:

➤ Dance/USA, 1156 15th St. NW., Suite 820, Washington, DC 20005. Internet: **http://www.danceusa.org**

Musicians, Singers, and Related Workers

(0*NET 27-2041.01, 27-2041.02, 27-2041.03, 27-2042.01, 27-2042.02)

Significant Points

- Part-time schedules and intermittent unemployment are common; many musicians supplement their income with earnings from other sources.
- Aspiring musicians begin studying an instrument or training their voices at an early age.
- Competition for jobs is keen; those who can play several instruments and perform a wide range of music styles should enjoy the best job prospects.

Nature of the Work

Musicians, singers, and related workers play musical instruments, sing, compose or arrange music, or conduct groups in instrumental or vocal performances. They may perform solo or as part of a group. Musicians, singers, and related workers entertain live audiences in nightclubs, concert halls, and theaters featuring opera, musical theater, or dance. Although most of these entertainers play for live audiences, many perform exclusively for recording or production studios. Regardless of the setting, musicians, singers, and related workers spend considerable time practicing, alone and with their band, orchestra, or other musical ensemble.

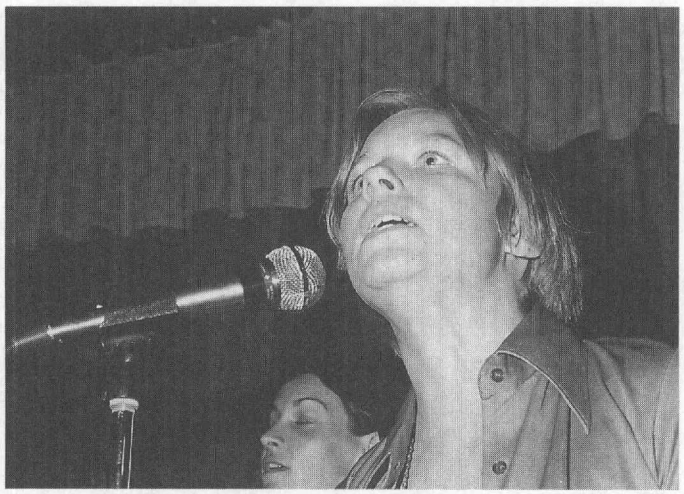
Musicians often gain their reputation or professional standing in a particular kind of music or performance. However, those who learn several related instruments, such as the flute and clarinet, and who can perform equally well in several musical styles, have better employment opportunities. Instrumental musicians, for example, may play in a symphony orchestra, rock group, or jazz combo one night, appear in another ensemble the next, and work in a studio band the following day. Some play a variety of string, brass, woodwind, or percussion instruments or electronic synthesizers.

Singers interpret music, using their knowledge of voice production, melody, and harmony. They sing character parts or perform in their own individual style. Singers are often classified according to their voice range—soprano, contralto, tenor, baritone, or bass—or by the type of music they sing, such as opera, rock, popular, folk, rap, or country and western.

Music directors conduct, direct, plan, and lead instrumental or vocal performances by musical groups, such as orchestras, choirs, and glee clubs. Conductors lead instrumental music groups, such as symphony orchestras, dance bands, show bands, and various popular ensembles. These leaders audition and select musicians, choose the music most appropriate for their talents and abilities, and direct rehearsals and performances. Choral directors lead choirs and glee clubs, sometimes working with a band or an orchestra conductor. Directors audition and select singers and lead them at rehearsals and performances in order to achieve harmony, rhythm, tempo, shading, and other desired musical effects.

Composers create original music such as symphonies, operas, sonatas, radio and television jingles, film scores, or popular songs. They transcribe ideas into musical notation, using harmony, rhythm, melody, and tonal structure. Although most

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Singers interpret music, using their knowledge of voice production, melody, and harmony.

composers and songwriters practice their craft on instruments and transcribe the notes with pen and paper, some use computer software to compose and edit their music.

Arrangers transcribe and adapt musical compositions to a particular style for orchestras, bands, choral groups, or individuals. Components of music—including tempo, volume, and the mix of instruments needed—are arranged to express the composer's message. While some arrangers write directly into a musical composition, others use computer software to make changes.

Working Conditions

Musicians typically perform at night and on weekends. They spend much of their remaining time practicing or in rehearsal. Full-time musicians with long-term employment contracts, such as those with symphony orchestras or television and film production companies, enjoy steady work and less travel. Nightclub, solo, or recital musicians frequently travel to perform in a variety of local settings and may tour nationally or internationally. Because many musicians find only part-time or intermittent work, experiencing unemployment between engagements, they often supplement their income with other types of jobs. The stress of constantly looking for work leads many musicians to accept permanent, full-time jobs in other occupations, while working only part time as musicians.

Most instrumental musicians work closely with a variety of other people, including their colleagues, agents, employers, sponsors, and audiences. Although they usually work indoors, some perform outdoors for parades, concerts, and dances. In some nightclubs and restaurants, smoke and odors may be present, and lighting and ventilation may be inadequate.

Employment

Musicians, singers, and related workers held about 215,000 jobs in 2002. Almost 40 percent worked part time, and more than one third were self-employed. Many found jobs in cities in which entertainment and recording activities are concentrated, such as New York, Los Angeles, Chicago, and Nashville.

Musicians, singers, and related workers are employed in a variety of settings. Of those who earn a wage or salary, more than one half are employed by religious organizations and one fourth by performing arts companies, such as professional orchestras, small chamber music groups, opera companies, musical theater companies, and ballet troupes. Musicians and singers also perform in nightclubs and restaurants and for weddings and other events. Well-known musicians and groups may perform in concerts, appear on radio and television broadcasts, and make recordings and music videos. The Armed Forces also offer careers in their bands and smaller musical groups.

Training, Other Qualifications, and Advancement

Aspiring musicians begin studying an instrument at an early age. They may gain valuable experience playing in a school or community band or an orchestra or with a group of friends. Singers usually start training when their voices mature. Participation in school musicals or choirs often provides good early training and experience.

Musicians need extensive and prolonged training to acquire the necessary skills, knowledge, and ability to interpret music. Like other artists, musicians and singers continually strive to stretch themselves—exploring different forms of music. Formal training may be obtained through private study with an accomplished musician, in a college or university music program, or in a music conservatory. For university or conservatory study, an audition generally is necessary. The National Association of Schools of Music accredits nearly 600 college-level programs in music. Courses typically include musical theory, music interpretation, composition, conducting, and performance in a particular instrument or in voice. Music directors, composers, conductors, and arrangers need considerable related work experience or advanced training in these subjects.

Many colleges, universities, and music conservatories grant bachelor's or higher degrees in music. A master's or doctoral degree is usually required to teach advanced music courses in colleges and universities; a bachelor's degree may be sufficient to teach basic courses. A degree in music education qualifies graduates for a State certificate to teach music in public elementary or secondary schools. Musicians who do not meet public school music education requirements may teach in private schools and recreation associations or instruct individual students in private sessions.

Musicians must be knowledgeable about a broad range of musical styles, but keenly aware of the form that interests them most. This broader range of interest, knowledge, and training can help expand employment opportunities and musical abilities. Voice training and private instrumental lessons, taken especially when the individual is young, also help develop technique and enhance one's performance.

Young persons considering careers in music should have musical talent, versatility, creativity, poise, and a good stage presence. Because quality performance requires constant study and practice, self-discipline is vital. Moreover, musicians who play in concerts or in nightclubs and those who tour must have physical stamina to endure frequent travel and an irregular performance schedule. Musicians and singers always must make their performances look effortless; therefore, preparation and practice are important. They also must be prepared to face the anxiety of intermittent employment and of rejection when auditioning for work.

Advancement for musicians usually means becoming better known and performing for higher earnings. Successful musicians often rely on agents or managers to find them performing engagements, negotiate contracts, and develop their careers.

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Job Outlook

Competition for jobs for musicians, singers, and related workers is expected to be keen. The vast number of persons with the desire to perform will exceed the number of openings. Talent alone is no guarantee of success: many people start out to become musicians or singers, but leave the profession because they find the work difficult, the discipline demanding, and the long periods of intermittent unemployment unendurable.

Overall employment of musicians, singers, and related workers is expected to grow about as fast as the average for all occupations through 2012. Most new wage and salary jobs for musicians will arise in religious organizations. Slower-than-average growth is expected for self-employed musicians, who generally perform in nightclubs, concert tours, and other venues. Although growth in demand for musicians will generate a number of job opportunities, many openings also will arise from the need to replace those who leave the field each year because they are unable to make a living solely as musicians or for other reasons.

Earnings

Median annual earnings of salaried musicians and singers were $36,290 in 2002. The middle 50 percent earned between $18,660 and $59,970. The lowest 10 percent earned less than $13,040, and the highest 10 percent earned more than $96,250. Median annual earnings were $43,060 in performing arts companies and $18,160 in religious organizations.

Median annual earnings of salaried music directors and composers were $31,310 in 2002. The middle 50 percent earned between $23,820 and $46,350. The lowest 10 percent earned less than $14,590, and the highest 10 percent earned more than $67,330.

Earnings often depend on the number of hours and weeks worked, a performer's professional reputation, and the setting. The most successful musicians earn performance or recording fees that far exceed the median earnings.

According to the American Federation of Musicians, weekly minimum salaries in major orchestras ranged from $734 to $1,925 during the 2002-03 performing season. Each orchestra works out a separate contract with its local union, with individual musicians eligible to negotiate a higher salary. Top orchestras have a season ranging from 24 to 52 weeks, with 18 orchestras reporting 52-week contracts. In regional orchestras, minimum salaries are often less, because fewer performances are scheduled. Community orchestras often have yet more limited levels of funding and offer salaries that are much lower for seasons of shorter duration. Regional orchestra musicians often are paid for their services, without any guarantee of future employment.

Although musicians employed by some symphony orchestras work under master wage agreements, which guarantee a season's work up to 52 weeks, many other musicians face relatively long periods of unemployment between jobs. Even when employed, many musicians and singers work part time in unrelated occupations. Thus, their earnings usually are lower than earnings in many other occupations. Moreover, because they may not work steadily for one employer, some performers cannot qualify for unemployment compensation, and few have typical benefits such as sick leave or paid vacations. For these reasons, many musicians give private lessons or take jobs unrelated to music to supplement their earnings as performers.

Many musicians belong to a local of the American Federation of Musicians. Professional singers who perform live often belong to a branch of the American Guild of Musical Artists; those who record for the broadcast industries may belong to the American Federation of Television and Radio Artists.

Related Occupations

Musical instrument repairers and tuners (part of precision instrument and equipment repairers) require technical knowledge of musical instruments. Others whose work involves music include actors, producers, and directors; announcers; and dancers and choreographers.

Sources of Additional Information

For general information about music and music teacher education and a list of accredited college-level programs, contact:

➤ National Association of Schools of Music, 11250 Roger Bacon Dr., Suite 21, Reston, VA 22091. Internet: **http://nasm.arts-accredit.org**

Media and Communication-Related Occupations

Announcers

(0*NET 27-3011.00, 27-3012.00)

Significant Points

- Competition for announcer jobs will continue to be keen.
- Jobs at small stations usually have low pay, but offer the best opportunities for beginners.
- Related work experience at a campus radio station or as an intern at a commercial station can be helpful in breaking into the occupation.

Nature of the Work

Announcers in radio and television perform a variety of tasks on and off the air. They announce station program information, such as program schedules and station breaks for commercials, or public service information, and they introduce and close programs. Announcers read prepared scripts or ad-lib commentary on the air, as they present news, sports, weather, time, and commercials. If a written script is required, they may do the research and writing. Announcers also interview guests and moderate panels or discussions. Some provide commentary for the audience during sporting events, at parades, and on other occasions. Announcers often are well known to radio and television audiences and may make promotional appearances and remote broadcasts for their stations.

Radio announcers often are called *disc jockeys* (*DJs*). Some disc jockeys specialize in one kind of music, announcing selections as they air them. Most DJs do not select much of the music they play (although they often did so in the past); instead, they follow schedules of commercials, talk, and music provided to them by management. While on the air, DJs comment on the music, weather, and traffic. They may take requests from listeners, interview guests, and manage listener contests.

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Newscasters, or *anchors*, work at large stations and specialize in news, sports, or weather. (See the related statement on news analysts, reporters, and correspondents elsewhere in the *Handbook*.) *Show hosts* may specialize in a certain area of interest, such as politics, personal finance, sports, or health. They contribute to the preparation of the program's content, interview guests, and discuss issues with viewers, listeners, or the studio audience.

Announcers at smaller stations may cover all of these areas and tend to have more off-air duties as well. They may operate the control board, monitor the transmitter, sell commercial time to advertisers, keep a log of the station's daily programming, and produce advertisements and other recorded material. Advances in technology make it possible for announcers to do some work previously performed by broadcast technicians. At many music stations, the announcer is simultaneously responsible for both announcing and operating the control board, which is used to broadcast programming, commercials, and public-service announcements according to the station's schedule. (See the statement on broadcast and sound engineering technicians and radio operators elsewhere in the *Handbook*.) Public radio and television announcers are involved in station fundraising efforts.

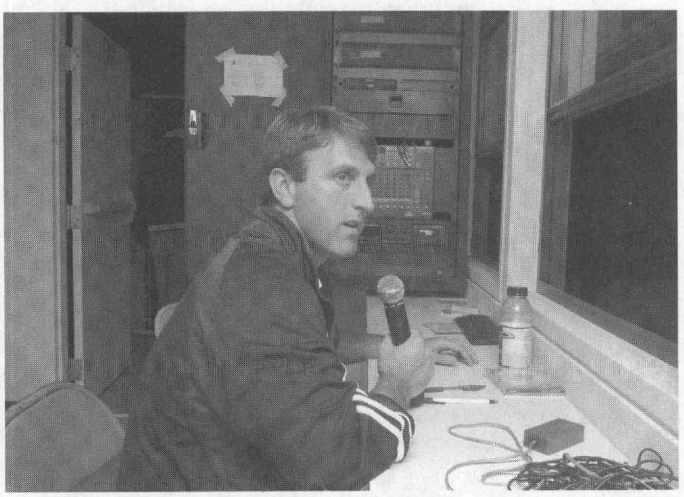
Changes in technology have led to more remote operation of stations. Several stations in different locations of the same region may be operated from one office. Some stations operate without any staff overnight, playing programming from a satellite feed or using programming that was recorder earlier, including segments from announcers.

Announcers frequently participate in community activities. Sports announcers, for example, may serve as masters of ceremonies at sports club banquets or may greet customers at openings of sporting goods stores.

Although most announcers are employed in broadcasting, some are employed in the motion picture production industry. *Public address system announcers* provide information to the audience at sporting, performing arts, and other events. Some disc jockeys announce and play music at clubs, dances, restaurants, and weddings.

Working Conditions

Announcers usually work in well-lighted, air-conditioned, soundproof studios. The broadcast day is long for radio and TV stations—many are on the air 24 hours a day—so announcers can expect to work unusual hours. Many present early-morning shows, when most people are getting ready for work or commuting, while others do late-night programs.



Some public-address system announcers work at sporting events.

Announcers often work within tight schedule constraints, which can be physically and mentally stressful. For many announcers, the intangible rewards—creative work, many personal contacts, and the satisfaction of becoming widely known—far outweigh the disadvantages of irregular and often unpredictable hours, work pressures, and disrupted personal lives.

Employment

Announcers held about 76,000 jobs in 2002. More than half were employed in broadcasting, but some were self-employed freelance announcers who sold their services for individual assignments to networks and stations or to advertising agencies and other independent producers. About a third of all announcers work part time.

Training, Other Qualifications, and Advancement

Entry into this occupation is highly competitive. Formal training in broadcasting from a college or technical school (private broadcasting school) is valuable. Most announcers have a bachelor's degree in a major such as communications, broadcasting, or journalism. Station officials pay particular attention to taped auditions that show an applicant's delivery and—in television—appearance and style on commercials, news, and interviews. Those hired by television stations usually start out as production assistants, researchers, or reporters and are given a chance to move into announcing if they show an aptitude for "on-air" work. A beginner's chance of landing an on-air job is remote, except possibly at a small radio station, as a substitute for a familiar announcer, or on the late-night shift at a larger station. In radio, newcomers usually start out taping interviews and operating equipment.

Announcers usually begin at a station in a small community and, if they are qualified, may move to a better paying job in a large city. They also may advance by hosting a regular program as a disc jockey, sportscaster, or other specialist. Competition is particularly intense for employment by networks, and employers look for college graduates with at least several years of successful announcing experience.

Announcers must have a pleasant and well-controlled voice, good timing, excellent pronunciation, and correct grammar. College broadcasting programs offer courses, such as voice and diction, to help students improve their vocal qualities. Television announcers need a neat, pleasing appearance as well. Knowledge of theater, sports, music, business, politics, and other subjects likely to be covered in broadcasts improves one's chances for success. Announcers also must be computer literate, because programming is created and edited by computer. Announcers need strong writing skills, because they normally write their own material. In addition, they should be able to ad-lib all or part of a show and to work under tight deadlines. The most successful announcers attract a large audience by combining a pleasing personality and voice with an appealing style.

High school and college courses in English, public speaking, drama, foreign languages, and computer science are valuable, and hobbies such as sports and music are additional assets. Students may gain valuable experience at campus radio or TV facilities and at commercial stations while serving as interns. Paid or unpaid internships provide students with hands-on training and the chance to establish contacts in the industry. Unpaid interns often receive college credit and are allowed to observe

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and assist station employees. Although the Fair Labor Standards Act limits the work unpaid interns may perform in a station, unpaid internships are the rule. Unpaid internships sometimes lead to paid internships, which are valuable because interns do work ordinarily performed by regular employees and may even go on the air.

Persons considering enrolling in a broadcasting school should contact personnel managers of radio and television stations, as well as broadcasting trade organizations, to determine the school's reputation for producing suitably trained candidates.

Job Outlook

Competition for jobs as announcers will be keen because the broadcasting field attracts many more jobseekers than there are jobs. Small radio stations are more inclined to hire beginners, but the pay is low. Applicants who have completed internships or have related work experience usually receive preference for available positions. Because competition for ratings is so intense in major metropolitan areas, large stations will continue to seek announcers who have proven that they can attract and retain a sizable audience.

Announcers who are knowledgeable in business, consumer, and health news may have an advantage over others. While specialization is more common at large stations and the networks, many small stations also encourage it.

Employment of announcers is expected to decline through 2012, due to the lack of growth of new radio and television stations and consolidation of existing stations, but some job openings will arise from the need to replace those who transfer to other kinds of work or leave the labor force. Some announcers leave the field because they cannot advance to better paying jobs. Changes in station ownership, format, and ratings frequently cause periods of unemployment for many announcers.

Increasing consolidation of radio and television stations, new technology, and the growth of alternative media sources, such as cable television and satellite radio, will contribute to the expected decline in employment of announcers. Consolidation in broadcasting may lead to an increased use of syndicated programming and programs originating outside a station's viewing or listening area. Digital technology is increasing the productivity of announcers, reducing the time required to edit material or perform other off-air technical and production work.

Earnings

Salaries in broadcasting vary widely, but generally are relatively low, except for announcers who work for large stations in major markets or for networks. Earnings are higher in television than in radio and higher in commercial than in public broadcasting.

Median hourly earnings of announcers in 2002 were $9.91. The middle 50 percent earned between $7.13 and $15.10. The lowest 10 percent earned less than $6.14, and the highest 10 percent earned more than $24.92. Median hourly earnings of announcers in 2002 were $9.86 in the radio and television broadcasting industry.

Related Occupations

The success of announcers depends upon how well they communicate. Others who must be skilled at oral communication include news analysts, reporters, and correspondents; interpreters and translators; salespersons and those in related occupations; and public-relations specialists. Many announcers also must entertain their audience, so their work is similar to other entertainment-related occupations, such as actors, producers, and directors; and musicians, singers, and related workers. Announcers perform a variety of duties, including some technical operations, like broadcast sound engineering technicians and radio operators.

Sources of Additional Information

General information on the broadcasting industry is available from

➤ National Association of Broadcasters, 1771 N St. NW., Washington, DC 20036. Internet: **http://www.nab.org**

Broadcast and Sound Engineering Technicians and Radio Operators

(0*NET 27-4011.00, 27-4012.00, 27-4013.00, 27-4014.00)

Significant Points

- Job applicants face strong competition for jobs in major metropolitan areas, where pay generally is higher; prospects are better in small cities and towns.
- Technical school, community college, or college training in electronics, computer networking, or broadcast technology provides the best preparation.
- About 32 percent work in broadcasting, mainly for radio and television stations, and 16 percent work in the motion picture and sound recording industries.
- Evening, weekend, and holiday work is common.

Nature of the Work

Broadcast and sound engineering technicians and radio operators set up, operate, and maintain a wide variety of electrical and electronic equipment involved in almost any radio or television broadcast, concert, play, musical recording, television show, or movie. With such a range of work, there are many specialized occupations within the field.

Audio and video equipment technicians set up and operate audio and video equipment, including microphones, sound speakers, video screens, projectors, video monitors, recording equipment, connecting wires and cables, sound and mixing boards, and related electronic equipment for concerts, sports events, meetings and conventions, presentations, and news conferences. They may also set up and operate associated spotlights and other custom lighting systems.

Broadcast technicians set up, operate, and maintain equipment that regulates the signal strength, clarity, and range of sounds and colors of radio or television broadcasts. They also operate control panels to select the source of the material. Technicians may switch from one camera or studio to another, from film to live programming, or from network to local programming.

Sound engineering technicians operate machines and equipment to record, synchronize, mix, or reproduce music, voices, or sound effects in recording studios, sporting arenas, theater productions, or movie and video productions.

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Radio operators mainly receive and transmit communications using a variety of tools. They also are responsible for repairing equipment, using such devices as electronic testing equipment, handtools, and power tools. One of their major duties is to help to maintain communication systems in good condition.

Broadcast and sound engineering technicians and radio operators perform a variety of duties in small stations. In large stations and at the networks, technicians are more specialized, although job assignments may change from day to day. The terms "operator," "engineer," and "technician" often are used interchangeably to describe these jobs. Workers in these positions may monitor and log outgoing signals and operate transmitters; set up, adjust, service, and repair electronic broadcasting equipment; and regulate fidelity, brightness, contrast, volume, and sound quality of television broadcasts.

Technicians also work in program production. *Recording engineers* operate and maintain video and sound recording equipment. They may operate equipment designed to produce special effects, such as the illusions of a bolt of lightning or a police siren. *Sound mixers* or *rerecording mixers* produce the soundtrack of a movie or television program. After filming or recording is complete, they may use a process called "dubbing" to insert sounds. *Field technicians* set up and operate portable transmission equipment outside the studio. Television news coverage requires so much electronic equipment, and the technology is changing so rapidly, that many stations assign technicians exclusively to news.

Chief engineers, *transmission engineers*, and *broadcast field supervisors* oversee other technicians and maintain broadcasting equipment.

The transition to digital recording, editing, and broadcasting has greatly changed the work of broadcast and sound engineering technicians and radio operators. Software on desktop computers has replaced specialized electronic equipment in many recording and editing functions. Most radio and television stations have replaced video and audio tapes with computer hard drives and other computer data storage systems. Computer networks linked to the specialized equipment dominate modern broadcasting. This transition has forced technicians to learn computer networking and software skills. (See the statement on computer support specialists and systems administrators elsewhere in the *Handbook*.)



Audio and video equipment technicians monitor and adjust sound and mixing boards.

Working Conditions

Broadcast and sound engineering technicians and radio operators generally work indoors in pleasant surroundings. However, those who broadcast news and other programs from locations outside the studio may work outdoors in all types of weather. Technicians doing maintenance may climb poles or antenna towers, while those setting up equipment do heavy lifting.

Technicians at large stations and the networks usually work a 40-hour week under great pressure to meet broadcast deadlines, and may occasionally work overtime. Technicians at small stations routinely work more than 40 hours a week. Evening, weekend, and holiday work is usual, because most stations are on the air 18 to 24 hours a day, 7 days a week. Even though a technician may not be on duty when the station is broadcasting, some technicians may be on call during nonwork hours; that is, they must handle any problems that occur when they are on call.

Those who work on motion pictures may be on a tight schedule and may work long hours to meet contractual deadlines.

Employment

Broadcast and sound engineering technicians and radio operators held about 93,000 jobs in 2002. Their employment was distributed among the following detailed occupations:

Audio and video equipment technicians	42,000
Broadcast technicians	5,000
Sound engineering technicians	13,000
Radio operators	3,000

About 32 percent worked in broadcasting (except Internet) and 16 percent worked in the motion picture and sound recording industries. Almost 1 in 10 were self-employed. Television stations employ, on average, many more technicians than do radio stations. Some technicians are employed in other industries, producing employee communications, sales, and training programs. Technician jobs in television are located in virtually all cities, whereas jobs in radio also are found in many small towns. The highest paying and most specialized jobs are concentrated in New York City, Los Angeles, Chicago, and Washington, DC—the originating centers for most network or news programs. Motion picture production jobs are concentrated in Los Angeles and New York City.

Training, Other Qualifications, and Advancement

The best way to prepare for a broadcast and sound engineering technician job is to obtain technical school, community college, or college training in electronics, computer networking, or broadcast technology. In the motion picture industry, people are hired as apprentice editorial assistants and work their way up to more skilled jobs. Employers in the motion picture industry usually hire experienced freelance technicians on a picture-by-picture basis. Reputation and determination are important in getting jobs.

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Beginners learn skills on the job from experienced technicians and supervisors. They often begin their careers in small stations and, once experienced, move on to larger ones. Large stations usually hire only technicians with experience. Many employers pay tuition and expenses for courses or seminars to help technicians keep abreast of developments in the field.

Audio and video equipment technicians generally need a high school diploma. Many recent entrants have a community college degree or various other forms of postsecondary degrees, although that is not always a requirement. They may substitute on-the-job training for formal education requirements. Working in a studio, as an assistant, is a great way of gaining experience and knowledge.

Radio operators do not usually require any formal training. This is an entry-level position that generally requires on-the-job training.

The Federal Communications Commission no longer requires the licensing of broadcast technicians, as the Telecommunications Act of 1996 eliminated this licensing requirement. Certification by the Society of Broadcast Engineers is a mark of competence and experience. The certificate is issued to experienced technicians who pass an examination.

Prospective technicians should take high school courses in math, physics, and electronics. Building electronic equipment from hobby kits and operating a "ham," or amateur, radio are good experience, as is work in college radio and television stations.

Broadcast and sound engineering technicians and radio operators must have manual dexterity and an aptitude for working with electrical, electronic, and mechanical systems and equipment.

Experienced technicians can become supervisory technicians or chief engineers. A college degree in engineering is needed in order to become chief engineer at a large television station.

Job Outlook

People seeking entry-level jobs as technicians in broadcasting are expected to face strong competition in major metropolitan areas, where pay generally is higher and the number of qualified jobseekers typically exceeds the number of openings. There, stations seek highly experienced personnel. Prospects for entry-level positions usually are better in small cities and towns for beginners with appropriate training.

Overall employment of broadcast and sound engineering technicians and radio operators is expected to about as fast as the average for all occupations through the year 2012. Job growth in radio and television broadcasting will be limited by consolidation of ownership of radio and television stations, and by laborsaving technical advances such as computer-controlled programming and remotely controlled transmitters. Changes to Federal Communications Commission (FCC) regulations now allow a single owner for up to eight radio stations in a single large market, and rules changes under consideration may have a similar impact on the ownership of television stations. Owners of multiple stations often consolidate the stations into a single location, reducing employment because one or a few technicians can provide support to multiple stations. Technicians who know how to install transmitters will be in demand as television stations install digital transmitters. Although most television stations are broadcasting in both analog and digital formats and plan to switch entirely to digital, radio stations are only beginning to broadcast digital signals.

Employment of broadcast and sound engineering technicians in the cable and pay television portion of the broadcasting industry should grow as the range of services is expanded to provide, such products as cable Internet access and video-on-demand. Employment of these workers in the motion picture industry will grow rapidly. However, job prospects are expected to remain competitive because of the large number of people who are attracted by the glamour of working in motion pictures.

Projected job growth varies among detailed occupations in this field. Employment of broadcast technicians is expected to grow about as fast as the average for all occupations through 2012, as advancements in technology enhance the capabilities of technicians to produce higher quality radio and television programming. Employment of radio operators is expected to decline as more stations operate transmitters that control programming remotely. Employment of audio and video equipment technicians and sound engineering technicians is expected to grow faster than the average for all occupations. Not only will these workers have to set up audio and video equipment, but it will be necessary for them to maintain and repair this equipment.

In addition to employment growth, job openings also will result from the need to replace experienced technicians who leave this field. Some of these workers leave for other jobs that require knowledge of electronics, such as computer repairer or industrial machinery repairer.

Earnings

Television stations usually pay higher salaries than do radio stations; commercial broadcasting usually pays more than public broadcasting; and stations in large markets pay more than those in small markets.

Median annual earnings of broadcast technicians in 2002 were $27,760. The middle 50 percent earned between $18,860 and $45,200. The lowest 10 percent earned less than $14,600, and the highest 10 percent earned more than $65,970.

Median annual earnings of sound engineering technicians in 2002 were $36,970. The middle 50 percent earned between $24,330 and $57,350. The lowest 10 percent earned less than $18,540, and the highest 10 percent earned more than $82,510.

Median annual earnings of audio and video equipment technicians in 2002 were $31,110. The middle 50 percent earned between $22,670 and $43,950. The lowest 10 percent earned less than $17,710, and the highest 10 percent earned more than $61,420.

Median annual earnings of radio operators in 2002 were $31,530. The middle 50 percent earned between $24,000 and $41,430. The lowest 10 percent earned less than $17,380, and the highest 10 percent earned more than $56,340.

Related Occupations

Broadcast and sound engineering technicians and radio operators need the electronics training necessary to operate technical equipment, and they generally complete specialized postsecondary programs. Occupations with similar characteristics include engineering technicians, science technicians, and

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electrical and electronics installers and repairers. Broadcast and sound engineering technicians also may operate computer networks, as do computer support specialists and systems administrators. Broadcast technicians on some live radio and television programs are responsible for screening incoming calls, similar to the work of communications equipment operators.

Sources of Additional Information

For career information and links to employment resources, contact:

➤ National Association of Broadcasters, 1771 N St. NW., Washington, DC 20036. Internet: **http://www.nab.org**

For information on certification, contact:

➤ Society of Broadcast Engineers, 9247 North Meridian St., Suite 305, Indianapolis, IN 46260. Internet: **http://www.sbe.org**

Interpreters and Translators

(0*NET 27-3091.00)

Significant Points

- Twenty percent of these workers are self-employed.
- Work is often sporadic and many interpreters and translators work part time.
- Although training requirements can vary, almost all interpreters and translators have a bachelor's degree.
- Job outlook varies by specialty and language combination.

Nature of the Work

Interpreters and translators enable the cross-cultural communication necessary in today's society by converting one language into another. However, these language specialists do more than simply translate words—they relay concepts and ideas between languages. They must thoroughly understand the subject matter in which they work, so that they are able to convert information from one language, known as the source language, into another, the target language. In addition, they must remain sensitive to the cultures associated with their languages of expertise.

Interpreters and translators are often discussed together because they share some common traits. For example, both need a special ability, known as language combination. This enables them to be fluent in at least two languages—a native, or active, language and a secondary, or passive, language. Their active language is the one they know best and into which they interpret or translate, and their passive language is one of which they have nearly perfect knowledge.

Although some people do both, interpretation and translation are different professions. Each requires a distinct set of skills and aptitudes, and most people are better suited for one or the other. While interpreters often work into and from both languages, translators generally work only into their active language.

Interpreters convert one spoken language into another—or, in the case of sign-language interpreters, between spoken communication and sign language. This requires interpreters to pay attention carefully, understand what is communicated in both languages, and express thoughts and ideas clearly. Strong research and analytical skills, mental dexterity, and an exceptional memory also are important.

The first part of an interpreter's work begins before arriving at the jobsite. The interpreter must become familiar with the subject matter that the speakers will cover, a task that may involve research to create a list of common words and phrases associated with the topic. Next, the interpreter usually travels to the location where his or her services are needed. Physical presence may not be required for some work, such as telephone interpretation. But it is usually important that the interpreter see the communicators in order to hear and observe the person speaking and to relay the message to the other party.

There are two types of interpretation: simultaneous and consecutive. Simultaneous interpretation requires interpreters to listen and speak (or sign) at the same time. In simultaneous interpretation, the interpreter begins to convey a sentence being spoken while the speaker is still talking. Ideally, simultaneous interpreters should be so familiar with a subject that they are able to anticipate the end of the speaker's sentence. Because they need a high degree of concentration, simultaneous interpreters work in pairs, with each interpreting for 20- to 30-minute segments. This type of interpretation is required at international conferences and is sometimes used in the courts.

In contrast to simultaneous interpretation's immediacy, consecutive interpretation begins only after the speaker has verbalized a group of words or sentences. Consecutive interpreters often take notes while listening to the speakers, so they must develop some type of note-taking or shorthand system. This form of interpretation is used most often for person-to-person communication, during which the interpreter sits near both parties.

Translators convert written materials from one language into another. They must have excellent writing and analytical ability. And because the documents they translate must be as flawless as possible, they also need good editing skills.

Translators' assignments may vary in length, writing style, and subject matter. When they first receive text to convert into another language, translators usually read it in its entirety to get an idea of the subject. Next, they identify and look up any unfamiliar words. Translators also might do additional reading on the subject matter if they are unclear about anything in the text. However, they also consult with the text's originator or issuing agency to clarify unclear or unfamiliar ideas, words, or acronyms.

Translating involves more than replacing a word with its equivalent in another language; sentences and ideas must be manipulated to flow with the same coherence as those in the source document, so that the translation reads as though it originated in the target language. Translators also must bear in mind any cultural references that may need to be explained to the intended audience, such as colloquialisms, slang, and other expressions that do not translate literally. Some subjects may be more difficult than others to translate because words or passages may have multiple meanings that make several translations possible. Not surprisingly, translated work often goes through multiple revisions before final text is submitted.

The way in which translators do their jobs has changed with advancements in technology. Today, nearly all translation work

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is done on a computer, and most assignments are received and submitted electronically. This enables translators to work from almost anywhere, and a large percentage of them work from home. The Internet provides advanced research capabilities and valuable language resources, such as specialized dictionaries and glossaries. In some cases, use of machine-assisted translation—including memory tools that provide comparisons of previous translations with current work—helps save time and reduce repetition.

The services of interpreters and translators are needed in a number of subject areas. While these workers may not completely specialize in a particular field or industry, many do focus on one area of expertise. Some of the most common areas are described below; however, interpreters and translators also may work in a variety of other areas, including business, social services, or entertainment.

Conference interpreters work at conferences that involve non-English-speaking attendees. This work includes international business and diplomacy, although conference interpreters also may interpret for any organization that works with foreign language speakers. Employers prefer high-level interpreters who have at least two language combinations—for example, the ability to interpret from English to French and English to Spanish. For some positions, such as those with the United Nations, this qualification is mandatory.

Much of the interpreting performed at conferences is simultaneous; however, at some meetings with a small number of attendees, consecutive interpreting also may be used. Usually, interpreters sit in soundproof booths, listening to the speakers through headphones and interpreting into a microphone what is said. The interpreted speech is then relayed to the listener through headsets. When interpreting is needed for only one or two people, the *chuchotage*, or *whispering*, method may be used. The interpreter sits behind or next to the attendee and whispers a translation of the proceedings.

Guide or escort interpreters accompany either U.S. visitors abroad or foreign visitors in the United States to ensure that they are able to communicate during their stay. These specialists interpret on a variety of subjects, both on an informal basis and on a professional level. Most of their interpretation is consecutive, and work is generally shared by two interpreters when the assignment requires more than an 8-hour day. Frequent travel, often for days or weeks at a time, is common, a factor which some find particularly appealing.

Judiciary interpreters and translators help people appearing in court who are unable or unwilling to communicate in English. These workers must remain detached from the content of their work and not alter or modify the meaning or tone of what is said. Legal translators must be thoroughly familiar with the language and functions of the U.S. judicial system, as well as other countries' legal systems. Court interpreters work in a variety of legal settings, such as attorney-client meetings, preliminary hearings, depositions, trials, and arraignments. Success as a court interpreter requires an understanding of both legal terminology and colloquial language. In addition to interpreting what is said, court interpreters also may be required to translate written documents and read them aloud, also known as sight translation.

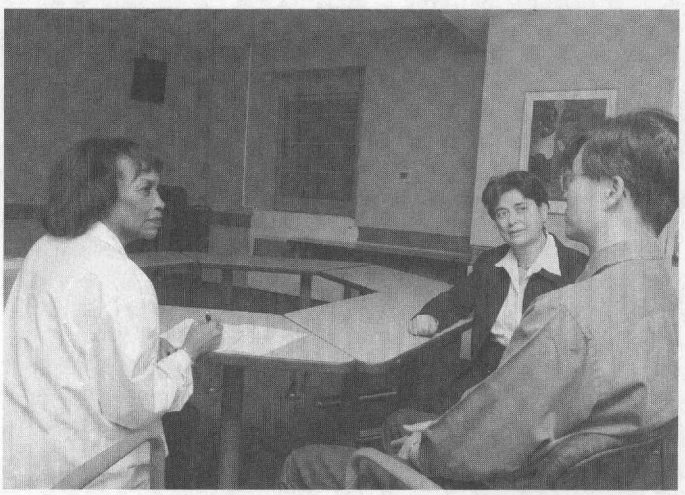
Literary translators adapt written literature from one language into another. They may translate any number of documents, including journal articles, books, poetry, and short stories. Literary translation is related to creative writing; literary translators must create a new text in the target language that reproduces the content and style of the original. Whenever possible, literary translators work closely with authors in order to best capture their intended meanings and literary characteristics.

This type of work often is done as a sideline by university professors; however, opportunities exist for well-established literary translators. As is the case with writers, finding a publisher is a critical part of the job. Most aspiring literary translators begin by submitting a short sample of their work, in the hope that it will be printed and give them recognition. For example, after receiving permission from the author, they might submit to a publishing house a previously unpublished short work, such as a poem or essay.

Localization translators constitute a relatively recent and rapidly expanding specialty. Localization involves the complete adaptation of a product for use in a different language and culture. At its earlier stages, this work dealt primarily with software localization, but the specialty has expanded to include the adaptation of Internet sites and products in manufacturing and other business sectors.

Translators working in localization need a solid grasp of the languages to be translated, a thorough understanding of technical concepts and vocabulary, and a high degree of knowledge about the intended target audience or users of the product. The goal of these specialists is for the product to appear as if it were originally manufactured in the country where it will be sold and supported. Because software often is involved, it is not uncommon for people who work in this area of translation to have a strong background in computer science or computer-related work experience.

Providing language services to healthcare patients with limited English proficiency is the realm of *medical interpreters and translators*. Medical interpreters help patients to communicate with doctors, nurses, and other medical staff. Translators working in this specialty primarily convert patient materials and informational brochures, issued by hospitals and medical facilities, into the desired language. Medical interpreters need a strong grasp of medical and colloquial terminology in both languages, along with cultural sensitivity regarding how the patient receives the information. They must remain detached but aware of the patient's feelings and pain.



Interpreters help people who speak different languages to communicate with each other.

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Sign language interpreters facilitate communication between people who are deaf or hard of hearing and people who can hear. Sign language interpreters must be fluent in English and American Sign Language (ASL), which combines signing, finger spelling, and specific body language. ASL has its own grammatical rules, sentence structure, idioms, historical contexts, and cultural nuances. Sign language interpreting, like foreign language interpreting, involves more than simply replacing a word of spoken English with a sign representing that word.

Most sign language interpreters either interpret, aiding communication between English and ASL, or transliterate, facilitating communication between English and contact signing—a form of signing that uses a more English language-based word order. Some interpreters specialize in oral interpreting for deaf or hard of hearing persons who lipread instead of sign. Other specialties include tactile signing, interpreting for persons who are deaf-blind; cued speech; and signing exact English.

Working Conditions

Working environments of interpreters and translators vary. Interpreters work in a variety of settings, such as hospitals, courtrooms and conference centers. They are required to travel to the site—whether it is a neighboring town or the other side of the world—where their services are needed. Interpreters who work over the telephone generally work on call or in call centers in urban areas and keep to a standard 5-day, 40-hour workweek. Interpreters for deaf students in schools usually work in a school setting and work 9 months out of the year. Translators usually work alone, and they must frequently perform under pressure of deadlines and tight schedules. Many translators choose to work at home; however, technology allows translators to work from virtually anywhere.

Because many interpreters and translators freelance, their schedules are often erratic, with extensive periods of no work interspersed with others requiring long, irregular hours. For those who freelance, a significant amount of time must be dedicated to looking for jobs. In addition, freelancers must manage their own finances, and payment for their services may not always be prompt. Freelancing, however, offers variety and flexibility, and allows many workers to choose which jobs to accept or decline.

The number of work-related accidents in these occupations is relatively low. The work can be stressful and exhausting and translation can be lonesome or dull. However, interpreters and translators may use their irregular schedules to pursue other interests, such as traveling, dabbling in a hobby, or working a second job. Many interpreters and translators enjoy what they do and value the ability to control their schedules and workloads.

Employment

Interpreters and translators held about 24,000 jobs in 2002. Because of the large number of people who work in the occupation sporadically, however, the actual number of interpreters and translators is probably significantly higher. Reflecting the diversity of employment options in the field, interpreters and translators are employed in a variety of industries. Nearly 3 in 10 worked in public and private educational institutions, such as schools, colleges, and universities. About 1 in 10 worked in healthcare, many of which worked for hospitals. More than 1 in 10 worked in other areas of government, such as Federal, State and local courts. Other employers of interpreters and translators include publishing companies, telephone companies, airlines, and interpreting and translating agencies.

More than 2 in 10 interpreters and translators are self-employed. To find work, these interpreters and translators may submit resumes to 100 or more employment agencies, and then wait to be contacted when an agency matches their skills with a job. After establishing a few regular clients, interpreters and translators often hear of subsequent jobs by word of mouth; or, they may receive enough work from a few clients to stay busy. Many who freelance in the occupation work only part time, relying on other sources of income to supplement earnings from interpreting or translation.

Training, Other Qualifications, and Advancement

The educational backgrounds of interpreters and translators vary. Knowing a language in addition to a native language is a given. Although it is not necessary to have been raised bilingual to succeed, many interpreters and translators grew up speaking two languages.

In high school, students can begin to prepare for these careers by taking a broad range of courses that include English writing and comprehension, foreign languages, and basic computer proficiency. Other helpful pursuits include spending time abroad, or comparable forms of direct contact with foreign cultures, and extensive reading on a variety of subjects in English and at least one other language.

Beyond high school, there are many educational options. Although a bachelor's degree is almost always required, interpreters and translators note that it is acceptable to major in something other than a language. However, specialized training in how to do the work is generally required. A number of formal programs in interpreting and translation are available at colleges nationwide and through nonuniversity training programs, conferences, and courses. Many people who work as conference interpreters or in more technical areas—such as localization, engineering, or finance—have master's degrees, while those working in the community as court or medical interpreters or translators are more likely to complete job-specific training programs.

There is currently no universal form of certification required of all interpreters and translators in the United States, but there are a variety of different tests that workers can take to demonstrate proficiency. The American Translators Association provides accreditation in more than 24 language combinations for its members; other options include a certification program offered by The Translators and Interpreters Guild. Many interpreters are not certified. Federal courts have certification for Spanish, Navaho, and Haitian Creole interpreters, and many State and municipal courts offer their own forms of certification. The National Association of Judiciary Interpreters and Translators also offers certification for court interpreting.

The U.S. Department of State has a three-test series for interpreters, including simple consecutive interpreting (escort), simultaneous interpreting (court/seminar), and conference-level interpreting (international conferences). These tests are not referred to directly as certification, but successful completion often indicates that a person has an adequate level of skill to work in the field.

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Both the National Association of the Deaf and the Registry of Interpreters for the Deaf offer certification for sign interpreters and have recently collaborated to develop a joint exam.

Experience is an essential part of a successful career in either interpreting or translation. In fact, many agencies or companies use only the services of people who have worked in the field for 3 to 5 years or who have a degree in translation studies or both.

A good way for translators to learn firsthand about the profession is to start out working in-house for a company; however, such jobs are not very numerous. Advice for new entrants to the field is to begin getting experience whatever way they can—even if it means doing informal or unpaid work. Mentoring relationships and internships are other ways to build skills and confidence. Escort interpreting may offer an opportunity for inexperienced candidates to work alongside a more seasoned interpreter. Interpreters might also find it easier to break into areas with particularly high demand for language services, such as court or medical interpretation. Once interpreters and translators have gained sufficient experience, they may then move up to more difficult or prestigious assignments, may be given editorial responsibility, or may eventually manage or start their own translation agency.

Job Outlook

Employment of interpreters and translators is projected to grow faster than the average for all occupations over the 2002-12 period, reflecting growth in the industries employing interpreters and translators. Higher demand for interpreters and translators in recent years has resulted directly from the broadening of international ties and the increase in foreign language speakers in the United States. Both of these trends are expected to continue, contributing to relatively rapid growth in the number of jobs for interpreters and translators.

Technology has made the work of interpreters and translators easier. However, technology is not likely to have a negative impact on employment of interpreters and translators because such innovations are incapable of producing work comparable with work produced by these professionals.

Translators are most in demand for the languages referred to as "PFIGS"—Portuguese, French, Italian, German, and Spanish—and the principal Asian languages—Chinese, Japanese, and Korean. Current events and changing political environments, often difficult to foresee, sometimes increase the need for persons who can work with other languages.

Urban areas, especially those in California, New York, and Washington, DC, provide the largest numbers of employment possibilities, especially for interpreters; however, as the immigrant population spreads into more rural areas, jobs in smaller communities will become more widely available.

Job prospects for interpreters and translators vary by specialty. In particular, there should be strong demand for specialists in localization, driven by imports and exports, the expansion of the Internet, and demand in other technical areas such as medicine or law. Rapid employment growth among interpreters and translators in health services industries will be fueled by relatively recent guidelines regarding compliance with Title VI of the Civil Rights Act, which requires all healthcare providers receiving Federal aid to provide language services to non-English speakers. Similarly, the Americans with Disabilities Act and other laws, such as the Rehabilitation Act, mandate that, in certain situations, an interpreter must be available for people who are deaf or hard of hearing. Given the lack of qualified candidates meeting these requirements, interpreters for the deaf will continue to have favorable employment prospects. On the other hand, job growth is expected to be limited for both conference interpreters and literary translators.

Earnings

Salaried interpreters and translators had median hourly earnings of $15.67 in 2002. The middle 50 percent earned between $11.97 and $20.33. The lowest 10 percent earned less than $9.37, and the highest 10 percent earned more than $25.99. Limited information suggests that highly skilled interpreters and translators—for example, high-level conference interpreters—working full time can earn more than $100,000 annually. Earnings depend on language, subject matter, skill, experience, education, certification, and type of employer, and salaries of interpreters and translators can vary widely. Interpreters and translators with language skills for which there is a greater demand, or for which there are relatively few people with the skills, often have higher earnings. According to a 2001 salary survey by the American Translators Association, Chinese and Japanese interpreters and translators earned the highest median hourly rates—ranging from $45 to $50 an hour. Interpreters and translators with specialized expertise, such as those working in software localization, also generally command higher rates. Individuals classified as language specialists for the Federal Government earned an average of $64,234 annually in 2003.

For those who are not salaried, earnings may fluctuate, depending on the availability of work. Furthermore, freelancers do not have any employer-paid benefits. Freelance interpreters usually earn an hourly rate, whereas translators who freelance typically earn a rate per word or per hour.

Related Occupations

Interpreters and translators use their multilingual skills, as do teachers of languages. These include teachers—preschool, kindergarten, elementary, middle, and secondary; teachers—postsecondary; teachers—special education; and teachers—adult literacy and remedial and self-enrichment education. The work of interpreters, particularly guide or escort interpreters, can be likened to that of tour and travel guides, in that they accompany individuals or groups on tours or to places of interest. Similarly, interpreters may share some common work characteristics with announcers, who also work in soundproof environments relaying information to listeners.

The work of translators is similar to that of writers and editors, in that they communicate information and ideas through the written word and prepare texts for publication or dissemination. Those working in localization of software have skills similar to those of computer software engineers, in that they analyze users' needs and design, create, and modify computer software, and many possess strong programming skills. Furthermore, interpreters or translators working in a legal or healthcare environment are required to have a knowledge of terms and concepts that is similar to that of professionals working in these fields, such as court reporters or medical transcriptionists.

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Sources of Additional Information

Organizations dedicated to these professions can provide valuable advice and guidance for people interested in learning more about interpretation and translation. The language services division of local hospitals or courthouses also may be able to offer information about available opportunities.

For career information, contact the organizations listed below:

➤ American Translators Association, 225 Reinekers Lane, Suite 590, Alexandria, VA 22314. Internet: **http://www.atanet.org**

➤ The Translators and Interpreters Guild, 8611 Second Ave., Suite 203, Silver Spring, MD 20910. Internet: **http://www.ttig.org**

➤ U.S. Department of State, Office of Language Services, Room 2212, Washington, DC 20520.

For more detailed information by specialty, contact the association affiliated with that subject area:

➤ National Association of Judiciary Interpreters and Translators, 2150 N. 107th St., Suite 205, Seattle, WA 98133. Internet: **http://www.najit.org**

➤ American Literary Translators Association, PO Box 830688, Richardson, TX 75083. Internet: **http://www.literarytranslators.org**

➤ The Localisation Industry Standards Association, 7 Route du Monastère-CH-1173, Féchy, Switzerland. Internet: **http://www.lisa.org**

➤ Massachusetts Medical Interpreters Association, New England Medical Center, 750 Washington St., NEMC Box 271, Boston, MA 02111. Internet: **http://www.mmia.org**

➤ Registry of Interpreters for the Deaf, 333 Commerce St., Alexandria, VA 22314. Internet: **http://www.rid.org**

News Analysts, Reporters, and Correspondents

(0*NET 27-3021.00, 27-3022.00)

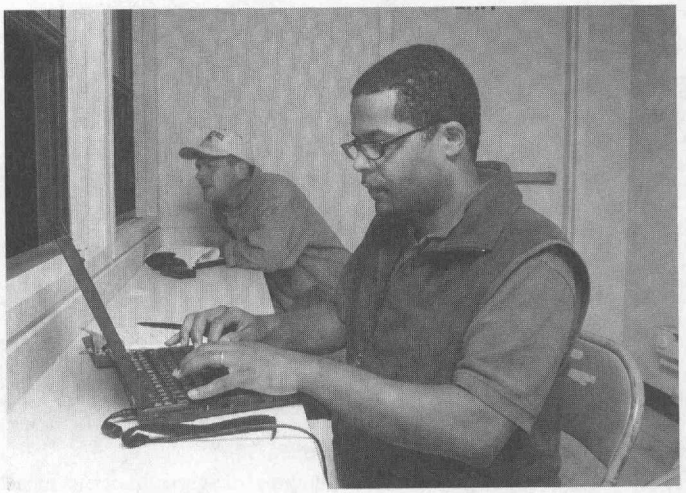
Significant Points

- Most employers prefer experienced individuals with a bachelor's degree in journalism or mass communications.
- Competition will be keen for jobs at large metropolitan and national newspapers, broadcast stations, and magazines; most entry-level openings arise at small broadcast stations and publications.
- Jobs often involve irregular hours, night and weekend work, and pressure to meet deadlines.

Nature of the Work

News analysts, reporters, and correspondents play a key role in our society. They gather information, prepare stories, and make broadcasts that inform us about local, State, national, and international events; present points of view on current issues; and report on the actions of public officials, corporate executives, special-interest groups, and others who exercise power.

News analysts examine, interpret, and broadcast news received from various sources. They also are called *newscasters* or *news anchors*. News anchors present news stories and introduce videotaped news or live transmissions from on-the-scene reporters. Some newscasters at large stations and networks specialize in a particular type of news, such as sports or weather. *Weathercasters*, also called weather reporters, report current and forecasted weather conditions. They gather information from national satellite weather services, wire services, and local and regional weather bureaus. Some weathercasters are trained meteorologists and can develop their own weather forecasts. (See the statement on atmospheric scientists elsewhere in the *Handbook*.) *Sportscasters* select, write, and deliver sports news. This may include interviews with sports personalities and coverage of games and other sporting events.



Reporters often travel to sporting events.

In covering a story, *reporters* investigate leads and news tips, look at documents, observe events at the scene, and interview people. Reporters take notes and also may take photographs or shoot videos. At their office, they organize the material, determine the focus or emphasis, write their stories, and edit accompanying video material. Many reporters enter information or write stories on laptop computers, and electronically submit the material to their offices from remote locations. In some cases, *newswriters* write a story from information collected and submitted by reporters. Radio and television reporters often compose stories and report "live" from the scene. At times, they later tape an introduction to or commentary on their story in the studio. Some journalists also interpret the news or offer opinions to readers, viewers, or listeners. In this role, they are called *commentators* or *columnists*.

General assignment reporters write about newsworthy occurrences, such as an accident, a political rally, the visit of a celebrity, or a company going out of business, as assigned. Large newspapers and radio and television stations assign reporters to gather news about specific topics or "beats," such as crime or education. Some reporters specialize in fields such as health, politics, foreign affairs, sports, theater, consumer affairs, social events, science, business, or religion. Investigative reporters cover stories that may take many days or weeks of information gathering. Some publications use teams of reporters instead of assigning specific beats, allowing reporters to cover a greater variety of stories. News teams may include reporters, editors, graphic artists, and photographers, working together to complete a story.

News *correspondents* report on news occurring in the large U.S. and foreign cities where they are stationed. Reporters on small publications cover all aspects of the news. They take photographs, write headlines, lay out pages, edit wire service stories, and write editorials. Some also solicit advertisements, sell subscriptions, and perform general office work.

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Working Conditions

The work of news analysts, reporters, and correspondents is usually hectic. They are under great pressure to meet deadlines. Broadcasts sometimes are made with little or no time for preparation. Some news analysts, reporters, and correspondents work in comfortable, private offices; others work in large rooms filled with the sound of keyboards and computer printers, as well as the voices of other reporters. Curious onlookers, police, or other emergency workers can distract those reporting from the scene for radio and television. Covering wars, political uprisings, fires, floods, and similar events is often dangerous.

Working hours vary. Reporters on morning papers often work from late afternoon until midnight. Radio and television reporters usually are assigned to a day or evening shift. Magazine reporters usually work during the day.

Reporters sometimes have to change their work hours to meet a deadline, or to follow late-breaking developments. Their work demands long hours, irregular schedules, and some travel. Many stations and networks are on the air 24 hours a day, so newscasters can expect to work unusual hours.

Employment

News analysts, reporters, and correspondents held about 66,000 jobs in 2002. About 60 percent worked for newspaper, periodical, book, and directory publishers. Another 25 percent worked in radio and television broadcasting. About 4,100 news analysts, reporters, and correspondents were self-employed.

Training, Other Qualifications, and Advancement

Most employers prefer individuals with a bachelor's degree in journalism or mass communications, but some hire graduates with other majors. They look for experience on school newspapers or broadcasting stations and internships with news organizations. Large-city newspapers and stations also may prefer candidates with a degree in a subject-matter specialty such as economics, political science, or business. Some large newspapers and broadcasters may hire only experienced reporters.

Bachelor's degree programs in journalism are available at more than 400 colleges or universities. About three-fourths of the courses in a typical curriculum are in liberal arts; the remaining courses are in journalism. Examples of journalism courses are introductory mass media, basic reporting and copy editing, history of journalism, and press law and ethics. Students planning a career in broadcasting take courses in radio and television news and production. Those planning newspaper or magazine careers usually specialize in news-editorial journalism. To create a story for an online presentation, they need to know how to use computer software to combine online story text with audio and video elements and graphics.

Many community and junior colleges offer journalism courses or programs; credits may be transferable to 4-year journalism programs. About 120 schools offered a master's degree in journalism in 2002; about 35 schools offered a Ph.D. degree. Some graduate programs are intended primarily as preparation for news careers, while others prepare journalism teachers, researchers and theorists, and advertising and public relations workers.

High school courses in English, journalism, and social studies provide a good foundation for college programs. Useful college liberal arts courses include English with an emphasis on writing, sociology, political science, economics, history, and psychology. Courses in computer science, business, and speech are useful as well. Fluency in a foreign language is necessary in some jobs.

Although reporters need good word processing skills, computer graphics and desktop publishing skills also are useful. Computer-assisted reporting involves the use of computers to analyze data in search of a story. This technique and the interpretation of the results require computer skills and familiarity with databases. Knowledge of news photography also is valuable for entry-level positions, which sometimes combine the responsibilities of a reporter with those of a camera operator or photographer.

Employers report that practical experience is the most important part of education and training. Upon graduation many students have already gained much practical experience through part-time or summer jobs or through internships with news organizations. Most newspapers, magazines, and broadcast news organizations offer reporting and editing internships. Work on high school and college newspapers, at broadcasting stations, or on community papers or U.S. Armed Forces publications also provides practical training. In addition, journalism scholarships, fellowships, and assistantships awarded to college journalism students by universities, newspapers, foundations, and professional organizations are helpful. Experience as a stringer or freelancer—a part-time reporter who is paid only for stories printed—is advantageous.

Reporters should be dedicated to providing accurate and impartial news. Accuracy is important, both to serve the public and because untrue or libelous statements can lead to lawsuits. A nose for news, persistence, initiative, poise, resourcefulness, a good memory, and physical stamina are important, as is the emotional stability to deal with pressing deadlines, irregular hours, and dangerous assignments. Broadcast reporters and news analysts must be comfortable on camera. All reporters must be at ease in unfamiliar places and with a variety of people. Positions involving on-air work require a pleasant voice and appearance.

Most reporters start at small publications or broadcast stations as general assignment reporters or copy editors. Large publications and stations hire few recent graduates; as a rule, they require new reporters to have several years of experience.

Beginning reporters cover court proceedings and civic and club meetings, summarize speeches, and write obituaries. With experience, they report more difficult assignments, cover an assigned beat, or specialize in a particular field.

Some news analysts and reporters can advance by moving to larger newspapers or stations. A few experienced reporters become columnists, correspondents, writers, announcers, or public relations specialists. Others become editors in print journalism or program managers in broadcast journalism, who supervise reporters. Some eventually become broadcasting or publishing industry managers.

Job Outlook

Employment of news analysts, reporters, and correspondents is expected to grow more slowly than the average for all occupations through the year 2012—the result of mergers, consolidations, and closures of newspapers; decreased circulation; increased expenses; and a decline in advertising profits. In addition to consolidation of local newspaper and television

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and radio station ownership, increasing competition for viewers from cable networks also should limit employment growth. Some job growth is expected in new media areas, such as online newspapers and magazines. Job openings also will result from the need to replace workers who leave their occupations permanently. Some news analysts, reporters, and correspondents find the work too stressful and hectic or do not like the lifestyle, and transfer to other occupations.

Most opportunities will be with smalltown and suburban newspapers and radio and television stations. Competition will continue to be keen for more sought-after jobs on large metropolitan and national newspapers, broadcast stations and networks, and magazines. Talented writers who can handle highly specialized scientific or technical subjects have an advantage. Also, newspapers increasingly are hiring stringers and freelancers.

Journalism graduates have the background for work in closely related fields such as advertising and public relations, and many take jobs in these fields. Other graduates accept sales, managerial, or other nonmedia positions.

The number of job openings in the newspaper and broadcasting industries—in which news analysts, reporters, and correspondents are employed—is sensitive to economic ups and downs, because these industries depend on advertising revenue.

Earnings

Salaries for news analysts, reporters, and correspondents vary widely. Median annual earnings of news analysts, reporters, and correspondents were $30,510 in 2002. The middle 50 percent earned between $22,350 and $47,170. The lowest 10 percent earned less than $17,620, and the highest 10 percent earned more than $69,450. Median annual earnings of news analysts, reporters, and correspondents were $33,320 in radio and television broadcasting and $29,090 in newspaper, periodical, book, and directory publishers in 2002.

Related Occupations

News analysts, reporters, and correspondents must write clearly and effectively to succeed in their profession. Others for whom good writing ability is essential include writers and editors, and public relations specialists. Many news analysts, reporters, and correspondents also must communicate information orally. Others for whom oral communication skills are important are announcers, interpreters and translators, sales and related occupations, and teachers.

Sources of Additional Information

For information on broadcasting education and scholarship resources, contact:

➤ National Association of Broadcasters, 1771 N St. NW., Washington, DC 20036. Internet: **http://www.nab.org**

Information on careers in journalism, colleges and universities offering degree programs in journalism or communications, and journalism scholarships and internships may be obtained from:

➤ Dow Jones Newspaper Fund, Inc., P.O. Box 300, Princeton, NJ 08543-0300.

Information on union wage rates for newspaper and magazine reporters is available from:

➤ Newspaper Guild, Research and Information Department, 501 3rd St. NW., Suite 250, Washington, DC 20001.

For a list of schools with accredited programs in journalism and mass communications, send a stamped, self-addressed envelope to:

➤ Accrediting Council on Education in Journalism and Mass Communications, University of Kansas School of Journalism and Mass Communications, Stauffer-Flint Hall, 1435 Jayhawk Blvd., Lawrence, KS 66045. Internet: **http://www.ku.edu/~acejmc/STUDENT/STUDENT.SHTML**

Names and locations of newspapers and a list of schools and departments of journalism are published in the *Editor and Publisher International Year Book*, available in most public libraries and newspaper offices.

Photographers

(0*NET 27-4021.01, 27-4021.02)

Significant Points

- Competition for jobs is expected to be keen because the work is attractive to many people.
- Technical expertise, a "good eye," imagination, and creativity are essential.
- More than half of all photographers are self-employed; the most successful are able to adapt to rapidly changing technologies and are adept at operating a business.

Nature of the Work

Photographers produce and preserve images that paint a picture, tell a story, or record an event. To create commercial quality photographs, photographers need both technical expertise and creativity. Producing a successful picture requires choosing and presenting a subject to achieve a particular effect, and selecting the appropriate equipment. For example, photographers may enhance the subject's appearance with natural or artificial light, use a particular lens depending on the desired range or level of detail, or draw attention to a particular aspect of the subject by blurring the background.

Today, many cameras adjust settings such as shutter speed and aperture automatically. They also let the photographer adjust these settings manually, allowing greater creative and technical control over the picture-taking process. In addition to automatic and manual cameras, photographers use an array of film, lenses, and equipment—from filters, tripods, and flash attachments to specially constructed lighting equipment.

Photographers use either a traditional camera that records images on silver halide film that is developed into prints or a digital camera that electronically records images. Some photographers send their film to laboratories for processing. Color film requires expensive equipment and exacting conditions for correct processing and printing. (See the statement on photographic process workers and processing machine operators elsewhere in the *Handbook*.) Other photographers, especially those who use black and white film or who require special effects, prefer to develop and print their own photographs. Photographers who do their own film developing must have the technical skill to operate a fully equipped darkroom or the appropriate computer software to process prints digitally.

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Portrait photographers take pictures of individuals or groups of people and often work in their own studios.

Recent advances in electronic technology now make it possible for the professional photographer to develop and scan standard 35mm or other types of film, and use flatbed scanners and photofinishing laboratories to produce computer-readable, digital images from film. After converting the film to a digital image, photographers can edit and electronically transmit images using a method as simple as e-mail or as advanced as a satellite phone. This makes it easier and faster to shoot, develop, and transmit pictures from remote locations.

Using computers and specialized software, photographers also can manipulate and enhance the scanned or digital image to create a desired effect. Images can be stored on portable memory devices including compact disks (CDs) or on new types of smaller "mini pocket" storage devices such as flash disks, which are small memory cards used in digital cameras. Digital technology also allows the production of larger, more colorful, and more accurate prints or images for use in advertising, photographic art, and scientific research. Some photographers use this technology to create electronic portfolios as well. Because much photography now involves the use of computer technology, photographers must have hands-on knowledge of computer editing software.

Some photographers specialize in areas such as portrait, commercial and industrial, scientific, news, or fine arts photography. *Portrait photographers* take pictures of individuals or groups of people and often work in their own studios. Some specialize in weddings, religious ceremonies, or school photographs and may work on location. Portrait photographers who are business owners arrange for advertising, schedule appointments, set and adjust equipment, develop and retouch negatives, and mount and frame pictures. They also purchase supplies, keep records, bill customers, and may hire and train employees.

Commercial and industrial photographers take pictures of various subjects, such as buildings, models, merchandise, artifacts, and landscapes. These photographs are used in a variety of media, including books, reports, advertisements, and catalogs. Industrial photographers often take pictures of equipment, machinery, products, workers, and company officials. The pictures are used for various purposes—for example, analysis of engineering projects, publicity, or records of equipment development or deployment, such as placement of an offshore rig. This photography frequently is done on location.

Scientific photographers take images of a variety of subjects to illustrate or record scientific or medical data or phenomena, using knowledge of scientific procedures. They typically possess additional knowledge in areas such as engineering, medicine, biology, or chemistry.

News photographers, also called *photojournalists*, photograph newsworthy people, places, and sporting, political, and community events for newspapers, journals, magazines, or television. Some news photographers are salaried staff; others are self-employed and are known as freelance photographers.

Fine arts photographers sell their photographs as fine artwork. In addition to technical proficiency, fine arts photographers need artistic talent and creativity.

Self-employed, or freelance, photographers may license the use of their photographs through stock photo agencies or contract with clients or agencies to provide photographs as necessary. Stock agencies grant magazines and other customers the right to purchase the use of photographs, and, in turn, pay the photographer on a commission basis. Stock photo agencies require an application from the photographer and a sizable portfolio. Once accepted, a large number of new submissions usually is required from the photographer each year.

Working Conditions

Working conditions for photographers vary considerably. Photographers employed in government and advertising agencies usually work a 5-day, 40-hour week. On the other hand, news photographers often work long, irregular hours and must be available to work on short notice. Many photographers work part-time or variable schedules.

Portrait photographers usually work in their own studios but also may travel to take photographs at the client's location, such as a school, a company office, or a private home. News and commercial photographers frequently travel locally, stay overnight on assignments, or travel to distant places for long periods.

Some photographers work in uncomfortable or even dangerous surroundings, especially news photographers covering accidents, natural disasters, civil unrest, or military conflicts. Many photographers must wait long hours in all kinds of weather for an event to take place and stand or walk for long periods while carrying heavy equipment. News photographers often work under strict deadlines.

Self-employment allows for greater autonomy, freedom of expression, and flexible scheduling. However, income can be uncertain and the continuous, time-consuming search for new clients can be stressful. Some self-employed photographers hire assistants who help seek out new business.

Employment

Photographers held about 130,000 jobs in 2002. More than half were self-employed, a much higher proportion than the average for all occupations. Some self-employed photographers have contracts with advertising agencies, magazines, or others to do individual projects at a predetermined fee, while others operate portrait studios or provide photographs to stock photo agencies.

Most salaried photographers work in portrait or commercial photography studios. Newspapers, magazines, television broadcasters, and advertising agencies employ most of the others. Most photographers work in metropolitan areas.

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Training, Other Qualifications, and Advancement

Employers usually seek applicants with a "good eye," imagination, and creativity, as well as a good technical understanding of photography. Entry-level positions in photojournalism or in industrial or scientific photography generally require a college degree in journalism or photography. Freelance and portrait photographers need technical proficiency, whether gained through a degree program, vocational training, or extensive work experience.

Many universities, community and junior colleges, vocational-technical institutes, and private trade and technical schools offer photography courses. Basic courses in photography cover equipment, processes, and techniques. Bachelor's degree programs, especially those including business courses, provide a well-rounded education. Art schools offer useful training in design and composition.

Individuals interested in photography should subscribe to photographic newsletters and magazines, join camera clubs, and seek summer or part-time employment in camera stores, newspapers, or photo studios.

Photographers may start out as assistants to experienced photographers. Assistants learn to mix chemicals, develop film, and print photographs, and acquire the other skills necessary to run a portrait or commercial photography business. Freelance photographers also should develop an individual style of photography in order to differentiate themselves from the competition. Some photographers enter the field by submitting unsolicited photographs to magazines and to art directors at advertising agencies. For freelance photographers, a good portfolio of their work is critical.

Photographers need good eyesight, artistic ability, and good hand-eye coordination. They should be patient, accurate, and detail-oriented. Photographers should be able to work well with others, as they frequently deal with clients, graphic designers, or advertising and publishing specialists. Increasingly, photographers need to know how to use computer software programs and applications that allow them to prepare and edit images.

Portrait photographers need the ability to help people relax in front of the camera. Commercial and fine arts photographers must be imaginative and original. News photographers not only must be good with a camera, but also must understand the story behind an event so that their pictures match the story. They must be decisive in recognizing a potentially good photograph and act quickly to capture it.

Photographers who operate their own businesses, or freelance, need business skills as well as talent. These individuals must know how to prepare a business plan; submit bids; write contracts; market their work; hire models, if needed; get permission to shoot on locations that normally are not open to the public; obtain releases to use photographs of people; license and price photographs; secure copyright protection for their work; and keep financial records. Knowledge of licensing and copyright laws as well as contract negotiation procedures is especially important for self-employed photographers, in order to protect their rights and their work.

After several years of experience, magazine and news photographers may advance to photography or picture editor positions. Some photographers teach at technical schools, film schools, or universities.

Job Outlook

Photographers can expect keen competition for job openings because the work is attractive to many people. The number of individuals interested in positions as commercial and news photographers usually is much greater than the number of openings. Those who succeed in landing a salaried job or attracting enough work to earn a living by freelancing are likely to be the most creative, able to adapt to rapidly changing technologies, and adept at operating a business. Related work experience, job-related training, or some unique skill or talent—such as a background in computers or electronics—also are beneficial to prospective photographers.

Employment of photographers is expected to increase about as fast as the average for all occupations through 2012. Demand for portrait photographers should increase as the population grows. As the number of electronic versions of magazines, journals, and newspapers increases on the Internet, commercial photographers will be needed to provide digital images.

Job growth, however, will be constrained somewhat by the widespread use of digital photography and the falling price of digital equipment. Besides increasing photographers' productivity, improvements in digital technology reduce barriers of entry into this profession and allow more individual consumers and businesses to produce, store, and access photographic images on their own. Declines in the newspaper industry also will reduce demand for photographers to provide still images for print.

Earnings

Median annual earnings of salaried photographers were $24,040 in 2002. The middle 50 percent earned between $17,740 and $34,910. The lowest 10 percent earned less than $14,640, and the highest 10 percent earned more than $49,920. Median annual earnings in the industries employing the largest numbers of salaried photographers were $31,460 for newspapers and periodicals and $21,860 for other professional or scientific services.

Salaried photographers—more of whom work full time—tend to earn more than those who are self-employed. Because most freelance and portrait photographers purchase their own equipment, they incur considerable expense acquiring and maintaining cameras and accessories. Unlike news and commercial photographers, few fine arts photographers are successful enough to support themselves solely through their art.

Related Occupations

Other occupations requiring artistic talent and creativity include architects, except landscape and naval; artists and related workers; designers; news analysts, reporters, and correspondents; and television, video, and motion picture camera operators and editors.

Sources of Additional Information

Career information on photography is available from:

➤ Professional Photographers of America, Inc., 229 Peachtree St. NE., Suite 2200, Atlanta, GA 30303.

➤ National Press Photographers Association, Inc., 3200 Croasdaile Dr., Suite 306, Durham, NC 27705. Internet: **http://www.nppa.org**

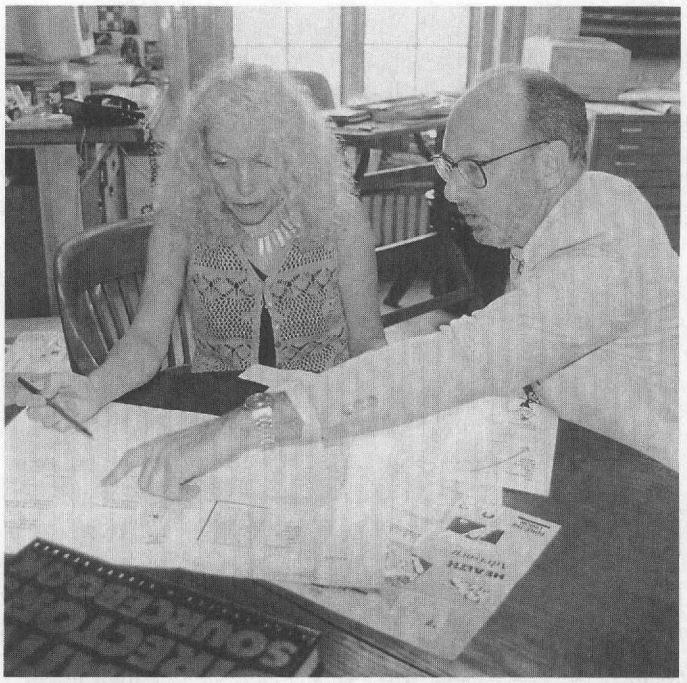
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Public Relations Specialists

(0*NET 27-3031.00)

Significant Points

- Although employment is projected to increase faster than average, keen competition is expected for entry-level jobs.
- Opportunities should be best for college graduates who combine a degree in public relations, journalism, or another communications-related field with a public relations internship or other related work experience.
- The ability to communicate effectively is essential.



Public relations specialists serve as advocates for organizations and build and maintain positive relationships with the public.

Nature of the Work

An organization's reputation, profitability, and even its continued existence can depend on the degree to which its targeted "publics" support its goals and policies. Public relations specialists—also referred to as communications specialists and media specialists, among other titles—serve as advocates for businesses, nonprofit associations, universities, hospitals, and other organizations, and build and maintain positive relationships with the public. As managers recognize the growing importance of good public relations to the success of their organizations, they increasingly rely on public relations specialists for advice on the strategy and policy of such programs.

Public relations specialists handle organizational functions such as media, community, consumer, industry, and governmental relations; political campaigns; interest-group representation; conflict mediation; or employee and investor relations. They help an organization and its public adapt mutually to each other. However, public relations are not only about "telling the organization's story." Understanding the attitudes and concerns of consumers, employees, and various other groups also is a vital part of the job. To improve communication, public relations specialists establish and maintain cooperative relationships with representatives of community, consumer, employee, and public interest groups, and with representatives from print and broadcast journalism.

Informing the general public, interest groups, and stockholders of an organization's policies, activities, and accomplishments is an important part of a public relations specialist's job. The work also involves keeping management aware of public attitudes and the concerns of the many groups and organizations with which they must deal.

Media specialists draft press releases and contact people in the media who might print or broadcast their material. Many radio or television special reports, newspaper stories, and magazine articles start at the desks of public relations specialists. Sometimes, the subject is an organization and its policies towards its employees or its role in the community. Often, the subject is a public issue, such as health, energy, or the environment.

Public affairs specialists also arrange and conduct programs to keep up contact between organization representatives and the public. For example, they set up speaking engagements and often prepare speeches for company officials. These media specialists represent employers at community projects; make film, slide, or other visual presentations at meetings and school assemblies; and plan conventions. In addition, they are responsible for preparing annual reports and writing proposals for various projects.

In government, public relations specialists—who may be called press secretaries, information officers, public affairs specialists, or communication specialists—keep the public informed about the activities of government agencies and officials. For example, public affairs specialists in the U.S. Department of State keep the public informed of travel advisories and of U.S. positions on foreign issues. A press secretary for a member of Congress keeps constituents aware of the representative's accomplishments.

In large organizations, the key public relations executive, who often is a vice president, may develop overall plans and policies with other executives. In addition, public relations departments employ public relations specialists to write, research, prepare materials, maintain contacts, and respond to inquiries.

People who handle publicity for an individual or who direct public relations for a small organization may deal with all aspects of the job. They contact people, plan and research, and prepare materials for distribution. They also may handle advertising or sales promotion work to support marketing.

Working Conditions

Some public relations specialists work a standard 35- to 40-hour week, but unpaid overtime is common. Occasionally, they must be at the job or on call around the clock, especially if there is an emergency or crisis. Public relations offices are busy places; work schedules can be irregular and frequently interrupted. Schedules often have to be rearranged so that workers can meet deadlines, deliver speeches, attend meetings and community activities, or travel.

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Employment

Public relations specialists held about 158,000 jobs in 2002. Public relations specialists are concentrated in service-providing industries such as advertising and related services; health care and social assistance; educational services; and government. Others worked for communications firms, financial institutions, and government agencies. About 11,000 public relations specialists were self-employed.

Public relations specialists are concentrated in large cities, where press services and other communications facilities are readily available and many businesses and trade associations have their headquarters. Many public relations consulting firms, for example, are in New York, Los Angeles, San Francisco, Chicago, and Washington, DC. There is a trend, however, for public relations jobs to be dispersed throughout the Nation, closer to clients.

Training, Other Qualifications, and Advancement

There are no defined standards for entry into a public relations career. A college degree combined with public relations experience, usually gained through an internship, is considered excellent preparation for public relations work; in fact, internships are becoming vital to obtaining employment. The ability to communicate effectively is essential. Many entry-level public relations specialists have a college major in public relations, journalism, advertising, or communication. Some firms seek college graduates who have worked in electronic or print journalism. Other employers seek applicants with demonstrated communication skills and training or experience in a field related to the firm's business—information technology, health, science, engineering, sales, or finance, for example.

Many colleges and universities offer bachelor's and postsecondary degrees in public relations, usually in a journalism or communications department. In addition, many other colleges offer at least one course in this field. A common public relations sequence includes courses in public relations principles and techniques; public relations management and administration, including organizational development; writing, emphasizing news releases, proposals, annual reports, scripts, speeches, and related items; visual communications, including desktop publishing and computer graphics; and research, emphasizing social science research and survey design and implementation. Courses in advertising, journalism, business administration, finance, political science, psychology, sociology, and creative writing also are helpful. Specialties are offered in public relations for business, government, and nonprofit organizations.

Many colleges help students gain part-time internships in public relations that provide valuable experience and training. The U.S. Armed Forces also can be an excellent place to gain training and experience. Membership in local chapters of the Public Relations Student Society of America (affiliated with the Public Relations Society of America) or the International Association of Business Communicators provides an opportunity for students to exchange views with public relations specialists and to make professional contacts that may help them find a job in the field. A portfolio of published articles, television or radio programs, slide presentations, and other work is an asset in finding a job. Writing for a school publication or television or radio station provides valuable experience and material for one's portfolio.

Creativity, initiative, good judgment, and the ability to express thoughts clearly and simply are essential. Decision making, problem-solving, and research skills also are important. People who choose public relations as a career need an outgoing personality, self-confidence, an understanding of human psychology, and an enthusiasm for motivating people. They should be competitive, yet able to function as part of a team and open to new ideas.

Some organizations, particularly those with large public relations staffs, have formal training programs for new employees. In smaller organizations, new employees work under the guidance of experienced staff members. Beginners often maintain files of material about company activities, scan newspapers and magazines for appropriate articles to clip, and assemble information for speeches and pamphlets. They also may answer calls from the press and public, work on invitation lists and details for press conferences, or escort visitors and clients. After gaining experience, they write news releases, speeches, and articles for publication or design and carry out public relations programs. Public relations specialists in smaller firms usually get all-around experience, whereas those in larger firms tend to be more specialized.

The Public Relations Society of America accredits public relations specialists who have at least 5 years of experience in the field and have passed a comprehensive 6-hour examination (5 hours written, 1 hour oral). The International Association of Business Communicators also has an accreditation program for professionals in the communication field, including public relations specialists. Those who meet all the requirements of the program earn the Accredited Business Communicator (ABC) designation. Candidates must have at least 5 years of experience in a communication field and pass a written and oral examination. They also must submit a portfolio of work samples demonstrating involvement in a range of communication projects and a thorough understanding of communication planning. Employers may consider professional recognition through accreditation a sign of competence in this field, which could be especially helpful in a competitive job market.

Promotion to supervisory jobs may come as public relations specialists show that they can handle more demanding assignments. In public relations firms, a beginner might be hired as a research assistant or account coordinator and be promoted to account executive, senior account executive, account manager, and, eventually, vice president. A similar career path is followed in corporate public relations, although the titles may differ. Some experienced public relations specialists start their own consulting firms. (For more information on public relations managers, see the *Handbook* statement on advertising, marketing, promotions, public relations, and sales managers.)

Job Outlook

Keen competition will likely continue for entry-level public relations jobs, as the number of qualified applicants is expected to exceed the number of job openings. Many people are attracted to this profession due to the high-profile nature of the work. Opportunities should be best for college graduates who combine a degree in journalism, public relations, advertising, or another communications-related field with a public relations internship or other related work experience. Applicants without the appropriate educational background or work experience will face the toughest obstacles.

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Employment of public relations specialists is expected to increase faster than the average for all occupations through 2012. The need for good public relations in an increasingly competitive business environment should spur demand for public relations specialists in organizations of all types and sizes. The value of a company is measured not just by its balance sheet, but also by the strength of its relationships with those upon whom it depends for its success. And, in the wake of corporate scandals, more emphasis will be placed on improving the image of the client, as well as building public confidence.

Employment in public relations firms should grow as firms hire contractors to provide public relations services rather than support full-time staff. In addition to those arising from employment growth, job opportunities should result from the need to replace public relations specialists who take other jobs or who leave the occupation altogether.

Earnings

Median annual earnings for salaried public relations specialists were $41,710 in 2002. The middle 50 percent earned between $31,300 and $56,180; the lowest 10 percent earned less than $24,240, and the top 10 percent earned more than $75,100. Median annual earnings in the industries employing the largest numbers of public relations specialists in 2002 were:

Advertising and related services	$48,070
Local government	42,000
Business, professional, labor, political, and similar organizations	39,330
Colleges, universities, and professional schools	36,820

According to a joint survey conducted by the International Association of Business Communicators and the Public Relations Society of America, the median annual income for a public relations specialist was $66,800 in 2002.

Related Occupations

Public relations specialists create favorable attitudes among various organizations, special interest groups, and the public through effective communication. Other workers with similar jobs include advertising, marketing, promotions, public relations, and sales managers; demonstrators, product promoters, and models; news analysts, reporters, and correspondents; lawyers; market and survey researchers; sales representatives, wholesale and manufacturing; and police and detectives involved in community relations.

Sources of Additional Information

A comprehensive directory of schools offering degree programs, a sequence of study in public relations, a brochure on careers in public relations, and a $5 brochure entitled *Where Shall I go to Study Advertising and Public Relations?* are available from:

➤ Public Relations Society of America, Inc., 33 Irving Place, New York, NY 10003-2376. Internet: **http://www.prsa.org**

For information on accreditation for public relations professionals, contact:

➤ International Association of Business Communicators, One Hallidie Plaza, Suite 600, San Francisco, CA 94102.

Television, Video, and Motion Picture Camera Operators and Editors

(0*NET 27-4031.00, 27-4032.00)

Significant Points

- Workers acquire their skills through on-the-job or formal postsecondary training.
- Technical expertise, a "good eye," imagination, and creativity are essential.
- Keen competition for job openings is expected, because many talented peopled are attracted to the field.
- About one in five camera operators are self-employed.

Nature of the Work

Television, video, and motion picture camera operators produce images that tell a story, inform or entertain an audience, or record an event. *Film and video editors* edit soundtracks, film, and video for the motion picture, cable, and broadcast television industries. Some camera operators do their own editing.

Making commercial-quality movies and video programs requires technical expertise and creativity. Producing successful images requires choosing and presenting interesting material, selecting appropriate equipment, and applying a good eye and steady hand to assure smooth, natural movement of the camera.

Camera operators use television, video, or motion picture cameras to shoot a wide range of material, including television series, studio programs, news and sporting events, music videos, motion pictures, documentaries, and training sessions. Some camera operators film or videotape private ceremonies and special events. Those who record images on videotape are often called *videographers*. Many are employed by independent television stations, local affiliates, large cable and television networks, or smaller, independent production companies. *Studio camera operators* work in a broadcast studio and usually videotape their subjects from a fixed position. *News camera operators*, also called *electronic news gathering (ENG) operators*, work as part of a reporting team, following newsworthy events as they unfold. To capture live events, they must anticipate the action and act quickly. ENG operators may



Film and video editors edit soundtracks, film, and video.

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need to edit raw footage on the spot for relay to a television affiliate for broadcast.

Camera operators employed in the entertainment field use motion picture cameras to film movies, television programs, and commercials. Those who film motion pictures are also known as *cinematographers*. Some specialize in filming cartoons or special effects. They may be an integral part of the action, using cameras in any of several different mounts. For example, the camera operator can be stationary and shoot whatever passes in front of the lens, or the camera can be mounted on a track, with the camera operator responsible for shooting the scene from different angles or directions. More recently, the introduction of digital cameras has enhanced the number of angles and the clarity that a camera operator can provide. Other camera operators sit on cranes and follow the action while crane operators move them into position. *Steadicam operators* mount a harness and carry the camera on their shoulders to provide a clear picture while they move about the action. Camera operators who work in the entertainment field often meet with directors, actors, editors, and camera assistants to discuss ways of filming, editing, and improving scenes.

Working Conditions

Working conditions for camera operators and editors vary considerably. Those employed in government, television and cable networks, and advertising agencies usually work a 5-day, 40-hour week. By contrast, ENG operators often work long, irregular hours and must be available to work on short notice. Camera operators and editors working in motion picture production also may work long, irregular hours.

ENG operators and those who cover major events, such as conventions or sporting events, frequently travel locally, stay overnight on assignments, or travel to distant places for longer periods. Camera operators filming television programs or motion pictures may travel to film on location.

Some camera operators—especially ENG operators covering accidents, natural disasters, civil unrest, or military conflicts—work in uncomfortable or even dangerous surroundings. Many camera operators must wait long hours in all kinds of weather for an event to take place and must stand or walk for long periods while carrying heavy equipment. ENG operators often work under strict deadlines.

Employment

Television, video, and motion picture camera operators held about 28,000 jobs in 2002, and film and video editors held about 19,000. About 1 in 5 camera operators were self-employed. Some self-employed camera operators contracted with television networks, documentary or independent filmmakers, advertising agencies, or trade show or convention sponsors to work on individual projects for a predetermined fee, often at a daily rate.

Most of the salaried camera operators were employed by television broadcasting stations or motion picture studios. More than half of the salaried film and video editors worked for motion picture studios. Most camera operators and editors worked in large metropolitan areas.

Training, Other Qualifications, and Advancement

Employers usually seek applicants with a "good eye," imagination, and creativity, as well as a good technical understanding of how the camera operates. Television, video, and motion picture camera operators and editors usually acquire their skills through on-the-job training or formal postsecondary training at vocational schools, colleges, universities, or photographic institutes. Formal education may be required for some positions.

Many universities, community and junior colleges, vocational-technical institutes, and private trade and technical schools offer courses in camera operation and videography. Basic courses cover equipment, processes, and techniques. Bachelor's degree programs, especially those including business courses, provide a well-rounded education.

Individuals interested in camera operations should subscribe to videographic newsletters and magazines, join clubs, and seek summer or part-time employment in cable and television networks, motion picture studios, or camera and video stores.

Camera operators in entry-level jobs learn to set up lights, cameras, and other equipment. They may receive routine assignments requiring adjustments to their cameras or decisions on what subject matter to capture. Camera operators in the film and television industries usually are hired for a project on the basis of recommendations from individuals such as producers, directors of photography, and camera assistants from previous projects or through interviews with the producer. ENG and studio camera operators who work for television affiliates usually start in small markets to gain experience.

Camera operators need good eyesight, artistic ability, and hand-eye coordination. They should be patient, accurate, and detail oriented. Camera operators also should have good communication skills and, if needed, the ability to hold a camera by hand for extended periods.

Camera operators who run their own businesses, or freelance, need business skills as well as talent. These individuals must know how to submit bids, write contracts, get permission to shoot on locations that normally are not open to the public, obtain releases to use film or tape of people, price their services, secure copyright protection for their work, and keep financial records.

With increased experience, operators may advance to more demanding assignments or to positions with larger or network television stations. Advancement for ENG operators may mean moving to larger media markets. Other camera operators and editors may become directors of photography for movie studios, advertising agencies, or television programs. Some teach at technical schools, film schools, or universities.

Job Outlook

Television, video, and motion picture camera operators and editors can expect keen competition for job openings because the work is attractive to many people. The number of individuals interested in positions as videographers and movie camera operators usually is much greater than the number of openings. Those who succeed in landing a salaried job or attracting enough work to earn a living by freelancing are likely to be the most creative, highly motivated, able to adapt to rapidly changing technologies, and adept at operating a business. Related work experience or job-related training also can benefit prospective camera operators.

Employment of camera operators and editors is expected to grow about as fast as the average for all occupations through 2012. Rapid expansion of the entertainment market, especially motion picture production and distribution, will spur growth of camera operators. In addition, computer and Internet services will provide new outlets for interactive productions. Growth will be tempered, however, by the increased off-shore production of motion pictures. Camera operators will be needed to film made-for-the-Internet broadcasts, such as live music videos, digital movies, sports features, and general information or

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entertainment programming. These images can be delivered directly into the home either on compact discs or over the Internet. Job growth also is expected in radio and television broadcasting.

Earnings

Median annual earnings for television, video, and motion picture camera operators were $32,720 in 2002. The middle 50 percent earned between $20,610 and $51,000. The lowest 10 percent earned less than $14,710, and the highest 10 percent earned more than $65,070. Median annual earnings were $46,540 in the motion picture and video industries and $25,830 in radio and television broadcasting.

Median annual earnings for film and video editors were $38,270 in 2002. The middle 50 percent earned between $26,780 and $55,300. The lowest 10 percent earned less than $20,030, and the highest 10 percent earned more than $78,070. Median annual earnings were $41,440 in the motion picture and video industries, which employ the largest numbers of film and video editors.

Many camera operators who work in film or video are freelancers whose earnings tend to fluctuate each year. Because most freelance camera operators purchase their own equipment, they incur considerable expense acquiring and maintaining cameras and accessories. Some camera operators belong to unions, including the International Alliance of Theatrical Stage Employees and the National Association of Broadcast Employees and Technicians.

Related Occupations

Related arts and media occupations include artists and related workers, broadcast and sound engineering technicians and radio operators, designers, and photographers.

Sources of Additional Information

Information about career and employment opportunities for camera operators and film and video editors is available from local offices of State employment service agencies, local offices of the relevant trade unions, and local television and film production companies that employ these workers.

Writers and Editors

(0*NET 27-3041.00, 27-3042.00, 27-3043.01, 27-3043.02, 27-3043.03, 27-3043.04)

Significant Points

- Most jobs in this occupation require a college degree in communications, journalism, or English, although a degree in a technical subject may be useful for technical-writing positions.
- The outlook for most writing and editing jobs is expected to be competitive, because many people with writing or journalism training are attracted to the occupation.
- Online publications and services are growing in number and sophistication, spurring the demand for writers and editors, especially those with Web experience.

Nature of the Work

Communicating through the written word, writers and editors generally fall into one of three categories. *Writers and authors* develop original fiction and nonfiction for books, magazines, trade journals, online publications, company newsletters, radio and television broadcasts, motion pictures, and advertisements. (Reporters and correspondents who collect and analyze facts about newsworthy events are described elsewhere in the *Handbook*.) *Editors* examine proposals and select material for publication or broadcast. They review and revise a writer's work for publication or dissemination. *Technical writers* develop technical materials, such as equipment manuals, appendices, or operating and maintenance instructions. They also may assist in layout work.

Most writers and editors have at least a basic familiarity with technology, regularly using personal computers, desktop or electronic publishing systems, scanners, and other electronic communications equipment. Many writers prepare material directly for the Internet. For example, they may write for electronic newspapers or magazines, create short fiction or poetry, or produce technical documentation that is available only online. Also, they may write text for Web sites. These writers should be knowledgeable about graphic design, page layout, and desktop publishing software. In addition, they should be familiar with interactive technologies of the Web so that they can blend text, graphics, and sound together.

Writers—especially of nonfiction—are expected to establish their credibility with editors and readers through strong research and the use of appropriate sources and citations. Sustaining high ethical standards and meeting publication deadlines are essential.

Creative writers, poets, and lyricists, including novelists, playwrights, and screenwriters, create original works—such as prose, poems, plays, and song lyrics—for publication or performance. Some works may be commissioned (at the request of a sponsor); others may be written for hire (on the basis of the completion of a draft or an outline).

Nonfiction writers either propose a topic or are assigned one, often by an editor or publisher. They gather information about the topic through personal observation, library and Internet research, and interviews. Writers then select the material they



Most writers and editors use computers and other communications equipment to compose and transmit written information.

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want to use, organize it, and use the written word to express ideas and convey information. Writers also revise or rewrite sections, searching for the best organization or the right phrasing. *Copy writers* prepare advertising copy for use by publication or broadcast media or to promote the sale of goods and services. *Newsletter writers* produce information for distribution to association memberships, corporate employees, organizational clients, or the public.

Freelance writers sell their work to publishers, publication enterprises, manufacturing firms, public-relations departments, or advertising agencies. Sometimes, they contract with publishers to write a book or an article. Others may be hired to complete specific assignments, such as writing about a new product or technique.

Editors review, rewrite, and edit the work of writers. They may also do original writing. An editor's responsibilities vary with the employer and type and level of editorial position held. Editorial duties may include planning the content of books, technical journals, trade magazines, and other general-interest publications. Editors also decide what material will appeal to readers, review and edit drafts of books and articles, offer comments to improve the work, and suggest possible titles. In addition, they may oversee the production of the publications. In the book-publishing industry, an editor's primary responsibility is to review proposals for books and decide whether to buy the publication rights from the author.

Major newspapers and newsmagazines usually employ several types of editors. The *executive editor* oversees *assistant editors* who have responsibility for particular subjects, such as local news, international news, feature stories, or sports. Executive editors generally have the final say about what stories are published and how they are covered. The *managing editor* usually is responsible for the daily operation of the news department. *Assignment editors* determine which reporters will cover a given story. *Copy editors* mostly review and edit a reporter's copy for accuracy, content, grammar, and style.

In smaller organizations, such as small daily or weekly newspapers or membership or publications departments of nonprofit or similar organizations, a single editor may do everything or share responsibility with only a few other people. Executive and managing editors typically hire writers, reporters, and other employees. They also plan budgets and negotiate contracts with freelance writers, sometimes called "stringers" in the news industry. In broadcasting companies, *program directors* have similar responsibilities.

Editors and program directors often have assistants, many of whom hold entry-level jobs. These assistants, such as copy editors and *production assistants*, review copy for errors in grammar, punctuation, and spelling and check the copy for readability, style, and agreement with editorial policy. They suggest revisions, such as changing words and rearranging sentences, to improve clarity or accuracy. They also carry out research for writers and verify facts, dates, and statistics. Production assistants arrange page layouts of articles, photographs, and advertising; compose headlines; and prepare copy for printing. *Publication assistants* who work for publishing houses may read and evaluate manuscripts submitted by freelance writers, proofread printers' galleys, or answer letters about published material. Production assistants on small newspapers or in radio stations compile articles available from wire services or the Internet, answer phones, and make photocopies.

Technical writers put technical information into easily understandable language. They prepare operating and maintenance manuals, catalogs, parts lists, assembly instructions, sales promotion materials, and project proposals. Many technical writers work with engineers on technical subject matters to prepare written interpretations of engineering and design specifications and other information for a general readership. They plan and edit technical materials and oversee the preparation of illustrations, photographs, diagrams, and charts.

Science and medical writers prepare a range of formal documents presenting detailed information on the physical or medical sciences. They convey research findings for scientific or medical professions and organize information for advertising or public-relations needs. Many writers work with researchers on technical subjects to prepare written interpretations of data and other information for a general readership.

Working Conditions

Some writers and editors work in comfortable, private offices; others work in noisy rooms filled with the sound of keyboards and computer printers, as well as the voices of other writers tracking down information over the telephone. The search for information sometimes requires that the writer travel to diverse workplaces, such as factories, offices, or laboratories, but many find their material through telephone interviews, the library, and the Internet.

For some writers, the typical workweek runs 35 to 40 hours. However, writers occasionally work overtime to meet publication deadlines. Those who prepare morning or weekend publications and broadcasts work some nights and weekends. Freelance writers generally work more flexible hours, but their schedules must conform to the needs of the client. Deadlines and erratic work hours, often part of the daily routine in these jobs, may cause stress, fatigue, or burnout.

Changes in technology and electronic communications also affect a writer's work environment. For example, laptops allow writers to work from home or on the road. Writers and editors who use computers for extended periods may experience back pain, eyestrain, or fatigue.

Employment

Writers and editors held about 319,000 jobs in 2002. More than one-third were self-employed. Writers and authors held about 139,000 jobs; editors, about 130,000 jobs; and technical writers, about 50,000 jobs. More than one-half of jobs for writers and editors were salaried positions in the information sector, which includes newspaper, periodical, book, and directory publishers; radio and television broadcasting; software publishers; motion picture and sound recording industries; Internet service providers, web search portals, and data processing services; and Internet publishing and broadcasting. Substantial numbers also worked in advertising and related services, computer systems design and related services, and public and private educational services. Other salaried writers and editors worked in computer and electronic product manufacturing, government agencies, religious organizations, and business, professional, labor, political, and similar organizations.

Jobs with major book publishers, magazines, broadcasting companies, advertising agencies, and public-relations firms are

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concentrated in New York, Chicago, Los Angeles, Boston, Philadelphia, and San Francisco. Jobs with newspapers, business and professional journals, and technical and trade magazines are more widely dispersed throughout the country.

Thousands of other individuals work as freelance writers, earning some income from their articles, books, and, less commonly, television and movie scripts. Most support themselves with income derived from other sources.

Training, Other Qualifications, and Advancement

A college degree generally is required for a position as a writer or editor. Although some employers look for a broad liberal arts background, most prefer to hire people with degrees in communications, journalism, or English. For those who specialize in a particular area, such as fashion, business, or legal issues, additional background in the chosen field is expected. Knowledge of a second language is helpful for some positions.

Increasingly, technical writing requires a degree in, or some knowledge about, a specialized field—engineering, business, or one of the sciences, for example. In many cases, people with good writing skills can learn specialized knowledge on the job. Some transfer from jobs as technicians, scientists, or engineers. Others begin as research assistants or as trainees in a technical information department, develop technical communication skills, and then assume writing duties.

Writers and editors must be able to express ideas clearly and logically and should love to write. Creativity, curiosity, a broad range of knowledge, self-motivation, and perseverance also are valuable. Writers and editors must demonstrate good judgment and a strong sense of ethics in deciding what material to publish. Editors also need tact and the ability to guide and encourage others in their work.

For some jobs, the ability to concentrate amid confusion and to work under pressure is essential. Familiarity with electronic publishing, graphics, and video production equipment increasingly is needed. Online newspapers and magazines require knowledge of computer software used to combine online text with graphics, audio, video, and animation.

High school and college newspapers, literary magazines, community newspapers, and radio and television stations all provide valuable, but sometimes unpaid, practical writing experience. Many magazines, newspapers, and broadcast stations have internships for students. Interns write short pieces, conduct research and interviews, and learn about the publishing or broadcasting business.

In small firms, beginning writers and editors hired as assistants may actually begin writing or editing material right away. Opportunities for advancement can be limited, however. Many writers look for work on a short-term, project-by-project basis. Many small or not-for-profit organizations either do not have enough regular work or cannot afford to employ writers on a full-time basis. However, they routinely contract out work to freelance writers as needed.

In larger businesses, jobs usually are more formally structured. Beginners generally do research, fact checking, or copy editing. Advancement to full-scale writing or editing assignments may occur more slowly for newer writers and editors in larger organizations than for employees of smaller companies. Advancement often is more predictable, though, coming with the assignment of more important articles.

Job Outlook

Employment of writers and editors is expected to grow about as fast as the average for all occupations through the year 2012. The outlook for most writing and editing jobs is expected to be competitive, because many people with writing or journalism training are attracted to the occupation.

Employment of salaried writers and editors for newspapers, periodicals, book publishers, and nonprofit organizations is expected to increase as demand grows for these publications. Magazines and other periodicals increasingly are developing market niches, appealing to readers with special interests. Businesses and organizations are developing newsletters and websites, and more companies are experimenting with publishing materials directly for the Internet. Online publications and services are growing in number and sophistication, spurring the demand for writers and editors, especially those with Web experience. Advertising and public-relations agencies, which also are growing, should be another source of new jobs.

Opportunities should be best for technical writers and those with training in a specialized field. Demand for technical writers and writers with expertise in specialty areas, such as law, medicine, or economics, is expected to increase because of the continuing expansion of scientific and technical information and the need to communicate it to others. Developments and discoveries in the law, science, and technology generate demand for people to interpret technical information for a more general audience. Rapid growth and change in the high-technology and electronics industries result in a greater need for people to write users' guides, instruction manuals, and training materials. This work requires people who are not only technically skilled as writers, but also familiar with the subject area.

In addition to job openings created by employment growth, some openings will arise as experienced workers retire, transfer to other occupations, or leave the labor force. Replacement needs are relatively high in this occupation; many freelancers leave because they cannot earn enough money.

Earnings

Median annual earnings for salaried writers and authors were $42,790 in 2002. The middle 50 percent earned between $29,150 and $58,930. The lowest 10 percent earned less than $21,320, and the highest 10 percent earned more than $85,140. Median annual earnings were $54,520 in advertising and related services and $33,550 in newspaper, periodical, book, and directory publishers.

Median annual earnings for salaried editors were $41,170 in 2002. The middle 50 percent earned between $30,770 and $56,360. The lowest 10 percent earned less than $24,010, and the highest 10 percent earned more than $76,620. Median annual earnings in newspaper, periodical, book, and directory publishers were $40,280.

Median annual earnings for salaried technical writers were $50,580 in 2002. The middle 50 percent earned between $39,100 and $64,750. The lowest 10 percent earned less than $30,270, and the highest 10 percent earned more than $80,900. Median annual earnings in computer systems design and related services were $51,730.

According to the Society for Technical Communication, the median annual salary for entry level technical writers was $41,000 in 2002. The median annual salary for mid-level non-

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supervisory technical writers was $49,900 and for senior-level non-supervisory technical writers, $66,000.

Related Occupations
Writers and editors communicate ideas and information. Other communications occupations include announcers; interpreters and translators; news analysts, reporters, and correspondents; and public relations specialists.

Sources of Additional Information
For information on careers in technical writing, contact:
➤ Society for Technical Communication, Inc., 901 N. Stuart St., Suite 904, Arlington, VA 22203. Internet: **http://www.stc.org**

Health Diagnosing and Treating Practitioners

Audiologists

(0*NET 29-1121.00)

Significant Points

- Employment of audiologists is expected to grow rapidly because the expanding population in older age groups is prone to medical conditions that result in hearing problems.
- More than half worked in healthcare facilities, and most others were employed by educational services.
- A master's degree in audiology is currently the standard credential; however, a clinical doctoral degree is expected to become the new standard.

Nature of the Work
Audiologists work with people who have hearing, balance, and related ear problems. They examine individuals of all ages and identify those with the symptoms of hearing loss and other auditory, balance, and related neural problems. They then assess the nature and extent of the problems and help the individuals manage them. Using audiometers, computers, and other testing devices, they measure the loudness at which a person begins to hear sounds, the ability to distinguish between sounds, and the impact of hearing loss or balance problems on an individual's daily life. Audiologists interpret these results and may coordinate them with medical, educational, and psychological information to make a diagnosis and determine a course of treatment.

Hearing disorders can result from a variety of causes including trauma at birth, viral infections, genetic disorders, exposure to loud noise, certain medications, or aging. Treatment may include examining and cleaning the ear canal, fitting and dispensing hearing aids, fitting and tuning cochlear implants, and audiologic rehabilitation. Audiologic rehabilitation emphasizes counseling on adjusting to hearing loss, training on the use of hearing instruments, and teaching communication strategies for use in a variety of listening environments. For example, they may provide instruction in lip reading. Audiologists also may recommend, fit, and dispense personal or large area amplification systems and alerting devices.

Audiologists provide direct clinical services to individuals with hearing or balance disorders. In audiology (hearing) clinics, they may independently develop and carry out treatment programs. Audiologists, in a variety of settings, work with other health professionals as a team in planning and implementing services for children and adults, from birth to old age. Audiologists keep records on the initial evaluation, progress, and discharge of clients. These records help pinpoint problems, track client progress, and justify the cost of treatment when applying for reimbursement.

Some audiologists specialize in work with the elderly, children, or hearing-impaired individuals who need special therapy programs. Others develop and implement ways to protect workers' ear from on-the-job injuries. They measure noise levels in workplaces and conduct hearing protection programs in factories, as well as in schools and communities.

Audiologists who work in private practice also manage the business aspects of running an office, such as developing a patient base, hiring employees, keeping records, and ordering equipment and supplies.

Audiologists may conduct research on types of—and treatment for—hearing, balance, and related disorders. Others design and develop equipment or techniques for diagnosing and treating these disorders.

Working Conditions
Audiologists usually work at a desk or table in clean, comfortable surroundings. The job is not physically demanding but does require attention to detail and intense concentration. The emotional needs of clients and their families may be demand-



Audiologists provide direct clinical services to individuals with hearing or balance disorders.

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ing. Most full-time audiologists work about 40 hours per week, which may include weekends and evenings to meet the needs of patients. Some work part time. Those who work on a contract basis may spend a substantial amount of time traveling between facilities.

Employment

Audiologists held about 11,000 jobs in 2002. More than half of all jobs were in offices of physicians; hospitals; offices of other health practitioners, including audiologists; and outpatient care centers. About 1 in 5 jobs was in educational services, including elementary and secondary schools. Other jobs for audiologists were in health and personal care stores, including hearing aid stores; scientific research and development services; and State and local governments.

A small number of audiologists were self-employed in private practice. They provided hearing healthcare services in their own offices or worked under contract for schools, healthcare facilities, or other establishments.

Training, Other Qualifications, and Advancement

Of the 48 States that require a license to practice audiology, almost all require that individuals have a master's degree in audiology or the equivalent; however, a clinical doctoral degree is expected to become the new standard. A passing score on a national examination on audiology offered through the Praxis Series of the Educational Testing Service is needed, as well. Other requirements are 300 to 375 hours of supervised clinical experience and 9 months of postgraduate professional clinical experience. An additional examination may be required in order to dispense hearing aids. Forty States have continuing education requirements for licensure renewal. Medicaid, medicare, and private health insurers generally require practitioners to be licensed to qualify for reimbursement.

About 107 colleges and universities offer graduate programs in audiology in the United States. About 39 of these offer a Doctor of Audiology (Au.D.) degree. Requirements for admission to programs in audiology include courses in English, mathematics, physics, chemistry, biology, psychology, and communication sciences. Graduate course work in audiology includes anatomy; physiology; physics; genetics; normal and abnormal communication development; auditory, balance, and neural systems assessment and treatment; diagnosis and treatment; pharmacology; and ethics.

Audiologists can acquire the Certificate of Clinical Competence in Audiology (CCC-A) offered by the American Speech-Language-Hearing Association. To earn a CCC, a person must have a graduate degree and 375 hours of supervised clinical experience, complete a 36-week postgraduate clinical fellowship, and pass the Praxis Series examination in audiology, administered by the Educational Testing Service. According to the American Speech-Language-Hearing Association, as of 2007, audiologists will need to have a bachelor's degree and complete 75 hours of credit toward a doctoral degree in order to seek certification. As of 2012, audiologists will have to earn a doctoral degree in order to be certified.

Audiologists may also be certified through the American Board of Audiology. Applicants must earn a Master's or Doctoral degree in audiology from a regionally accredited college or university, achieve a passing score on a national examination in audiology, and demonstrate that they have completed a minimum of 2,000 hours of mentored professional practice in a two-year period with a qualified audiologist. Certificants must apply for renewal every three years. They must demonstrate that they have earned 45 hours of approved continuing education within the three-year period. Beginning in the year 2007, all applicants must earn a doctoral degree in audiology.

Audiologists should be able to effectively communicate diagnostic test results, diagnoses, and proposed treatments in a manner easily understood by their clients. They must be able to approach problems objectively and provide support to clients and their families. Because a client's progress may be slow, patience, compassion, and good listening skills are necessary.

Job Outlook

Employment of audiologists is expected to grow faster than the average for all occupations through the year 2012. Because hearing loss is strongly associated with aging, rapid growth in the population age 55 and over will cause the number of persons with hearing impairment to increase markedly. In addition, members of the baby boom generation are now entering middle age, when the possibility of neurological disorders and associated hearing impairments increases. Medical advances are also improving the survival rate of premature infants and trauma and stroke victims, who then need assessment and possible treatment. Many States now require that all newborns be screened for hearing loss and receive appropriate early intervention services.

Employment in educational services will increase along with growth in elementary and secondary school enrollments, including enrollment of special education students. Federal law guarantees special education and related services to all eligible children with disabilities. Greater awareness of the importance of early identification and diagnosis of hearing disorders will also increase employment.

The number of audiologists in private practice will rise due to the increasing demand for direct services to individuals as well as increasing use of contract services by hospitals, schools, and nursing care facilities. Only a few job openings for audiologists will arise from the need to replace those who leave the occupation, because the occupation is small.

Earnings

Median annual earnings of audiologists were $48,400 in 2002. The middle 50 percent earned between $39,510 and $58,430. The lowest 10 percent earned less than $32,500, and the highest 10 percent earned more than $73,130.

According to a 2003 survey by the American Speech-Language-Hearing Association, the median annual salary for full-time certified audiologists who worked on a calendar-year basis, generally 11 or 12 months annually, was $52,000. For those who worked on an academic-year basis, usually 9 or 10 months annually, the median annual salary was $47,500. The median starting salary for certified audiologists with one to three years experience was $43,000 on a calendar-year basis. Certified audiologists who worked 25 or fewer hours per week had a median hourly salary of $28.00.

Related Occupations

Audiologists specialize in the prevention, diagnosis, and treatment of hearing problems. Workers in related occupations in-

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clude occupational therapists, optometrists, physical therapists, psychologists, recreational therapists, rehabilitation counselors, and speech-language pathologists.

Sources of Additional Information

State licensing boards can provide information on licensure requirements. State departments of education can supply information on certification requirements for those who wish to work in public schools.

General information on careers in audiology is available from:

➤ American Speech-Language-Hearing Association, 10801 Rockville Pike, Rockville, MD 20852. Internet: **http://www.asha.org**

➤ Academy of Audiology, 11730 Plaza America Dr., Suite 300, Reston, VA 20190. Internet: **http://www.audiology.org**

Chiropractors

(0*NET 29-1011.00)

Significant Points

- Chiropractors must be licensed, requiring 2 to 4 years of undergraduate education, completion of a 4-year chiropractic college course, and passing scores on national and State examinations.
- Employment is expected to increase faster than average as a result of research and changing attitudes about alternative healthcare practices.
- Job prospects should be good; establishing a new practice will be easiest in areas with a low concentration of chiropractors.
- As with other types of independent practice, earnings for chiropractors are relatively low in the beginning, but increase as the practice grows.

Nature of the Work

Chiropractors, also known as *doctors of chiropractic* or *chiropractic physicians*, diagnose and treat patients whose health problems are associated with the body's muscular, nervous, and skeletal systems, especially the spine. Chiropractors believe that interference with these systems impairs the body's normal functions and lowers its resistance to disease. They also hold that spinal or vertebral dysfunction alters many important body functions by affecting the nervous system and that skeletal imbalance through joint or articular dysfunction, especially in the spine, can cause pain.

The chiropractic approach to healthcare is holistic, stressing the patient's overall health and wellness. It recognizes that many factors affect health, including exercise, diet, rest, environment, and heredity. Chiropractors provide natural, drugless, nonsurgical health treatments and rely on the body's inherent recuperative abilities. They also recommend changes in lifestyle—in eating, exercise, and sleeping habits, for example—to their patients. When appropriate, chiropractors consult with and refer patients to other health practitioners.

Like other health practitioners, chiropractors follow a standard routine to secure the information they need for diagnosis and treatment. They take the patient's medical history, conduct physical, neurological, and orthopedic examinations, and may order laboratory tests. X rays and other diagnostic images are important tools because of the chiropractor's emphasis on the spine and its proper function. Chiropractors also employ a postural and spinal analysis common to chiropractic diagnosis.

In cases in which difficulties can be traced to the involvement of musculoskeletal structures, chiropractors manually adjust the spinal column. Some chiropractors use water, light, massage, ultrasound, electric, and heat therapy. They also may apply supports such as straps, tapes, and braces. Chiropractors counsel patients about wellness concepts such as nutrition, exercise, changes in lifestyle, and stress management, but do not prescribe drugs or perform surgery.

Some chiropractors specialize in sports injuries, neurology, orthopedics, pediatrics, nutrition, internal disorders, or diagnostic imaging.

Many chiropractors are solo or group practitioners who also have the administrative responsibilities of running a practice. In larger offices, chiropractors delegate these tasks to office managers and chiropractic assistants. Chiropractors in private practice are responsible for developing a patient base, hiring employees, and keeping records.

Working Conditions

Chiropractors work in clean, comfortable offices. Their average workweek is about 40 hours, although longer hours are not uncommon. Solo practitioners set their own hours, but may work evenings or weekends to accommodate patients.



A chiropractor manually adjusts the spine to relieve pressure.

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Like other health practitioners, chiropractors are sometimes on their feet for long periods. Chiropractors who take x rays must employ appropriate precautions against the dangers of repeated exposure to radiation.

Employment

Chiropractors held about 49,000 jobs in 2002. Most chiropractors are in solo practice, although some are in group practice or work for other chiropractors. A small number teach, conduct research at chiropractic institutions, or work in hospitals and clinics.

Many chiropractors are located in small communities. There are geographic imbalances in the distribution of chiropractors, in part because many establish practices close to chiropractic institutions.

Training, Other Qualifications, and Advancement

All States and the District of Columbia regulate the practice of chiropractic and grant licenses to chiropractors who meet educational and examination requirements established by the State. Chiropractors can practice only in States where they are licensed. Some States have agreements permitting chiropractors licensed in one State to obtain a license in another without further examination, provided that their educational, examination, and practice credentials meet State specifications.

Most State boards require at least 2 years of undergraduate education; an increasing number are requiring a 4-year bachelor's degree. All boards require the completion of a 4-year program at an accredited chiropractic college leading to the Doctor of Chiropractic degree.

For licensure, most State boards recognize either all or part of the four-part test administered by the National Board of Chiropractic Examiners. State examinations may supplement the National Board tests, depending on State requirements.

To maintain licensure, almost all States require the completion of a specified number of hours of continuing education each year. Chiropractic associations and accredited chiropractic programs and institutions offer continuing education programs. Specialty councils within some chiropractic associations also offer programs leading to clinical specialty certification, called "diplomate" certification, in areas such as orthopedics, neurology, sports injuries, occupational and industrial health, nutrition, diagnostic imaging, thermography, and internal disorders.

In 2003, 16 chiropractic programs and 2 chiropractic institutions in the United States were accredited by the Council on Chiropractic Education. Applicants are required to have at least 90 semester hours of undergraduate study leading toward a bachelor's degree, including courses in English, the social sciences or humanities, organic and inorganic chemistry, biology, physics, and psychology. Many applicants have a bachelor's degree, which may eventually become the minimum entry requirement. Several chiropractic colleges offer prechiropractic study, as well as a bachelor's degree program. Recognition of prechiropractic education offered by chiropractic colleges varies among the State boards.

During the first 2 years, most chiropractic programs emphasize classroom and laboratory work in basic science subjects such as anatomy, physiology, public health, microbiology, pathology, and biochemistry. The last 2 years stress courses in manipulation and spinal adjustment and provide clinical experience in physical and laboratory diagnosis, neurology, orthopedics, geriatrics, physiotherapy, and nutrition. Chiropractic programs and institutions grant the degree of Doctor of Chiropractic.

Chiropractic requires keen observation to detect physical abnormalities. It also takes considerable manual dexterity, but not unusual strength or endurance, to perform adjustments. Chiropractors should be able to work independently and handle responsibility. As in other health-related occupations, empathy, understanding, and the desire to help others are good qualities for dealing effectively with patients.

Newly licensed chiropractors can set up a new practice, purchase an established one, or enter into partnership with an established practitioner. They also may take a salaried position with an established chiropractor, a group practice, or a healthcare facility.

Job Outlook

Job prospects are expected to be good for persons who enter the practice of chiropractic. Employment of chiropractors is expected to grow faster than the average for all occupations through the year 2012 as consumer demand for alternative healthcare grows. Chiropractors emphasize the importance of healthy lifestyles and do not prescribe drugs or perform surgery. As a result, chiropractic care is appealing to many health-conscious Americans. Chiropractic treatment of the back, neck, extremities, and joints has become more accepted as a result of research and changing attitudes about alternative, noninvasive healthcare practices. The rapidly expanding older population, with its increased likelihood of mechanical and structural problems, also will increase demand for chiropractors.

Demand for chiropractic treatment also is related to the ability of patients to pay, either directly or through health insurance. Although more insurance plans now cover chiropractic services, the extent of such coverage varies among plans. Increasingly, chiropractors must educate communities about the benefits of chiropractic care in order to establish a successful practice.

In this occupation, replacement needs arise almost entirely from retirements. Chiropractors usually remain in the occupation until they retire; few transfer to other occupations. Establishing a new practice will be easiest in areas with a low concentration of chiropractors.

Earnings

Median annual earnings of salaried chiropractors were $65,330 in 2002. The middle 50 percent earned between $44,140 and $102,400 a year.

Self-employed chiropractors usually earn more than salaried chiropractors. According to the American Chiropractic Association, in 2000, the average income for all chiropractors, including the self-employed, was about $81,500 after expenses. In chiropractic, as in other types of independent practice, earnings are relatively low in the beginning and increase as the practice grows. Geographic location and the characteristics and qualifications of the practitioner also may influence earnings. Self-employed chiropractors must provide for their own health insurance and retirement.

Related Occupations

Chiropractors treat patients and work to prevent bodily disorders and injuries. So do dentists, occupational therapists, optometrists, physical therapists, physicians and surgeons, podiatrists, and veterinarians.

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Sources of Additional Information

General information on chiropractic as a career is available from:

➤ American Chiropractic Association, 1701 Clarendon Blvd., Arlington, VA 22209. Internet: **http://www.amerchiro.org**

➤ International Chiropractors Association, 1110 North Glebe Rd., Suite 1000, Arlington, VA 22201. Internet: **http://www.chiropractic.org**

➤ World Chiropractic Alliance, 2950 N. Dobson Rd., Suite 1, Chandler, AZ 85224-1802.

➤ Dynamic Chiropractic, P.O. Box 40109, Huntington, CA 92605-4109.

For a list of chiropractic programs and institutions, as well as general information on chiropractic education, contact:

➤ Council on Chiropractic Education, 8049 North 85th Way, Scottsdale, AZ 85258-4321. Internet: **http://www.cce-usa.org**.

For information on State education and licensure requirements, contact:

➤ Federation of Chiropractic Licensing Boards, 901 54th Ave., Suite 101, Greeley, CO 80634-4400. Internet: **http://www.fclb.org**

For information on admission requirements to a specific chiropractic college, as well as scholarship and loan information, contact the college's admissions office.

Dentists

(0*NET 29-1021.00, 29-1022.00, 29-1023.00, 29-1024.00, 29-1029.99)

Significant Points

- Most dentists are solo practitioners.
- Dentists usually complete at least 8 years of education beyond high school.
- Employment is projected to grow more slowly than average, and most job openings will result from the need to replace the large number of dentists expected to retire.
- Job prospects should be good.

Nature of the Work

Dentists diagnose, prevent, and treat problems with teeth or mouth tissue. They remove decay, fill cavities, examine x rays, place protective plastic sealants on children's teeth, straighten teeth, and repair fractured teeth. They also perform corrective surgery on gums and supporting bones to treat gum diseases. Dentists extract teeth and make models and measurements for dentures to replace missing teeth. They provide instruction on diet, brushing, flossing, the use of fluorides, and other aspects of dental care. They also administer anesthetics and write prescriptions for antibiotics and other medications.

Dentists use a variety of equipment, including x-ray machines, drills, and instruments such as mouth mirrors, probes, forceps, brushes, and scalpels. They wear masks, gloves, and safety glasses to protect themselves and their patients from infectious diseases.

Dentists in private practice oversee a variety of administrative tasks, including bookkeeping and buying equipment and supplies. They may employ and supervise dental hygienists, dental assistants, dental laboratory technicians, and receptionists. (These occupations are described elsewhere in the *Handbook*.)

Most dentists are general practitioners, handling a variety of dental needs. Other dentists practice in any of nine specialty areas. *Orthodontists*, the largest group of specialists, straighten teeth by applying pressure to the teeth with braces or retainers. The next largest group, *oral and maxillofacial surgeons*, operates on the mouth and jaws. The remainder may specialize as *pediatric dentists* (focusing on dentistry for children); *periodontists* (treating gums and bone supporting the teeth); *prosthodontists* (replacing missing teeth with permanent fixtures, such as crowns and bridges, or removable fixtures, such as dentures); *endodontists* (performing root canal therapy); *public-health dentists* (promoting good dental health and preventing dental diseases within the community); *oral pathologists* (studying oral diseases); or *oral and maxillofacial radiologists* (diagnosing diseases in the head and neck through the use of imaging technologies).

Working Conditions

Most dentists work 4 or 5 days a week. Some work evenings and weekends to meet their patients' needs. Most full-time dentists work between 35 and 40 hours a week, but others work more. Initially, dentists may work more hours as they establish their practice. Experienced dentists often work fewer hours. A considerable number continue in part-time practice well beyond the usual retirement age.

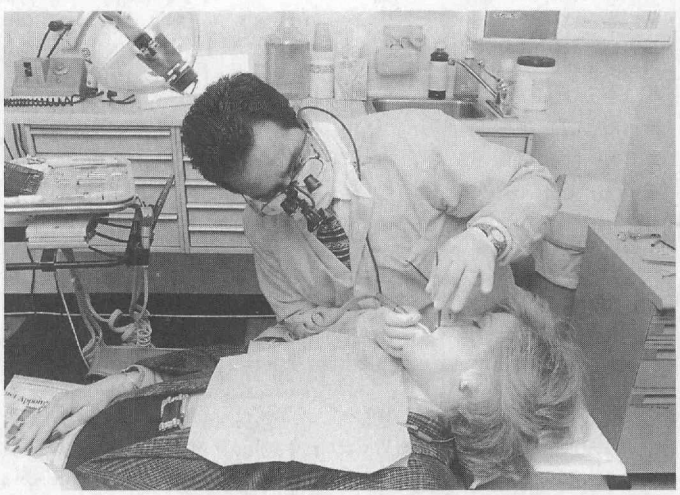
Most dentists are solo practitioners, meaning that they own their own businesses and work alone or with a small staff. Some dentists have partners, and a few work for other dentists as associate dentists.

Employment

Dentists held about 153,000 jobs in 2002. About 2 in 5 dentists were self-employed. Almost all dentists work in private practice. According to the American Dental Association (ADA), about 80 percent of dentists in private practice are sole proprietors, and 13 percent belong to a partnership. A small number of salaried dentists work in hospitals and offices of physicians.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require dentists to be licensed. To qualify for a license in most States, a candidate must graduate from one of the 55 dental schools accredited by the ADA's Commission on Dental Accreditation in 2002 and also must pass written and practical examinations. Candidates may fulfill the written part of the State licensing requirements by passing the National Board Dental Examinations. Individual



Most dentists are general practitioners, handling a variety of dental needs.

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States or regional testing agencies administer the written or practical examinations.

Dental schools require a minimum of 2 years of college-level predental education, regardless of the major chosen. However, most dental students have at least a bachelor's degree. Predental education emphasizes course work in science, and many applicants to dental school major in a science such as biology or chemistry, while other applicants major in another subject and take many science courses as well. A small number of applicants are accepted to dental school after 2 or 3 years of college and complete their bachelor's degree while attending dental school.

All dental schools require applicants to take the Dental Admissions Test (DAT). When selecting students, schools consider scores earned on the DAT, applicants' grade point averages, and information gathered through recommendations and interviews. Competition for admission to dental school is keen.

Dental school usually lasts 4 academic years. Studies begin with classroom instruction and laboratory work in basic sciences, including anatomy, microbiology, biochemistry, and physiology. Beginning courses in clinical sciences, including laboratory techniques, also are provided at this time. During the last 2 years, students treat patients, usually in dental clinics, under the supervision of licensed dentists.

Most dental schools award the degree of Doctor of Dental Surgery (DDS). The rest award an equivalent degree, Doctor of Dental Medicine (DMD).

Currently, about 17 States license or certify dentists who intend to practice in a specialty area. Requirements include 2 to 4 years of postgraduate education and, in some cases, the completion of a special State examination. Most State licenses permit dentists to engage in both general and specialized practice. Dentists who want to teach or conduct research usually spend an additional 2 to 5 years in advanced dental training, in programs operated by dental schools or hospitals.

Dentistry requires diagnostic ability and manual skills. Dentists should have good visual memory, excellent judgment regarding space and shape, a high degree of manual dexterity, and scientific ability. Good business sense, self-discipline, and good communication skills are helpful for success in private practice. High school and college students who want to become dentists should take courses in biology, chemistry, physics, health, and mathematics.

Some dental school graduates work for established dentists as associates for a year or two in order to gain experience and save money to equip an office of their own. Most dental school graduates, however, purchase an established practice or open a new one immediately after graduation. According to the ADA, each year about 12 percent of new graduates enroll in postgraduate training programs to prepare for a dental specialty.

Job Outlook

Employment of dentists is expected to grow more slowly than the average for all occupations through 2012. Although employment growth will provide some job opportunities, most jobs will result from the need to replace the large number of dentists projected to retire. Job prospects should be good as new dentists take over established practices or start their own.

Demand for dental care should grow substantially through 2012. As members of the baby-boom generation advance into middle age, a large number will need maintenance on complicated dental work, such as bridges. In addition, elderly people are more likely to retain their teeth than were their predecessors, so they will require much more care than in the past. The younger generation will continue to need preventive checkups despite treatments such as fluoridation of the water supply, which decreases the incidence of tooth decay. However, employment of dentists is not expected to grow as rapidly as the demand for dental services, because, as their practices expand, dentists are likely to hire more dental hygienists and dental assistants to handle routine services.

Dental care will focus more on prevention, including teaching people how to take better care of their teeth. Dentists will increasingly provide care that is aimed at preventing the loss of teeth—rather than simply providing treatments, such as fillings. Improvements in dental technology also will allow dentists to offer more effective and less painful treatment to their patients.

Earnings

Median annual earnings of salaried dentists were $123,210 in 2002. Earnings vary according to number of years in practice, location, hours worked, and specialty.

Self-employed dentists in private practice tend to earn more than salaried dentists. A relatively large proportion of dentists is self-employed. Like other business owners, these dentists must provide their own health insurance, life insurance, and retirement benefits.

Related Occupations

Dentists examine, diagnose, prevent, and treat diseases and abnormalities. So do chiropractors, optometrists, physicians and surgeons, podiatrists, psychologists, and veterinarians.

Sources of Additional Information

For information on dentistry as a career, a list of accredited dental schools, and a list of State boards of dental examiners, contact:

➤ American Dental Association, Commission on Dental Accreditation, 211 E. Chicago Ave., Chicago, IL 60611. Internet: **http://www.ada.org**

For information on admission to dental schools, contact:

➤ American Dental Education Association, 1625 Massachusetts Ave. NW., Suite 600, Washington, DC 20036. Internet: **http://www.adea.org**

Persons interested in practicing dentistry should obtain the requirements for licensure from the board of dental examiners of the State in which they plan to work.

Prospective dental students should contact the office of student financial aid at the schools to which they apply, in order to obtain information on scholarships, grants, and loans, including Federal financial aid.

Dietitians and Nutritionists

(0*NET 29-1031.00)

Significant Points

- Most jobs were in hospitals, nursing care facilities, and offices of physicians or other health practitioners.
- Dietitians and nutritionists need at least a bachelor's degree in dietetics, foods and nutrition, food service systems management, or a related area.
- Average employment growth is expected; however, growth may be constrained if employers substitute other workers for dietitians and if limitations are placed on insurance reimbursement for dietetic services.

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Nature of the Work

Dietitians and nutritionists plan food and nutrition programs and supervise the preparation and serving of meals. They help to prevent and treat illnesses by promoting healthy eating habits and recommending dietary modifications, such as the use of less salt for those with high blood pressure or the reduction of fat and sugar intake for those who are overweight.

Dietitians manage food service systems for institutions such as hospitals and schools, promote sound eating habits through education, and conduct research. Major areas of practice include clinical, community, management, and consultant dietetics.

Clinical dietitians provide nutritional services for patients in institutions such as hospitals and nursing care facilities. They assess patients' nutritional needs, develop and implement nutrition programs, and evaluate and report the results. They also confer with doctors and other healthcare professionals in order to coordinate medical and nutritional needs. Some clinical dietitians specialize in the management of overweight patients or the care of critically ill or renal (kidney) and diabetic patients. In addition, clinical dietitians in nursing care facilities, small hospitals, or correctional facilities may manage the food service department.

Community dietitians counsel individuals and groups on nutritional practices designed to prevent disease and promote health. Working in places such as public health clinics, home health agencies, and health maintenance organizations, community dietitians evaluate individual needs, develop nutritional care plans, and instruct individuals and their families. Dietitians working in home health agencies provide instruction on grocery shopping and food preparation to the elderly, individuals with special needs, and children.

Increased public interest in nutrition has led to job opportunities in food manufacturing, advertising, and marketing. In these areas, dietitians analyze foods, prepare literature for distribution, or report on issues such as the nutritional content of recipes, dietary fiber, or vitamin supplements.

Management dietitians oversee large-scale meal planning and preparation in healthcare facilities, company cafeterias, prisons, and schools. They hire, train, and direct other dietitians and food service workers; budget for and purchase food, equipment, and supplies; enforce sanitary and safety regulations; and prepare records and reports.



Dietitians and nutritionists usually work in clean, well-lighted, and well-ventilated areas.

Consultant dietitians work under contract with healthcare facilities or in their own private practice. They perform nutrition screenings for their clients and offer advice on diet-related concerns such as weight loss or cholesterol reduction. Some work for wellness programs, sports teams, supermarkets, and other nutrition-related businesses. They may consult with food service managers, providing expertise in sanitation, safety procedures, menu development, budgeting, and planning.

Working Conditions

In 2002, most full-time dietitians and nutritionists worked a regular 40-hour week, although some worked weekends. About 1 in 4 worked part time.

Dietitians and nutritionists usually work in clean, well-lighted, and well-ventilated areas. However, some dietitians work in warm, congested kitchens. Many dietitians and nutritionists are on their feet for much of the workday.

Employment

Dietitians and nutritionists held about 49,000 jobs in 2002. More than half of all jobs were in hospitals, nursing care facilities, outpatient care centers, or offices of physicians and other health practitioners. State and local government agencies provided about 1 job in 5—mostly in correctional facilities, health departments, and other public health-related areas. Some dietitians and nutritionists were employed in special food services, an industry which includes firms that provide food services on contract to facilities such as colleges and universities, airlines, correctional facilities, and company cafeterias. Other jobs were in public and private educational services, community care facilities for the elderly (which includes assisted-living facilities), individual and family services, home healthcare services, and the Federal Government—mostly in the U.S. Department of Veterans Affairs.

Some dietitians were self-employed, working as consultants to facilities such as hospitals and nursing care facilities or providing dietary counseling to individual clients.

Training, Other Qualifications, and Advancement

High school students interested in becoming a dietitian or nutritionist should take courses in biology, chemistry, mathematics, health, and communications. Dietitians and nutritionists need at least a bachelor's degree in dietetics, foods and nutrition, food service systems management, or a related area. College students in these majors take courses in foods, nutrition, institution management, chemistry, biochemistry, biology, microbiology, and physiology. Other suggested courses include business, mathematics, statistics, computer science, psychology, sociology, and economics.

Of the 46 States and jurisdictions with laws governing dietetics, 30 require licensure, 15 require certification, and 1 requires registration. The Commission on Dietetic Registration of the American Dietetic Association (ADA) awards the Registered Dietitian credential to those who pass a certification exam after completing their academic coursework and supervised experience. Because practice requirements vary by State, interested candidates should determine the requirements of the State in which they want to work before sitting for any exam.

As of 2003, there were about 230 bachelor's and master's degree programs approved by the ADA's Commission on Accreditation for Dietetics Education (CADE). Supervised prac-

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tice experience can be acquired in two ways. The first requires the completion of a CADE-accredited coordinated program. As of 2003, there were more than 50 accredited programs, which combined academic and supervised practice experience and generally lasted 4 to 5 years. The second option requires the completion of 900 hours of supervised practice experience in any of the 264 CADE-accredited/approved internships. These internships may be full-time programs lasting 6 to 12 months or part-time programs lasting 2 years. Students interested in research, advanced clinical positions, or public health may need an advanced degree.

Experienced dietitians may advance to assistant director, associate director, or director of a dietetic department or may become self-employed. Some dietitians specialize in areas such as renal or pediatric dietetics. Others may leave the occupation to become sales representatives for equipment, pharmaceutical, or food manufacturers.

Job Outlook

Employment of dietitians is expected to grow about as fast as the average for all occupations through 2012 as a result of increasing emphasis on disease prevention through improved dietary habits. A growing and aging population will boost the demand for meals and nutritional counseling in hospitals, nursing care facilities, schools, prisons, community health programs, and home healthcare agencies. Public interest in nutrition and increased emphasis on health education and prudent lifestyles will also spur demand, especially in management. In addition to employment growth, job openings will result from the need to replace experienced workers who leave the occupation.

On the one hand, the number of dietitian positions in nursing care facilities and in State government is expected to decline slightly, as these establishments continue to contract out food service operations. On the other hand, employment is expected to grow rapidly in contract providers of food services, outpatient care centers, and offices of physicians and other health practitioners.

Employment growth for dietitians and nutritionists may be constrained if some employers substitute other workers, such as health educators, food service managers, and dietetic technicians. Growth also may be curbed by limitations on insurance reimbursement for dietetic services.

Earnings

Median annual earnings of dietitians and nutritionists were $41,170 in 2002. The middle 50 percent earned between $33,210 and $49,830. The lowest 10 percent earned less than $25,520, and the highest 10 percent earned more than $58,700. In 2002, median annual earnings in general medical and surgical hospitals, the industry employing the largest number of dietitians and nutritionists, were $41,910.

According to the American Dietetic Association, median annual income for registered dietitians in 2002 varied by practice area as follows: $60,000 in consultation and business; $55,000 in food and nutrition management; $54,800 in education and research; $44,000 in clinical nutrition/ambulatory care; $43,300 in clinical nutrition/long-term care; $43,200 in community nutrition; and $40,800 in clinical nutrition/acute care. Salaries also vary by years in practice, educational level, geographic region, and size of the community.

Related Occupations

Workers in other occupations who may apply the principles of food and nutrition include food service managers, health educators, and registered nurses.

Sources of Additional Information

For a list of academic programs, scholarships, and other information about dietetics, contact:

➤ The American Dietetic Association, 120 South Riverside Plaza, Suite 2000, Chicago, IL 60606-6995. Internet: **http://www.eatright.org**

Occupational Therapists

(0*NET 29-1122.00)

Significant Points

- Employment is projected to increase faster than the average, as rapid growth in the number of middle-aged and elderly individuals increases the demand for therapeutic services.
- A bachelor's degree in occupational therapy is the minimum educational requirement; beginning in 2007, however, a master's degree or higher will be required.
- Occupational therapists are increasingly taking on supervisory roles.
- More than a quarter of occupational therapists work part time.

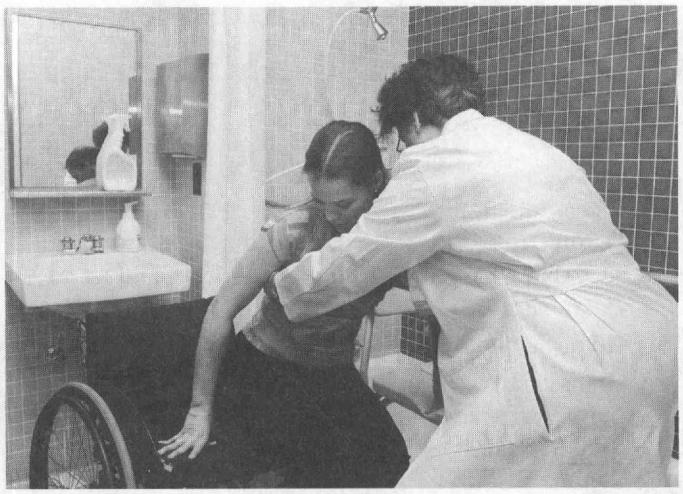
Nature of the Work

Occupational therapists (OTs) help people improve their ability to perform tasks in their daily living and working environments. They work with individuals who have conditions that are mentally, physically, developmentally, or emotionally disabling. They also help them to develop, recover, or maintain daily living and work skills. Occupational therapists help clients not only to improve their basic motor functions and reasoning abilities, but also to compensate for permanent loss of function. Their goal is to help clients have independent, productive, and satisfying lives.

Occupational therapists assist clients in performing activities of all types, ranging from using a computer to caring for daily needs such as dressing, cooking, and eating. Physical exercises may be used to increase strength and dexterity, while other activities may be chosen to improve visual acuity and the ability to discern patterns. For example, a client with short-term memory loss might be encouraged to make lists to aid recall, and a person with coordination problems might be assigned exercises to improve hand-eye coordination. Occupational therapists also use computer programs to help clients improve decisionmaking, abstract-reasoning, problem-solving, and perceptual skills, as well as memory, sequencing, and coordination—all of which are important for independent living.

Therapists instruct those with permanent disabilities, such as spinal cord injuries, cerebral palsy, or muscular dystrophy, in the use of adaptive equipment, including wheelchairs, splints,

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Occupational therapists help people improve their ability to perform tasks in their daily living and working environments.

and aids for eating and dressing. They also design or make special equipment needed at home or at work. Therapists develop computer-aided adaptive equipment and teach clients with severe limitations how to use that equipment in order to communicate better and control various aspects of their environment.

Some occupational therapists treat individuals whose ability to function in a work environment has been impaired. These practitioners arrange employment, evaluate the work environment, plan work activities, and assess the client's progress. Therapists also may collaborate with the client and the employer to modify the work environment so that the work can be successfully completed.

Occupational therapists may work exclusively with individuals in a particular age group or with particular disabilities. In schools, for example, they evaluate children's abilities, recommend and provide therapy, modify classroom equipment, and help children participate as fully as possible in school programs and activities. Occupational therapy also is beneficial to the elderly population. Therapists help the elderly lead more productive, active, and independent lives through a variety of methods, including the use of adaptive equipment.

Occupational therapists in mental-health settings treat individuals who are mentally ill, mentally retarded, or emotionally disturbed. To treat these problems, therapists choose activities that help people learn to engage in and cope with daily life. Activities include time management skills, budgeting, shopping, homemaking, and the use of public transportation. Occupational therapists also may work with individuals who are dealing with alcoholism, drug abuse, depression, eating disorders, or stress-related disorders.

Assessing and recording a client's activities and progress is an important part of an occupational therapist's job. Accurate records are essential for evaluating clients, for billing, and for reporting to physicians and other healthcare providers.

Working Conditions

Occupational therapists in hospitals and other healthcare and community settings usually worked a 40-hour week. Those in schools may participate in meetings and other activities during and after the school day. In 2002, more than a quarter of occupational therapists worked part time.

In large rehabilitation centers, therapists may work in spacious rooms equipped with machines, tools, and other devices generating noise. The work can be tiring, because therapists are on their feet much of the time. Those providing home healthcare services may spend time driving from appointment to appointment. Therapists also face hazards such as back strain from lifting and moving clients and equipment.

Therapists increasingly are taking on supervisory roles. Due to rising healthcare costs, third-party payers are beginning to encourage occupational therapist assistants and aides to take more hands-on responsibility. By having assistants and aides work more closely with clients under the guidance of a therapist, the cost of therapy should decline.

Employment

Occupational therapists held about 82,000 jobs in 2002. About 1 in 10 occupational therapists held more than one job. The largest number of jobs was in hospitals. Other major employers were offices of other health practitioners (which includes offices of occupational therapists), public and private educational services, and nursing care facilities. Some occupational therapists were employed by home healthcare services, outpatient care centers, offices of physicians, individual and family services, community care facilities for the elderly, and government agencies.

A small number of occupational therapists were self-employed in private practice. These practitioners saw clients referred by physicians or other health professionals or provided contract or consulting services to nursing care facilities, schools, adult daycare programs, and home healthcare agencies.

Training, Other Qualifications, and Advancement

Currently, a bachelor's degree in occupational therapy is the minimum requirement for entry into this field. Beginning in 2007, however, a master's degree or higher will be the minimum educational requirement. As a result, students in bachelor's-level programs should complete their coursework and fieldwork before 2007. All States, Puerto Rico, and the District of Columbia regulate the practice of occupational therapy. To obtain a license, applicants must graduate from an accredited educational program and pass a national certification examination. Those who pass the exam are awarded the title "Occupational Therapist Registered (OTR)."

In 2003, entry-level education was offered in 38 bachelor's degree programs, 3 postbaccalaureate certificate programs for students with a degree other than occupational therapy, and 86 entry-level master's degree programs. There were 48 programs that offered a combined bachelor's and master's degree and 5 offered an entry-level doctoral degree. Most schools have full-time programs, although a growing number also offer weekend or part-time programs.

Occupational therapy coursework includes physical, biological, and behavioral sciences and the application of occupational therapy theory and skills. Completion of 6 months of supervised fieldwork also is required.

Persons considering this profession should take high school courses in biology, chemistry, physics, health, art, and the social

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sciences. College admissions offices also look favorably at paid or volunteer experience in the healthcare field.

Occupational therapists need patience and strong interpersonal skills to inspire trust and respect in their clients. Ingenuity and imagination in adapting activities to individual needs are assets. Those working in home healthcare services must be able to adapt to a variety of settings.

Job Outlook

Employment of occupational therapists is expected to increase faster than the average for all occupations through 2012. The impact of proposed Federal legislation imposing limits on reimbursement for therapy services may adversely affect the job market for occupational therapists in the near term. However, over the long run, the demand for occupational therapists should continue to rise as a result of growth in the number of individuals with disabilities or limited function who require therapy services. The baby-boom generation's movement into middle age, a period when the incidence of heart attack and stroke increases, will spur the demand for therapeutic services. Growth in the population 75 years and older—an age group that suffers from high incidences of disabling conditions—also will increase the demand for therapeutic services. In addition, medical advances now enable more patients with critical problems to survive—patients who ultimately may need extensive therapy.

Hospitals will continue to employ a large number of occupational therapists to provide therapy services to acutely ill inpatients. Hospitals also will need occupational therapists to staff their outpatient rehabilitation programs.

Employment growth in schools will result from the expansion of the school-age population and extended services for disabled students. Therapists will be needed to help children with disabilities prepare to enter special education programs.

Earnings

Median annual earnings of occupational therapists were $51,990 in 2002. The middle 50 percent earned between $42,910 and $ 61,620. The lowest 10 percent earned less than $35,130, and the highest 10 percent earned more than $74,390. Median annual earnings in the industries employing the largest numbers of occupational therapists in 2002 were as follows:

Offices of other health practitioners	$53,660
Nursing care facilities	53,930
General medical and surgical hospitals	53,210
Elementary and secondary schools	45,740

Related Occupations

Occupational therapists use specialized knowledge to help individuals perform daily living skills and achieve maximum independence. Other workers performing similar duties include audiologists, chiropractors, physical therapists, recreational therapists, rehabilitation counselors, respiratory therapists, and speech-language pathologists.

Sources of Additional Information

For more information on occupational therapy as a career, contact:

➤ American Occupational Therapy Association, 4720 Montgomery Lane, Bethesda, MD 20824-1220. Internet: **http://www.aota.org**

Optometrists

(0*NET 29-1041.00)

Significant Points

- Licensed optometrists must earn a Doctor of Optometry degree from an accredited optometry school and pass a written and a clinical State board examination.
- Admission to optometry school is competitive.
- Optometrists usually remain in practice until they retire, so relatively few job openings arise from the need to replace those who leave the occupation.

Nature of the Work

Optometrists, also known as *doctors of optometry,* or *ODs*, provide most primary vision care. They examine people's eyes to diagnose vision problems and eye diseases, and they test patients' visual acuity, depth and color perception, and ability to focus and coordinate the eyes. Optometrists prescribe eyeglasses and contact lenses and provide vision therapy and low-vision rehabilitation. Optometrists analyze test results and develop a treatment plan. They administer drugs to patients to aid in the diagnosis of vision problems and prescribe drugs to treat some eye diseases. Optometrists often provide preoperative and postoperative care to cataract patients, as well as patients who have had laser vision correction or other eye surgery. They also diagnose conditions due to systemic diseases such as diabetes and high blood pressure, referring patients to other health practitioners as needed.

Optometrists should not be confused with ophthalmologists or dispensing opticians. Ophthalmologists are physicians who perform eye surgery, and diagnose and treat eye diseases and injuries. Like optometrists, they also examine eyes and prescribe eyeglasses and contact lenses. Dispensing opticians fit and adjust eyeglasses and, in some States, may fit contact lenses according to prescriptions written by ophthalmologists or optometrists. (See the sections on physicians and surgeons; and opticians, dispensing, elsewhere in the *Handbook*.)

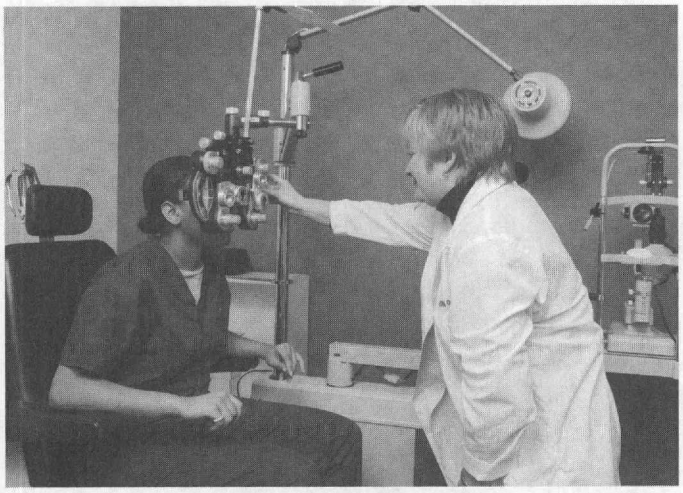
Most optometrists are in general practice. Some specialize in work with the elderly, children, or partially sighted persons who need specialized visual devices. Others develop and implement ways to protect workers' eyes from on-the-job strain or injury. Some specialize in contact lenses, sports vision, or vision therapy. A few teach optometry, perform research, or consult.

Most optometrists are private practitioners who also handle the business aspects of running an office, such as developing a patient base, hiring employees, keeping records, and ordering equipment and supplies. Optometrists who operate franchise optical stores also may have some of these duties.

Working Conditions

Optometrists work in places—usually their own offices—that are clean, well lighted, and comfortable. Most full-time optometrists work about 40 hours a week. Many work weekends and evenings to suit the needs of patients. Emergency calls, once uncommon, have increased with the passage of therapeutic-drug laws expanding optometrists' ability to prescribe medications.

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Most optometrists are private practitioners who also handle the business aspects of running an office.

Employment

Optometrists held about 32,000 jobs in 2002. The number of jobs is greater than the number of practicing optometrists because some optometrists hold two or more jobs. For example, an optometrist may have a private practice, but also work in another practice, in a clinic, or in a vision care center. According to the American Optometric Association, about two-thirds of practicing optometrists are in private practice. Although many optometrists practice alone, a growing number are in a partnership or group practice.

Salaried jobs for optometrists were primarily in offices of other health practitioners, including optometrists; offices of physicians, including ophthalmologists; or health and personal care stores, including optical goods stores. A small number of salaried jobs for optometrists were in hospitals; the Federal government; or outpatient care centers, including health maintenance organizations. Almost a third of optometrists were self-employed.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require that optometrists be licensed. Applicants for a license must have a Doctor of Optometry degree from an accredited optometry school and pass both a written and a clinical State board examination. In many States, applicants can substitute the examinations of the National Board of Examiners in Optometry, usually taken during the student's academic career, for part or all of the written examination. Licenses are renewed every 1 to 3 years, and, in all States, continuing education credits are needed for renewal.

The Doctor of Optometry degree requires the completion of a 4-year program at an accredited optometry school, preceded by at least 3 years of preoptometric study at an accredited college or university. Most optometry students hold a bachelor's or higher degree. In 2002, 17 U.S. schools and colleges of optometry held an accredited status with the Accreditation Council on Optometric Education of the American Optometric Association.

Requirements for admission to schools of optometry include courses in English, mathematics, physics, chemistry, and biology. A few schools also require or recommend courses in psychology, history, sociology, speech, or business. Since a strong background in science is important, many applicants to optometry school major in a science such as biology or chemistry, while other applicants major in another subject and take many science courses as well. Applicants must take the Optometry Admissions Test, which measures academic ability and scientific comprehension. Most applicants take the test after their sophomore or junior year, allowing them an opportunity to take the test again and raise their score. A small number of applicants are accepted to optometry school after 3 years of college and complete their bachelor's degree while attending optometry school. Admission to optometry school is competitive.

Optometry programs include classroom and laboratory study of health and visual sciences, as well as clinical training in the diagnosis and treatment of eye disorders. Courses in pharmacology, optics, vision science, biochemistry, and systemic disease are included.

Business ability, self-discipline, and the ability to deal tactfully with patients are important for success. The work of optometrists requires attention to detail and manual dexterity.

Optometrists wishing to teach or do research may study for a master's or Ph.D. degree in visual science, physiological optics, neurophysiology, public health, health administration, health information and communication, or health education. One-year postgraduate clinical residency programs are available for optometrists who wish to specialize in family practice optometry, pediatric optometry, geriatric optometry, vision therapy, contact lenses, hospital-based optometry, primary care optometry, or ocular disease.

Job Outlook

Employment of optometrists is expected to grow about as fast as the average for all occupations through 2012, in response to the vision care needs of a growing and aging population. As baby boomers age, they will be more likely to visit optometrists and ophthalmologists because of the onset of vision problems in middle age, including those resulting from the extensive use of computers. The demand for optometric services also will increase because of growth in the oldest age group, with its increased likelihood of cataracts, glaucoma, diabetes, and hypertension. Greater recognition of the importance of vision care, rising personal incomes, and growth in employee vision care plans will spur employment growth, as well.

Employment of optometrists would grow more rapidly were it not for anticipated productivity gains that will allow each optometrist to see more patients. These expected gains stem from greater use of optometric assistants and other support personnel, who will reduce the amount of time optometrists need with each patient. Also, laser surgery that can correct some vision problems is available, but expensive. Optometrists will still be needed to perform preoperative and postoperative care for laser surgery; however, patients who successfully undergo this surgery may not require optometrists to prescribe glasses or contacts for several years.

In addition to growth, the need to replace optometrists who leave the occupation will create employment opportunities. Relatively few opportunities from this source are expected, however, because optometrists usually continue to practice until they retire; few transfer to other occupations.

Earnings

Median annual earnings of salaried optometrists were $86,090 in 2002. The middle 50 percent earned between $62,030 and $115,550. Median annual earnings of salaried optometrists in

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2002 were $87,070 in offices of other health practitioners. Salaried optometrists tend to earn more initially than do optometrists who set up their own independent practice. In the long run, however, those in private practice usually earn more.

According to the American Optometric Association, median net annual income for all optometrists, including the self-employed, was $110,000 in 2002. The middle 50 percent earned between $82,500 and $156,500.

Related Occupations

Other workers who apply scientific knowledge to prevent, diagnose, and treat disorders and injuries are chiropractors, dentists, physicians and surgeons, podiatrists, and veterinarians.

Sources of Additional Information

For information on optometry as a career and a list of accredited optometric educational institutions, contact:

➤ Association of Schools and Colleges of Optometry, 6110 Executive Blvd., Suite 510, Rockville, MD 20852. Internet: **http://www.opted.org**

Additional career information is available from:

➤ American Optometric Association, Educational Services, 243 North Lindbergh Blvd., St. Louis, MO 63141-7881. Internet: **http://www.aoanet.org**

The Board of Optometry in each State can supply information on licensing requirements.

For information on specific admission requirements and sources of financial aid, contact the admissions officers of individual optometry schools.

Pharmacists

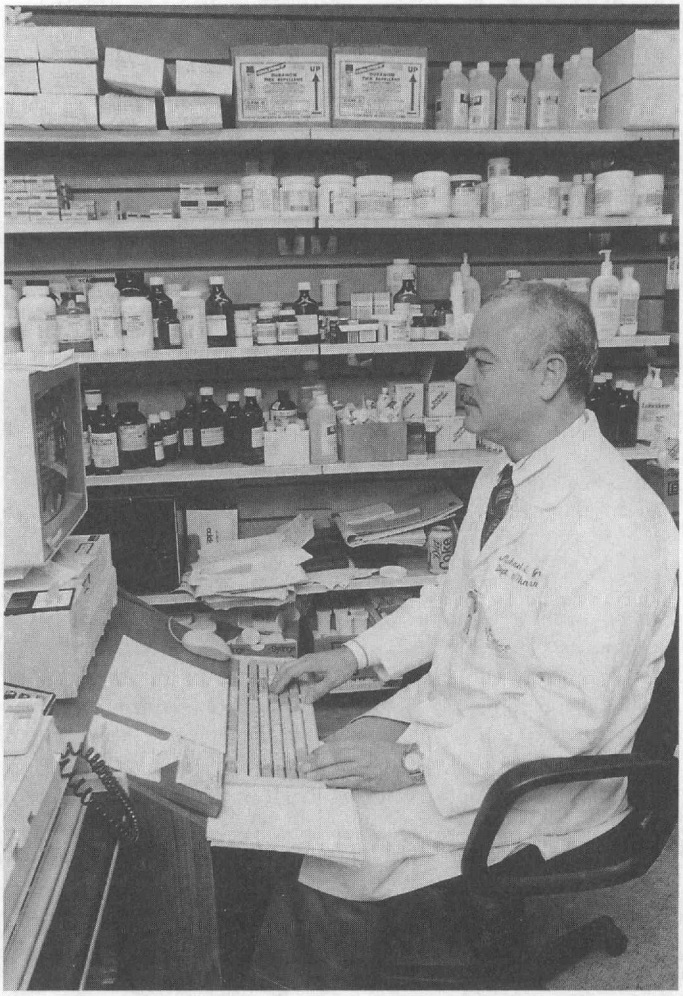
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Significant Points

- Pharmacists are becoming more involved in drug therapy decisionmaking and patient counseling.
- A license is required; one must graduate from an accredited college of pharmacy and pass a State examination.
- Very good employment opportunities are expected.
- Earnings are very high, but some pharmacists work long hours, nights, weekends, and holidays.

Nature of the Work

Pharmacists dispense drugs prescribed by physicians and other health practitioners and provide information to patients about medications and their use. They advise physicians and other health practitioners on the selection, dosages, interactions, and side effects of medications. Pharmacists also monitor the health and progress of patients in response to drug therapy to ensure safe and effective use of medication. Pharmacists must understand the use, clinical effects, and composition of drugs, including their chemical, biological, and physical properties. Compounding—the actual mixing of ingredients to form powders, tablets, capsules, ointments, and solutions—is a small part of a pharmacist's practice, because most medicines are produced by pharmaceutical companies in a standard dosage and drug delivery form. Traditionally, most pharmacists work in a community setting, such as a retail drugstore, or in a healthcare facility, such as a hospital, nursing home, mental health institution, or neighborhood health clinic.



Pharmacists must check records to ensure that patients are not allergic to new medications.

Pharmacists in community and retail pharmacies counsel patients and answer questions about prescription drugs, including questions regarding possible side effects or interactions among various drugs. They provide information about over-the-counter drugs and make recommendations after talking with the patient. They also may give advice about diet, exercise, or stress management, or about durable medical equipment and home healthcare supplies. They also may complete third-party insurance forms and other paperwork. Those who own or manage community pharmacies may sell non-health-related merchandise, hire and supervise personnel, and oversee the general operation of the pharmacy. Some community pharmacists provide specialized services to help patients manage conditions such as diabetes, asthma, smoking cessation, or high blood pressure. Some community pharmacists are also certified to administer vaccinations.

Pharmacists in healthcare facilities dispense medications and advise the medical staff on the selection and effects of drugs. They may make sterile solutions and buy medical supplies. They also assess, plan, and monitor drug programs or regimens. They counsel patients on the use of drugs while in the hospital, and on their use at home when the patients are discharged. Pharma-

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cists also may evaluate drug use patterns and outcomes for patients in hospitals or managed care organizations.

Pharmacists who work in home healthcare monitor drug therapy and prepare infusions—solutions that are injected into patients—and other medications for use in the home.

Some pharmacists specialize in specific drug therapy areas, such as intravenous nutrition support, oncology (cancer), nuclear pharmacy (used for chemotherapy), geriatric pharmacy, and psychopharmacotherapy (the treatment of mental disorders with drugs).

Most pharmacists keep confidential computerized records of patients' drug therapies to ensure that harmful drug interactions do not occur. Pharmacists are responsible for the accuracy of every prescription that is filled, but they often rely upon pharmacy technicians and pharmacy aides to assist them in the dispensing process. Thus, the pharmacist may delegate prescription-filling and administrative tasks and supervise their completion. They also frequently oversee pharmacy students serving as interns in preparation for graduation and licensure.

Increasingly, pharmacists pursue nontraditional pharmacy work. Some are involved in research for pharmaceutical manufacturers, developing new drugs and therapies and testing their effects on people. Others work in marketing or sales, providing expertise to clients on a drug's use, effectiveness, and possible side effects. Some pharmacists also work for health insurance companies, developing pharmacy benefit packages and carrying out cost-benefit analyses on certain drugs. Other pharmacists work for the government and pharmacy associations. Finally, some pharmacists are employed full time or part time as college faculty, teaching classes and performing research in a wide range of areas.

Working Conditions

Pharmacists work in clean, well-lighted, and well-ventilated areas. Many pharmacists spend most of their workday on their feet. When working with sterile or potentially dangerous pharmaceutical products, pharmacists wear gloves and masks and work with other special protective equipment. Many community and hospital pharmacies are open for extended hours or around the clock, so pharmacists may work evenings, nights, weekends, and holidays. Consultant pharmacists may travel to nursing homes or other facilities to monitor patients' drug therapy.

About 19 percent of pharmacists worked part time in 2002. Most full-time salaried pharmacists worked about 40 hours a week. Some, including many self-employed pharmacists, worked more than 50 hours a week.

Employment

Pharmacists held about 230,000 jobs in 2002. About 62 percent work in community pharmacies that are either independently owned or part of a drugstore chain, grocery store, department store, or mass merchandiser. Most community pharmacists are salaried employees, but some are self-employed owners. About 22 percent of salaried pharmacists work in hospitals, and others work in clinics, mail-order pharmacies, pharmaceutical wholesalers, home healthcare agencies, or the Federal Government.

Training, Other Qualifications, and Advancement

A license to practice pharmacy is required in all States, the District of Columbia, and U.S. territories. To obtain a license, one must graduate from a college of pharmacy accredited by the American Council on Pharmaceutical Education (ACPE) and pass an examination. All States except California require the North American Pharmacist Licensure Exam (NAPLEX) and the Multistate Pharmacy Jurisprudence Exam (MPJE), both administered by the National Association of Boards of Pharmacy. California has its own pharmacist licensure exam. In addition to the NAPLEX and MPJE, some States require additional exams unique to their State. All States except California currently grant a license without extensive re-examination to qualified pharmacists already licensed by another State. In Florida, reexamination is not required if a pharmacist passed the NAPLEX and MPJE within 12 years of his or her application for license transfer. Many pharmacists are licensed to practice in more than one State. States may require continuing education for license renewal. Persons interested in a career as a pharmacist should check with State boards of pharmacy for details on examination requirements and license transfer procedures.

In 2002, 85 colleges of pharmacy were accredited to confer degrees by the American Council on Pharmaceutical Education. Pharmacy programs grant the degree of Doctor of Pharmacy (Pharm.D.), which requires at least 6 years of postsecondary study and the passing of the licensure examination of a State board of pharmacy. Courses offered at colleges of pharmacy are designed to teach students how to dispense prescriptions and communicate with patients and other health care providers about drug information and patient care. Students also learn professional ethics. In addition to classroom study, students in the Pharm.D. program are provided in-depth exposure to and active participation in a variety of pharmacy practice settings under the supervision of licensed pharmacists. The Pharm.D. degree has replaced the Bachelor of Pharmacy (B.Pharm.) degree, which is no longer offered to new students and will cease to be awarded after 2005.

The Pharm.D. is a 4-year program that requires at least 2 years of college study prior to admittance, although most applicants have 3 years prior to entering the program. Entry requirements usually include courses in mathematics and natural sciences, such as chemistry, biology, and physics, as well as courses in the humanities and social sciences. Approximately half of all colleges require the applicant to take the Pharmacy College Admissions Test (PCAT).

In 2003, the American Association of Colleges of Pharmacy (AACP) launched the Pharmacy College Application Service, known as PharmCAS, for students interested in applying to schools and colleges of pharmacy. This centralized service allows applicants to use a single Web-based application and one set of transcripts to apply to multiple Pharm.D. degree programs. A total of 43 pharmacy programs participated in 2003.

In the 2002-03 academic year, 66 colleges of pharmacy awarded the master of science degree or the Ph.D. degree. Both the master's and Ph.D. degrees are awarded after completion of a Pharm.D. degree. These degrees are designed for those who want more laboratory and research experience. Many master's and Ph.D. degree holders do research for a drug company or teach at a university. Other options for pharmacy graduates who are interested in further training include 1- or 2-year residency programs or fellowships. Pharmacy residencies are postgraduate training programs in pharmacy practice, and usually require the completion of a research study. Pharmacy fellowships are highly individualized programs designed to prepare participants to work in research laboratories. Some pharmacists who run

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their own pharmacy obtain a master's degree in business administration (MBA).

Areas of graduate study include pharmaceutics and pharmaceutical chemistry (physical and chemical properties of drugs and dosage forms), pharmacology (effects of drugs on the body), and pharmacy administration.

Prospective pharmacists should have scientific aptitude, good communication skills, and a desire to help others. They also must be conscientious and pay close attention to detail, because the decisions they make affect human lives.

In community pharmacies, pharmacists usually begin at the staff level. In independent pharmacies, after they gain experience and secure the necessary capital, some become owners or part owners of pharmacies. Pharmacists in chain drugstores may be promoted to pharmacy supervisor or manager at the store level, then to manager at the district or regional level, and later to an executive position within the chain's headquarters.

Hospital pharmacists may advance to supervisory or administrative positions. Pharmacists in the pharmaceutical industry may advance in marketing, sales, research, quality control, production, packaging, or other areas.

Job Outlook

Very good employment opportunities are expected for pharmacists over the 2002-12 period because the number of degrees granted in pharmacy is expected to be less than the number of job openings created by employment growth and the need to replace pharmacists who retire or otherwise leave the occupation. Recently, enrollments in pharmacy programs are rising as more students are attracted by high salaries and good job prospects. Despite this increase in enrollments, pharmacist jobs should still be more numerous than those seeking employment.

Employment of pharmacists is expected to grow faster than the average for all occupations through the year 2012, due to the increased pharmaceutical needs of a growing elderly population and increased use of medications. The growing numbers of middle-aged and elderly people—who, on average, use more prescription drugs than do younger people—will continue to spur demand for pharmacists in all employment settings. Other factors likely to increase the demand for pharmacists include scientific advances that will make more drug products available, new developments in genome research and medication distribution systems, increasingly sophisticated consumers seeking more information about drugs, and coverage of prescription drugs by a greater number of health insurance plans and by Medicare.

Community pharmacies are taking steps to manage increasing prescription volume. Automation of drug dispensing and greater employment of pharmacy technicians and pharmacy aides will help these establishments to dispense more prescriptions.

With its emphasis on cost control, managed care encourages the use of lower cost prescription drug distributors, such as mail-order firms and online pharmacies, for purchases of certain medications. Prescriptions ordered through the mail via the Internet are filled in a central location and shipped to the patient at a lower cost. Mail-order and online pharmacies typically use automated technology to dispense medication and employ fewer pharmacists. If the utilization of mail-order pharmacies increases rapidly, job growth among pharmacists could be limited.

Employment of pharmacists will not grow as fast in hospitals as in other industries, as hospitals reduce inpatient stays, downsize, and consolidate departments. The increase in outpatient surgeries means more patients are discharged and purchase medications through retail, supermarket, or mail-order pharmacies, rather than through the hospital. An aging population means more pharmacy services are required in nursing homes, assisted living facilities, and home care settings, where the most rapid job growth among pharmacists is expected.

New opportunities are emerging for pharmacists in managed-care organizations, where they may analyze trends and patterns in medication use for their populations of patients, and for pharmacists trained in research, disease management, and pharmacoeconomics—determining the costs and benefits of different drug therapies. Pharmacists also will have opportunities to work in research and development as well as sales and marketing for pharmaceutical manufacturing firms. New breakthroughs in biotechnology will increase the potential for drugs to treat diseases and expand the opportunities for pharmacists to conduct research and sell medications.

Job opportunities for pharmacists in patient care will arise as cost-conscious insurers and health systems continue to emphasize the role of pharmacists in primary and preventive health services. Health insurance companies realize that the expense of using medication to treat diseases and various health conditions often is considerably less than the potential costs for patients whose conditions go untreated. Pharmacists also can reduce the expenses resulting from unexpected complications due to allergic reactions or medication interactions.

Earnings

Median annual wage and salary earnings of pharmacists in 2002 were $77,050. The middle 50 percent earned between $66,210 and $87,250 a year. The lowest 10 percent earned less than $54,110, and the highest 10 percent earned more than $94,570 a year. Median annual earnings in the industries employing the largest numbers of pharmacists in 2002 were as follows:

Grocery stores	$78,270
Health and personal care stores	76,800
General medical and surgical hospitals	76,620

Related Occupations

Pharmacy technicians and pharmacy aides also work in pharmacies. Persons in other professions who may work with pharmaceutical compounds include biological scientists, medical scientists, and chemists and materials scientists. Increasingly, pharmacists are involved in patient care and therapy, work that they have in common with physicians and surgeons.

Sources of Additional Information

For information on pharmacy as a career, preprofessional and professional requirements, programs offered by colleges of pharmacy, and student financial aid, contact:

➤ American Association of Colleges of Pharmacy, 1426 Prince St., Alexandria, VA 22314. Internet: **http://www.aacp.org**

General information on careers in pharmacy is available from:

➤ American Society of Health-System Pharmacists, 7272 Wisconsin Ave., Bethesda, MD 20814. Internet: **http://www.ashp.org**

➤ National Association of Chain Drug Stores, 413 N. Lee St., P.O. Box 1417-D49, Alexandria, VA 22313-1480. Internet: **http://www.nacds.org**

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Information on the North American Pharmacist Licensure Exam (NAPLEX) and the Multistate Pharmacy Jurisprudence Exam (MPJE) is available from:

➤ National Association of Boards of Pharmacy, 700 Busse Hwy., Park Ridge, IL 60068. Internet: **http://www.nabp.net**

State licensure requirements are available from each State's Board of Pharmacy. Information on specific college entrance requirements, curriculums, and financial aid is available from any college of pharmacy.

Physical Therapists

(0*NET 29-1123.00)

Significant Points

- Employment is expected to increase faster than the average, as growth in the number of individuals with disabilities or limited function spurs demand for therapy services.
- After graduating from an accredited physical therapist educational program, therapists must pass a licensure exam before they can practice.
- About two-thirds of physical therapists work either in hospitals or in offices of physical therapists.

Nature of the Work

Physical therapists (PTs) provide services that help restore function, improve mobility, relieve pain, and prevent or limit permanent physical disabilities of patients suffering from injuries or disease. They restore, maintain, and promote overall fitness and health. Their patients include accident victims and individuals with disabling conditions such as low-back pain, arthritis, heart disease, fractures, head injuries, and cerebral palsy.

Therapists examine patients' medical histories and then test and measure the patients' strength, range of motion, balance and coordination, posture, muscle performance, respiration, and motor function. They also determine patients' ability to be independent and reintegrate into the community or workplace after injury or illness. Next, physical therapists develop treatment plans describing a treatment strategy, its purpose, and its anticipated outcome. Physical therapist assistants, under the direction and supervision of a physical therapist, may be involved in implementing treatment plans with patients. Physical therapist aides perform routine support tasks, as directed by the therapist. (*Physical therapist assistants and aides* are discussed elsewhere in the *Handbook*.)

Treatment often includes exercise for patients who have been immobilized and lack flexibility, strength, or endurance. Physical therapists encourage patients to use their own muscles to increase their flexibility and range of motion before finally advancing to other exercises that improve strength, balance, coordination, and endurance. The goal is to improve how an individual functions at work and at home.

Physical therapists also use electrical stimulation, hot packs or cold compresses, and ultrasound to relieve pain and reduce swelling. They may use traction or deep-tissue massage to relieve pain. Therapists also teach patients to use assistive and adaptive devices, such as crutches, prostheses, and wheelchairs. They also may show patients exercises to do at home to expedite their recovery.

As treatment continues, physical therapists document the patient's progress, conduct periodic examinations, and modify treatments when necessary. Besides tracking the patient's progress, such documentation identifies areas requiring more or less attention.

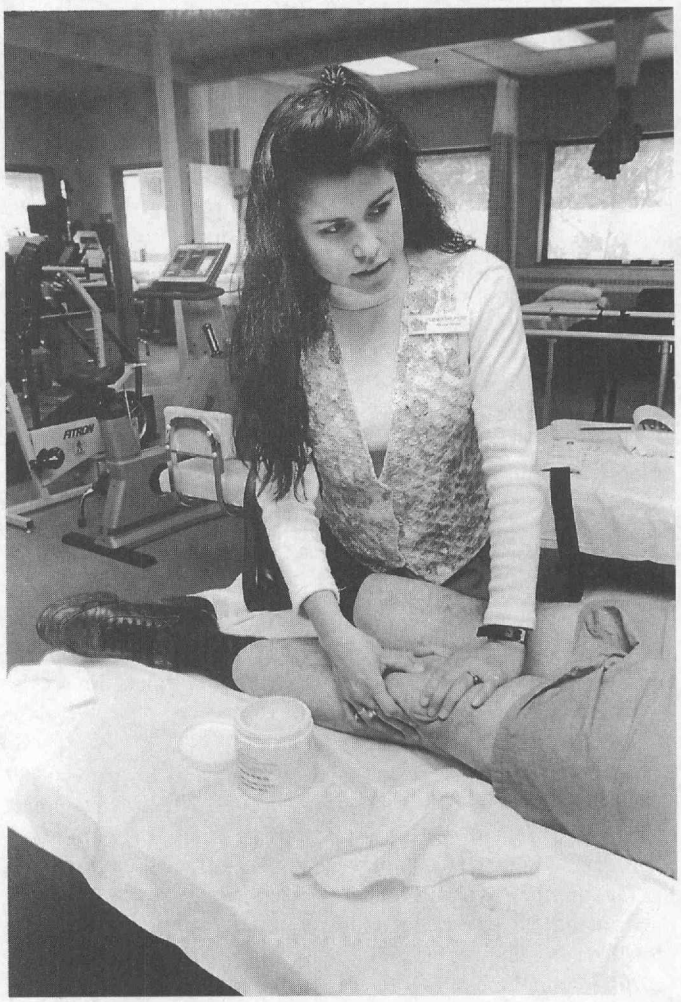
Physical therapists often consult and practice with a variety of other professionals, such as physicians, dentists, nurses, educators, social workers, occupational therapists, speech-language pathologists, and audiologists.

Some physical therapists treat a wide range of ailments; others specialize in areas such as pediatrics, geriatrics, orthopedics, sports medicine, neurology, and cardiopulmonary physical therapy.

Working Conditions

Physical therapists practice in hospitals, clinics, and private offices that have specially equipped facilities, or they treat patients in hospital rooms, homes, or schools.

In 2002, most full-time physical therapists worked a 40-hour week; some worked evenings and weekends to fit their patients' schedules. More than 1 in 5 physical therapists worked part time. The job can be physically demanding because therapists often have to stoop, kneel, crouch, lift, and stand for long periods. In addition, physical therapists move heavy equipment and lift patients or help them turn, stand, or walk.



Physical therapists may use traction or deep-tissue massage to relieve pain.

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Employment

Physical therapists held about 137,000 jobs in 2002. The number of jobs is greater than the number of practicing physical therapists, because some physical therapists hold two or more jobs. For example, some may work in a private practice, but also work part time in another healthcare facility.

About two-thirds of jobs for physical therapists were either in hospitals or in offices of other health practitioners (which includes offices of physical therapists). Other jobs were in home healthcare services, nursing care facilities, outpatient care centers, and offices of physicians. Some physical therapists were self-employed in private practices, seeing individual patients and contracting to provide services in hospitals, rehabilitation centers, nursing care facilities, home healthcare agencies, adult daycare programs, and schools. Physical therapists also teach in academic institutions and conduct research.

Training, Other Qualifications, and Advancement

All States require physical therapists to pass a licensure exam before they can practice, after graduating from an accredited physical therapist educational program.

According to the American Physical Therapy Association, there were 203 accredited physical therapist programs in 2003. Of the accredited programs, 113 offered master's degrees, and 90 offered doctoral degrees. All physical therapist programs seeking accreditation are required to offer degrees at the master's degree level and above, in accordance with the Commission on Accreditation in Physical Therapy Education.

Physical therapist programs start with basic science courses such as biology, chemistry, and physics and then introduce specialized courses, including biomechanics, neuroanatomy, human growth and development, manifestations of disease, examination techniques, and therapeutic procedures. Besides getting classroom and laboratory instruction, students receive supervised clinical experience. Among the courses that are useful when one applies to a physical therapist educational program are anatomy, biology, chemistry, social science, mathematics, and physics. Before granting admission, many professional education programs require experience as a volunteer in a physical therapy department of a hospital or clinic.

Physical therapists should have strong interpersonal skills in order to be able to educate patients about their physical therapy treatments. PTs also should be compassionate and possess a desire to help patients. Similar traits are needed to interact with the patient's family.

Physical therapists are expected to continue their professional development by participating in continuing education courses and workshops. In fact, a number of States require continuing education as a condition of maintaining one's licensure.

Job Outlook

Employment of physical therapists is expected to grow faster than the average for all occupations through 2012. The impact of proposed Federal legislation imposing limits on reimbursement for therapy services may adversely affect the short-term job outlook for physical therapists. However, over the long run, the demand for physical therapists should continue to rise as growth in the number of individuals with disabilities or limited function spurs demand for therapy services. The growing elderly population is particularly vulnerable to chronic and debilitating conditions that require therapeutic services. Also, the baby-boom generation is entering the prime age for heart attacks and strokes, increasing the demand for cardiac and physical rehabilitation. Further, young people will need physical therapy as technological advances save the lives of a larger proportion of newborns with severe birth defects.

Future medical developments also should permit a higher percentage of trauma victims to survive, creating additional demand for rehabilitative care. In addition, growth may result from advances in medical technology that could permit the treatment of more disabling conditions.

Widespread interest in health promotion also should increase demand for physical therapy services. A growing number of employers are using physical therapists to evaluate worksites, develop exercise programs, and teach safe work habits to employees in the hope of reducing injuries.

Earnings

Median annual earnings of physical therapists were $57,330 in 2002. The middle 50 percent earned between $48,480 and $70.050. The lowest 10 percent earned less than $40,200, and the highest 10 percent earned more than $86,260. Median annual earnings in the industries employing the largest numbers of physical therapists in 2002 were as follows:

Home health care services	$62,480
Offices of other health practitioners	58,510
Offices of physicians	57,640
Nursing care facilities	57,570
General medical and surgical hospitals	57,200

Related Occupations

Physical therapists rehabilitate persons with physical disabilities. Others who work in the rehabilitation field include audiologists, chiropractors, occupational therapists, recreational therapists, rehabilitation counselors, respiratory therapists, and speech-language pathologists.

Sources of Additional Information

Additional career information and a list of accredited educational programs in physical therapy are available from:

➤ American Physical Therapy Association, 1111 North Fairfax St., Alexandria, VA 22314-1488. Internet: **http://www.apta.org**

Physician Assistants

(0*NET 29-1071.00)

Significant Points

- The typical physician assistant program lasts about 2 years and requires at least 2 years of college and some healthcare experience for admission.
- Most applicants to physician assistant programs hold a bachelor's or master's degree.
- Job opportunities should be good, particularly in rural and inner city clinics.
- Earnings are high.

Nature of the Work

Physician assistants (PAs) provide healthcare services under the supervision of physicians. They should not be confused with

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medical assistants, who perform routine clinical and clerical tasks. (Medical assistants are discussed elsewhere in the *Handbook*.) PAs are formally trained to provide diagnostic, therapeutic, and preventive healthcare services, as delegated by a physician. Working as members of the healthcare team, they take medical histories, examine and treat patients, order and interpret laboratory tests and x rays, make diagnoses, and prescribe medications. They also treat minor injuries, by suturing, splinting, and casting. PAs record progress notes, instruct and counsel patients, and order or carry out therapy. In 47 States and the District of Columbia, physician assistants may prescribe medications. PAs also may have managerial duties. Some order medical and laboratory supplies and equipment and may supervise technicians and assistants.

Physician assistants work under the supervision of a physician. However, PAs may be the principal care providers in rural or inner city clinics, where a physician is present for only 1 or 2 days each week. In such cases, the PA confers with the supervising physician and other medical professionals as needed or as required by law. PAs also may make house calls or go to hospitals and nursing care facilities to check on patients, after which they report back to the physician.

The duties of physician assistants are determined by the supervising physician and by State law. Aspiring PAs should investigate the laws and regulations in the States in which they wish to practice.

Many PAs work in primary care specialties, such as general internal medicine, pediatrics, and family medicine. Others specialty areas include general and thoracic surgery, emergency medicine, orthopedics, and geriatrics. PAs specializing in surgery provide preoperative and postoperative care and may work as first or second assistants during major surgery.

Working Conditions

Although PAs usually work in a comfortable, well-lighted environment, those in surgery often stand for long periods, and others do considerable walking. Schedules vary according to the practice setting, and often depend on the hours of the supervising physician. The workweek of hospital-based PAs may include weekends, nights, or early morning hospital rounds to visit patients. These workers also may be on call. PAs in clinics usually work a 40-hour week.



Physician assistants conduct medical examinations under a physician's supervision.

Employment

Physician assistants held about 63,000 jobs in 2002. The number of jobs is greater than the number of practicing PAs because some hold two or more jobs. For example, some PAs work with a supervising physician, but also work in another practice, clinic, or hospital. According to the American Academy of Physician Assistants, almost 90 percent of certified PAs were in clinical practice in 2003.

More than half of jobs for PAs were in the offices of physicians or other health practitioners. About a quarter were in hospitals. The rest were mostly in outpatient care centers, the Federal government, educational services, and employment services.

Training, Other Qualifications, and Advancement

All States require that new PAs complete an accredited, formal education program. In 2002 there were about 133 accredited or provisionally accredited education programs for physician assistants. Sixty-eight of these programs offered a master's degree, and the rest offered either a bachelor's degree or an associate degree. Most PA graduates have at least a bachelor's degree.

Admission requirements vary, but many programs require 2 years of college and some work experience in the healthcare field. Students should take courses in biology, English, chemistry, mathematics, psychology, and the social sciences. Most applicants to PA programs hold a bachelor's or master's degree. Many PAs have backgrounds as registered nurses, while others come from varied backgrounds, including military corpsman/medics and allied health occupations such as respiratory therapists, physical therapists, and emergency medical technicians and paramedics.

PA programs usually last at least 2 years and are full time. Most programs are in schools of allied health, academic health centers, medical schools, or 4-year colleges; a few are in community colleges, the military, or hospitals. Many accredited PA programs have clinical teaching affiliations with medical schools.

PA education includes classroom instruction in biochemistry, pathology, human anatomy, physiology, microbiology, clinical pharmacology, clinical medicine, geriatric and home healthcare, disease prevention, and medical ethics. Students obtain supervised clinical training in several areas, including primary care medicine, inpatient medicine, surgery, obstetrics and gynecology, geriatrics, emergency medicine, psychiatry, and pediatrics. Sometimes, PA students serve one or more of these "rotations" under the supervision of a physician who is seeking to hire a PA. The rotations often lead to permanent employment.

All States and the District of Columbia have legislation governing the qualifications or practice of physician assistants. All jurisdictions require physician assistants to pass the Physician Assistants National Certifying Examination, administered by the National Commission on Certification of Physician Assistants (NCCPA) and open to graduates of accredited PA education programs. Only those successfully completing the examination may use the credential "Physician Assistant-Certified." In order to remain certified, PAs must complete 100 hours of continuing medical education every 2 years. Every 6 years, they must pass a recertification examination or complete an alternative program combining learning experiences and a take-home examination.

Some PAs pursue additional education in a specialty such as surgery, neonatology, or emergency medicine. PA postgraduate

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residency training programs are available in areas such as internal medicine, rural primary care, emergency medicine, surgery, pediatrics, neonatology, and occupational medicine. Candidates must be graduates of an accredited program and be certified by the NCCPA.

Physician assistants need leadership skills, self-confidence, and emotional stability. They must be willing to continue studying throughout their career to keep up with medical advances.

As they attain greater clinical knowledge and experience, PAs can advance to added responsibilities and higher earnings. However, by the very nature of the profession, clinically practicing PAs always are supervised by physicians.

Job Outlook

Employment of PAs is expected to grow much faster than the average for all occupations through the year 2012, due to anticipated expansion of the health services industry and an emphasis on cost containment, resulting in increasing utilization of PAs by physicians and healthcare institutions.

Physicians and institutions are expected to employ more PAs to provide primary care and to assist with medical and surgical procedures because PAs are cost-effective and productive members of the healthcare team. Physician assistants can relieve physicians of routine duties and procedures. Telemedicine—using technology to facilitate interactive consultations between physicians and physician assistants—also will expand the use of physician assistants. Job opportunities for PAs should be good, particularly in rural and inner city clinics, because those settings have difficulty attracting physicians.

Besides the traditional office-based setting, PAs should find a growing number of jobs in institutional settings such as hospitals, academic medical centers, public clinics, and prisons. Additional PAs may be needed to augment medical staffing in inpatient teaching hospital settings as the number of hours physician residents are permitted to work is reduced, encouraging hospitals to use PAs to supply some physician resident services. Opportunities will be best in States that allow PAs a wider scope of practice.

Earnings

Median annual earnings of physician assistants were $64,670 in 2002. The middle 50 percent earned between $49,640 and $77,280. The lowest 10 percent earned less than $35,410, and the highest 10 percent earned more than $90,350. Median annual earnings of physician assistants in 2002 were $65,910 in general medical and surgical hospitals and $64,170 in offices of physicians.

According to the American Academy of Physician Assistants, median income for physician assistants in full-time clinical practice in 2003 was about $72,457; median income for first-year graduates was about $63,437. Income varies by specialty, practice setting, geographical location, and years of experience.

Related Occupations

Other health workers who provide direct patient care that requires a similar level of skill and training include audiologists, occupational therapists, physical therapists, and speech-language pathologists.

Sources of Additional Information

For information on a career as a physician assistant, contact:

➤ American Academy of Physician Assistants Information Center, 950 North Washington St., Alexandria, VA 22314-1552. Internet: **http://www.aapa.org**

For a list of accredited programs and a catalog of individual PA training programs, contact:

➤ Association of Physician Assistant Programs, 950 North Washington St., Alexandria, VA 22314-1552. Internet: **http://www.apap.org**

For eligibility requirements and a description of the Physician Assistant National Certifying Examination, contact:

➤ National Commission on Certification of Physician Assistants, Inc., 6849-B Peachtree Dunwoody Rd., Atlanta, GA 30328. Internet: **http://www.nccpa.net**

Physicians and Surgeons

(O*NET 29-1061.00, 29-1062.00, 29-1063.00, 29-1064.00, 29-1065.00, 29-1066.00, 29-1067.00, 29-1069.99)

Significant Points

- Many physicians and surgeons work long, irregular hours; almost one-third of physicians worked 60 or more hours a week in 2002.
- New physicians are much less likely to enter solo practice and more likely to work as salaried employees of group medical practices, clinics, hospitals, or health networks.
- Formal education and training requirements are among the most demanding of any occupation, but earnings are among the highest.

Nature of the Work

Physicians and surgeons serve a fundamental role in our society and have an effect upon all our lives. They diagnose illnesses and prescribe and administer treatment for people suffering from injury or disease. Physicians examine patients, obtain medical histories, and order, perform, and interpret diagnostic tests. They counsel patients on diet, hygiene, and preventive healthcare.

There are two types of physicians: M.D.—Doctor of Medicine—and D.O.—Doctor of Osteopathic Medicine. M.D.s also are known as allopathic physicians. While both M.D.s and D.O.s may use all accepted methods of treatment, including drugs and surgery, D.O.s place special emphasis on the body's musculoskeletal system, preventive medicine, and holistic patient care. D.O.s are more likely than M.D.s to be primary care specialists although they can be found in all specialties. About half of D.O.s practice general or family medicine, general internal medicine, or general pediatrics.

Physicians work in one or more of several specialties, including, but not limited to, anesthesiology, family and general medicine, general internal medicine, general pediatrics, obstetrics and gynecology, psychiatry, and surgery.

Anesthesiologists. Anesthesiologists focus on the care of surgical patients and pain relief. Like other physicians, they evaluate and treat patients and direct the efforts of those on their staffs. Anesthesiologists confer with other physicians and surgeons about appropriate treatments and procedures before, during, and after operations. These critical specialists are responsible for maintenance of the patient's vital life functions—heart rate, body temperature, blood pressure, breathing—through continual monitoring and assessment during surgery.

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Family and general practitioners. Family and general practitioners are often the first point of contact for people seeking health care, acting as the traditional family doctor. They assess and treat a wide range of conditions, ailments, and injuries, from sinus and respiratory infections to broken bones and scrapes. Family and general practitioners typically have a patient base of regular, long-term visitors. Patients with more serious conditions are referred to specialists or other healthcare facilities for more intensive care.

General internists. General internists diagnose and provide nonsurgical treatment for diseases and injuries of internal organ systems. They provide care mainly for adults who have a wide range of problems associated with the internal organs, such as the stomach, kidneys, liver, and digestive tract. Internists use a variety of diagnostic techniques to treat patients through medication or hospitalization. Like general practitioners, general internists are commonly looked upon as primary care specialists. They have patients referred to them by other specialists, in turn referring patients to those and yet other specialists when more complex care is required.

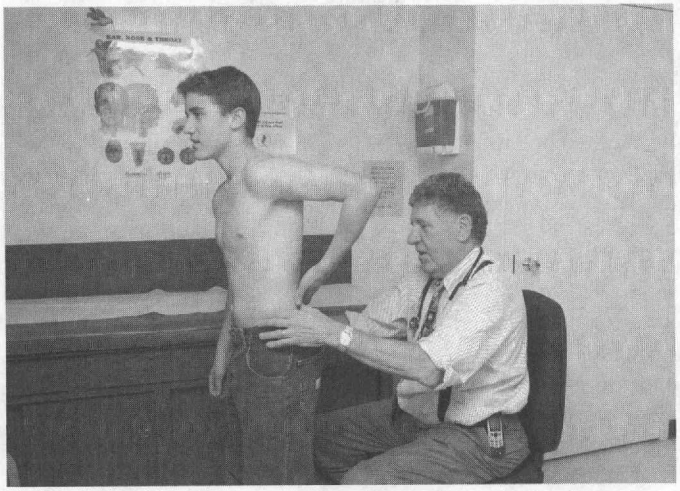
General pediatricians. Providing care from birth to early adulthood, pediatricians are concerned with the health of infants, children, and teenagers. They specialize in the diagnosis and treatment of a variety of ailments specific to young people and track their patients' growth to adulthood. Like most physicians, pediatricians work with different healthcare workers, such as nurses and other physicians, to assess and treat children with various ailments, such as muscular dystrophy. Most of the work of pediatricians, however, involves treating day-to-day illnesses that are common to children—minor injuries, infectious diseases, and immunizations—much as a general practitioner treats adults. Some pediatricians specialize in serious medical conditions and pediatric surgery, treating autoimmune disorders or serious chronic ailments.

Obstetricians and gynecologists. Obstetricians and gynecologists (ob/gyns) are specialists whose focus is women's health. They are responsible for general medical care for women, but also provide care related to pregnancy and the reproductive system. Like general practitioners, ob/gyns are concerned with the prevention, diagnosis, and treatment of general health problems, but they focus on ailments specific to the female anatomy, such as breast and cervical cancer, urinary tract and pelvic disorders, and hormonal disorders. Ob/gyns also specialize in childbirth, treating and counseling women throughout their pregnancy, from giving prenatal diagnoses to delivery and postpartum care. Ob/gyns track the health of, and treat, both mother and fetus as the pregnancy progresses.

Psychiatrists. Psychiatrists are the primary caregivers in the area of mental health. They assess and treat mental illnesses through a combination of psychotherapy, psychoanalysis, hospitalization, and medication. Psychotherapy involves regular discussions with patients about their problems; the psychiatrist helps them find solutions through changes in their behavioral patterns, the exploration of their past experiences, and group and family therapy sessions. Psychoanalysis involves long-term psychotherapy and counseling for patients. In many cases, medications are administered to correct chemical imbalances that may be causing emotional problems. Psychiatrists may also administer electroconvulsive therapy to those of their patients who do not respond to, or who cannot take, medications.

Surgeons. Surgeons are physicians who specialize in the treatment of injury, disease, and deformity through operations. Using a variety of instruments, and with patients under general or local anesthesia, a surgeon corrects physical deformities, repairs bone and tissue after injuries, or performs preventive surgeries on patients with debilitating diseases or disorders. Although a large number perform general surgery, many surgeons choose to specialize in a specific area. One of the most prevalent specialties is orthopedic surgery: the treatment of the skeletal system and associated organs. Others include neurological surgery (treatment of the brain and nervous system), ophthalmology (treatment of the eye), orthopedic surgery, otolaryngology (treatment of the ear, nose, and throat), and plastic or reconstructive surgery. Like primary care and other specialist physicians, surgeons also examine patients, perform and interpret diagnostic tests, and counsel patients on preventive health care.

A number of other medical specialists, including allergists, cardiologists, dermatologists, emergency physicians, gastroenterologists, pathologists, and radiologists, also work in clinics, hospitals, and private offices.



Physicians practice in a variety of specialties, including general pediatrics.

Working Conditions

Many physicians—primarily general and family practitioners, general internists, pediatricians, ob/gyns, and psychiatrists—work in small private offices or clinics, often assisted by a small staff of nurses and other administrative personnel. Increasingly, physicians are practicing in groups or healthcare organizations that provide backup coverage and allow for more time off. These physicians often work as part of a team coordinating care for a population of patients; they are less independent than solo practitioners of the past.

Surgeons and anesthesiologists typically work in well-lighted, sterile environments while performing surgery and often stand for long periods. Most work in hospitals or in surgical outpatient centers. Many physicians and surgeons work long, irregular hours. Almost one-third of physicians worked 60 hours or more a week in 2002. Physicians and surgeons must travel frequently between office and hospital to care for their patients. Those who are on call deal with many patients' concerns over the phone and may make emergency visits to hospitals or nursing homes.

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Employment

Physicians and surgeons held about 583,000 jobs in 2002; approximately 1 out of 6 was self-employed. About half of salaried physicians and surgeons were in office-based practice, and almost a quarter were employed by hospitals. Others practiced in Federal, State, and local government; educational services; and outpatient care centers.

A growing number of physicians are partners or salaried employees of group practices. Organized as clinics or as associations of physicians, medical groups can afford expensive medical equipment and realize other business advantages.

The New England and Middle Atlantic States have the highest ratio of physicians to population; the South Central States have the lowest. D.O.s are more likely than M.D.s to practice in small cities and towns and in rural areas. M.D.s tend to locate in urban areas, close to hospital and education centers.

Training and Other Qualifications

It takes many years of education and training to become a physician: 4 years of undergraduate school, 4 years of medical school, and 3 to 8 years of internship and residency, depending on the specialty selected. A few medical schools offer a combined undergraduate and medical school programs that last 6 rather than the customary 8 years.

Premedical students must complete undergraduate work in physics, biology, mathematics, English, and inorganic and organic chemistry. Students also take courses in the humanities and the social sciences. Some students volunteer at local hospitals or clinics to gain practical experience in the health professions.

The minimum educational requirement for entry into a medical school is 3 years of college; most applicants, however, have at least a bachelor's degree, and many have advanced degrees. There are 146 medical schools in the United States—126 teach allopathic medicine and award a Doctor of Medicine (M.D.) degree; 20 teach osteopathic medicine and award the Doctor of Osteopathic Medicine (D.O.) degree. Acceptance to medical school is highly competitive. Applicants must submit transcripts, scores from the Medical College Admission Test, and letters of recommendation. Schools also consider applicants' character, personality, leadership qualities, and participation in extracurricular activities. Most schools require an interview with members of the admissions committee.

Students spend most of the first 2 years of medical school in laboratories and classrooms, taking courses such as anatomy, biochemistry, physiology, pharmacology, psychology, microbiology, pathology, medical ethics, and laws governing medicine. They also learn to take medical histories, examine patients, and diagnose illnesses. During their last 2 years, students work with patients under the supervision of experienced physicians in hospitals and clinics, learning acute, chronic, preventive, and rehabilitative care. Through rotations in internal medicine, family practice, obstetrics and gynecology, pediatrics, psychiatry, and surgery, they gain experience in the diagnosis and treatment of illness.

Following medical school, almost all M.D.s enter a residency—graduate medical education in a specialty that takes the form of paid on-the-job training, usually in a hospital. Most D.O.s serve a 12-month rotating internship after graduation and before entering a residency, which may last 2 to 6 years.

All States, the District of Columbia, and U.S. territories license physicians. To be licensed, physicians must graduate from an accredited medical school, pass a licensing examination, and complete 1 to 7 years of graduate medical education. Although physicians licensed in one State usually can get a license to practice in another without further examination, some States limit reciprocity. Graduates of foreign medical schools generally can qualify for licensure after passing an examination and completing a U.S. residency.

M.D.s and D.O.s seeking board certification in a specialty may spend up to 7 years in residency training, depending on the specialty. A final examination immediately after residency or after 1 or 2 years of practice also is necessary for certification by the American Board of Medical Specialists or the American Osteopathic Association. There are 24 specialty boards, ranging from allergy and immunology to urology. For certification in a subspecialty, physicians usually need another 1 to 2 years of residency.

A physician's training is costly. More than 80 percent of medical students borrow money to cover their expenses.

People who wish to become physicians must have a desire to serve patients, be self-motivated, and be able to survive the pressures and long hours of medical education and practice. Physicians also must have a good bedside manner, emotional stability, and the ability to make decisions in emergencies. Prospective physicians must be willing to study throughout their career in order to keep up with medical advances.

Job Outlook

Employment of physicians and surgeons will grow about as fast as the average for all occupations through the year 2012 due to continued expansion of the health services industries. The growing and aging population will drive overall growth in the demand for physician services, as consumers continue to demand high levels of care using the latest technologies, diagnostic tests, and therapies.

Demand for physicians' services is highly sensitive to changes in consumer preferences, healthcare reimbursement policies, and legislation. For example, if changes to health coverage result in consumers facing higher out-of-pocket costs, they may demand fewer physician services. Demand for physician services may also be tempered by patients relying more on other healthcare providers—such as physician assistants, nurse practitioners, optometrists, and nurse anesthetists—for some healthcare services. In addition, new technologies will increase physician productivity. Telemedicine will allow physicians to treat patients or consult with other providers remotely. Increasing use of electronic medical records, test and prescription orders, billing, and scheduling will also improve physician productivity.

Opportunities for individuals interested in becoming physicians and surgeons are expected to be favorable. Reports of shortages in some specialties or geographic areas should attract new entrants, encouraging schools to expand programs and hospitals to expand available residency slots. However, because physician training is so lengthy, employment change happens gradually. In the short term, to meet increased demand, experienced physicians may work longer hours, delay retirement, or take measures to increase productivity, such as using more support staff to provide services. Opportunities should be particularly good in rural and low-income areas, because some physi-

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cians find these areas unattractive due to lower earnings potential, isolation from medical colleagues, or other reasons.

Unlike their predecessors, newly trained physicians face radically different choices of where and how to practice. New physicians are much less likely to enter solo practice and more likely to take salaried jobs in group medical practices, clinics, and health networks.

Earnings

Physicians have among the highest earnings of any occupation. According to the Medical Group Management Association's Physician Compensation and Production Survey, median total compensation for physicians in 2002 varied by specialty, as shown in table 1. Total compensation for physicians reflects the amount reported as direct compensation for tax purposes, plus all voluntary salary reductions. Salary, bonus and/or incentive payments, research stipends, honoraria, and distribution of profits were included in total compensation.

Table 1. Total compensation of physicians by specialty, 2002

Anesthesiology	$306,964
Surgery, general	255,438
Obstetrics/gynecology	233,061
Psychiatry	163,144
Internal medicine	155,530
Pediatrics/adolescent medicine	152,690
Family practice (without obstetrics)	150,267

SOURCE: *Medical Group Management Association, Physician Compensation and Production Report, 2003.*

Self-employed physicians—those who own or are part owners of their medical practice—generally have higher median incomes than salaried physicians. Earnings vary according to number of years in practice, geographic region, hours worked, and skill, personality, and professional reputation. Self-employed physicians and surgeons must provide for their own health insurance and retirement.

Related Occupations

Physicians work to prevent, diagnose, and treat diseases, disorders, and injuries. Professionals in other occupations requiring similar skills and critical judgment include chiropractors, dentists, optometrists, physician assistants, podiatrists, registered nurses, and veterinarians.

Sources of Additional Information

For a list of medical schools and residency programs, as well as general information on premedical education, financial aid, and medicine as a career, contact:

➤ Association of American Medical Colleges, Section for Student Services, 2450 N St. NW., Washington, DC 20037-1126. Internet: **http://www.aamc.org**

➤ American Association of Colleges of Osteopathic Medicine, 5550 Friendship Blvd., Suite 310, Chevy Chase, MD 20815-7231. Internet: **http://www.aacom.org**

For general information on physicians, contact:

➤ American Medical Association, Department of Communications and Public Relations, 515 N. State St., Chicago, IL 60610. Internet: **http://www.ama-assn.org**

➤ American Osteopathic Association, Division of Public Relations, 142 East Ontario St., Chicago, IL 60611. Internet: **http://www.aoa-net.org**

For information about various medical specialties, contact:

➤ American Society of Anesthesiologists, 520 N. Northwest Hwy., Park Ridge, IL 60068-2573. Internet: **http://www.asahq.org**

➤ American Board of Anesthesiology, 4101 Lake Boone Trail, Suite 510, Raleigh, NC 27607-7506. Internet: **http://www.abanes.org**

➤ Society of General Internal Medicine, 2501 M St. NW., Suite 575, Washington, DC 20037. Internet: **http://www.sgim.org**

➤ American Academy of Pediatrics, 141 Northwest Point Blvd., Elk Grove Village, IL 60007-1098. Internet: **http://www.aap.org**

➤ American Board of Obstetrics and Gynecology, 2915 Vine St., Dallas, TX 75204. Internet: **http://www.abog.org**

➤ American College of Obstetrics and Gynecologists, 409 12th St.SW., P.O. Box 96920, Washington, DC 20090-6920. Internet: **http://www.acog.org**

➤ American Psychiatric Association, 1000 Wilson Blvd., Suite 1825, Arlington, VA 22209-3901. Internet: **http://www.psych.org**

➤ American College of Surgeons, 633 North Saint Clair St., Chicago, IL 60611-3211. Internet: **http://www.facs.org**

Information on Federal scholarships and loans is available from the directors of student financial aid at schools of medicine.

Information on licensing is available from State boards of examiners.

Podiatrists

(0*NET 29-1081.00)

Significant Points

- Demand for podiatric care is expected to increase; however, only a limited number of job openings for podiatrists is expected because the occupation is small and most podiatrists remain in it until they retire.
- Podiatrists need a State license that requires the completion of at least 90 hours of undergraduate study, the completion of a 4-year program at a college of podiatric medicine, and in most States, a postdoctoral residency program of at least 1 year.
- Many podiatrists are solo practitioners, although more are entering partnerships with other podiatrists or other health practitioners; establishing a new practice will be most difficult in the areas surrounding colleges of podiatric medicine.
- Podiatrists enjoy very high earnings.

Nature of the Work

Americans spend a great deal of time on their feet. As the Nation becomes more active across all age groups, the need for foot care will become increasingly important to maintaining a healthy lifestyle.

The human foot is a complex structure. It contains 26 bones—plus muscles, nerves, ligaments, and blood vessels—and is designed for balance and mobility. The 52 bones in your feet make up about one-fourth of all the bones in your body. Podiatrists, also known as *doctors of podiatric medicine* (*DPMs*), diagnose and treat disorders, diseases, and injuries of the foot and lower leg to keep this part of the body working properly.

Podiatrists treat corns, calluses, ingrown toenails, bunions, heel spurs, and arch problems; ankle and foot injuries, deformities, and infections; and foot complaints associated with diseases such as diabetes. To treat these problems, podiatrists prescribe drugs, order physical therapy, set fractures, and perform sur-

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A podiatrist fits corrective inserts called orthotics.

gery. They also fit corrective inserts called orthotics, design plaster casts and strappings to correct deformities, and design custom-made shoes. Podiatrists may use a force plate to help design the orthotics. Patients walk across a plate connected to a computer that "reads" their feet, picking up pressure points and weight distribution. From the computer readout, podiatrists order the correct design or recommend another kind of treatment.

To diagnose a foot problem, podiatrists also order x rays and laboratory tests. The foot may be the first area to show signs of serious conditions such as arthritis, diabetes, and heart disease. For example, diabetics are prone to foot ulcers and infections due to poor circulation. Podiatrists consult with and refer patients to other health practitioners when they detect symptoms of these disorders.

Most podiatrists have a solo practice, although more are forming group practices with other podiatrists or health practitioners. Some specialize in surgery, orthopedics, primary care, or public health. Besides these board-certified specialties, podiatrists may practice other specialties, such as sports medicine, pediatrics, dermatology, radiology, geriatrics, or diabetic foot care.

Podiatrists who are in private practice are responsible for running a small business. They may hire employees, order supplies, and keep records, among other tasks. In addition, some educate the community on the benefits of foot care through speaking engagements and advertising.

Working Conditions

Podiatrists usually work in their own offices. They also may spend time visiting patients in nursing homes or performing surgery at hospitals or ambulatory surgical centers, but usually have fewer afterhours emergencies than other doctors have. Those with private practices set their own hours, but may work evenings and weekends to meet the needs of their patients.

Employment

Podiatrists held about 13,000 jobs in 2002. Most podiatrists were solo practitioners, although more are entering partnerships and multispecialty group practices. Solo practitioners were primarily unincorporated self-employed workers, although some were also incorporated wage and salary workers in offices of other health practitioners. Other podiatrists are employed in hospitals and the Federal government.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require a license for the practice of podiatric medicine. Each State defines its own licensing requirements, although many States grant reciprocity to podiatrists who are licensed in another State. Generally, the applicant must be a graduate of an accredited college of podiatric medicine and pass written and oral examinations. Some States permit applicants to substitute the examination of the National Board of Podiatric Medical Examiners, given in the second and fourth years of podiatric medical college, for part or all of the written State examination. Most States also require the completion of a postdoctoral residency program of at least 1 year and continuing education for licensure renewal.

Prerequisites for admission to a college of podiatric medicine include the completion of at least 90 semester hours of undergraduate study, an acceptable grade point average, and suitable scores on the Medical College Admission Test (some colleges also may accept the Dental Admission Test or the Graduate Record Exam). All of the colleges require 8 semester hours each of biology, inorganic chemistry, organic chemistry, and physics, as well as 6 hours of English. The science courses should be those designed for premedical students. Potential podiatric medical students also are evaluated on the basis of extracurricular and community activities, personal interviews, and letters of recommendation. More than 90 percent of podiatric students have at least a bachelor's degree.

Colleges of podiatric medicine offer a 4-year program whose core curriculum is similar to that in other schools of medicine. During the first 2 years, students receive classroom instruction in basic sciences, including anatomy, chemistry, pathology, and pharmacology. Third- and fourth-year students have clinical rotations in private practices, hospitals, and clinics. During these rotations, they learn how to take general and podiatric histories, perform routine physical examinations, interpret tests and findings, make diagnoses, and perform therapeutic procedures. Graduates receive the degree of Doctor of Podiatric Medicine (DPM).

Most graduates complete a hospital residency program after receiving a DPM. Residency programs last from 1 to 3 years. Residents receive advanced training in podiatric medicine and surgery and serve clinical rotations in anesthesiology, internal medicine, pathology, radiology, emergency medicine, and orthopedic and general surgery. Residencies lasting more than 1 year provide more extensive training in specialty areas.

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There are a number of certifying boards for the podiatric specialties of orthopedics, primary medicine, and surgery. Certification means that the DPM meets higher standards than those required for licensure. Each board requires advanced training, the completion of written and oral examinations, and experience as a practicing podiatrist. Most managed care organizations prefer board-certified podiatrists.

People planning a career in podiatry should have scientific aptitude, manual dexterity, interpersonal skills, and good business sense.

Podiatrists may advance to become professors at colleges of podiatric medicine, department chiefs in hospitals, or general health administrators.

Job Outlook

Employment of podiatrists is expected to grow about as fast as the average for all occupations through 2012. More people will turn to podiatrists for foot care as the number of injuries sustained by a more active and increasingly older population grows. Additional job openings will result from podiatrists who retire from the occupation, particularly members of the "baby-boom" generation. However, relatively few job openings from this source are expected because the occupation is small and most podiatrists remain in it until they retire.

Medicare and most private health insurance programs cover acute medical and surgical foot services, as well as diagnostic x rays and leg braces. Details of such coverage vary among plans. However, routine foot care—including the removal of corns and calluses—ordinarily is not covered, unless the patient has a systemic condition that has resulted in severe circulatory problems or areas of desensitization in the legs or feet. Like dental services, podiatric care is often discretionary and, therefore, more dependent on disposable income than some other medical services.

Employment of podiatrists would grow even faster were it not for continued emphasis on controlling the costs of specialty healthcare. Insurers will balance the cost of sending patients to podiatrists against the cost and availability of substitute practitioners, such as physicians and physical therapists. Opportunities will be better for board-certified podiatrists, because many managed care organizations require board certification. Opportunities for newly trained podiatrists will be better in group medical practices, clinics, and health networks than in a traditional solo practice. Establishing a practice will be most difficult in the areas surrounding colleges of podiatric medicine, because podiatrists are concentrated in these locations.

Earnings

Median annual earnings of salaried podiatrists were $94,870 in 2002. The middle 50 percent earned between $62,500 and $139,230 a year. According to a survey by the American Podiatric Medical Association, median net income for all podiatrists was $134,415 in 2001. Additionally, a survey by *Podiatric Magazine* reported median net income of $114,200 in 2003. Podiatrists in partnerships tended to earn higher net incomes than those in solo practice. Self-employed podiatrists must provide for their own health insurance and retirement.

Related Occupations

Other workers who apply scientific knowledge to prevent, diagnose, and treat disorders and injuries include chiropractors, dentists, optometrists, physicians and surgeons, and veterinarians.

Sources of Additional Information

For information on podiatric medicine as a career, contact:

➤ American Podiatric Medical Association, 9312 Old Georgetown Rd., Bethesda, MD 20814-1621. Internet: **http://www.apma.org**

Information on the colleges of podiatric medicine and their entrance requirements, curricula, and student financial aid is available from:

➤ American Association of Colleges of Podiatric Medicine, 15850 Crabbs Branch Way, Suite 320, Rockville, MD 20855-2622. Internet: **http://www.aacpm.org**

Recreational Therapists

(0*NET 29-1125.00)

Significant Points

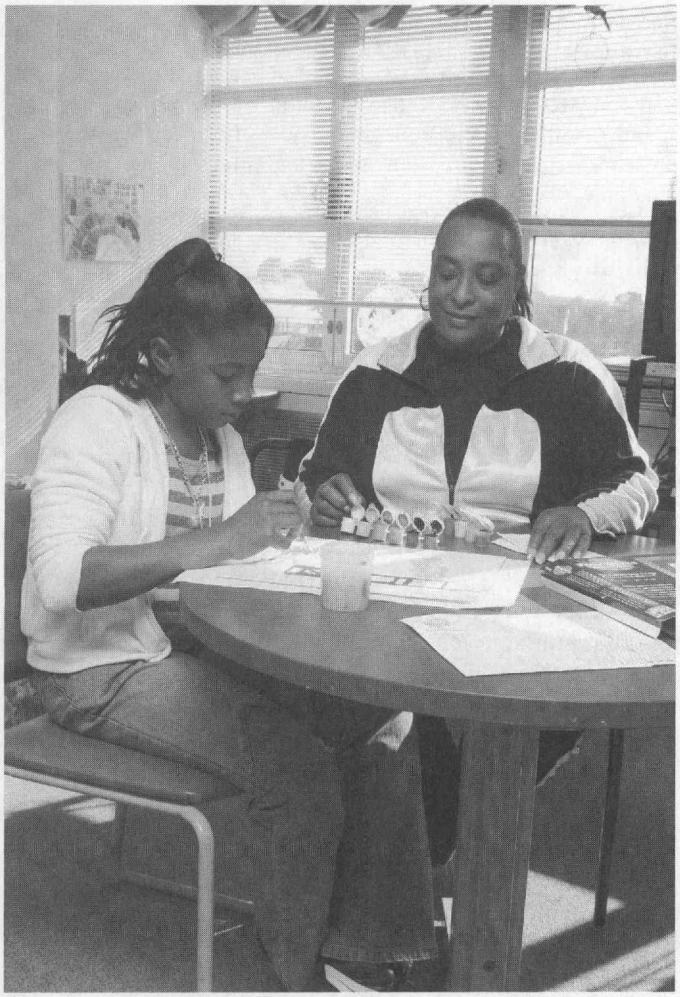
- Overall employment of recreational therapists is expected to grow more slowly than the average for all occupations, but employment of therapists who work in community care facilities for the elderly and in residential mental retardation, mental health, and substance abuse facilities should grow faster than the average.
- Recreational therapists should be comfortable working with persons who are ill or who have disabilities.
- Opportunities should be best for persons with a bachelor's degree in therapeutic recreation or in recreation with a concentration in therapeutic recreation.

Nature of the Work

Recreational therapists, also referred to as *therapeutic recreation specialists*, provide treatment services and recreation activities to individuals with disabilities or illnesses. Using a variety of techniques, including arts and crafts, animals, sports, games, dance and movement, drama, music, and community outings, therapists treat and maintain the physical, mental, and emotional well-being of their clients. Therapists help individuals reduce depression, stress, and anxiety; recover basic motor functioning and reasoning abilities; build confidence; and socialize effectively so that they can enjoy greater independence, as well as reduce or eliminate the effects of their illness or disability. In addition, therapists help integrate people with disabilities into the community by teaching them how to use community resources and recreational activities. Recreational therapists should not be confused with recreation and fitness workers, who organize recreational activities primarily for enjoyment. (Recreation and fitness workers are discussed elsewhere in the *Handbook*.)

In acute healthcare settings, such as hospitals and rehabilitation centers, recreational therapists treat and rehabilitate individuals with specific health conditions, usually in conjunction or collaboration with physicians, nurses, psychologists, social workers, and physical and occupational therapists. In long-term and residential care facilities, recreational therapists use leisure activities—especially structured group programs—to improve and maintain their clients' general health and well-being. They also may provide interventions to prevent the cli-

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With a variety of techniques, including the use of arts and crafts, recreational therapists treat clients and maintain their well-being.

ent from suffering further medical problems and complications related to illnesses and disabilities.

Recreational therapists assess clients on the basis of information the therapists learn from standardized assessments, observations, medical records, the medical staff, the clients' families, and the clients themselves. They then develop and carry out therapeutic interventions consistent with the clients' needs and interests. For example, clients who are isolated from others or who have limited social skills may be encouraged to play games with others, and right-handed persons with right-side paralysis may be instructed in how to adapt to using their unaffected left side to throw a ball or swing a racket. Recreational therapists may instruct patients in relaxation techniques to reduce stress and tension, stretching and limbering exercises, proper body mechanics for participation in recreation activities, pacing and energy conservation techniques, and individual as well as team activities. In addition, therapists observe and document a patient's participation, reactions, and progress.

Community-based recreational therapists may work in park and recreation departments, special-education programs for school districts, or programs for older adults and people with disabilities. Included in the last group are programs and facilities such as assisted-living, adult daycare, and substance abuse rehabilitation centers. In these programs, therapists use interventions to develop specific skills, while providing opportunities for exercise, mental stimulation, creativity, and fun. Although most therapists are employed in other areas, those who work in schools help counselors, teachers, and parents address the special needs of students, including easing disabled students' transition into adult life.

Working Conditions

Recreational therapists provide services in special activity rooms, but also plan activities and prepare documentation in offices. When working with clients during community integration programs, they may travel locally to instruct the clients regarding the accessibility of public transportation and other public areas, such as parks, playgrounds, swimming pools, restaurants, and theaters.

Therapists often lift and carry equipment, as well as lead recreational activities. Recreational therapists generally work a 40-hour week that may include some evenings, weekends, and holidays.

Employment

Recreational therapists held about 27,000 jobs in 2002. About a third of salaried jobs for therapists were in nursing care facilities and almost another third were in hospitals. Others worked in State and local government agencies and in community care facilities for the elderly, including assisted-living facilities. The rest worked primarily in residential mental retardation, mental health, and substance abuse facilities; individual and family services; Federal government agencies; educational services; and outpatient care centers. Only a small number of therapists were self-employed, generally contracting with long-term care facilities or community agencies to develop and oversee programs.

Training, Other Qualifications, and Advancement

A bachelor's degree in therapeutic recreation, or in recreation with a concentration in therapeutic recreation, is the usual requirement for entry-level positions. Persons may qualify for paraprofessional positions with an associate degree in therapeutic recreation or a healthcare-related field. An associate degree in recreational therapy; training in art, drama, or music therapy; or qualifying work experience may be sufficient for activity director positions in nursing homes.

Approximately 140 programs prepare students to become recreational therapists. Most offer bachelor's degrees, although some also offer associate, master's, or doctoral degrees. Programs include courses in assessment, treatment and program planning, intervention design, and evaluation. Students also study human anatomy, physiology, abnormal psychology, medical and psychiatric terminology, characteristics of illnesses and disabilities, professional ethics, and the use of assistive devices and technology.

Most employers prefer to hire candidates who are certified therapeutic recreation specialists. The National Council for Therapeutic Recreation Certification is the certificatory agency. To become certified, specialists must have a bachelor's degree, pass a written certification examination, and complete an internship of at least 480 hours. Additional requirements apply in order to maintain certification and to recertify.

Recreational therapists should be comfortable working with persons who are ill or who have disabilities. Therapists must be patient, tactful, and persuasive when working with people who have a variety of special needs. Ingenuity, a sense of humor, and

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imagination are needed to adapt activities to individual needs, and good physical coordination is necessary to demonstrate or participate in recreational activities.

Therapists may advance to supervisory or administrative positions. Some teach, conduct research, or consult for health or social services agencies.

Job Outlook

Overall employment of recreational therapists is expected to grow more slowly than the average for all occupations through the year 2012. In nursing care facilities—the largest industry employing recreational therapists—employment will grow slightly faster than the occupation as a whole, as the number of older adults continues to grow. Employment is expected to decline, however, in hospitals as services shift to outpatient settings and employers emphasize cost containment. Fast employment growth is expected in the residential and outpatient settings that serve disabled persons, the elderly, or those diagnosed with mental retardation, mental illness, or substance abuse problems—for example, community care facilities for the elderly (which includes assisted-living facilities); residential mental retardation, mental health, and substance abuse facilities; and individual and family services (which includes daycare centers for disabled persons and the elderly). Opportunities should be best for persons with a bachelor's degree in therapeutic recreation or in recreation with an option in therapeutic recreation.

Health services facilities will support a growing number of jobs in adult daycare and outpatient programs offering short-term mental health and alcohol or drug abuse services. Rehabilitation, home healthcare, and transitional programs will provide additional jobs.

The rapidly growing number of older adults is expected to spur job growth for recreational therapy professionals and paraprofessionals in assisted-living facilities, adult daycare programs, and other social assistance agencies. Continued growth also is expected in community residential care facilities, as well as daycare programs for individuals with disabilities.

Earnings

Median annual earnings of recreational therapists were $30,540 in 2002. The middle 50 percent earned between $23,180 and $38,620. The lowest 10 percent earned less than $18,130, and the highest 10 percent earned more than $47,180. In 2002, median annual earnings for recreational therapists were $25,010 in nursing care facilities.

Related Occupations

Recreational therapists primarily design activities to help people with disabilities lead more fulfilling and independent lives. Other workers who have similar jobs are occupational therapists, physical therapists, recreation and fitness workers, and rehabilitation counselors.

Sources of Additional Information

For information on how to order materials describing careers and academic programs in recreational therapy, contact either of the following sources:

➤ American Therapeutic Recreation Association, 1414 Prince St., Suite 204, Alexandria, VA 22314-2853. Internet: **http://www.atra-tr.org**

➤ National Therapeutic Recreation Society, 22377 Belmont Ridge Rd., Ashburn, VA 20148-4501. Internet: **http://www.nrpa.org/index.cfm?publicationID=21**

Information on certification may be obtained from:

➤ National Council for Therapeutic Recreation Certification, 7 Elmwood Dr., New City, NY 10956. Internet: **http://www.nctrc.org**

Registered Nurses

(0*NET 29-1111.00)

Significant Points

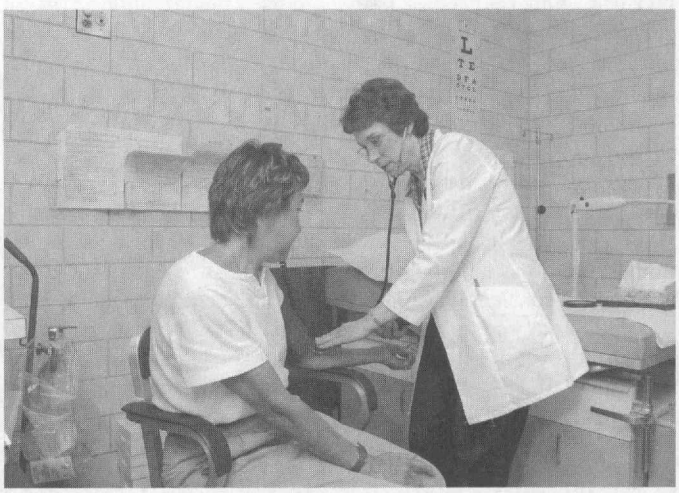
- Registered nurses constitute the largest healthcare occupation, with 2.3 million jobs.
- More new jobs are expected to be created for registered nurses than for any other occupation.
- Job opportunities are expected to be very good.
- The three major educational paths to registered nursing are a bachelor's degree, an associate degree, and a diploma.

Nature of the Work

Registered nurses (RNs) work to promote health, prevent disease, and help patients cope with illness. They are advocates and health educators for patients, families, and communities. When providing direct patient care, they observe, assess, and record symptoms, reactions, and progress in patients; assist physicians during surgeries, treatments, and examinations; administer medications; and assist in convalescence and rehabilitation. RNs also develop and manage nursing care plans, instruct patients and their families in proper care, and help individuals and groups take steps to improve or maintain their health. While State laws govern the tasks that RNs may perform, it is usually the work setting that determines their daily job duties.

Hospital nurses form the largest group of nurses. Most are staff nurses, who provide bedside nursing care and carry out medical regimens. They also may supervise licensed practical nurses and nursing aides. Hospital nurses usually are assigned to one department, such as surgery, maternity, pediatrics, the emergency room, intensive care, or the treatment of cancer patients. Some may rotate among departments.

Office nurses care for outpatients in physicians' offices, clinics, ambulatory surgical centers, and emergency medical centers. They prepare patients for, and assist with, examinations; administer injections and medications; dress wounds and incisions; assist with minor surgery; and maintain records. Some also perform routine laboratory and office work.



Registered nurses work to promote health, prevent disease, and help patients to cope with illness.

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Nursing care facility nurses manage care for residents with conditions ranging from a fracture to Alzheimer's disease. Although they often spend much of their time on administrative and supervisory tasks, RNs also assess residents' health, develop treatment plans, supervise licensed practical nurses and nursing aides, and perform invasive procedures, such as starting intravenous fluids. They also work in specialty-care departments, such as long-term rehabilitation units for patients with strokes and head injuries.

Home health nurses provide nursing services to patients at home. RNs assess patients' home environments and instruct patients and their families. Home health nurses care for a broad range of patients, such as those recovering from illnesses and accidents, cancer, and childbirth. They must be able to work independently and may supervise home health aides.

Public health nurses work in government and private agencies, including clinics, schools, retirement communities, and other community settings. They focus on populations, working with individuals, groups, and families to improve the overall health of communities. They also work with communities to help plan and implement programs. Public health nurses instruct individuals, families, and other groups regarding health issues such as preventive care, nutrition, and childcare. They arrange for immunizations, blood pressure testing, and other health screening. These nurses also work with community leaders, teachers, parents, and physicians in community health education.

Occupational health nurses, also called *industrial nurses*, provide nursing care at worksites to employees, customers, and others with injuries and illnesses. They give emergency care, prepare accident reports, and arrange for further care if necessary. They also offer health counseling, conduct health examinations and inoculations, and assess work environments to identify potential or actual health problems.

Head nurses or *nurse supervisors* direct nursing activities, primarily in hospitals. They plan work schedules and assign duties to nurses and aides, provide or arrange for training, and visit patients to observe nurses and to ensure that the patients receive proper care. They also may ensure that records are maintained and equipment and supplies are ordered.

At the advanced level, *nurse practitioners* provide basic, primary healthcare. They diagnose and treat common acute illnesses and injuries. Nurse practitioners also can prescribe medications—but certification and licensing requirements vary by State. Other advanced practice nurses include *clinical nurse specialists, certified registered nurse anesthetists,* and *certified nurse midwives*. Advanced practice nurses must meet educational and clinical practice requirements beyond the basic nursing education and licensing required of all RNs.

Working Conditions

Most nurses work in well-lighted, comfortable healthcare facilities. Home health and public health nurses travel to patients' homes, schools, community centers, and other sites. Nurses may spend considerable time walking and standing. Patients in hospitals and nursing care facilities require 24-hour care; consequently, nurses in these institutions may work nights, weekends, and holidays. RNs also may be on call—available to work on short notice. Office, occupational health, and public health nurses are more likely to work regular business hours. More than 1 in 5 RNs worked part time in 2002 and nearly 1 in 10 held more than one job.

Nursing has its hazards, especially in hospitals, nursing care facilities, and clinics, in all three of which nurses may care for individuals with infectious diseases. Nurses must observe rigid standardized guidelines to guard against disease and other dangers, such as those posed by radiation, accidental needle sticks, chemicals used to sterilize instruments, and anesthetics. In addition, they are vulnerable to back injury when moving patients, shocks from electrical equipment, and hazards posed by compressed gases.

Employment

As the largest healthcare occupation, registered nurses held about 2.3 million jobs in 2002. Almost 3 out of 5 jobs were in hospitals, in inpatient and outpatient departments. Others worked in offices of physicians, nursing care facilities, home healthcare services, employment services, government agencies, and outpatient care centers. The remainder worked mostly in social assistance agencies and educational services, public and private. About 1 in 5 RNs worked part time.

Training, Other Qualifications, and Advancement

In all States and the District of Columbia, students must graduate from an approved nursing program and pass a national licensing examination in order to obtain a nursing license. Nurses may be licensed in more than one State, either by examination, by the endorsement of a license issued by another State, or through a multi-State licensing agreement. All States require periodic renewal of licenses, which may involve continuing education.

There are three major educational paths to registered nursing: a bachelor's of science degree in nursing (BSN), an associate degree in Nursing (ADN), and a diploma. BSN programs, offered by colleges and universities, take about 4 years to complete. In 2002, 678 nursing programs offered degrees at the bachelor's level. ADN programs, offered by community and junior colleges, take about 2 to 3 years to complete. About 700 RN programs in 2002 were at the ADN level. Diploma programs, administered in hospitals, last about 3 years. Only a small and declining number of programs offer diplomas. Generally, licensed graduates of any of the three types of educational programs qualify for entry-level positions as staff nurses.

Many ADN- and diploma-educated nurses later enter bachelor's programs to prepare for a broader scope of nursing practice. Often, they can find a staff nurse position and then take advantage of tuition reimbursement benefits to work toward a BSN by completing one of many RN-to-BSN programs.

Accelerated BSN programs also are available for individuals who have a bachelor's or higher degree in another field and who are interested in moving into nursing. In 2002, more than 110 of these programs were available. Accelerated BSN programs last 12 to 18 months and provide the fastest route to a BSN for individuals who already hold a degree. Accelerated master's degree programs in nursing also are available and take about 3 years to complete.

Individuals considering nursing should carefully weigh the advantages and disadvantages of enrolling in a BSN program, because, if they do, their advancement opportunities usually are broader. In fact, some career paths are open only to nurses with bachelor's or advanced degrees. A bachelor's degree often is necessary for administrative positions and is a prerequisite for admission to graduate nursing programs in research, consulting, teaching, or a clinical specialization.

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Nursing education includes classroom instruction and supervised clinical experience in hospitals and other healthcare facilities. Students take courses in anatomy, physiology, microbiology, chemistry, nutrition, psychology and other behavioral sciences, and nursing. Course work also includes the liberal arts.

Supervised clinical experience is provided in hospital departments such as pediatrics, psychiatry, maternity, and surgery. A growing number of programs include clinical experience in nursing care facilities, public health departments, home health agencies, and ambulatory clinics.

Nurses should be caring, sympathetic, responsible, and detail oriented. They must be able to direct or supervise others, correctly assess patients' conditions, and determine when consultation is required. They need emotional stability to cope with human suffering, emergencies, and other stresses.

Experience and good performance can lead to promotion to more responsible positions. In management, nurses can advance to assistant head nurse or head nurse and, from there, to assistant director, director, and vice president. Increasingly, management-level nursing positions require a graduate or an advanced degree in nursing or health services administration. They also require leadership, negotiation skills, and good judgment. Graduate programs preparing executive-level nurses usually last about 2 years.

Within patient care, nurses can move into a nursing specialty such as clinical nurse specialist, nurse practitioner, certified nurse midwife, or certified registered nurse anesthetist. These positions require about 2 years of graduate education leading to a master's degree.

Some nurses move into the business side of health care. Their nursing expertise and experience on a healthcare team equip them with the ability to manage ambulatory, acute, home health, and chronic care services. Employers—including hospitals, insurance companies, pharmaceutical manufacturers, and managed care organizations, among others—need RNs for health planning and development, marketing, consulting, policy development, and quality assurance. Other nurses work as college and university faculty or conduct research.

Job Outlook

Job opportunities for RNs are expected to be very good. Employment of registered nurses is expected to grow faster than the average for all occupations through 2012, and because the occupation is very large, many new jobs will result. In fact, more new jobs are expected be created for RNs than for any other occupation. Thousands of job openings also will result from the need to replace experienced nurses who leave the occupation, especially as the median age of the registered nurse population continues to rise.

Faster-than-average growth will be driven by technological advances in patient care, which permit a greater number of medical problems to be treated, and an increasing emphasis on preventive care. In addition, the number of older people, who are much more likely than younger people to need nursing care, is projected to grow rapidly.

Employers in some parts of the country are reporting difficulty in attracting and retaining an adequate number of RNs, due primarily to an aging RN workforce and insufficient nursing school enrollments. Imbalances between the supply of, and demand for, qualified workers should spur efforts to attract and retain qualified RNs. For example, employers may restructure workloads, improve compensation and working conditions, and subsidize training or continuing education.

Employment in hospitals, the largest sector, is expected to grow more slowly than in most other healthcare sectors. While the intensity of nursing care is likely to increase, requiring more nurses per patient, the number of inpatients (those who remain in the hospital for more than 24 hours) is not likely to increase much. Patients are being discharged earlier and more procedures are being done on an outpatient basis, both inside and outside hospitals. Rapid growth is expected in hospital outpatient facilities, such as those providing same-day surgery, rehabilitation, and chemotherapy.

An increasing proportion of sophisticated procedures, which once were performed only in hospitals, are being performed in physicians' offices and in outpatient care centers, such as free-standing ambulatory surgical and emergency centers. Accordingly, employment is expected to grow faster than average in these places as healthcare in general expands.

Employment in nursing care facilities is expected to grow faster than average due to increases in the number of elderly, many of whom require long-term care. In addition, the financial pressure on hospitals to discharge patients as soon as possible should produce more admissions to nursing care facilities. Job growth also is expected in units that provide specialized long-term rehabilitation for stroke and head injury patients, as well as units that treat Alzheimer's victims.

Employment in home healthcare is expected to increase rapidly in response to the growing number of older persons with functional disabilities, consumer preference for care in the home, and technological advances that make it possible to bring increasingly complex treatments into the home. The type of care demanded will require nurses who are able to perform complex procedures.

In evolving integrated healthcare networks, nurses may rotate among various employment settings. Because jobs in traditional hospital nursing positions are no longer the only option, RNs will need to be flexible. Opportunities should be excellent, particularly for nurses with advanced education and training.

Earnings

Median annual earnings of registered nurses were $48,090 in 2002. The middle 50 percent earned between $40,140 and $57,490. The lowest 10 percent earned less than $33,970, and the highest 10 percent earned more than $69,670. Median annual earnings in the industries employing the largest numbers of registered nurses in 2002 were as follows:

Employment services	$55,980
General medical and surgical hospitals	49,190
Home health care services	45,890
Offices of physicians	44,870
Nursing care facilities	43,850

Many employers offer flexible work schedules, childcare, educational benefits, and bonuses.

Related Occupations

Workers in other healthcare occupations with responsibilities and duties related to those of registered nurses are emergency medical technicians and paramedics, occupational therapists, physical therapists, physician assistants, respiratory therapists, and social workers.

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Sources of Additional Information

For information on a career as a registered nurse and nursing education, contact:

➤ National League for Nursing, 61 Broadway, New York, NY 10006. Internet: **http://www.nln.org**

For a list of BSN, graduate, and accelerated nursing programs, contact:

➤ American Association of Colleges of Nursing, 1 Dupont Circle NW., Suite 530, Washington, DC 20036. Internet: **http://www.aacn.nche.edu**

Information on registered nurses also is available from:

➤ American Nurses Association, 600 Maryland Ave. SW., Washington, DC 20024-2571. Internet: **http://www.nursingworld.org**

Respiratory Therapists

(0*NET 29-1126.00, 29-2054.00)

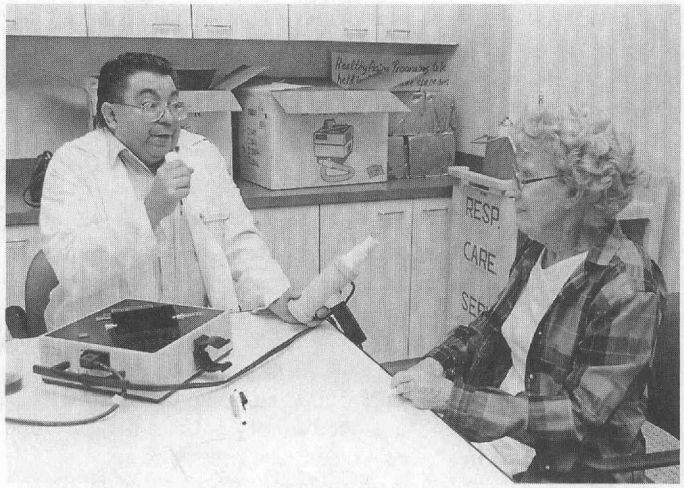
Significant Points

- An associate degree has become the general requirement for entry into this field.
- Hospitals will continue to employ the vast majority of respiratory therapists, but a growing number of therapists will work in other settings.
- Job opportunities will be very good, especially for therapists with cardiopulmonary care skills or experience working with newborns and infants.

Nature of the Work

Respiratory therapists and *respiratory therapy technicians*—also known as respiratory care practitioners—evaluate, treat, and care for patients with breathing or other cardiopulmonary disorders. Respiratory therapists, practicing under physician direction, assume primary responsibility for all respiratory care therapeutic treatments and diagnostic procedures, including the supervision of respiratory therapy technicians. Respiratory therapy technicians follow specific, well-defined respiratory care procedures, under the direction of respiratory therapists and physicians. In clinical practice, many of the daily duties of therapists and technicians overlap, although therapists generally have greater responsibility than technicians. For example, respiratory therapists will primarily consult with physicians and other healthcare staff to help develop and modify individual patient care plans. Respiratory therapists are also more likely to provide complex therapy requiring considerable independent judgment, such as caring for patients on life support in hospital intensive care units. In this statement, the term *respiratory therapists* includes both respiratory therapists and respiratory therapy technicians.

To evaluate patients, respiratory therapists interview them, perform limited physical examinations, and conduct diagnostic tests. For example, respiratory therapists test patients' breathing capacity and determine the concentration of oxygen and other gases in patients' blood. They also measure patients' pH, which indicates the acidity or alkalinity level of the blood. To evaluate a patient's lung capacity, respiratory therapists have the patient breathe into an instrument that measures the volume and flow of oxygen during inhalation and exhalation. By comparing the reading with the norm for the patient's age, height, weight, and sex, respiratory therapists can provide information that helps determine whether the patient has any lung deficiencies. To analyze oxygen, carbon dioxide, and pH levels, therapists draw an arterial blood sample, place it in a blood gas analyzer, and relay the results to a physician. Physicians rely on data provided by respiratory therapists to make treatment decisions.



To evaluate patients, respiratory therapists test the capacity of the lungs and analyze their oxygen and carbon dioxide concentrations.

Respiratory therapists treat all types of patients, ranging from premature infants whose lungs are not fully developed to elderly people whose lungs are diseased. Respiratory therapists provide temporary relief to patients with chronic asthma or emphysema, as well as emergency care to patients who are victims of a heart attack, stroke, drowning, or shock.

To treat patients, respiratory therapists use oxygen or oxygen mixtures, chest physiotherapy, and aerosol medications. When a patient has difficulty getting enough oxygen into their blood, therapists increase the patient's concentration of oxygen by placing an oxygen mask or nasal cannula on a patient and set the oxygen flow at the level prescribed by a physician. Therapists also connect patients who cannot breathe on their own to ventilators that deliver pressurized oxygen into the lungs. The therapists insert a tube into the patient's trachea, or windpipe; connect the tube to the ventilator; and set the rate, volume, and oxygen concentration of the oxygen mixture entering the patient's lungs.

Therapists perform regular checks on patients and equipment. If the patient appears to be having difficulty, or if the oxygen, carbon dioxide, or pH level of the blood is abnormal, therapists change the ventilator setting according to the doctor's orders or check the equipment for mechanical problems. In home care, therapists teach patients and their families to use ventilators and other life-support systems. In addition, therapists visit patients several times a month to inspect and clean equipment and to ensure its proper use. Therapists also make emergency visits if equipment problems arise.

Respiratory therapists perform chest physiotherapy on patients to remove mucus from their lungs and make it easier for them to breathe. For example, during surgery, anesthesia depresses respiration, so chest physiotherapy may be prescribed to help get the patient's lungs back to normal and to prevent congestion. Chest physiotherapy also helps patients suffering from lung diseases, such as cystic fibrosis, that cause mucus to collect in the lungs. Therapists place patients in positions that

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help drain mucus, and then they thump and vibrate the patients' rib cages and instruct the patients to cough.

Respiratory therapists also administer aerosols—liquid medications suspended in a gas that forms a mist which is inhaled—and teach patients how to inhale the aerosol properly to ensure its effectiveness.

In some hospitals, therapists perform tasks that fall outside their traditional role. Therapists' tasks are expanding into cardiopulmonary procedures such as taking electrocardiograms and administering stress tests, as well as other areas—for example, drawing blood samples from patients. Therapists also keep records of materials used and charges to patients.

Working Conditions

Respiratory therapists generally work between 35 and 40 hours a week. Because hospitals operate around the clock, therapists may work evenings, nights, or weekends. They spend long periods standing and walking between patients' rooms. In an emergency, therapists work under a great deal of stress. Respiratory therapists employed in home healthcare must travel frequently to the homes of patients.

Respiratory therapists are trained to work with gases stored under pressure that can be hazardous. Adherence to safety precautions and regular maintenance and testing of equipment minimize the risk of injury. As in many other health occupations, respiratory therapists run a risk of catching an infectious disease, but carefully following proper procedures minimizes this risk.

Employment

Respiratory therapists held about 112,000 jobs in 2002. More than 4 out of 5 jobs were in hospital departments of respiratory care, anesthesiology, or pulmonary medicine. Most of the remaining jobs were found in offices of physicians or other health practitioners, consumer goods rental firms that supply respiratory equipment for home use, nursing care facilities, and home healthcare services. Holding a second job is relatively common for respiratory therapists. About 17 percent held another job, compared with 5 percent of workers in all occupations.

Training, Other Qualifications, and Advancement

Formal training is necessary for entry into this field. Training is offered at the postsecondary level by colleges and universities, medical schools, vocational-technical institutes, and the Armed Forces. An associate degree has become the general requirement for entry into this field. Most programs award associate or bachelor's degrees and prepare graduates for jobs as advanced respiratory therapists. Other programs award associate degrees or certificates and lead to jobs as entry-level respiratory therapists. According to the Commission on Accreditation of Allied Health Education Programs (CAAHEP), 59 entry-level and 319 advanced respiratory therapy programs are presently accredited in the United States, including Puerto Rico.

Areas of study in respiratory therapy programs include human anatomy and physiology, pathophysiology, chemistry, physics, microbiology, pharmacology, and mathematics. Other courses deal with therapeutic and diagnostic procedures and tests, equipment, patient assessment, cardiopulmonary resuscitation, application of clinical practice guidelines, patient care outside of hospitals, cardiac and pulmonary rehabilitation, respiratory health promotion and disease prevention, and medical recordkeeping and reimbursement.

More than 40 States license respiratory care personnel. Aspiring respiratory care practitioners should check on licensure requirements with the board of respiratory care examiners for the State in which they plan to work. Also, most employers require respiratory therapists to maintain a cardiopulmonary resuscitation (CPR) certification.

The National Board for Respiratory Care (NBRC) offers voluntary certification and registration to graduates of programs accredited by CAAHEP or the Committee on Accreditation for Respiratory Care (CoARC). Two credentials are awarded to respiratory therapists who satisfy the requirements: Registered Respiratory Therapist (RRT) and Certified Respiratory Therapist (CRT). Graduates from accredited programs in respiratory therapy may take the CRT examination. CRTs who meet education and experience requirements can take two separate examinations leading to the award of the RRT credential. The CRT examination is the standard in the States requiring licensure.

Most employers require applicants for entry-level or generalist positions to hold the CRT or at least be eligible to take the certification examination. Supervisory positions and intensive-care specialties usually require the RRT or RRT eligibility.

Therapists should be sensitive to patients' physical and psychological needs. Respiratory care practitioners must pay attention to detail, follow instructions, and work as part of a team. In addition, operating advanced equipment requires proficiency with computers.

High school students interested in a career in respiratory care should take courses in health, biology, mathematics, chemistry, and physics. Respiratory care involves basic mathematical problem solving and an understanding of chemical and physical principles. For example, respiratory care workers must be able to compute dosages of medication and calculate gas concentrations.

Respiratory therapists advance in clinical practice by moving from general care to care of critical patients who have significant problems in other organ systems, such as the heart or kidneys. Respiratory therapists, especially those with 4-year degrees, may also advance to supervisory or managerial positions in a respiratory therapy department. Respiratory therapists in home healthcare and equipment rental firms may become branch managers. Some respiratory therapists advance by moving into teaching positions.

Job Outlook

Job opportunities are expected to be very good, especially for respiratory therapists with cardiopulmonary care skills or experience working with infants. Employment of respiratory therapists is expected to increase faster than the average for all occupations through the year 2012, because of substantial growth in numbers of the middle-aged and elderly population—a development that will heighten the incidence of cardiopulmonary disease.

Older Americans suffer most from respiratory ailments and cardiopulmonary diseases such as pneumonia, chronic bronchitis, emphysema, and heart disease. As their numbers increase, the need for respiratory therapists will increase as well. In addition, advances in treating victims of heart attacks, accident victims, and premature infants (many of whom are dependent on a ventilator during part of their treatment) will increase the demand for the services of respiratory care practitioners.

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Although hospitals will continue to employ the vast majority of therapists, a growing number can expect to work outside of hospitals in home healthcare services, offices of physicians or other health practitioners, or consumer goods rental firms.

Earnings

Median annual earnings of respiratory therapists were $40,220 in 2002. The middle 50 percent earned between $34,430 and $46,130. The lowest 10 percent earned less than $30,270, and the highest 10 percent earned more than $54,030. In general medical and surgical hospitals, median annual earnings of respiratory therapists were $40,390 in 2002.

Median annual earnings of respiratory therapy technicians were $34,130 in 2002. The middle 50 percent earned between $28,460 and $41,140. The lowest 10 percent earned less than $23,230, and the highest 10 percent earned more than $47,800. Median annual earnings of respiratory therapy technicians employed in general medical and surgical hospitals were $34,210 in 2002.

Related Occupations

Under the supervision of a physician, respiratory therapists administer respiratory care and life support to patients with heart and lung difficulties. Other workers who care for, treat, or train people to improve their physical condition include registered nurses, occupational therapists, physical therapists, and radiation therapists.

Sources of Additional Information

Information concerning a career in respiratory care is available from:

➤ American Association for Respiratory Care, 9425 N. MacArthur Blvd., Suite 100, Irving, TX 75063-4706. Internet: **http://www.aarc.org**

For a list of accredited educational programs for respiratory care practitioners, contact:

➤ Commission on Accreditation for Allied Health Education Programs, 39 East Wacker Dr., Chicago, IL 60601. Internet: **http://www.caahep.org**

➤ Committee on Accreditation for Respiratory Care, 1248 Harwood Rd., Bedford, TX 76021-4244.

Information on gaining credentials in respiratory care and a list of State licensing agencies can be obtained from:

➤ National Board for Respiratory Care, Inc., 8310 Nieman Rd., Lenexa, KS 66214-1579. Internet: **http://www.nbrc.org**

Speech-Language Pathologists

(0*NET 29-1127.00)

Significant Points

- Employment of speech-language pathologists is expected to grow rapidly because the expanding population in older age groups is prone to medical conditions that result in speech, language, and swallowing problems.
- About half worked in educational services, and most others were employed by healthcare and social assistance facilities.
- A master's degree in speech-language pathology is the standard credential.

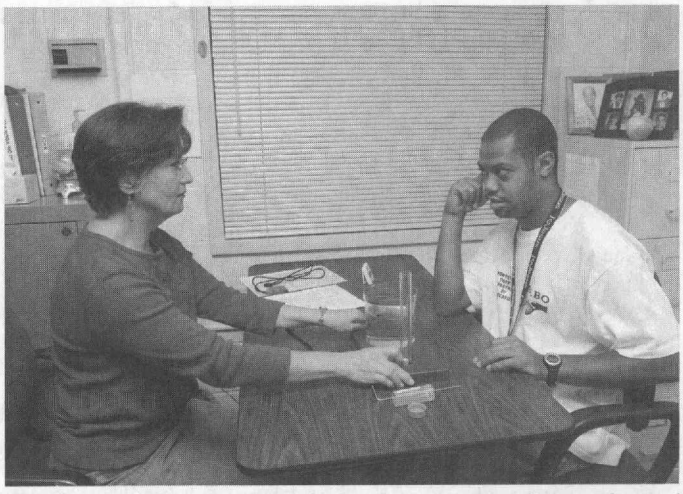
Nature of the Work

Speech-language pathologists, sometimes called *speech therapists*, assess, diagnose, treat, and help to prevent speech, language, cognitive, communication, voice, swallowing, fluency, and other related disorders.

Speech-language pathologists work with people who cannot make speech sounds, or cannot make them clearly; those with speech rhythm and fluency problems, such as stuttering; people with voice quality problems, such as inappropriate pitch or harsh voice; those with problems understanding and producing language; those who wish to improve their communication skills by modifying an accent; those with cognitive communication impairments, such as attention, memory, and problem solving disorders; and those with hearing loss who use hearing aids or cochlear implants in order to develop auditory skills and improve communication. They also work with people who have swallowing difficulties.

Speech and language difficulties can result from a variety of causes including stroke, brain injury or deterioration, developmental delays, cerebral palsy, cleft palate, voice pathology, mental retardation, hearing impairment, or emotional problems. Problems can be congenital, developmental, or acquired. Speech-language pathologists use written and oral tests, as well as special instruments, to diagnose the nature and extent of impairment and to record and analyze speech, language, and swallowing irregularities. Speech-language pathologists develop an individualized plan of care, tailored to each patient's needs. For individuals with little or no speech capability, speech-language pathologists may select augmentative or alternative communication methods, including automated devices and sign language, and teach their use. They teach these individuals how to make sounds, improve their voices, or increase their language skills to communicate more effectively. Speech-language pathologists help patients develop, or recover, reliable communication skills so patients can fulfill their educational, vocational, and social roles.

Most speech-language pathologists provide direct clinical services to individuals with communication or swallowing disorders. In speech and language clinics, they may independently develop and carry out treatment programs. In medical facilities, they may work with physicians, social workers, psychologists, and other therapists. Speech-language pathologists in schools



Most speech-language pathologists provide direct clinical services to individuals with communication or swallowing disorders.

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develop individual or group programs, counsel parents, and may assist teachers with classroom activities.

Speech-language pathologists keep records on the initial evaluation, progress, and discharge of clients. This helps pinpoint problems, tracks client progress, and justifies the cost of treatment when applying for reimbursement. They counsel individuals and their families concerning communication disorders and how to cope with the stress and misunderstanding that often accompany them. They also work with family members to recognize and change behavior patterns that impede communication and treatment and show them communication-enhancing techniques to use at home.

Some speech-language pathologists conduct research on how people communicate. Others design and develop equipment or techniques for diagnosing and treating speech problems.

Working Conditions

Speech-language pathologists usually work at a desk or table in clean comfortable surroundings. In medical settings, they may work at the patient's bedside and assist in positioning the patient. In school settings they may participate in classroom activities. While the job is not physically demanding, it requires attention to detail and intense concentration. The emotional needs of clients and their families may be demanding. Most full-time speech-language pathologists work between 35 and 40 hours per week; some work part time. Those who work on a contract basis may spend a substantial amount of time traveling between facilities.

Employment

Speech-language pathologists held about 94,000 jobs in 2002. About half of jobs were in educational services, including preschools, elementary and secondary schools, and colleges and universities. Others were in hospitals; offices of other health practitioners, including speech-language pathologists; nursing care facilities; home healthcare services; individual and family services; outpatient care centers; child day care services; or other facilities.

A few speech-language pathologists are self-employed in private practice. They contract to provide services in schools, offices of physicians, hospitals, or nursing care facilities, or work as consultants to industry.

Training, Other Qualifications, and Advancement

Of the 46 States that regulate licensing, almost all require a master's degree or equivalent. A passing score on a national examination on speech-language pathology offered through the Praxis Series of the Educational Testing Service is needed, as well. Other requirements are 300 to 375 hours of supervised clinical experience and 9 months of postgraduate professional clinical experience. Thirty-eight States have continuing education requirements for licensure renewal. Medicaid, Medicare, and private health insurers generally require a practitioner to be licensed to qualify for reimbursement.

About 233 colleges and universities offer graduate programs in speech-language pathology. Courses cover anatomy and physiology of the areas of the body involved in speech, language, swallowing, and hearing; the development of normal speech, language, swallowing, and hearing; the nature of disorders; acoustics; and psychological aspects of communication. Graduate students also learn to evaluate and treat speech, language, swallowing, and hearing disorders and receive supervised clinical training in communication disorders.

Speech-language pathologists can acquire the Certificate of Clinical Competence in Speech-Language Pathology (CCC-SLP) offered by the American Speech-Language-Hearing Association. To earn a CCC, a person must have a graduate degree and 375 hours of supervised clinical experience, complete a 36-week postgraduate clinical fellowship, and pass the Praxis Series examination in speech-language pathology administered by the Educational Testing Service (ETS).

Speech-language pathologists should be able to effectively communicate diagnostic test results, diagnoses, and proposed treatment in a manner easily understood by their clients. They must be able to approach problems objectively and provide support to clients and their families. Because a client's progress may be slow, patience, compassion, and good listening skills are necessary.

Job Outlook

Employment of speech-language pathologists is expected to grow faster than the average for all occupations through the year 2012. Members of the baby boom generation are now entering middle age, when the possibility of neurological disorders and associated speech, language, swallowing, and hearing impairments increases. Medical advances are also improving the survival rate of premature infants and trauma and stroke victims, who then need assessment and possible treatment. Many States now require that all newborns be screened for hearing loss and receive appropriate early intervention services.

In health services facilities, the impact of proposed Federal legislation imposing limits on reimbursement for therapy services may adversely affect the short-term job outlook for therapy providers. However, over the long run, the demand for therapists should continue to rise as growth in the number of individuals with disabilities or limited function spurs demand for therapy services.

Employment in educational services will increase along with growth in elementary and secondary school enrollments, including enrollment of special education students. Federal law guarantees special education and related services to all eligible children with disabilities. Greater awareness of the importance of early identification and diagnosis of speech, language, swallowing, and hearing disorders will also increase employment.

The number of speech-language pathologists in private practice will rise due to the increasing use of contract services by hospitals, schools, and nursing care facilities. In addition to job openings stemming from employment growth, a number of openings for speech-language pathologists will arise from the need to replace those who leave the occupation.

Earnings

Median annual earnings of speech-language pathologists were $49,450 in 2002. The middle 50 percent earned between $39,930 and $60,190. The lowest 10 percent earned less than $32,580, and the highest 10 percent earned more than $74,010. Median annual earnings in the industries employing the largest numbers of speech-language pathologists in 2002 were as follows:

Offices of other health practitioners	$53,090
General medical and surgical hospitals	52,940
Elementary and secondary schools	46,060

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According to a 2003 survey by the American Speech-Language-Hearing Association, the median annual salary for full-time certified speech-language pathologists who worked on a calendar-year basis, generally 11 or 12 months annually, was $48,000. For those who worked on an academic-year basis, usually 9 or 10 months annually, the median annual salary was $44,800. Certified speech-language pathologists who worked 25 or fewer hours per week had a median hourly salary of $40.00. Starting salaries for certified speech-language pathologists with one to three years experience were $42,000 for those who worked on a calendar-year basis and $37,000 for those who worked on an academic-year basis.

Related Occupations

Speech-language pathologists specialize in the prevention, diagnosis, and treatment of speech and language problems. Workers in related occupations include audiologists, occupational therapists, optometrists, physical therapists, psychologists, recreational therapists, and rehabilitation counselors.

Sources of Additional Information

State licensing boards can provide information on licensure requirements. State departments of education can supply information on certification requirements for those who wish to work in public schools.

General information on careers in speech-language pathology is available from:

➤ American Speech-Language-Hearing Association, 10801 Rockville Pike, Rockville, MD 20852. Internet: **http://www.asha.org**

Veterinarians

(0*NET 29-1131.00)

Significant Points

- Graduation from an accredited college of veterinary medicine and a State license are required.
- Employment opportunities are expected to be very good, but competition for admission to veterinary school is keen.
- Veterinarians should have an affinity for animals and the ability to get along with animal owners.

Nature of the Work

Veterinarians play a major role in the healthcare of pets, livestock, and zoo, sporting, and laboratory animals. Some veterinarians use their skills to protect humans against diseases carried by animals and conduct clinical research on human and animal health problems. Others work in basic research, broadening the scope of fundamental theoretical knowledge and, in applied research, developing new ways to use knowledge.

Most veterinarians perform clinical work in private practices. More than one-half of these veterinarians predominately, or exclusively, treat small animals. Small-animal practitioners usually care for companion animals, such as dogs and cats, but also treat birds, reptiles, rabbits, and other animals that can be kept as pets. About one-fourth of all veterinarians work in mixed animal practices where they see pigs, goats, sheep, and some nondomestic animals, in addition to companion animals. Veterinarians in clinical practice diagnose animal health problems; vaccinate against diseases, such as distemper and rabies; medicate animals suffering from infections or illnesses; treat and dress wounds; set fractures; perform surgery; and advise owners about animal feeding, behavior, and breeding.

A small number of private practice veterinarians work exclusively with large animals, focusing mostly on horses or cows; some also care for various kinds of food animals. These veterinarians usually drive to farms or ranches to provide veterinary services for herds or individual animals. Much of this work involves preventive care to maintain the health of the food animals. These veterinarians test for and vaccinate against diseases and consult with farm or ranch owners and managers on animal production, feeding, and housing issues. They also treat and dress wounds, set fractures, and perform surgery—including cesarean sections on birthing animals. Veterinarians also euthanize animals when necessary. Other veterinarians care for zoo, aquarium, or laboratory animals.

Veterinarians who treat animals use medical equipment, such as stethoscopes; surgical instruments; and diagnostic equipment, such as radiographic and ultrasound equipment. Veterinarians working in research use a full range of sophisticated laboratory equipment.

Veterinarians can contribute to human as well as animal health. A number of veterinarians work with physicians and scientists as they research ways to prevent and treat various human health



Most veterinarians perform clinical work in private practices on animals such as cats and dogs.

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problems. For example, veterinarians contributed greatly in conquering malaria and yellow fever, solved the mystery of botulism, produced an anticoagulant used to treat some people with heart disease, and defined and developed surgical techniques for humans, such as hip and knee joint replacements and limb and organ transplants. Today, some determine the effects of drug therapies, antibiotics, or new surgical techniques by testing them on animals.

Some veterinarians are involved in food safety at various levels. Veterinarians who are livestock inspectors check animals for transmissible diseases, advise owners on treatment, and may quarantine animals. Veterinarians who are meat, poultry, or egg product inspectors examine slaughtering and processing plants, check live animals and carcasses for disease, and enforce government regulations regarding food purity and sanitation.

Working Conditions

Veterinarians often work long hours. Those in group practices may take turns being on call for evening, night, or weekend work; and solo practitioners can work extended and weekend hours, responding to emergencies or squeezing in unexpected appointments. The work setting often can be noisy.

Veterinarians in large-animal practice also spend time driving between their office and farms or ranches. They work outdoors in all kinds of weather, and may have to treat animals or perform surgery under unsanitary conditions. When working with animals that are frightened or in pain, veterinarians risk being bitten, kicked, or scratched.

Veterinarians working in nonclinical areas, such as public health and research, have working conditions similar to those of other professionals in those lines of work. In these cases, veterinarians enjoy clean, well-lit offices or laboratories and spend much of their time dealing with people rather than animals.

Employment

Veterinarians held about 58,000 jobs in 2002. About 28 percent were self-employed in solo or group practices. Most others were salaried employees of another veterinary practice. The Federal Government employed about 1,100 civilian veterinarians, chiefly in the U.S. Departments of Agriculture and Health and Human Services. Other employers of veterinarians are State and local governments, colleges of veterinary medicine, medical schools, research laboratories, animal food companies, and pharmaceutical companies. A few veterinarians work for zoos, but most veterinarians caring for zoo animals are private practitioners who contract with zoos to provide services, usually on a part-time basis.

In addition, many veterinarians hold veterinary faculty positions in colleges and universities. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Prospective veterinarians must graduate from a 4-year program at an accredited college of veterinary medicine with a Doctor of Veterinary Medicine (D.V.M. or V.M.D.) degree and obtain a license to practice. There are 28 colleges in 26 States that meet accreditation standards set by the Council on Education of the American Veterinary Medical Association (AVMA). The prerequisites for admission vary by veterinary medical college. Many of these colleges do not require a bachelor's degree for entrance, but all require a significant number of credit hours—ranging from 45 to 90 semester hours—at the undergraduate level. However, most of the students admitted have completed an undergraduate program. Applicants without a bachelor's degree face a difficult task gaining admittance.

Preveterinary courses emphasize the sciences. Veterinary medical colleges typically require classes in organic and inorganic chemistry, physics, biochemistry, general biology, animal biology, animal nutrition, genetics, vertebrate embryology, cellular biology, microbiology, zoology, and systemic physiology. Some programs require calculus; some require only statistics, college algebra and trigonometry, or precalculus. Most veterinary medical colleges also require core courses, including some in English or literature, the social sciences, and the humanities. Increasingly, courses in practice management and career development are becoming a standard part of the curriculum to provide a foundation of general business knowledge for new graduates.

In addition to satisfying preveterinary course requirements, applicants also must submit test scores from the Graduate Record Examination (GRE), the Veterinary College Admission Test (VCAT), or the Medical College Admission Test (MCAT), depending on the preference of each college. Currently, 21 schools require the GRE, 5 require the VCAT, and 2 accept the MCAT.

Some veterinary medical colleges place heavy consideration on a candidate's veterinary and animal experience in admittance decisions. Formal experience, such as work with veterinarians or scientists in clinics, agribusiness, research, or some area of health science, is particularly advantageous. Less formal experience, such as working with animals on a farm or ranch or at a stable or animal shelter, also is helpful. Students must demonstrate ambition and an eagerness to work with animals.

There is keen competition for admission to veterinary school. The number of accredited veterinary colleges has largely remained the same since 1983, whereas the number of applicants has risen significantly. Only about 1 in 3 applicants was accepted in 2002. Most veterinary medical colleges are public, State-supported institutions and reserve the majority of their openings for instate residents, making admission for out-of-state applicants difficult.

While in veterinary medical college, students receive additional academic instruction in the basic sciences for the first 2 years. Later in the program, students are exposed to clinical procedures, such as diagnosing and treating animal diseases and performing surgery. They also do laboratory work in anatomy, biochemistry, medicine, and other scientific subjects. At most veterinary medical colleges, students who plan a career in research can earn both a D.V.M. degree and a Doctor of Philosophy (Ph.D.) degree at the same time.

Veterinary graduates who plan to work with specific types of animals typically choose to pursue additional education in 1 of 20 AVMA-recognized veterinary specialties—such as pathology, internal medicine, dentistry, ophthalmology, surgery, radiology, preventive medicine, or laboratory animal medicine—usually in the form of a 2-year internship. Interns receive a small salary but usually find that their internship experience leads to a higher beginning salary, relative to those of other starting veterinarians. Veterinarians who seek board certification in a specialty must also complete a 3- to 4-year residency program that provides intensive training in specialties, such as internal medicine, oncology, radiology, surgery, dermatology, anesthesiology, neurology, cardiology, ophthalmology, and exotic small-animal medicine.

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All States and the District of Columbia require that veterinarians be licensed before they can practice. The only exemptions are for veterinarians working for some Federal agencies and some State governments. Licensing is controlled by the States and is not strictly uniform, although all States require successful completion of the D.V.M. degree—or equivalent education—and passage of a national board examination. The Educational Commission for Foreign Veterinary Graduates (ECFVG) grants certification to individuals trained outside the United States who demonstrate that they meet specified requirements for the English language and clinical proficiency. ECFVG certification fulfills the educational requirement for licensure in all States except Nebraska. Applicants for licensure satisfy the examination requirement by passing the North American Veterinary Licensing Exam (NAVLE). The NAVLE, administered by computer, takes 1 day to complete and consists of 360 multiple-choice questions, covering all aspects of veterinary medicine. The NAVLE also includes visual materials designed to test diagnostic skills, comprising 10 percent of the total examination.

The majority of States also require candidates to pass a State jurisprudence examination covering State laws and regulations. Some States also do additional testing on clinical competency. There are few reciprocal agreements between States, making it difficult for a veterinarian to practice in a different State without first taking another State examination.

Nearly all States have continuing education requirements for licensed veterinarians. Requirements differ by State and may involve attending a class or otherwise demonstrating knowledge of recent medical and veterinary advances.

Most veterinarians begin as employees in established practices. Despite the substantial financial investment in equipment, office space, and staff, many veterinarians with experience set up their own practice or purchase an established one.

Newly trained veterinarians can become U.S. Government meat and poultry inspectors, disease-control workers, animal welfare and safety workers, epidemiologists, research assistants, or commissioned officers in the U.S. Public Health Service or various branches of the U.S. Armed Forces. A State license may be required.

Prospective veterinarians must have good manual dexterity. They should have an affinity for animals and the ability to get along with animal owners, especially when working with pet owners, who tend to form a strong bond with their pet. Veterinarians who intend to go into private practice should possess excellent communication and business skills because they will need to successfully manage their practice and employees and will need to promote, market, and sell their services.

Job Outlook

Very good opportunities are expected because the number of graduates from veterinary school is not expected to increase significantly over the 2002-12 period. However, as mentioned earlier, there is keen competition for admittance to veterinary school. Employment of veterinarians is expected to increase faster than the average for all occupations through the year 2012. As pets are increasingly viewed as a member of the family, pet owners will be more willing to spend increasing amounts on advanced veterinary medical care, creating more demand for veterinarians.

Most veterinarians practice in animal hospitals or clinics and care primarily for companion animals. Recent trends indicate particularly strong interest in cats as pets. Faster growth of the cat population is expected to increase the demand for feline medicine and veterinary services, while demand for veterinary care for dogs should continue to grow at a more modest pace.

Pet owners are becoming more aware of the availability of advanced care and are more willing to pay for intensive veterinary care than in the past because many pet owners are more affluent, and because they consider their pet part of the family. More pet owners even purchase pet insurance, increasing the likelihood that a considerable amount of money will be spent on veterinary care for their pets. More pet owners also will take advantage of nontraditional veterinary services, such as preventive dental care.

New graduates continue to be attracted to small-animal medicine because they prefer to deal with pets and to live and work near heavily populated areas. This situation will not necessarily limit the ability of veterinarians to find employment or to set up and maintain a practice in a particular area. Rather, beginning veterinarians may take positions requiring evening or weekend work to accommodate the extended hours of operation that many practices are offering. Some veterinarians take salaried positions in retail stores offering veterinary services. Self-employed veterinarians usually have to work hard and long to build a sufficient client base.

The number of jobs for large-animal veterinarians is likely to grow more slowly than that for veterinarians in private practice who care for companion animals. Nevertheless, job prospects may be better for veterinarians who specialize in farm animals than for small-animal practitioners because of low earnings in the former specialty and because many veterinarians do not want to work in rural or isolated areas.

Continued support for public health and food safety, national disease control programs, and biomedical research on human health problems will contribute to the demand for veterinarians, although positions in these areas of interest are few in number. Homeland security also may provide opportunities for veterinarians involved in efforts to minimize animal diseases and prevent them from entering the country. Veterinarians with training in public health and epidemiology should have the best opportunities for a career in the Federal Government.

Earnings

Median annual earnings of veterinarians were $63,090 in 2002. The middle 50 percent earned between $49,050 and $85,770. The lowest 10 percent earned less than $38,000, and the highest 10 percent earned more than $123,370.

According to a survey by the American Veterinary Medical Association, average starting salaries of 2002 veterinary medical college graduates varied by type of practice as follows:

All private clinical practices	$46,339
Large animals, exclusively	48,303
Small animals, exclusively	48,178
Small animals, predominantly	46,582
Large animals, predominantly	45,087
Mixed animals	43,948
Equine (horses)	34,273

The average annual salary for veterinarians in the Federal Government in nonsupervisory, supervisory, and managerial positions was $72,208 in 2003.

Related Occupations

Veterinarians prevent, diagnose, and treat diseases, disorders, and injuries in animals. Those who do similar work for humans include chiropractors, dentists, optometrists, physicians and sur-

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geons, and podiatrists. Veterinarians have extensive training in physical and life sciences, and some do scientific and medical research, closely paralleling the work of biological scientists and medical scientists.

Animal care and service workers and veterinary technologists and technicians work extensively with animals. Like veterinarians, they must have patience and feel comfortable with animals. However, the level of training required for these occupations is substantially less than that needed by veterinarians.

Sources of Additional Information

For additional information on careers in veterinary medicine, a list of U.S. schools and colleges of veterinary medicine, and accreditation policies, send a letter-size, self-addressed, stamped envelope to:

➤ American Veterinary Medical Association, 1931 N. Meacham Rd., Suite 100, Schaumburg, IL 60173-4360. Internet: **http://www.avma.org**

For information on veterinary education, write to:

➤ Association of American Veterinary Medical Colleges, 1101 Vermont Ave. NW., Suite 710, Washington, DC 20005. Internet: **http://www.aavmc.org**

For information on scholarships, grants, and loans, contact the financial aid officer at the veterinary schools to which you wish to apply.

Information on obtaining a veterinarian position with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the OPM Internet site: **http://www.usajobs.opm.gov**.

Health Technologists and Technicians

Cardiovascular Technologists and Technicians

(0*NET 29-2031.00)

Significant Points

- Employment will grow faster than the average, but the number of job openings created will be low because the occupation is small.
- Employment of most specialties will grow, but fewer EKG technicians will be needed.
- About 3 out of 4 jobs were in hospitals.

Nature of the Work

Cardiovascular technologists and technicians assist physicians in diagnosing and treating cardiac (heart) and peripheral vascular (blood vessel) ailments. Cardiovascular technologists may specialize in three areas of practice—invasive cardiology, echocardiography, and vascular technology. Cardiovascular technicians who specialize in electrocardiograms (EKGs), stress testing, and Holter monitors are known as *cardiographic*, or *EKG technicians*.

Cardiovascular technologists specializing in invasive procedures are called *cardiology technologists*. They assist physicians with cardiac catheterization procedures in which a small tube, or catheter, is wound through a patient's blood vessel from a spot on the patient's leg into the heart. The procedure can determine whether a blockage exists in the blood vessels that supply the heart muscle. The procedure also can help to diagnose other problems. Part of the procedure may involve balloon angioplasty, which can be used to treat blockages of blood vessels or heart valves without the need for heart surgery. Cardiology technologists assist physicians as they insert a catheter with a balloon on the end to the point of the obstruction.

Technologists prepare patients for cardiac catheterization and balloon angioplasty by first positioning them on an examining table and then shaving, cleaning, and administering anesthesia to the top of their leg near the groin. During the procedures, they monitor patients' blood pressure and heart rate with EKG equipment and notify the physician if something appears to be wrong. Technologists also may prepare and monitor patients during open-heart surgery and the implantation of pacemakers.

Cardiovascular technologists who specialize in echocardiography or vascular technology often run noninvasive tests using ultrasound instrumentation, such as Doppler ultrasound. Tests are called "noninvasive" if they do not require the insertion of probes or other instruments into the patient's body. The ultrasound instrumentation transmits high-frequency sound waves into areas of the patient's body and then processes reflected echoes of the sound waves to form an image. Technologists view the ultrasound image on a screen, and may record the image on videotape or photograph it for interpretation and diagnosis by a physician. As the instrument scans the image, technologists check the image on the screen for subtle differences between healthy and diseased areas, decide which images to include in the report to the physician, and judge if the images are satisfactory for diagnostic purposes. They also explain the procedure to patients, record any additional medical history the patient relates, select appropriate equipment settings, and change the patient's position as necessary. (See the statement on diagnostic medical sonographers elsewhere in the *Handbook* to learn more about other sonographers.)

Those who assist physicians in the diagnosis of disorders affecting the circulation are known as *vascular technologists* or *vascular sonographers.* They perform a medical history and evaluate pulses by listening to the sounds of the arteries for abnormalities. Then, they perform a noninvasive procedure using ultrasound instrumentation to record vascular information, such as vascular blood flow, blood pressure, limb volume changes, oxygen saturation, cerebral circulation, peripheral circulation, and abdominal circulation. Many of these tests are performed during or immediately after surgery.

Technologists who use ultrasound to examine the heart chambers, valves, and vessels are referred to as *cardiac sonographers*, or *echocardiographers*. They use ultrasound instrumentation to create images called echocardiograms. An echocardiogram

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may be performed while the patient is either resting or physically active. Technologists may administer medication to physically active patients to assess their heart function. Cardiac sonographers may also assist physicians who perform transesophageal echocardiography, which involves placing a tube in the patient's esophagus to obtain ultrasound images.

Cardiovascular technicians who obtain EKGs are known as *electrocardiograph (*or *EKG) technicians*. To take a basic EKG, which traces electrical impulses transmitted by the heart, technicians attach electrodes to the patient's chest, arms, and legs, and then manipulate switches on an EKG machine to obtain a reading. A printout is made for interpretation by the physician. This test is done before most kinds of surgery or as part of a routine physical examination, especially for persons who have reached middle age or who have a history of cardiovascular problems.

EKG technicians with advanced training perform Holter monitor and stress testing. For Holter monitoring, technicians place electrodes on the patient's chest and attach a portable EKG monitor to the patient's belt. Following 24 or more hours of normal activity by the patient, the technician removes a tape from the monitor and places it in a scanner. After checking the quality of the recorded impulses on an electronic screen, the technician usually prints the information from the tape so that a physician can interpret it later. Physicians use the output from the scanner to diagnose heart ailments, such as heart rhythm abnormalities or problems with pacemakers.

For a treadmill stress test, EKG technicians document the patient's medical history, explain the procedure, connect the patient to an EKG monitor, and obtain a baseline reading and resting blood pressure. Next, they monitor the heart's performance while the patient is walking on a treadmill, gradually increasing the treadmill's speed to observe the effect of increased exertion. Like vascular technologists and cardiac sonographers, cardiographic technicians who perform EKG, Holter monitor, and stress tests are known as "noninvasive" technicians.

Some cardiovascular technologists and technicians schedule appointments, type doctors' interpretations, maintain patient files, and care for equipment.

Working Conditions

Technologists and technicians generally work a 5-day, 40-hour week that may include weekends. Those in catheterization labs tend to work longer hours and may work evenings. They also may be on call during the night and on weekends.

Cardiovascular technologists and technicians spend a lot of time walking and standing. Those who work in catheterization labs may face stressful working conditions because they are in close contact with patients with serious heart ailments. Some patients, for example, may encounter complications from time to time that have life-or-death implications.

Employment

Cardiovascular technologists and technicians held about 43,000 jobs in 2002. About 3 out 4 jobs were in hospitals, primarily in cardiology departments. The remaining jobs were mostly in offices of physicians, including cardiologists; or in medical and diagnostic laboratories, including diagnostic imaging centers.

Training, Other Qualifications, and Advancement

Although a few cardiovascular technologists, vascular technologists, and cardiac sonographers are currently trained on the job, most receive training in 2- to 4-year programs. Cardiovascular technologists, vascular technologists, and cardiac sonographers normally complete a 2-year junior or community college program. The first year is dedicated to core courses and is followed by a year of specialized instruction in either invasive, noninvasive cardiovascular, or noninvasive vascular technology. Those who are qualified in an allied health profession need to complete only the year of specialized instruction.

Graduates from the 29 programs accredited by the Joint Review Committee on Education in Cardiovascular Technology are eligible to obtain professional certification in cardiac catheterization, echocardiography, vascular ultrasound, and cardiographic techniques from Cardiovascular Credentialing International. Cardiac sonographers and vascular technologists also may obtain certification from the American Registry of Diagnostic Medical Sonographers.

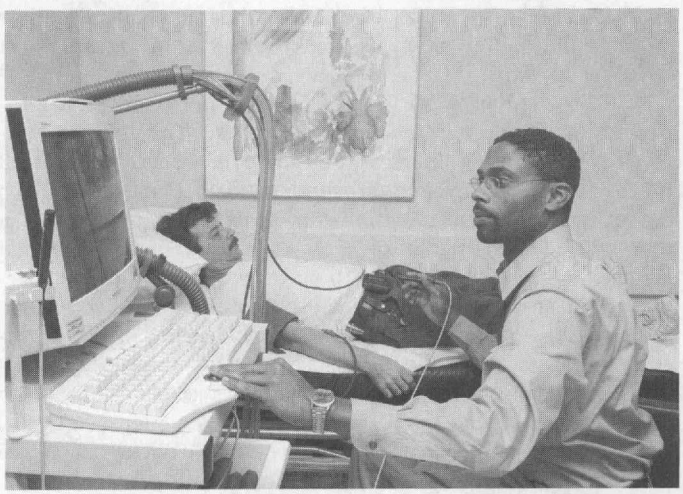
For basic EKGs, Holter monitoring, and stress testing, 1-year certification programs exist, but most EKG technicians are still trained on the job by an EKG supervisor or a cardiologist. On-the-job training usually lasts about 8 to 16 weeks. Most employers prefer to train people already in the healthcare field—nursing aides, for example. Some EKG technicians are students enrolled in 2-year programs to become technologists, working part time to gain experience and make contact with employers.

Cardiovascular technologists and technicians must be reliable, have mechanical aptitude, and be able to follow detailed instructions. A pleasant, relaxed manner for putting patients at ease is an asset.

Job Outlook

Employment of cardiovascular technologists and technicians is expected to grow faster than the average for all occupations through the year 2012. Growth will occur as the population ages, because older people have a higher incidence of heart problems. Employment of vascular technologists and echocardiographers will grow as advances in vascular technology and sonography reduce the need for more costly and invasive procedures. However, fewer EKG technicians will be needed, as hospitals train nursing aides and others to perform basic EKG procedures. Individuals trained in Holter monitoring and stress testing are expected to have more favorable job prospects than are those who can perform only a basic EKG.

Some job openings for cardiovascular technologists and technicians will arise from replacement needs, as individuals trans-



Cardiovascular technologists use ultrasound technology to produce images for diagnosis.

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fer to other jobs or leave the labor force. However, job growth and replacement needs will produce relatively few job openings because the occupation is small.

Earnings

Median annual earnings of cardiovascular technologists and technicians were $36,430 in 2002. The middle 50 percent earned between $26,730 and $46,570. The lowest 10 percent earned less than $20,920, and the highest 10 percent earned more than $56,080. Median annual earnings of cardiovascular technologists and technicians in 2002 were $36,420 in offices of physicians and $35,800 in general medical and surgical hospitals.

Related Occupations

Cardiovascular technologists and technicians operate sophisticated equipment that helps physicians and other health practitioners to diagnose and treat patients. So do diagnostic medical sonographers, nuclear medicine technologists, radiation therapists, radiologic technologists and technicians, and respiratory therapists.

Sources of Additional Information

For general information about a career in cardiovascular technology, contact:

➤ Alliance of Cardiovascular Professionals, 4456 Thalia Landing Offices, Bldg. 2, 4356 Bonney Rd., Suite 103, Virginia Beach, VA 23452-1200. Internet: **http://www.acp-online.org**

For a list of accredited programs in cardiovascular technology, contact:

➤ Committee on Accreditation for Allied Health Education Programs, 39 East Wacker Dr., Chicago, IL 60601. Internet: **http://www.caahep.org**

➤ Joint Review Committee on Education in Cardiovascular Technology, 3525 Ellicott Mills Dr., Suite N, Ellicott City, MD 21043-4547.

For information on vascular technology, contact:

➤ Society of Vascular Ultrasound, 4601 Presidents Dr., Suite 260, Lanham, MD 20706-4381. Internet: **http://www.svunet.org**

For information on echocardiography, contact:

➤ American Society of Echocardiography, 1500 Sunday Dr., Suite 102, Raleigh, NC 27607. Internet: **http://www.asecho.org**

For information regarding registration and certification, contact:

➤ Cardiovascular Credentialing International, 1500 Sunday Dr., Suite 102, Raleigh, NC 27607. Internet: **http://www.cci-online.org**

➤ American Registry of Diagnostic Medical Sonographers, 51 Monroe St., Plaza East One, Rockville, MD 20850-2400. Internet: **http://www.ardms.org**

Clinical Laboratory Technologists and Technicians

(0*NET 29-2011.00, 29-2012.00)

Significant Points

- Clinical laboratory technologists usually have a bachelor's degree with a major in medical technology or in one of the life sciences; clinical laboratory technicians generally need either an associate degree or a certificate.
- Average employment growth is expected as the volume of laboratory tests increases with both population growth and the development of new types of tests.
- Job opportunities are expected to be excellent.

Nature of the Work

Clinical laboratory testing plays a crucial role in the detection, diagnosis, and treatment of disease. Clinical laboratory technologists, also referred to as clinical laboratory scientists or medical technologists, and clinical laboratory technicians, also known as medical technicians or medical laboratory technicians, perform most of these tests.

Clinical laboratory personnel examine and analyze body fluids, tissues, and cells. They look for bacteria, parasites, and other microorganisms; analyze the chemical content of fluids; match blood for transfusions; and test for drug levels in the blood to show how a patient is responding to treatment. These technologists also prepare specimens for examination, count cells, and look for abnormal cells. They use automated equipment and instruments capable of performing a number of tests simultaneously, as well as microscopes, cell counters, and other sophisticated laboratory equipment. Then they analyze the results and relay them to physicians. With increasing automation and the use of computer technology, the work of technologists and technicians has become less hands-on and more analytical.

The complexity of tests performed, the level of judgment needed, and the amount of responsibility workers assume depend largely on the amount of education and experience they have.

Clinical laboratory technologists generally have a bachelor's degree in medical technology or in one of the life sciences, or they have a combination of formal training and work experience. They perform complex chemical, biological, hematological, immunologic, microscopic, and bacteriological tests. Technologists microscopically examine blood, tissue, and other body substances. They make cultures of body fluid and tissue samples, to determine the presence of bacteria, fungi, parasites, or other microorganisms. Clinical laboratory technologists analyze samples for chemical content or a chemical reaction and determine blood glucose and cholesterol levels. They also type and cross match blood samples for transfusions.

Clinical laboratory technologists evaluate test results, develop and modify procedures, and establish and monitor programs, to ensure the accuracy of tests. Some clinical laboratory technologists supervise clinical laboratory technicians.

Technologists in small laboratories perform many types of tests, whereas those in large laboratories generally specialize. Technologists who prepare specimens and analyze the chemical and hormonal contents of body fluids are called clinical chemistry technologists. Those who examine and identify bacteria and other microorganisms are microbiology technologists. Blood bank technologists, or immunohematology technologists, collect, type, and prepare blood and its components for transfusions. Immunology technologists examine elements of the human immune system and its response to foreign bodies. Cytotechnologists prepare slides of body cells and examine these cells microscopically for abnormalities that may signal the beginning of a cancerous growth. Molecular biology technologists perform complex protein and nucleic acid testing on cell samples.

Clinical laboratory technicians perform less complex tests and laboratory procedures than technologists perform. Technicians may prepare specimens and operate automated analyzers, for example, or they may perform manual tests in accordance with detailed instructions. Like technologists, they may work in several areas of the clinical laboratory or specialize in just one. Histotechnicians cut and stain tissue specimens for microscopic examination by pathologists, and phlebotomists collect

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blood samples. They usually work under the supervision of medical and clinical laboratory technologists or laboratory managers.

Working Conditions

Hours and other working conditions of clinical laboratory technologists and technicians vary with the size and type of employment setting. In large hospitals or in independent laboratories that operate continuously, personnel usually work the day, evening, or night shift and may work weekends and holidays. Laboratory personnel in small facilities may work on rotating shifts, rather than on a regular shift. In some facilities, laboratory personnel are on call several nights a week or on weekends, in case of an emergency.

Clinical laboratory personnel are trained to work with infectious specimens. When proper methods of infection control and sterilization are followed, few hazards exist. Protective masks, gloves, and goggles are often necessary to ensure the safety of laboratory personnel.

Laboratories usually are well lighted and clean; however, specimens, solutions, and reagents used in the laboratory sometimes produce fumes. Laboratory workers may spend a great deal of time on their feet.

Employment

Clinical laboratory technologists and technicians held about 297,000 jobs in 2002. More than half of jobs were in hospitals. Most of the remaining jobs were in offices of physicians and in medical and diagnostic laboratories. A small proportion was in educational services; other ambulatory healthcare services, including blood and organ banks; outpatient care centers; and scientific research and development services.

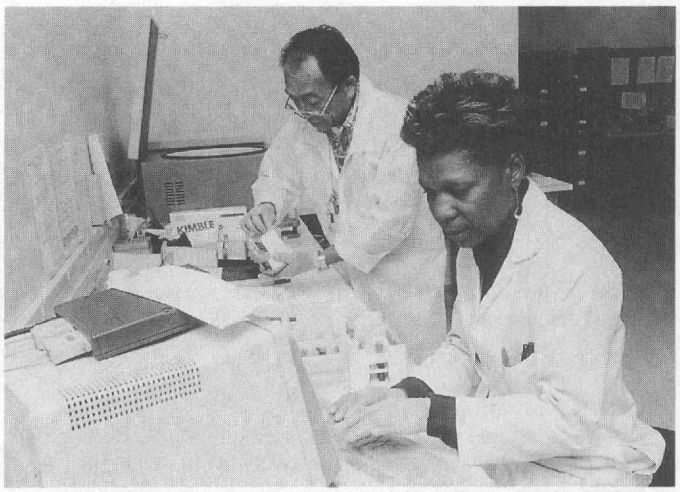
Training, Other Qualifications, and Advancement

The usual requirement for an entry-level position as a clinical laboratory technologist is a bachelor's degree with a major in medical technology or in one of the life sciences; although it is possible to qualify through a combination of education, on-the-job, and specialized training. Universities and hospitals offer medical technology programs.

Bachelor's degree programs in medical technology include courses in chemistry, biological sciences, microbiology, mathematics, and statistics, as well as specialized courses devoted to knowledge and skills used in the clinical laboratory. Many programs also offer or require courses in management, business, and computer applications. The Clinical Laboratory Improvement Act requires technologists who perform highly complex tests to have at least an associate degree.

Medical and clinical laboratory technicians generally have either an associate degree from a community or junior college or a certificate from a hospital, a vocational or technical school, or one of the U.S. Armed Forces. A few technicians learn their skills on the job.

The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) fully accredits 467 programs for medical and clinical laboratory technologists, medical and clinical laboratory technicians, histotechnologists and histotechnicians, cytogenetic technologists, and diagnostic molecular scientists. NAACLS also approves 57 programs in phlebotomy and clinical assisting. Other nationally recognized accrediting agencies that accredit specific areas for clinical laboratory workers include the Commission on Accreditation of Allied Health Education Programs and the Accrediting Bureau of Health Education Schools.



Clinical laboratory technologists and technicians examine and analyze body fluids, tissues, and cells.

Some States require laboratory personnel to be licensed or registered. Information on licensure is available from State departments of health or boards of occupational licensing. Certification is a voluntary process by which a nongovernmental organization, such as a professional society or certifying agency, grants recognition to an individual whose professional competence meets prescribed standards. Widely accepted by employers in the health industry, certification is a prerequisite for most jobs and often is necessary for advancement. Agencies certifying medical and clinical laboratory technologists and technicians include the Board of Registry of the American Society for Clinical Pathology, the American Medical Technologists, the National Credentialing Agency for Laboratory Personnel, and the Board of Registry of the American Association of Bioanalysts. These agencies have different requirements for certification and different organizational sponsors.

Clinical laboratory personnel need good analytical judgment and the ability to work under pressure. Close attention to detail is essential, because small differences or changes in test substances or numerical readouts can be crucial for patient care. Manual dexterity and normal color vision are highly desirable. With the widespread use of automated laboratory equipment, computer skills are important. In addition, technologists in particular are expected to be good at problem solving.

Technologists may advance to supervisory positions in laboratory work or may become chief medical or clinical laboratory technologists or laboratory managers in hospitals. Manufacturers of home diagnostic testing kits and laboratory equipment and supplies seek experienced technologists to work in product development, marketing, and sales. A graduate degree in medical technology, one of the biological sciences, chemistry, management, or education usually speeds advancement. A doctorate is needed to become a laboratory director; however, Federal regulation allows directors of moderately complex laboratories to have either a master's degree or a bachelor's degree, combined with the appropriate amount of training and experience. Technicians can become technologists through additional education and experience.

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Job Outlook

Job opportunities are expected to be excellent, because the number of job openings is expected to continue to exceed the number of job seekers. Employment of clinical laboratory workers is expected to grow about as fast as the average for all occupations through the year 2012, as the volume of laboratory tests increases with both population growth and the development of new types of tests.

Technological advances will continue to have two opposing effects on employment through 2012. On the one hand, new, increasingly powerful diagnostic tests will encourage additional testing and spur employment. On the other hand, research and development efforts targeted at simplifying routine testing procedures may enhance the ability of nonlaboratory personnel—physicians and patients in particular—to perform tests now conducted in laboratories. Although hospitals are expected to continue to be the major employer of clinical laboratory workers, employment is expected to grow faster in medical and diagnostic laboratories, offices of physicians, and other ambulatory health care services, including blood and organ banks.

Although significant, job growth will not be the only source of opportunities. As in most occupations, many openings will result from the need to replace workers who transfer to other occupations, retire, or stop working for some other reason.

Earnings

Median annual earnings of medical and clinical laboratory technologists were $42,910 in 2002. The middle 50 percent earned between $36,400 and $50,820. The lowest 10 percent earned less than $30,530, and the highest 10 percent earned more than $58,000. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technologists in 2002 were as follows:

General medical and surgical hospitals	$43,340
Medical and diagnostic laboratories	42,020
Offices of physicians	38,690

Median annual earnings of medical and clinical laboratory technicians were $29,040 in 2002. The middle 50 percent earned between $23,310 and $35,840. The lowest 10 percent earned less than $19,070, and the highest 10 percent earned more than $43,960. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technicians in 2002 were as follows:

General medical and surgical hospitals	$30,500
Colleges, universities, and professional schools	30,350
Offices of physicians	27,820
Medical and diagnostic laboratories	27,550
Other ambulatory health care services	26,710

According to the American Society for Clinical Pathology, median annual wages of staff clinical laboratory technologists and technicians in 2002 varied by specialty as follows:

	Lowest	*Average*	*Highest*
Cytotechnologist	$41,454	$49,920	$54,600
Histotechnologist	33,280	41,122	45,760
Medical technologist	33,280	40,186	45,760
Histotechnician	28,413	34,549	38,667
Medical laboratory technician	27,040	31,928	35,776
Phlebotomist	18,720	21,944	25,168

Related Occupations

Clinical laboratory technologists and technicians analyze body fluids, tissue, and other substances, using a variety of tests. Similar or related procedures are performed by chemists and materials scientists, science technicians, and veterinary technologists and technicians.

Sources of Additional Information

For a list of accredited and approved educational programs for clinical laboratory personnel, contact:

➤ National Accrediting Agency for Clinical Laboratory Sciences, 8410 W. Bryn Mawr Ave., Suite 670, Chicago, IL 60631. Internet: **http://www.naacls.org**

Information on certification is available from the following organizations:

➤ American Association of Bioanalysts, Board of Registry, 917 Locust St., Suite 1100, St. Louis, MO 63101. Internet: **http://www.aab.org**

➤ American Medical Technologists, 710 Higgins Rd., Park Ridge, IL 60068.

➤ American Society for Clinical Pathology, Board of Registry, 2100 West Harrison St., Chicago, IL 60612. Internet: **http://www.ascp.org/bor**

➤ National Credentialing Agency for Laboratory Personnel, P.O. Box 15945-289, Lenexa, KS 66285. Internet: **http://www.nca-info.org**

Additional career information is available from the following sources:

➤ American Association of Blood Banks, 8101 Glenbrook Rd., Bethesda, MD 20814-2749. Internet: **http://www.aabb.org**

➤ American Society for Clinical Laboratory Science, 6701 Democracy Blvd., Suite 300, Bethesda, MD 20817. Internet: **http://www.ascls.org**

➤ American Society for Clinical Pathology, 2100 West Harrison St., Chicago, IL 60612. Internet: **http://www.ascp.org**

➤ American Society for Cytopathology, 400 West 9th St., Suite 201, Wilmington, DE 19801. Internet: **http://www.cytopathology.org**

➤ Clinical Laboratory Management Association, 989 Old Eagle School Rd., Wayne, PA 19087. Internet: **http://www.clma.org**

Dental Hygienists

(0*NET 29-2021.00)

Significant Points

- Most dental hygiene programs grant an associate degree; others offer a certificate, a bachelor's degree, or a master's degree.
- Job prospects are expected to remain excellent.
- Opportunities for part-time work and flexible schedules are common.

Nature of the Work

Dental hygienists remove soft and hard deposits from teeth, teach patients how to practice good oral hygiene, and provide other preventive dental care. Hygienists examine patients' teeth and gums, recording the presence of diseases or abnormalities. They remove calculus, stains, and plaque from teeth; perform root planing as a periodontal therapy; take and develop dental x rays; and apply cavity-preventive agents such as fluorides and pit and fissure sealants. In some States, hygienists administer anesthetics; place and carve filling materials, temporary fillings, and periodontal dressings; remove sutures; and smooth and polish metal restorations. Although hygienists may not diagnose diseases, they can prepare clinical and laboratory di-

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agnostic tests for the dentist to interpret. Hygienists sometimes work chairside with the dentist during treatment.

Dental hygienists also help patients develop and maintain good oral health. For example, they may explain the relationship between diet and oral health or inform patients how to select toothbrushes and show them how to brush and floss their teeth.

Dental hygienists use hand and rotary instruments and ultrasonics to clean and polish teeth, x-ray machines to take dental pictures, syringes with needles to administer local anesthetics, and models of teeth to explain oral hygiene.

Working Conditions

Flexible scheduling is a distinctive feature of this job. Full-time, part-time, evening, and weekend schedules are widely available. Dentists frequently hire hygienists to work only 2 or 3 days a week, so hygienists may hold jobs in more than one dental office.

Dental hygienists work in clean, well-lighted offices. Important health safeguards include strict adherence to proper radiological procedures, and the use of appropriate protective devices when administering anesthetic gas. Dental hygienists also wear safety glasses, surgical masks, and gloves to protect themselves and patients from infectious diseases.

Employment

Dental hygienists held about 148,000 jobs in 2002. Because multiple jobholding is common in this field, the number of jobs exceeds the number of hygienists. More than half of all dental hygienists worked part time—less than 35 hours a week.

Almost all jobs for dental hygienists were in offices of dentists. A very small number worked for employment services or in offices of physicians.

Training, Other Qualifications, and Advancement

Dental hygienists must be licensed by the State in which they practice. To qualify for licensure, a candidate must graduate from an accredited dental hygiene school and pass both a written and clinical examination. The American Dental Association Joint Commission on National Dental Examinations administers the written examination, which is accepted by all States and the District of Columbia. State or regional testing agencies administer the clinical examination. In addition, most States require an examination on the legal aspects of dental hygiene practice. Alabama allows candidates to take its examinations if they have been trained through a State-regulated on-the-job program in a dentist's office.

In 2002, the Commission on Dental Accreditation accredited about 265 programs in dental hygiene. Most dental hygiene programs grant an associate degree, although some also offer a certificate, a bachelor's degree, or a master's degree. A minimum of an associate degree or certificate in dental hygiene is required for practice in a private dental office. A bachelor's or master's degree usually is required for research, teaching, or clinical practice in public or school health programs.

About half of the dental hygiene programs prefer applicants who have completed at least 1 year of college. However, requirements vary from one school to another. Schools offer laboratory, clinical, and classroom instruction in subjects such as anatomy, physiology, chemistry, microbiology, pharmacology, nutrition, radiography, histology (the study of tissue structure), periodontology (the study of gum diseases), pathology, dental materials, clinical dental hygiene, and social and behavioral sciences.

Dental hygienists should work well with others and must have good manual dexterity, because they use dental instruments within a patient's mouth, with little room for error. High school students interested in becoming a dental hygienist should take courses in biology, chemistry, and mathematics.

Job Outlook

Employment of dental hygienists is expected to grow much faster than the average for all occupations through 2012, in response to increasing demand for dental care and the greater utilization of hygienists to perform services previously performed by dentists. Job prospects are expected to remain excellent. In fact, dental hygienists is expected to be one of the fastest growing occupations through the year 2012.

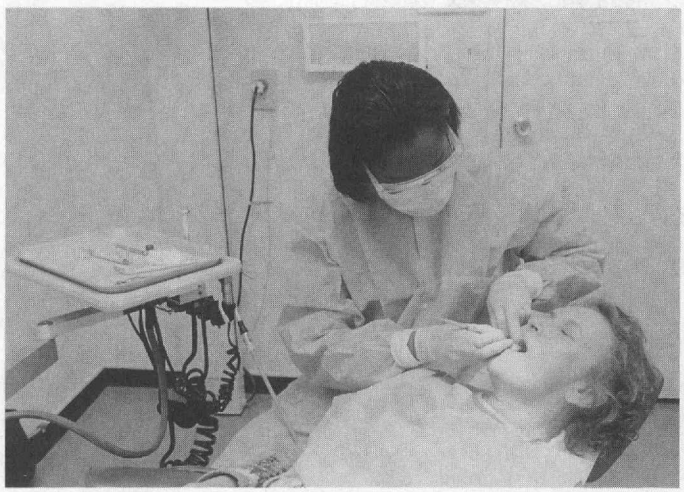
Population growth and greater retention of natural teeth will stimulate demand for dental hygienists. Older dentists, who have been less likely to employ dental hygienists, are leaving the occupation and will be replaced by recent graduates, who are more likely to employ one or even two hygienists. In addition, as dentists' workloads increase, they are expected to hire more hygienists to perform preventive dental care, such as cleaning, so that they may devote their own time to more profitable procedures.

Earnings

Median hourly earnings of dental hygienists were $26.59 in 2002. The middle 50 percent earned between $21.96 and $32.48 an hour. The lowest 10 percent earned less than $17.34, and the highest 10 percent earned more than $39.24 an hour.

Earnings vary by geographic location, employment setting, and years of experience. Dental hygienists may be paid on an hourly, daily, salary, or commission basis.

Benefits vary substantially by practice setting and may be contingent upon full-time employment. According to the American Dental Association, almost all full-time dental hygienists employed by private practitioners received paid vacation. The ADA also found that 9 out of 10 full-time and part-time dental hygienists received dental coverage. Dental hygienists who work for school systems, public health agen-



Dental hygienists use hand and rotary instruments and ultrasonics to clean and polish teeth.

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cies, the Federal Government, or State agencies usually have substantial benefits.

Related Occupations

Other workers supporting health practitioners in an office setting include dental assistants, medical assistants, occupational therapist assistants and aides, physical therapist assistants and aides, physician assistants, and registered nurses.

Sources of Additional Information

For information on a career in dental hygiene, including educational requirements, contact:

➤ Division of Education, American Dental Hygienists' Association, 444 N. Michigan Ave., Suite 3400, Chicago, IL 60611. Internet: **http://www.adha.org**

For information about accredited programs and educational requirements, contact:

➤ Commission on Dental Accreditation, American Dental Association, 211 E. Chicago Ave., Suite 1814, Chicago, IL 60611. Internet: **http://www.ada.org**

The State Board of Dental Examiners in each State can supply information on licensing requirements.

Diagnostic Medical Sonographers

(0*NET 29-2032.00)

Significant Points

- More than half of all sonographers were employed by hospitals, and most of the rest worked in offices of physicians or in medical and diagnostic laboratories, including diagnostic imaging centers.
- Sonographers may train in hospitals, vocational-technical institutions, colleges and universities, and the Armed Forces.
- Sonographers should experience favorable job opportunities, as sonography becomes an increasingly attractive alternative to radiologic procedures.

Nature of the Work

Diagnostic imaging embraces several procedures that aid in diagnosing ailments. Besides the familiar x ray, another common diagnostic imaging method is magnetic resonance imaging, which uses giant magnets that create radio waves, rather than radiation, to form an image. Not all imaging technologies use ionizing radiation or radio waves, however. Sonography, or ultrasonography, is the use of sound waves to generate an image for the assessment and diagnosis of various medical conditions. Many people associate sonography with obstetrics and the viewing of the fetus in the womb, but this technology has many other applications in the diagnosis and treatment of medical conditions.

Diagnostic medical sonographers, also known as *ultrasonographers*, use special equipment to direct nonionizing, high frequency sound waves into areas of the patient's body. Sonographers operate the equipment, which collects reflected echoes and forms an image that may be videotaped, transmitted, or photographed for interpretation and diagnosis by a physician.

Sonographers begin by explaining the procedure to the patient and recording any medical history that may be relevant to the condition being viewed. They then select appropriate equipment settings and direct the patient to move into positions that will provide the best view. To perform the exam, sonographers use a transducer, which transmits sound waves in a cone- or rectangle-shaped beam. Although techniques vary with the area being examined, sonographers usually spread a special gel on the skin to aid the transmission of sound waves.

Viewing the screen during the scan, sonographers look for subtle visual cues that contrast healthy areas with unhealthy ones. They decide whether the images are satisfactory for diagnostic purposes and select which ones to show to the physician.

Diagnostic medical sonographers may specialize in obstetric and gynecologic sonography (the female reproductive system), abdominal sonography (the liver, kidneys, gallbladder, spleen, and pancreas), neurosonography (the brain), or ophthalmologic sonography (the eyes). In addition, sonographers may specialize in vascular technology or echocardiography. (Vascular technologists and echocardiographers are covered in the *Handbook* statement on cardiovascular technologists and technicians.)

Obstetric and gynecologic sonographers specialize in the study of the female reproductive system. Included in the discipline is one of the more well-known uses of sonography: examining the fetus of a pregnant woman to track its growth and health.

Abdominal sonographers inspect a patient's abdominal cavity to help diagnose and treat conditions involving primarily the gallbladder, bile ducts, kidneys, liver, pancreas, and spleen. Abdominal sonographers also are able to scan parts of the chest, although studies of the heart using sonography usually are done by echocardiographers.

Neurosonographers focus on the nervous system, including the brain. In neonatal care, neurosonographers study and diagnose neurological and nervous system disorders in premature infants. They also may scan blood vessels to check for abnormalities indicating a stroke in infants diagnosed with sickle-cell anemia. Like other sonographers, neurosonographers operate transducers to perform the sonogram, but use frequencies and beam shapes different from those used by obstetric and abdominal sonographers.

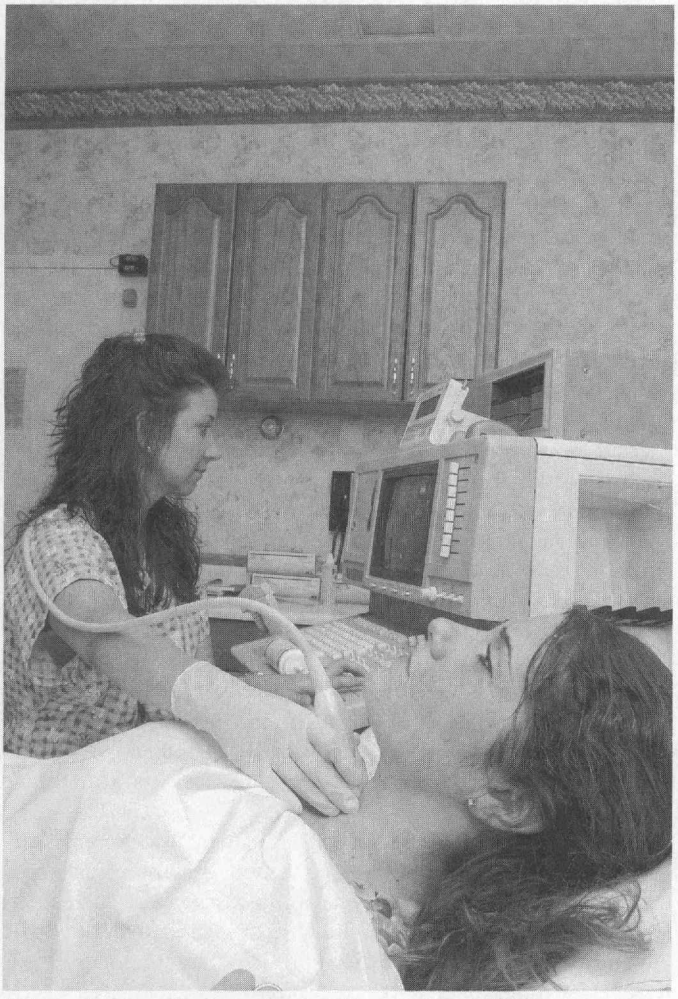
Ophthalmologic sonographers use sonography to study the eyes. Sonography aids in the insertion of prosthetic lenses by allowing accurate measurement of the eyes. Ophthalmologic sonography also helps diagnose and track tumors, blood supply conditions, separated retinas, and other ailments of the eye and the surrounding tissue. Ophthalmologic sonographers use high-frequency transducers, made exclusively to study the eyes, which are much smaller than those used in other specialties.

In addition to working directly with patients, diagnostic medical sonographers keep patient records and adjust and maintain equipment. They also may prepare work schedules, evaluate equipment purchases, or manage a sonography or diagnostic imaging department.

Working Conditions

Most full-time sonographers work about 40 hours a week. Hospital-based sonographers may have evening and weekend hours and times when they are on call and must be ready to report to work on short notice.

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Using ultrasound equipment, a diagnostic medical sonographer creates an image of a patient's throat.

Sonographers typically work in healthcare facilities that are clean and well lighted. Some travel to patients in large vans equipped with sophisticated diagnostic equipment. Sonographers are on their feet for long periods and may have to lift or turn disabled patients. They work at diagnostic imaging machines, but also may perform some procedures at patients' bedsides.

Employment

Diagnostic medical sonographers held about 37,000 jobs in 2002. More than half of all sonographer jobs were in hospitals. Most of the rest were in offices of physicians or in medical and diagnostic laboratories, including diagnostic imaging centers. According to data from the Sonography Benchmark Survey conducted by the Society of Diagnostic Medical Sonography, about 3 out of 4 sonographers worked in urban areas.

Training, Other Qualifications, and Advancement

There are several avenues for entry into the field of diagnostic medical sonography. Sonographers may train in hospitals, vocational-technical institutions, colleges and universities, and the Armed Forces. Some training programs prefer applicants with a background in science or experience in other health professions, but also will consider high school graduates with courses in mathematics and science, as well as applicants with liberal arts backgrounds.

Colleges and universities offer formal training in both 2- and 4-year programs, culminating in an associate or a bachelor's degree. Two-year programs are most prevalent. Course work includes classes in anatomy, physiology, instrumentation, basic physics, patient care, and medical ethics. The Commission on Accreditation for Allied Health Education Programs accredits most formal training programs—about 102 programs in 2003.

Some health workers, such as obstetric nurses and radiologic technologists, increase their marketability by seeking training in fields such as sonography. This usually requires completion of an additional 1-year program that may result in a certificate. In addition, sonographers specializing in one particular discipline often seek competency in others; for example, obstetric sonographers might seek training in, and exposure to, abdominal sonography to broaden their opportunities.

Although no State requires licensure in diagnostic medical sonography, organizations such as the American Registry of Diagnostic Medical Sonographers (ARDMS) certify the competency of sonographers through registration. Because registration provides an independent, objective measure of an individual's professional standing, many employers prefer to hire registered sonographers. Registration with ARDMS requires passing a general physics and instrumentation examination, in addition to passing an exam in a specialty such as obstetric and gynecologic sonography, abdominal sonography, or neurosonography. To keep their registration current, sonographers must complete continuing education to stay abreast of technological advances related to the occupation.

Sonographers need good communication and interpersonal skills because they must be able to explain technical procedures and results to their patients, some of whom may be nervous about the exam or the problems it may reveal. Sonographers also should have a background in mathematics and science.

Job Outlook

Employment of diagnostic medical sonographers is expected to grow faster than the average for all occupations through 2012 as the population grows and ages, increasing the demand for diagnostic imaging and therapeutic technology. In addition to job openings due to growth, some job openings will arise from the need to replace sonographers who leave the occupation permanently.

Opportunities should be favorable because sonography is becoming an increasingly attractive alternative to radiologic procedures, as patients seek safer treatment methods. Unlike most diagnostic imaging methods, sonography does not involve radiation, so harmful side effects and complications from repeated use are rarer for both the patient and the sonographer. Sonographic technology is expected to evolve rapidly and to spawn many new sonography procedures, such as 3D-sonography for use in obstetric and ophthalmologic diagnosis. However, high costs may limit the rate at which some promising new technologies are adopted.

Hospitals will remain the principal employer of diagnostic medical sonographers. However, employment is expected to grow more rapidly in offices of physicians and in medical and diagnostic laboratories, including diagnostic imaging centers. Health facilities such as these are expected to grow very rapidly through 2012 due to the strong shift toward outpatient care, encouraged by third-party payers and made possible by technological advances that permit more procedures to be performed outside the hospital.

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Earnings

Median annual earnings of diagnostic medical sonographers were $48,660 in 2002. The middle 50 percent earned between $41,420 and $56,020 a year. The lowest 10 percent earned less than $35,800, and the highest 10 percent earned more than $66,680. Median annual earnings of diagnostic medical sonographers in 2002 were $50,390 in offices of physicians and $47,530 in hospitals.

Related Occupations

Diagnostic medical sonographers operate sophisticated equipment to help physicians and other health practitioners diagnose and treat patients. Workers in related occupations include cardiovascular technologists and technicians, clinical laboratory technologists and technicians, nuclear medicine technologists, radiologic technologists and technicians, and respiratory therapists.

Sources of Additional Information

For information on a career as a diagnostic medical sonographer, contact:

➤ Society of Diagnostic Medical Sonography, 2745 Dallas Pkwy., Suite 350, Plano, TX 75093-8730. Internet: **http://www.sdms.org**

For information on becoming a registered diagnostic medical sonographer, contact:

➤ American Registry of Diagnostic Medical Sonographers, 51 Monroe St., Plaza East 1, Rockville, MD 20850-2400. Internet: **http://www.ardms.org**

For a current list of accredited education programs in diagnostic medical sonography, contact:

➤ Joint Review Committee on Education in Diagnostic Medical Sonography, 2025 Woodlane Dr., St. Paul, MN 55125-2998. Internet: **http://www.jrcdms.org**

➤ Commission on Accreditation for Allied Health Education Programs, 39 East Wacker Dr., Chicago, IL 60601. Internet: **http://www.caahep.org**

Emergency Medical Technicians and Paramedics

(0*NET 29-2041.00)

Significant Points

- Job stress is common because hours of work are irregular and workers often must treat patients in life-or-death situations.
- Formal training and certification are required, but State requirements vary.
- Employment is projected to grow faster than average as paid emergency medical technician positions replace unpaid volunteers.
- Competition will be greater for jobs in local fire, police, and rescue squad departments than in private ambulance services; opportunities will be best for those who have advanced certification.

Nature of the Work

People's lives often depend on the quick reaction and competent care of emergency medical technicians (EMTs) and paramedics—EMTs with additional advanced training to perform more difficult prehospital medical procedures. Incidents as varied as automobile accidents, heart attacks, drownings, childbirth, and gunshot wounds all require immediate medical attention. EMTs and paramedics provide this vital attention as they care for and transport the sick or injured to a medical facility.

In an emergency, EMTs and paramedics typically are dispatched to the scene by a 911 operator, and often work with police and fire department personnel. (Police and detectives and firefighting occupations are discussed elsewhere in the *Handbook.*) Once they arrive, they determine the nature and extent of the patient's condition while trying to ascertain whether the patient has preexisting medical problems. Following strict rules and guidelines, they give appropriate emergency care and, when necessary, transport the patient. Some paramedics are trained to treat patients with minor injuries on the scene of an accident or at their home without transporting them to a medical facility. Emergency treatment for more complicated problems is carried out under the direction of medical doctors by radio preceding or during transport.

EMTs and paramedics may use special equipment, such as backboards, to immobilize patients before placing them on stretchers and securing them in the ambulance for transport to a medical facility. Usually, one EMT or paramedic drives while the other monitors the patient's vital signs and gives additional care as needed. Some EMTs work as part of the flight crew of helicopters that transport critically ill or injured patients to hospital trauma centers.

At the medical facility, EMTs and paramedics help transfer patients to the emergency department, report their observations and actions to emergency room staff, and may provide additional emergency treatment. After each run, EMTs and paramedics replace used supplies and check equipment. If a transported patient had a contagious disease, EMTs and paramedics decontaminate the interior of the ambulance and report cases to the proper authorities.

Beyond these general duties, the specific responsibilities of EMTs and paramedics depend on their level of qualification and training. To determine this, the National Registry of Emergency Medical Technicians (NREMT) registers emergency medical service (EMS) providers at four levels: First Responder, EMT-Basic, EMT-Intermediate, and EMT-Paramedic. Some States, however, do their own certification and use numeric ratings from 1 to 4 to distinguish levels of proficiency.

The lowest-level workers—First Responders—are trained to provide basic emergency medical care because they tend to be the first persons to arrive at the scene of an incident. Many firefighters, police officers, and other emergency workers have this level of training. The EMT-Basic, also known as EMT-1, represents the first component of the emergency medical technician system. An EMT-1 is trained to care for patients at the scene of an accident and while transporting patients by ambulance to the hospital under medical direction. The EMT-1 has the emergency skills to assess a patient's condition and manage respiratory, cardiac, and trauma emergencies.

The EMT-Intermediate (EMT-2 and EMT-3) has more advanced training that allows the administration of intravenous fluids, the use of manual defibrillators to give lifesaving shocks to a stopped heart, and the application of advanced airway techniques and equipment to assist patients experiencing respiratory emergencies. EMT-Paramedics (EMT-4) provide the most extensive prehospital care. In addition to carrying out the procedures already described, paramedics may administer drugs

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Emergency medical technicians provide medical care to patients at the scene of an emergency.

orally and intravenously, interpret electrocardiograms (EKGs), perform endotracheal intubations, and use monitors and other complex equipment.

Working Conditions

EMTs and paramedics work both indoors and outdoors, in all types of weather. They are required to do considerable kneeling, bending, and heavy lifting. These workers risk noise-induced hearing loss from sirens and back injuries from lifting patients. In addition, EMTs and paramedics may be exposed to diseases such as hepatitis-B and AIDS, as well as violence from drug overdose victims or mentally unstable patients. The work is not only physically strenuous, but also stressful, involving life-or-death situations and suffering patients. Nonetheless, many people find the work exciting and challenging and enjoy the opportunity to help others.

EMTs and paramedics employed by fire departments work about 50 hours a week. Those employed by hospitals frequently work between 45 and 60 hours a week, and those in private ambulance services, between 45 and 50 hours. Some of these workers, especially those in police and fire departments, are on call for extended periods. Because emergency services function 24 hours a day, EMTs and paramedics have irregular working hours that add to job stress.

Employment

EMTs and paramedics held about 179,000 jobs in 2002. Most career EMTs and paramedics work in metropolitan areas. There are many more volunteer EMTs and paramedics, especially in smaller cities, towns, and rural areas. These individuals volunteer for fire departments, emergency medical services (EMS), or hospitals, and may respond to only a few calls for service per month or may answer the majority of calls, especially in smaller communities. EMTs and paramedics work closely with firefighters, who often are certified as EMTs as well and act as first responders.

Full-time and part-time paid EMTs and paramedics were employed in a number of industries. About 4 out of 10 worked as employees of private ambulance services. About 3 out of 10 worked in local government for fire departments, public ambulance services, and EMS. Another 2 out 10 were found in hospitals, working full time within the medical facility or responded to calls in ambulances or helicopters to transport critically ill or injured patients. The remainder worked in various industries providing emergency services.

Training, Other Qualifications, and Advancement

Formal training and certification is needed to become an EMT or paramedic. All 50 States have a certification procedure. In most States and the District of Columbia, registration with the NREMT is required at some or all levels of certification. Other States administer their own certification examination or provide the option of taking the NREMT examination. To maintain certification, EMTs and paramedics must reregister, usually every 2 years. In order to reregister, an individual must be working as an EMT or paramedic and meet a continuing education requirement.

Training is offered at progressive levels: EMT-Basic, also known as EMT-1; EMT-Intermediate, or EMT-2 and EMT-3; and EMT-Paramedic, or EMT-4. EMT-Basic coursework typically emphasizes emergency skills, such as managing respiratory, trauma, and cardiac emergencies, and patient assessment. Formal courses are often combined with time in an emergency room or ambulance. The program also provides instruction and practice in dealing with bleeding, fractures, airway obstruction, cardiac arrest, and emergency childbirth. Students learn how to use and maintain common emergency equipment, such as backboards, suction devices, splints, oxygen delivery systems, and stretchers. Graduates of approved EMT basic training programs who pass a written and practical examination administered by the State certifying agency or the NREMT earn the title "Registered EMT-Basic." The course also is a prerequisite for EMT-Intermediate and EMT-Paramedic training.

EMT-Intermediate training requirements vary from State to State. Applicants can opt to receive training in EMT-Shock Trauma, wherein the caregiver learns to start intravenous fluids and give certain medications, or in EMT-Cardiac, which includes learning heart rhythms and administering advanced medications. Training commonly includes 35 to 55 hours of additional instruction beyond EMT-Basic coursework, and covers patient assessment as well as the use of advanced airway devices and intravenous fluids. Prerequisites for taking the EMT-Intermediate examination include registration as an EMT-Basic, required classroom work, and a specified amount of clinical experience.

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The most advanced level of training for this occupation is EMT-Paramedic. At this level, the caregiver receives additional training in body function and learns more advanced skills. The Technology program usually lasts up to 2 years and results in an associate degree in applied science. Such education prepares the graduate to take the NREMT examination and become certified as an EMT-Paramedic. Extensive related coursework and clinical and field experience is required. Due to the longer training requirement, almost all EMT-Paramedics are in paid positions, rather than being volunteers. Refresher courses and continuing education are available for EMTs and paramedics at all levels.

EMTs and paramedics should be emotionally stable, have good dexterity, agility, and physical coordination, and be able to lift and carry heavy loads. They also need good eyesight (corrective lenses may be used) with accurate color vision.

Advancement beyond the EMT-Paramedic level usually means leaving fieldwork. An EMT-Paramedic can become a supervisor, operations manager, administrative director, or executive director of emergency services. Some EMTs and paramedics become instructors, dispatchers, or physician assistants, while others move into sales or marketing of emergency medical equipment. A number of people become EMTs and paramedics to assess their interest in healthcare, and then decide to return to school and become registered nurses, physicians, or other health workers.

Job Outlook

Employment of emergency medical technicians and paramedics is expected to grow faster than the average for all occupations through 2012. Population growth and urbanization will increase the demand for full-time paid EMTs and paramedics rather than for volunteers. In addition, a large segment of the population—the aging baby boomers—will further spur demand for EMT services as they become more likely to have medical emergencies. There will still be demand for part-time, volunteer EMTs and paramedics in rural areas and smaller metropolitan areas. In addition to those arising from job growth, openings will occur because of replacement needs; some workers leave the occupation because of stressful working conditions, limited potential for advancement, and the modest pay and benefits in private-sector jobs.

Most opportunities for EMTs and paramedics are expected to found in private ambulance services. Competition will be greater for jobs in local government, including fire, police, and independent third-service rescue squad departments, in which salaries and benefits tend to be slightly better. Opportunities will be best for those who have advanced certifications, such as EMT-Intermediate and EMT-Paramedic, as clients and patients demand higher levels of care before arriving at the hospital.

Earnings

Earnings of EMTs and paramedics depend on the employment setting and geographic location as well as the individual's training and experience. Median annual earnings of EMTs and paramedics were $24,030 in 2002. The middle 50 percent earned between $19,040 and $31,600. The lowest 10 percent earned less than $15,530, and the highest 10 percent earned more than $41,980. Median annual earnings in the industries employing the largest numbers of EMTs and paramedics in 2002 were:

Local government	$27,440
General medical and surgical hospitals	24,760
Other ambulatory health care services	22,180

Those in emergency medical services who are part of fire or police departments receive the same benefits as firefighters or police officers. For example, many are covered by pension plans that provide retirement at half pay after 20 or 25 years of service or if the worker is disabled in the line of duty.

Related Occupations

Other workers in occupations that require quick and level-headed reactions to life-or-death situations are air traffic controllers, firefighting occupations, physician assistants, police and detectives, and registered nurses.

Sources of Additional Information

General information about emergency medical technicians and paramedics is available from:

➤ National Association of Emergency Medical Technicians, P.O. Box 1400, Clinton, MS 39060-1400. Internet: **http://www.naemt.org**

➤ National Registry of Emergency Medical Technicians, Rocco V. Morando Bldg., 6610 Busch Blvd., P.O. Box 29233, Columbus, OH 43229. Internet: **http://www.nremt.org**

➤ National Highway Transportation Safety Administration, EMS Division, 400 7th St. SW., NTS-14, Washington, DC 20590. Internet: **http://www.nhtsa.dot.gov/people/injury/ems**

Licensed Practical and Licensed Vocational Nurses

(0*NET 29-2061.00)

Significant Points

- Training lasting about 1 year is available in about 1,100 State-approved programs, mostly in vocational or technical schools.
- Nursing care facilities will offer the most new jobs.
- Applicants for jobs in hospitals may face competition as the number of hospital jobs for LPNs declines.

Nature of the Work

Licensed practical nurses (LPNs), or licensed vocational nurses (LVNs), care for the sick, injured, convalescent, and disabled under the direction of physicians and registered nurses. (The work of *physicians and surgeons* and *registered nurses* is described elsewhere in the *Handbook*.)

Most LPNs provide basic bedside care, taking vital signs such as temperature, blood pressure, pulse, and respiration. They also prepare and give injections and enemas, monitor catheters, apply dressings, treat bedsores, and give alcohol rubs and massages. LPNs monitor their patients and report adverse reactions to medications or treatments. They collect samples for testing, perform routine laboratory tests, feed patients, and record food and fluid intake and output. To help keep patients comfortable, LPNs assist with bathing, dressing, and personal hygiene. In States where the law allows, they may administer prescribed medicines or start intravenous fluids. Some LPNs help deliver,

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care for, and feed infants. Experienced LPNs may supervise nursing assistants and aides.

In addition to providing routine beside care, LPNs in nursing care facilities help evaluate residents' needs, develop care plans, and supervise the care provided by nursing aides. In doctors' offices and clinics, they also may make appointments, keep records, and perform other clerical duties. LPNs who work in private homes may prepare meals and teach family members simple nursing tasks.

Working Conditions

Most licensed practical nurses in hospitals and nursing care facilities work a 40-hour week, but because patients need around-the-clock care, some work nights, weekends, and holidays. They often stand for long periods and help patients move in bed, stand, or walk.

LPNs may face hazards from caustic chemicals, radiation, and infectious diseases such as hepatitis. They are subject to back injuries when moving patients and shock from electrical equipment. They often must deal with the stress of heavy workloads. In addition, the patients they care for may be confused, irrational, agitated, or uncooperative.

Employment

Licensed practical nurses held about 702,000 jobs in 2002. About 28 percent of LPNs worked in hospitals, 26 percent in nursing care facilities, and another 12 percent in offices of physicians. Others worked for home healthcare services, employment services, community care facilities for the elderly, public and private educational services, outpatient care centers, and Federal, State, and local government agencies; about 1 in 5 worked part time.

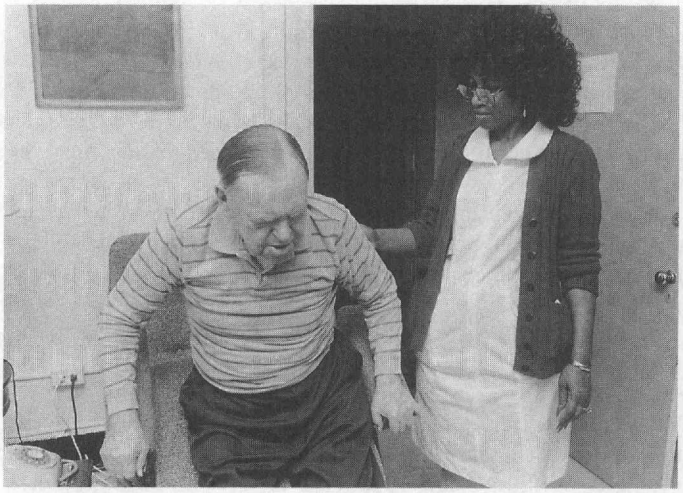
Training, Other Qualifications, and Advancement

All States and the District of Columbia require LPNs to pass a licensing examination after completing a State-approved practical nursing program. A high school diploma or its equivalent usually is required for entry, although some programs accept candidates without a diploma or are designed as part of a high school curriculum.

In 2002, approximately 1,100 State-approved programs provided training in practical nursing. Almost 6 out of 10 students were enrolled in technical or vocational schools, while 3 out of 10 were in community and junior colleges. Others were in high schools, hospitals, and colleges and universities.

Most practical nursing programs last about 1 year and include both classroom study and supervised clinical practice (patient care). Classroom study covers basic nursing concepts and patient care-related subjects, including anatomy, physiology, medical-surgical nursing, pediatrics, obstetrics, psychiatric nursing, the administration of drugs, nutrition, and first aid. Clinical practice usually is in a hospital, but sometimes includes other settings.

LPNs should have a caring, sympathetic nature. They should be emotionally stable, because work with the sick and injured can be stressful. They also should have keen observational, decisionmaking, and communication skills. As part of a healthcare team, they must be able to follow orders and work under close supervision.



Licensed practical and licensed vocational nurses care for the sick, injured, convalescent, and disabled.

Job Outlook

Employment of LPNs is expected to grow about as fast as the average for all occupations through 2012 in response to the long-term care needs of an increasing elderly population and the general growth of healthcare. Replacement needs will be a major source of job openings, as many workers leave the occupation permanently.

Applicants for jobs in hospitals may face competition as the number of hospital jobs for LPNs declines. An increasing proportion of sophisticated procedures, which once were performed only in hospitals, is being performed in physicians' offices and in outpatient care centers such as ambulatory surgical and emergency medical centers, due largely to advances in technology. Consequently, employment of LPNs is projected to grow faster than average in these sectors as healthcare expands outside the traditional hospital setting.

Employment of LPNs in nursing care facilities is expected to grow faster than the average. Such facilities will offer the most new jobs for LPNs as the number of aged and disabled persons in need of long-term care rises. In addition to caring for the aged and the disabled, LPNs in nursing care facilities will care for the increasing number of patients who will have been discharged from the hospital, but have not recovered enough to return home.

Employment of LPNs is expected to grow much faster than average in home healthcare services. This growth is in response to an increasing number of older persons with functional disabilities, consumer preference for care in the home, and technological advances that make it possible to bring increasingly complex treatments into the home.

Earnings

Median annual earnings of licensed practical nurses were $31,440 in 2002. The middle 50 percent earned between $26,430 and $37,050. The lowest 10 percent earned less than $22,860, and the highest 10 percent earned more than $44,040. Median annual earnings in the industries employing the largest numbers of licensed practical nurses in 2002 were as follows:

Employment services	$40,550
Home health care services	32,850
Nursing care facilities	32,220
General medical and surgical hospitals	30,310
Offices of physicians	28,710

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Related Occupations

LPNs work closely with people while helping them. So do emergency medical technicians and paramedics, social and human service assistants, surgical technologists, and teacher assistants.

Sources of Additional Information

For information about practical nursing, contact any of the following organizations:

➤ National League for Nursing, 61 Broadway, New York, NY 10006. Internet: **http://www.nln.org**

➤ National Federation of Licensed Practical Nurses, Inc., 605 Poole Dr., Garner, NC 27529.

Medical Records and Health Information Technicians

(0*NET 29-2071.00)

Significant Points

- This is one of the few health occupations in which there is little or no direct contact with patients.
- Medical records and health information technicians entering the field usually have an associate degree; courses include anatomy, physiology, medical terminology, and computer science.
- Job prospects should be very good, particularly in offices of physicians.

Nature of the Work

Every time a patient receives healthcare, a record is maintained of the observations, medical or surgical interventions, and treatment outcomes. This record includes information that the patient provides concerning his or her symptoms and medical history, the results of examinations, reports of x rays and laboratory tests, diagnoses, and treatment plans. Medical records and health information technicians organize and evaluate these records for completeness and accuracy.

Technicians begin to assemble patients' health information by first making sure their initial medical charts are complete. They ensure that all forms are completed and properly identified and signed, and that all necessary information is in the computer. They regularly communicate with physicians or other healthcare professionals to clarify diagnoses or to obtain additional information.

Medical records and health information technicians assign a code to each diagnosis and procedure. They consult classification manuals and also rely on their knowledge of disease processes. Technicians then use computer software to assign the patient to one of several hundred "diagnosis-related groups," or DRGs. The DRG determines the amount for which the hospital will be reimbursed if the patient is covered by Medicare or other insurance programs using the DRG system. Technicians who specialize in coding are called health information coders, medical record coders, coder/abstractors, or coding specialists. In addition to the DRG system, coders use other coding systems, such as those geared towards ambulatory settings or long-term care.

Technicians also use computer programs to tabulate and analyze data to help improve patient care, to control costs, for use in legal actions, in response to surveys, or for use in research studies. Cancer registrars compile, maintain, and review records of cancer patients to provide information to physicians and for use in research studies.

Medical records and health information technicians' duties vary with the size of the facility. In large to medium-sized facilities, technicians may specialize in one aspect of health information, or supervise health information clerks and transcriptionists while a medical records and health information administrator manages the department. (See the statement on medical and health services managers elsewhere in the *Handbook.*) In small facilities, a credentialed medical records and health information technician sometimes manages the department.

Working Conditions

Medical records and health information technicians usually work a 40-hour week. Some overtime may be required. In hospitals—where health information departments often are open 24 hours a day, 7 days a week—technicians may work day, evening, and night shifts.

Medical records and health information technicians work in pleasant and comfortable offices. This is one of the few health occupations in which there is little or no direct contact with patients. Because accuracy is essential in their jobs, technicians must pay close attention to detail. Technicians who work at computer monitors for prolonged periods must guard against eyestrain and muscle pain.

Employment

Medical records and health information technicians held about 147,000 jobs in 2002. Thirty-seven percent of all jobs were in hospitals. The rest were mostly in offices of physicians, nursing care facilities, outpatient care centers, and home healthcare services. Insurance firms that deal in health matters employ a small number of health information technicians to tabulate and analyze health information. Public health departments also hire technicians to supervise data collection from healthcare institutions and to assist in research.

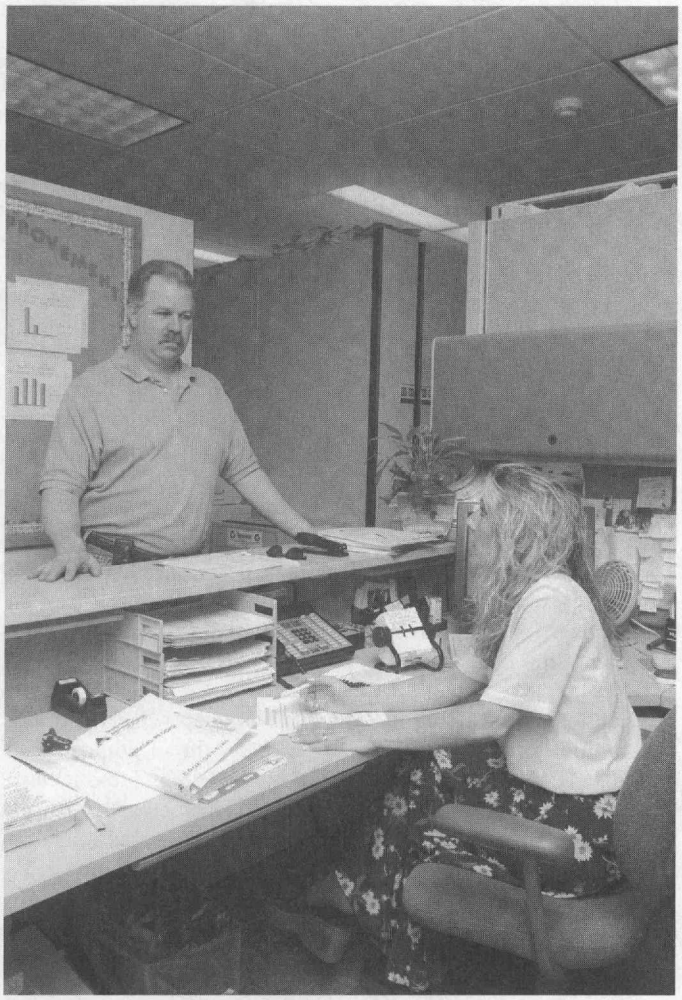
Training, Other Qualifications, and Advancement

Medical records and health information technicians entering the field usually have an associate degree from a community or junior college. In addition to general education, coursework includes medical terminology, anatomy and physiology, legal aspects of health information, coding and abstraction of data, statistics, database management, quality improvement methods, and computer science. Applicants can improve their chances of admission into a program by taking biology, chemistry, health, and computer science courses in high school.

Hospitals sometimes advance promising health information clerks to jobs as medical records and health information technicians, although this practice may be less common in the future. Advancement usually requires 2 to 4 years of job experience and completion of a hospital's in-house training program.

Most employers prefer to hire Registered Health Information Technicians (RHIT), who must pass a written examination offered by the American Health Information Management Association (AHIMA). To take the examination, a person must graduate from a 2-year associate degree program accredited by the Commission on Accreditation of Allied Health Education Pro-

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Medical records and health information technicians work in pleasant and comfortable offices.

grams (CAAHEP) of the American Medical Association. Technicians trained in non-CAAHEP-accredited programs, or on the job, are not eligible to take the examination. In 2003, CAAHEP accredited 182 programs for health information technicians. Technicians who specialize in coding may obtain voluntary certification.

Experienced medical records and health information technicians usually advance in one of two ways—by specializing or managing. Many senior technicians specialize in coding, particularly Medicare coding, or in cancer registry.

In large medical records and health information departments, experienced technicians may advance to section supervisor, overseeing the work of the coding, correspondence, or discharge sections, for example. Senior technicians with RHIT credentials may become director or assistant director of a medical records and health information department in a small facility. However, in larger institutions, the director is usually an administrator, with a bachelor's degree in medical records and health information administration.

Job Outlook

Job prospects should be very good. Employment of medical records and health information technicians is expected to grow much faster than the average for all occupations through 2012, due to rapid growth in the number of medical tests, treatments, and procedures that will be increasingly scrutinized by third-party payers, regulators, courts, and consumers.

Although employment growth in hospitals will not keep pace with growth in other healthcare industries, many new jobs will nevertheless be created. The fastest employment growth and a majority of the new jobs are expected in offices of physicians, due to increasing demand for detailed records, especially in large group practices. Rapid growth also is expected in nursing care facilities, home healthcare services, and outpatient care centers. Additional job openings will result from the need to replace technicians who retire or leave the occupation permanently.

Earnings

Median annual earnings of medical records and health information technicians were $23,890 in 2002. The middle 50 percent earned between $19,550 and $30,600. The lowest 10 percent earned less than $16,460, and the highest 10 percent earned more than $38,640. Median annual earnings in the industries employing the largest numbers of medical records and health information technicians in 2002 were as follows:

Nursing care facilities	$25,160
General medical and surgical hospitals	24,910
Outpatient care centers	22,380
Offices of physicians	21,320

Related Occupations

Medical records and health information technicians need a strong clinical background to analyze the contents of medical records. Other workers who need knowledge of medical terminology, anatomy, and physiology, but have little or no direct contact with the patient, include medical secretaries and medical transcriptionists.

Sources of Additional Information

Information on careers in medical records and health information technology, including a list of programs accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP), is available from:

➤ American Health Information Management Association, 233 N. Michigan Ave., Suite 2150, Chicago, IL 60601-5800. Internet: **http://www.ahima.org**

Nuclear Medicine Technologists

(0*NET 29-2033.00)

Significant Points

- Nuclear medicine technology programs range in length from 1 to 4 years and lead to a certificate, associate degree, or bachelor's degree.
- Faster-than-average growth will arise from an increase in the number of middle-aged and elderly persons, who are the primary users of diagnostic procedures.

Nature of the Work

Diagnostic imaging embraces several procedures that aid in diagnosing ailments, the most familiar being the x ray. Another

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increasingly common diagnostic imaging method, called magnetic resonance imaging (MRI), uses giant magnets and radio waves, rather than radiation, to create an image. Not all imaging technologies use ionizing radiation or radio waves, however: In nuclear medicine, radionuclides—unstable atoms that emit radiation spontaneously—are used to diagnose and treat disease. Radionuclides are purified and compounded to form radiopharmaceuticals. Nuclear medicine technologists administer radiopharmaceuticals to patients and then monitor the characteristics and functions of tissues or organs in which the drugs localize. Abnormal areas show higher- or lower-than-expected concentrations of radioactivity.

Nuclear medicine technologists operate cameras that detect and map the radioactive drug in a patient's body to create diagnostic images. After explaining test procedures to patients, technologists prepare a dosage of the radiopharmaceutical and administer it by mouth, injection, or other means. They position patients and start a gamma scintillation camera, or "scanner," which creates images of the distribution of a radiopharmaceutical as it localizes in, and emits signals from, the patient's body. The images are produced on a computer screen or on film for a physician to interpret.

When preparing radiopharmaceuticals, technologists adhere to safety standards that keep the radiation dose to workers and patients as low as possible. Technologists keep patient records and record the amount and type of radionuclides received, used, and discarded.

Radiologic technologists and technicians, diagnostic medical sonographers, and cardiovascular technologists and technicians also operate diagnostic imaging equipment, but their equipment creates images by means of a different technology. (See the statements on these occupations elsewhere in the *Handbook*.)

Nuclear medicine technologists also perform radioimmunoassay studies that assess the behavior of a radioactive substance inside the body. For example, technologists may add radioactive substances to blood or serum to determine levels of hormones or of therapeutic drugs in the body. Some nuclear medicine studies, such as cardiac function studies, are processed with the aid of a computer.

Working Conditions

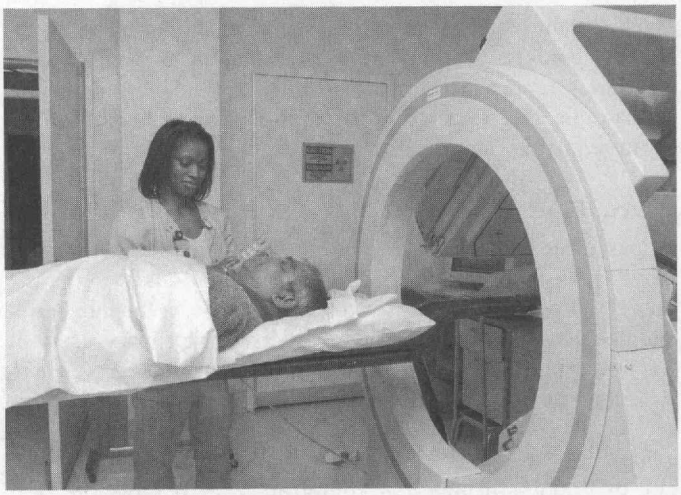
Nuclear medicine technologists generally work a 40-hour week, perhaps including evening or weekend hours in departments that operate on an extended schedule. Opportunities for part-time and shift work are also available. In addition, technologists in hospitals may have on-call duty on a rotational basis.

Because technologists are on their feet much of the day and may lift or turn disabled patients, physical stamina is important.

Although the potential for radiation exposure exists in this field, it is kept to a minimum by the use of shielded syringes, gloves, and other protective devices and by adherence to strict radiation safety guidelines. Technologists also wear badges that measure radiation levels. Because of safety programs, badge measurements rarely exceed established safety levels.

Employment

Nuclear medicine technologists held about 17,000 jobs in 2002. About two-thirds of all jobs were in hospitals. Most of the rest were in offices of physicians or in medical and diagnostic laboratories, including diagnostic imaging centers.



A nuclear medicine technologist readies a patient prior to a scan.

Training, Other Qualifications, and Advancement

Many employers and an increasing number of States require certification or licensure. Aspiring nuclear medicine technologists should check the requirements for the State in which they plan to work. Certification is available from the American Registry of Radiologic Technologists and from the Nuclear Medicine Technology Certification Board. Nuclear medicine technologists must meet the minimum Federal standards on the administration of radioactive drugs and the operation of radiation detection equipment.

Nuclear medicine technology programs range in length from 1 to 4 years and lead to a certificate, associate degree, or bachelor's degree. Generally, certificate programs are offered in hospitals, associate degree programs in community colleges, and bachelor's degree programs in 4-year colleges and universities. Courses cover the physical sciences, biological effects of radiation exposure, radiation protection and procedures, the use of radiopharmaceuticals, imaging techniques, and computer applications.

One-year certificate programs are for health professionals—especially radiologic technologists and diagnostic medical sonographers—who wish to specialize in nuclear medicine. They also attract medical technologists, registered nurses, and others who wish to change fields or specialize. Others interested in the nuclear medicine technology field have three options: a 2-year certificate program, a 2-year associate degree program, or a 4-year bachelor's degree program.

The Joint Review Committee on Education Programs in Nuclear Medicine Technology accredits most formal training programs in nuclear medicine technology. In 2002, there were 92 accredited programs in the continental United States and Puerto Rico.

Nuclear medicine technologists should be sensitive to patients' physical and psychological needs. They must pay attention to detail, follow instructions, and work as part of a team. In addition, operating complicated equipment requires mechanical ability and manual dexterity.

Technologists may advance to supervisor, then to chief technologist, and, finally, to department administrator or director. Some technologists specialize in a clinical area such as nuclear cardiology or computer analysis or leave patient care to take positions in research laboratories. Some become instructors or directors in nuclear medicine technology programs, a step that

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usually requires a bachelor's or master's degree in nuclear medicine technology. Others leave the occupation to work as sales or training representatives for medical equipment and radiopharmaceutical manufacturing firms or as radiation safety officers in regulatory agencies or hospitals.

Job Outlook

Employment of nuclear medicine technologists is expected to grow faster than the average for all occupations through the year 2012. Growth will arise from an increase in the number of middle-aged and older persons, who are the primary users of diagnostic procedures, including nuclear medicine tests. However, the number of openings each year will be relatively low because the occupation is small. Technologists who are also trained in other diagnostic methods, such as radiologic technology or diagnostic medical sonography, will have the best prospects.

Technological innovations may increase the diagnostic uses of nuclear medicine. One example is the use of radiopharmaceuticals in combination with monoclonal antibodies to detect cancer at far earlier stages than is customary today and without resorting to surgery. Another is the use of radionuclides to examine the heart's ability to pump blood. Wider use of nuclear medical imaging to observe metabolic and biochemical changes for neurology, cardiology, and oncology procedures also will spur demand for nuclear medicine technologists.

Nonetheless, cost considerations will affect the speed with which new applications of nuclear medicine grow. Some promising nuclear medicine procedures, such as positron emission tomography, are extremely costly, and hospitals contemplating these procedures will have to consider equipment costs, reimbursement policies, and the number of potential users.

Earnings

Median annual earnings of nuclear medicine technologists were $48,750 in 2002. The middle 50 percent earned between $41,460 and $57,200. The lowest 10 percent earned less than $35,870, and the highest 10 percent earned more than $68,710. Median annual earnings of nuclear medicine technologists in 2002 were $48,210 in general medical and surgical hospitals.

Related Occupations

Nuclear medical technologists operate sophisticated equipment to help physicians and other health practitioners diagnose and treat patients. Cardiovascular technologists and technicians, clinical laboratory technologists and technicians, diagnostic medical sonographers, radiation therapists, radiologic technologists and technicians, and respiratory therapists also perform similar functions.

Sources of Additional Information

Additional information on a career as a nuclear medicine technologist is available from:

➤ Society of Nuclear Medicine Technologists, 1850 Samuel Morse Dr., Reston, VA 20190-5316. Internet: **http://www.snm.org**

For career information, send a stamped, self-addressed, business-size envelope with your request to:

➤ American Society of Radiologic Technologists, 15000 Central Ave. SE., Albuquerque, NM 87123-3917. Telephone (tollfree): 800-444-2778. Internet: **http://www.asrt.org**

For a list of accredited programs in nuclear medicine technology, write to:

➤ Joint Review Committee on Educational Programs in Nuclear Medicine Technology, PMB 418, 1 2nd Ave. East, Suite C, Polson, MT 59860-2320. Internet: **http://www.jrcnmt.org**

Information on certification is available from:

➤ American Registry of Radiologic Technologists, 1255 Northland Dr., St. Paul, MN 55120-1155. Internet: **http://www.arrt.org**

➤ Nuclear Medicine Technology Certification Board, 2970 Clairmont Rd., Suite 935, Atlanta, GA 30329. Internet: **http://www.nmtcb.org**

Occupational Health and Safety Specialists and Technicians

(0*NET 29-9011.00, 29-9012.00)

Significant Points

- About 2 out of 5 worked in Federal, State, and local government agencies that enforce rules on health and safety.
- Many employers, including the Federal Government, require 4-year college degrees in safety or a related field for some specialist positions.
- Projected average employment growth reflects a balance of continuing public demand for a safe and healthy work environment against the desire for smaller government and fewer regulations.

Nature of the Work

Occupational health and safety specialists and technicians, also known as occupational health and safety inspectors, industrial hygienists, environmental protection officers, or ergonomists, help prevent harm to workers, property, and the environment, as well as the general public. They promote occupational health and safety within organizations by developing safer, healthier, and more efficient ways of working. (Industrial engineers, including health and safety—who have similar goals—are discussed elsewhere in the *Handbook*.)

Occupational health and safety specialists analyze work environments and design programs to control, eliminate, and prevent disease or injury caused by chemical, physical, and biological agents or ergonomic factors that involve the impact of equipment design on a worker's comfort or fatigue. They may conduct inspections and enforce adherence to laws, regulations, or employer policies governing worker health and safety.

Occupational health and safety technicians collect data on work environments for analysis by occupational health and safety specialists. Usually working under the supervision of specialists, they help implement and evaluate programs designed to limit risks to workers.

The specific responsibilities of occupational health and safety specialists and technicians vary by industry, workplace, and types of hazards affecting employees. In most settings, they initially focus on identifying hazardous conditions and practices. Sometimes they develop methods to predict hazards from experience, historical data, and other information sources. Then they identify potential hazards in systems, equipment, products, facilities, or processes planned for use in the future. After reviewing the causes or effects of hazards, they evaluate the

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probability and severity of accidents that may result. For example, they might uncover patterns in injury data that implicate a specific cause such as system failure, human error, incomplete or faulty decision making, or a weakness in existing policies or practices. Then they develop and help enforce a plan to eliminate hazards, conducting training sessions for management, supervisors, and workers on health and safety practices and regulations, as necessary. Lastly, they may check on the progress of the safety plan after its implementation. If improvements are not satisfactory, a new plan might be designed and put into practice.

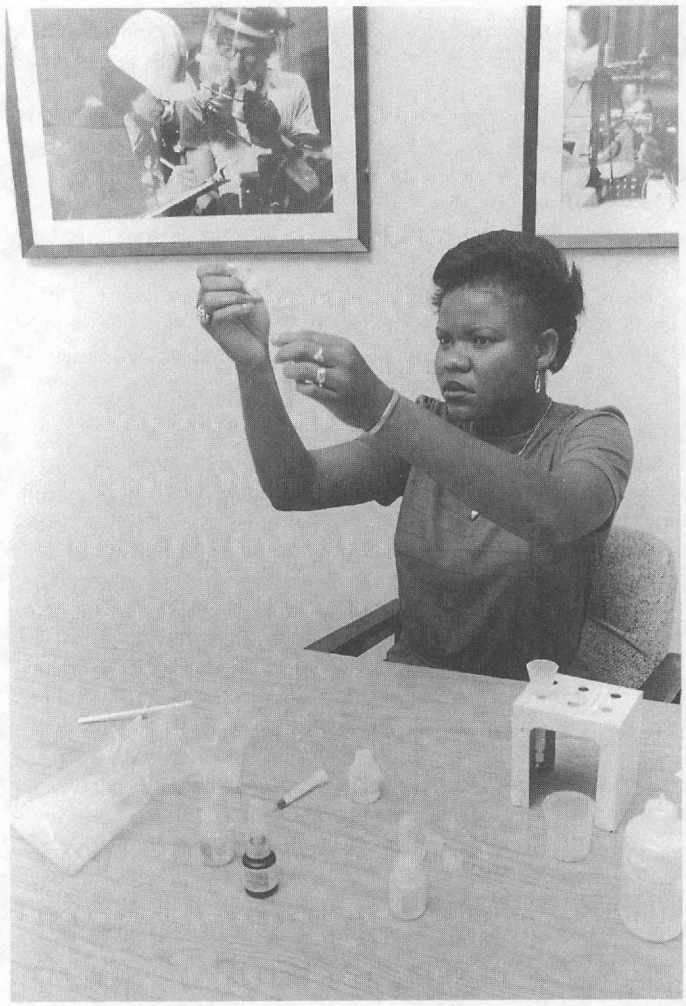
Many occupational health and safety specialists examine and test machinery and equipment, such as lifting devices, machine guards, or scaffolding, to ensure the machinery and equipment meet appropriate safety regulations. They may check that personal protective equipment, such as masks, respirators, protective eyewear, or hardhats, is being used in workplaces according to regulations. They also check that dangerous materials are stored correctly. They test and identify work areas for potential accident and health hazards, such as toxic fumes and explosive gas-air mixtures, and may implement appropriate control measures, such as adjustments to ventilation systems. Their investigations might involve talking with workers and observing their work, as well as inspecting elements in their work environment, such as lighting, tools, and equipment.

To measure and control hazardous substances, such as the noise or radiation levels, occupational health and safety specialists and technicians prepare and calibrate scientific equipment. Samples of dust, gases, vapors, and other potentially toxic materials must be collected and handled properly to ensure safety and accurate test results.

If an accident occurs, occupational health and safety specialists help investigate unsafe working conditions, study possible causes, and recommend remedial action. Some occupational health and safety specialists and technicians assist with the rehabilitation of workers after accidents and injuries, and make sure they return to work successfully.

Frequent communication with management may be necessary to report on the status of occupational health and safety programs. Consultation with engineers or physicians also may be required.

Occupational health and safety specialists prepare reports including observations, analysis of contaminants, and recommendation for control and correction of hazards. Those who develop expertise in certain areas may develop occupational health and safety systems, including policies, procedures, and manuals.



About 2 out of 5 occupational health and safety specialists and technicians work for Federal, State, or local government agencies.

Working Conditions

Occupational health and safety specialists and technicians work with many different people in a variety of environments. Their jobs often involve considerable fieldwork, and some travel frequently. Many occupational health and safety specialists and technicians work long and often irregular hours.

Occupational health and safety specialists and technicians may experience unpleasant, stressful, and dangerous working conditions. For example, health and safety inspectors are exposed to many of the same physically strenuous conditions and hazards as industrial employees, and the work may be performed in unpleasant, stressful, and dangerous working conditions. Health and safety inspectors may find themselves in adversarial roles when the organization or individual being inspected objects to the process or its consequences.

Employment

Occupational health and safety specialists and technicians held about 41,000 jobs in 2002, primarily in government agencies. Local governments employed 17 percent, State governments employed 14 percent, and the Federal Government—chiefly the Department of Labor—employed 6 percent. Other occupational health and safety specialists and technicians were employed in manufacturing firms; hospitals; educational services, including colleges, universities, and professional schools; employment services; management, scientific, and technical consulting services; management of companies and enterprises; electric power generation, transmission, and distribution; support activities for mining; scientific research and development services; and architectural, engineering, and related services.

Within the Federal government, most jobs are as Occupational Safety and Health Administration (OSHA) inspectors, who enforce U.S. Department of Labor regulations that ensure adequate safety principles, practices, and techniques are applied

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in workplaces. Employers may be fined for violation of OSHA standards. Within the U.S. Department of Health and Human Services, occupational health and safety specialists working for the National Institute of Occupational Safety and Health (NIOSH) provide private companies with an avenue to evaluate the health and safety of their employees without the risk of being fined. Most large government agencies also employ occupational health and safety specialists and technicians who work to protect agency employees.

Most private companies either employ their own occupational health and safety personnel or contract with occupational health and safety professionals to ensure OSHA compliance.

Training, Other Qualifications, and Advancement

Requirements for becoming an occupational health and safety specialist or technician include a combination of education, experience, and passing scores on written examinations. Many employers, including the Federal Government, require a 4-year college degree in safety or a related field for some specialist positions. Experience as an occupational health and safety professional is also a prerequisite for many positions.

All occupational health and safety specialists and technicians are trained in the applicable laws or inspection procedures through some combination of classroom and on-the-job training. In general, people who want to enter this occupation should be responsible and like detailed work. Occupational health and safety specialists and technicians should be able to communicate well. Recommended high school courses include English, mathematics, chemistry, biology, and physics.

Certification is available through the Board of Certified Safety Professionals (BCSP) and the American Board of Industrial Hygiene (ABIH). The BCSP offers the Certified Safety Professional (CSP) credential, while the ABIH offers the Certified Industrial Hygienist (CIH) and Certified Associate Industrial Hygienist (CAIH) credentials. Also, the Council on Certification of Health, Environmental, and Safety Technologists, a joint effort between the BCSP and ABIH, awards the Occupational Health and Safety Technologist (OHST) credential. Requirements for the OHST credential are less stringent than those for the CSP, CIH, or CAIH credentials. Once education and experience requirements have been met, certification may be obtained through an examination. Continuing education is required for recertification. Although voluntary, many employers encourage certification.

Federal Government occupational health and safety specialists and technicians whose job performance is satisfactory advance through their career ladder to a specified full-performance level. For positions above this level, usually supervisory positions, advancement is competitive and based on agency needs and individual merit. Advancement opportunities in State and local governments and the private sector are often similar to those in the Federal Government.

With additional experience or education, promotion to a managerial position is possible. Research or related teaching positions at the college level require advanced education.

Job Outlook

Employment of occupational health and safety specialists and technicians is expected to grow about as fast as the average for all occupations through 2012, reflecting a balance of continuing public demand for a safe and healthy work environment against the desire for smaller government and fewer regulations. Additional job openings will arise from the need to replace those who transfer to other occupations, retire, or leave the labor force for other reasons. In private industry, employment growth will reflect industry growth and the continuing self-enforcement of government and company regulations and policies.

Employment of occupational health and safety specialists and technicians is affected less by general economic fluctuations than employment in other occupations. Federal, State, and local governments, which employ about 2 out of 5 of all specialists and technicians, provide considerable job security.

Earnings

Median annual earnings of occupational health and safety specialists and technicians were $46,010 in 2002. The middle 50 percent earned between $34,280 and $58,230. The lowest 10 percent earned less than $25,080, and the highest 10 percent earned more than $71,450. Median annual earnings of occupational health and safety specialists and technicians in 2002 were $44,260 in State government and $42,430 in local government.

Most occupational health and safety specialists and technicians work for Federal, State, and local governments or in large private firms, most of which generally offer more generous benefits than smaller firms.

Related Occupations

Occupational health and safety specialists and technicians ensure that laws and regulations are obeyed. Others who enforce laws and regulations include agricultural inspectors, construction and building inspectors, correctional officers, financial examiners, fire inspectors, police and detectives, and transportation inspectors.

Sources of Additional Information

Information about jobs in Federal, State, and local government as well as in private industry is available from State employment service offices.

For information on a career as an industrial hygienist and a list of colleges and universities offering programs in industrial hygiene, contact:

➤ American Industrial Hygiene Association, 2700 Prosperity Ave., Suite 250, Fairfax, VA 22031. Internet: **http://www.aiha.org**

For information on the Certified Industrial Hygiene or Certified Associate Industrial Hygiene credential, contact:

➤ American Board of Industrial Hygiene, 6015 West St. Joseph Hwy., Suite 102, Lansing, MI 48917. Internet: **http://www.abih.org**

For more information on professions in safety and a list of colleges and universities offering safety and related degrees, including correspondence courses, contact:

➤ American Society of Safety Engineers, 1800 E Oakton St., Des Plaines, IL 60018. Internet: **http://www.asse.org**

For more information on professions in safety and the Certified Safety Professional credential, contact:

➤ Board of Certified Safety Professionals, 208 Burwash Ave., Savoy, IL 61874. Internet: **http://www.bcsp.org**

For information on the Occupational Health and Safety Technologist credential, contact:

➤ Council on Certification of Health, Environmental, and Safety Technologists, 208 Burwash Ave., Savoy, IL 61874. Internet: **http://www.cchest.org**

For additional career information, contact:

➤ U.S. Department of Health and Human Services, Center for Disease Control and Prevention, National Institute of Occupational Safety and Health, Hubert H. Humphrey Bldg., 200 Independence Ave. SW., Room 715H, Washington, DC 20201. Internet: **http://www.cdc.gov/niosh**

➤ U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Ave. NW., Washington, DC 20210. Internet: **http://www.osha.gov**

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Information on obtaining positions as occupational health and safety specialists and technicians with the Federal Government is available from the Office of Personnel Management through a telephone-based system. Consult your telephone directory under U.S. Government for a local number or call (703) 724-1850; Federal Relay Service: (800) 877-8339. The first number is not tollfree, and charges may result. Information also is available from the Internet site: **http://www.usajobs.opm.gov.**

Opticians, Dispensing

(0*NET 29-2081.00)

Significant Points

- Most dispensing opticians receive training on the job or through apprenticeships lasting 2 or more years; twenty-one States require a license.
- Projected employment growth reflects steady demand for corrective lenses and eyeglass frames that are in fashion.
- The number of job openings will be limited because the occupation is small.

Nature of Work

Dispensing opticians fit eyeglasses and contact lenses, following prescriptions written by ophthalmologists or optometrists. (The work of optometrists is described in a statement elsewhere in the *Handbook*. See the statement on physicians and surgeons for information about ophthalmologists.)

Dispensing opticians examine written prescriptions to determine the specifications of lenses. They recommend eyeglass frames, lenses, and lens coatings after considering the prescription and the customer's occupation, habits, and facial features. Dispensing opticians measure clients' eyes, including the distance between the centers of the pupils and the distance between the surface and the lens. For customers without prescriptions, dispensing opticians may use a lensometer to record eyeglass measurements. They also may obtain a customer's previous record or verify a prescription with the examining optometrist or ophthalmologist.

Dispensing opticians prepare work orders that give ophthalmic laboratory technicians information needed to grind and insert lenses into a frame. The work order includes prescriptions for lenses and information on their size, material, color, and style. Some dispensing opticians grind and insert lenses themselves. After the glasses are made, dispensing opticians verify that the lenses have been ground to specifications. Then they may reshape or bend the frame, by hand or using pliers, so that the eyeglasses fit the customer properly and comfortably. Some also fix, adjust, and refit broken frames. They instruct clients about adapting to, wearing, or caring for eyeglasses.

Some dispensing opticians specialize in fitting contacts, artificial eyes, or cosmetic shells to cover blemished eyes. To fit contact lenses, dispensing opticians measure the shape and size of the eye, select the type of contact lens material, and prepare work orders specifying the prescription and lens size. Fitting contact lenses requires considerable skill, care, and patience. Dispensing opticians observe customers' eyes, corneas, lids, and contact lenses with special instruments and microscopes. During several visits, opticians show customers how to insert, remove, and care for their contacts. Opticians do all this to ensure that the fit is correct.

Dispensing opticians keep records on customers' prescriptions, work orders, and payments; track inventory and sales; and perform other administrative duties.

Working Conditions

Dispensing opticians work indoors in attractive, well-lighted, and well-ventilated surroundings. They may work in medical offices or small stores where customers are served one at a time. Some work in large stores where several dispensing opticians serve a number of customers at once. Opticians spend a lot of time on their feet. If they prepare lenses, they need to take precautions against the hazards associated with glass cutting, chemicals, and machinery.

Most dispensing opticians work a 40-hour week, although some work longer hours. Those in retail stores may work evenings and weekends. Some work part time.

Employment

Dispensing opticians held about 63,000 jobs in 2002. About 2 out of 5 worked in health and personal care stores, including optical goods stores. Many of these stores offer one-stop shopping. Customers may have their eyes examined, choose frames, and have glasses made on the spot. Another 2 out of 5 dispensing opticians worked in offices of physicians or other health practitioners for ophthalmologists or optometrists who sell glasses directly to patients. Some work in optical departments of department stores or other general merchandise stores, such as warehouse clubs and superstores.

Training, Other Qualifications, and Advancement

Employers usually hire individuals with no background as an optician or those who have worked as ophthalmic laboratory



Dispensing opticians may work in medical offices or small stores where customers are served one at a time.

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technicians. The employers then provide the required training. (See the statement on ophthalmic laboratory technicians elsewhere in the *Handbook*.) Most dispensing opticians receive training on the job or through apprenticeships lasting 2 or more years. Some employers, however, seek people with postsecondary training in the field.

Knowledge of physics, basic anatomy, algebra, geometry, and mechanical drawing is particularly valuable, because training usually includes instruction in optical mathematics, optical physics, and the use of precision measuring instruments and other machinery and tools. Dispensing opticians deal directly with the public, so they should be tactful, pleasant, and communicate well. Manual dexterity and the ability to do precision work are essential.

Large employers usually offer structured apprenticeship programs; small employers provide more informal, on-the-job training. In the 21 States that require dispensing opticians to be licensed, individuals without postsecondary training work from 2 to 4 years as apprentices. Apprenticeship or formal training is offered in most States as well.

Apprentices receive technical training and learn office management and sales. Under the supervision of an experienced optician, optometrist, or ophthalmologist, apprentices work directly with patients, fitting eyeglasses and contact lenses. In States requiring licensure, information about apprenticeships and licensing procedures is available from the State board of occupational licensing.

Formal training in the field is offered in community colleges and a few colleges and universities. In 2002, the Commission on Opticianry Accreditation accredited 22 programs that awarded 2-year associate degrees. There also are shorter programs of 1 year or less. Some States that offer a license to dispensing opticians allow graduates to take the licensure exam immediately upon graduation; others require a few months to a year of experience.

Dispensing opticians may apply to the American Board of Opticianry (ABO) and the National Contact Lens Examiners (NCLE) for certification of their skills. Certification must be renewed every 3 years through continuing education. Those licensed in States where licensing renewal requirements include continuing education credits may use proof of their renewed State license to meet the recertification requirements of the ABO. Likewise, the NCLE will accept proof of renewal from any State that has contact lens requirements.

Many experienced dispensing opticians open their own optical stores. Others become managers of optical stores or sales representatives for wholesalers or manufacturers of eyeglasses or lenses.

Job Outlook

Employment of dispensing opticians is expected to increase about as fast as the average for all occupations through 2012 as demand grows for corrective lenses. The number of middle-aged and elderly persons is projected to increase rapidly. Middle age is a time when many individuals use corrective lenses for the first time, and elderly persons generally require more vision care than others.

Fashion, too, influences demand. Frames come in a growing variety of styles and colors—encouraging people to buy more than one pair. Demand also is expected to grow in response to the availability of new technologies that improve the quality and look of corrective lenses, such as antireflective coatings and bifocal lenses without the line that is visible in old-style bifocals. Improvements in bifocal, extended-wear, and disposable contact lenses also will spur demand.

The need to replace those who leave the occupation will result in additional job openings. Nevertheless, the number of job openings will be limited because the occupation is small. Dispensing opticians are vulnerable to changes in the business cycle, because eyewear purchases often can be deferred for a time.

Earnings

Median annual earnings of dispensing opticians were $25,600 in 2002. The middle 50 percent earned between $19,960 and $33,530. The lowest 10 percent earned less than $16,310, and the highest 10 percent earned more than $43,490. Median annual earnings in the industries employing the largest numbers of dispensing opticians in 2002 were as follows:

Offices of physicians	$28,250
Health and personal care stores	25,860
Offices of other health practitioners	24,900

Related Occupations

Other workers who deal with customers and perform delicate work include jewelers and precious stone and metal workers, locksmiths and safe repairers, orthotists and prosthetists, and precision instrument and equipment repairers.

Sources of Additional Information

For general information about opticians and a list of home-study programs, seminars, and review materials, contact:

➤ National Academy of Opticianry, 8401 Corporate Dr., Suite 605, Landover, MD 20785. Telephone (tollfree): 800-229-4828. Internet: **http://www.nao.org**

For a list of accredited programs in opticianry, contact:

➤ Commission on Opticianry Accreditation, P.O. Box 3073, Merrifield, VA 22116-3073.

To learn about voluntary certification for opticians who fit eyeglasses, as well as a list of State licensing boards for opticians, contact:

➤ American Board of Opticianry, 6506 Loisdale Rd., Suite 209, Springfield, VA 22150. Internet: **http://www.abo.org**

For information on voluntary certification for dispensing opticians who fit contact lenses, contact:

➤ National Contact Lens Examiners, 6506 Loisdale Rd., Suite 209, Springfield, VA 22150. Internet: **http://www.abo.org**

Pharmacy Technicians

(0*NET 29-2052.00)

Significant Points

- Job opportunities are expected to be good, especially for those with certification or previous work experience.
- Many technicians work evenings, weekends, and holidays.
- Two-thirds of all jobs are in retail pharmacies.

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Nature of the Work

Pharmacy technicians help licensed pharmacists provide medication and other healthcare products to patients. Technicians usually perform routine tasks to help prepare prescribed medication for patients, such as counting tablets and labeling bottles. Technicians refer any questions regarding prescriptions, drug information, or health matters to a *pharmacist.* (See the statement on pharmacists elsewhere in the *Handbook.*)

Pharmacy aides work closely with pharmacy technicians. They are often clerks or cashiers who primarily answer telephones, handle money, stock shelves, and perform other clerical duties. (See the statement on pharmacy aides elsewhere in the *Handbook.*) Pharmacy technicians usually perform more complex tasks than do pharmacy aides, although, in some States, their duties and job titles overlap.

Pharmacy technicians who work in retail or mail-order pharmacies have varying responsibilities, depending on State rules and regulations. Technicians receive written prescriptions or requests for prescription refills from patients. They also may receive prescriptions sent electronically from the doctor's office. They must verify that the information on the prescription is complete and accurate. To prepare the prescription, technicians must retrieve, count, pour, weigh, measure, and sometimes mix the medication. Then, they prepare the prescription labels, select the type of prescription container, and affix the prescription and auxiliary labels to the container. Once the prescription is filled, technicians price and file the prescription, which must be checked by a pharmacist before it is given to a patient. Technicians may establish and maintain patient profiles, prepare insurance claim forms, and stock and take inventory of prescription and over-the-counter medications.

In hospitals, nursing homes, and assisted-living facilities, technicians have added responsibilities. They read patient charts and prepare and deliver the medicine to patients. The pharmacist must check the order before it is delivered to the patient. The technician then copies the information about the prescribed medication onto the patient's profile. Technicians also may assemble a 24-hour supply of medicine for every patient. They package and label each dose separately. The package is then placed in the medicine cabinet of each patient until the supervising pharmacist checks it for accuracy. It is then given to the patient.

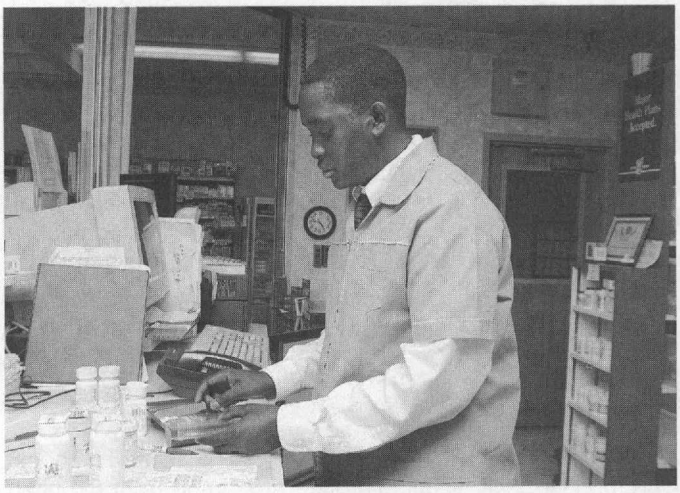
Working Conditions

Pharmacy technicians work in clean, organized, well-lighted, and well-ventilated areas. Most of their workday is spent on their feet. They may be required to lift heavy boxes or to use stepladders to retrieve supplies from high shelves.

Technicians work the same hours that pharmacists work. These may include evenings, nights, weekends, and holidays. Because some hospital and retail pharmacies are open 24 hours a day, technicians may work varying shifts. As their seniority increases, technicians often have increased control over the hours they work. There are many opportunities for part-time work in both retail and hospital settings.

Employment

Pharmacy technicians held about 211,000 jobs in 2002. Two-thirds of all jobs were in retail pharmacies, either independently owned or part of a drugstore chain, grocery store, department store, or mass retailer. About 22 percent of jobs were in hospitals and a small proportion was in mail-order and Internet pharmacies, clinics, pharmaceutical wholesalers, and the Federal Government.



Pharmacy technicians frequently fill prescriptions.

Training, Other Qualifications, and Advancement

Although most pharmacy technicians receive informal on-the-job training, employers favor those who have completed formal training and certification. However, there are currently few State and no Federal requirements for formal training or certification of pharmacy technicians. Employers who have neither the time nor money to give on-the-job training often seek formally educated pharmacy technicians. Formal education programs and certification emphasize the technician's interest in and dedication to the work. In addition to the military, some hospitals, proprietary schools, vocational or technical colleges, and community colleges offer formal education programs.

Formal pharmacy technician education programs require classroom and laboratory work in a variety of areas, including medical and pharmaceutical terminology, pharmaceutical calculations, pharmacy recordkeeping, pharmaceutical techniques, and pharmacy law and ethics. Technicians also are required to learn medication names, actions, uses, and doses. Many training programs include internships, in which students gain hands-on experience in actual pharmacies. Students receive a diploma, a certificate, or an associate degree, depending on the program.

Prospective pharmacy technicians with experience working as an aide in a community pharmacy or volunteering in a hospital may have an advantage. Employers also prefer applicants with strong customer service and communication skills and with experience managing inventories, counting, measuring, and using computers. Technicians entering the field need strong mathematics, spelling, and reading skills. A background in chemistry, English, and health education also may be beneficial. Some technicians are hired without formal training, but under the condition that they obtain certification within a specified period to retain employment.

The Pharmacy Technician Certification Board administers the National Pharmacy Technician Certification Examination. This exam is voluntary in most States and displays the competency of the individual to act as a pharmacy technician. However, more States and employers are requiring certification as reliance on pharmacy technicians grows. Eligible candidates must have a high school diploma or GED and no felony convictions, and those who pass the exam earn the title of Certified Pharmacy Technician (CPhT). The exam is offered several times per year at various locations nationally. Employers, often pharmacists, know that individuals who pass the exam have a standardized body of knowledge and skills. Many employers will also reimburse the costs of the exam as an incentive for certification.

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Certified technicians must be recertified every 2 years. Technicians must complete 20 contact hours of pharmacy-related topics within the 2-year certification period to become eligible for recertification. Contact hours are awarded for on-the-job training, attending lectures, and college coursework. At least 1 contact hour must be in pharmacy law. Contact hours can be earned from several different sources, including pharmacy associations, pharmacy colleges, and pharmacy technician training programs. Up to 10 contact hours can be earned when the technician is employed under the direct supervision and instruction of a pharmacist.

Successful pharmacy technicians are alert, observant, organized, dedicated, and responsible. They should be willing and able to take directions. They must enjoy precise work—details are sometimes a matter of life and death. Although a pharmacist must check and approve all their work, they should be able to work on their own without constant instruction from the pharmacist. Candidates interested in becoming pharmacy technicians cannot have prior records of drug or substance abuse.

Strong interpersonal and communication skills are needed because there is a lot of interaction with patients, coworkers, and healthcare professionals. Teamwork is very important because technicians are often required to work with pharmacists, aides, and other technicians.

Job Outlook

Good job opportunities are expected for full-time and part-time work, especially for technicians with formal training or previous experience. Job openings for pharmacy technicians will result from the expansion of retail pharmacies and other employment settings, and from the need to replace workers who transfer to other occupations or leave the labor force.

Employment of pharmacy technicians is expected to grow faster than the average for all occupations through 2012 due to the increased pharmaceutical needs of a larger and older population, and to the greater use of medication. The increased number of middle-aged and elderly people—who, on average, use more prescription drugs than do younger people—will spur demand for technicians in all practice settings. With advances in science, more medications are becoming available to treat more conditions.

Cost-conscious insurers, pharmacies, and health systems will continue to emphasize the role of technicians. As a result, pharmacy technicians will assume responsibility for more routine tasks previously performed by pharmacists. Pharmacy technicians also will need to learn and master new pharmacy technology as it surfaces. For example, robotic machines are used to dispense medicine into containers; technicians must oversee the machines, stock the bins, and label the containers. Thus, while automation is increasingly incorporated into the job, it will not necessarily reduce the need for technicians.

Almost all States have legislated the maximum number of technicians who can safely work under a pharmacist at one time. In some States, technicians have assumed more medication dispensing duties as pharmacists have become more involved in patient care, resulting in more technicians per pharmacist. Changes in these laws could directly affect employment.

Earnings

Median hourly earnings of wage and salary pharmacy technicians in 2002 were $10.70. The middle 50 percent earned between $8.74 and $13.19; the lowest 10 percent earned less than $7.44, and the highest 10 percent earned more than $15.82. Median hourly earnings in the industries employing the largest numbers of pharmacy technicians in 2002 were as follows:

General medical and surgical hospitals	$12.32
Grocery stores	11.34
Drugs and druggists' sundries merchant wholesalers	10.60
Health and personal care stores	9.70
Department stores	9.69

Certified technicians may earn more. Shift differentials for working evenings or weekends also can increase earnings. Some technicians belong to unions representing hospital or grocery store workers.

Related Occupations

This occupation is most closely related to pharmacists and pharmacy aides. Workers in other medical support occupations include dental assistants, licensed practical and licensed vocational nurses, medical transcriptionists, medical records and health information technicians, occupational therapist assistants and aides, physical therapist assistants and aides, and surgical technologists.

Sources of Additional Information

For information on the Certified Pharmacy Technician designation, contact:

➤ Pharmacy Technician Certification Board, 2215 Constitution Ave. NW., Washington DC 20037. Internet: **http://www.ptcb.org**

For a list of accredited pharmacy technician training programs, contact:

➤ American Society of Health-System Pharmacists, 7272 Wisconsin Ave., Bethesda, MD 20814. Internet: **http://www.ashp.org**

Radiologic Technologists and Technicians

(0*NET 29-2034.01, 29-2034.02)

Significant Points

- Formal training programs in radiography range in length from 1 to 4 years and lead to a certificate, associate degree, or bachelor's degree.
- Although hospitals will remain the primary employer, a greater number of new jobs will be found in physicians' offices and diagnostic imaging centers.
- Job opportunities are expected to be favorable; some employers report difficulty hiring sufficient numbers of radiologic technologists and technicians.

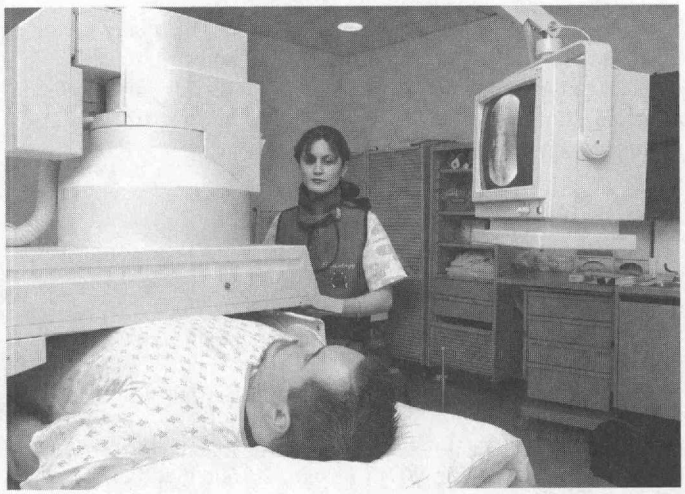
Nature of the Work

Radiologic technologists and technicians take x rays and administer nonradioactive materials into patients' bloodstreams for diagnostic purposes. Some specialize in diagnostic imaging technologies, such as computerized tomography (CT) and magnetic resonance imaging (MRI).

In addition to radiologic technologists and technicians, others who conduct diagnostic imaging procedures include cardiovascular technologists and technicians, diagnostic medical sonographers, and nuclear medicine technologists. (Each is discussed elsewhere in the *Handbook.)*

Radiologic technologists and technicians, also referred to as *radiographers*, produce x ray films (radiographs) of parts of the human body for use in diagnosing medical problems. They prepare patients for radiologic examinations by explaining the procedure, removing articles such as jewelry, through which x

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Radiologic technologists use advanced imaging technology to create diagnostic images for interpretation by a physician.

rays cannot pass, and positioning patients so that the parts of the body can be appropriately radiographed. To prevent unnecessary radiation exposure, these workers surround the exposed area with radiation protection devices, such as lead shields, or limit the size of the x ray beam. Radiographers position radiographic equipment at the correct angle and height over the appropriate area of a patient's body. Using instruments similar to a measuring tape, they may measure the thickness of the section to be radiographed and set controls on the x ray machine to produce radiographs of the appropriate density, detail, and contrast. They place the x ray film under the part of the patient's body to be examined and make the exposure. They then remove the film and develop it.

Experienced radiographers may perform more complex imaging procedures. For fluoroscopies, radiographers prepare a solution of contrast medium for the patient to drink, allowing the radiologist (a physician who interprets radiographs) to see soft tissues in the body. Some radiographers, called *CT technologists,* operate CT scanners to produce cross-sectional images of patients. Radiographers who operate machines that use strong magnets and radio waves, rather than radiation, to create an image are called *MRI technologists.*

Radiologic technologists and technicians must follow physicians' orders precisely and conform to regulations concerning the use of radiation to protect themselves, their patients, and their coworkers from unnecessary exposure.

In addition to preparing patients and operating equipment, radiologic technologists and technicians keep patient records and adjust and maintain equipment. They also may prepare work schedules, evaluate equipment purchases, or manage a radiology department.

Working Conditions

Most full-time radiologic technologists and technicians work about 40 hours a week; they may have evening, weekend, or on-call hours. Opportunities for part-time and shift work also are available.

Because technologists and technicians are on their feet for long periods and may lift or turn disabled patients, physical stamina is important. Technologists and technicians work at diagnostic machines, but may also perform some procedures at patients' bedsides. Some travel to patients in large vans equipped with sophisticated diagnostic equipment.

Although radiation hazards exist in this occupation, they are minimized by the use of lead aprons, gloves, and other shielding devices, as well as by instruments monitoring radiation exposure. Technologists and technicians wear badges measuring radiation levels in the radiation area, and detailed records are kept on their cumulative lifetime dose.

Employment

Radiologic technologists and technicians held about 174,000 jobs in 2002. Almost 1 in 5 worked part time. About half of all jobs were in hospitals. Most of the rest were in offices of physicians; medical and diagnostic laboratories, including diagnostic imaging centers; and outpatient care centers.

Training, Other Qualifications, and Advancement

Preparation for this profession is offered in hospitals, colleges and universities, vocational-technical institutes, and the U.S. Armed Forces. Hospitals, which employ most radiologic technologists and technicians, prefer to hire those with formal training.

Formal training programs in radiography range in length from 1 to 4 years and lead to a certificate, associate degree, or bachelor's degree. Two-year associate degree programs are most prevalent.

Some 1-year certificate programs are available for experienced radiographers or individuals from other health occupations, such as medical technologists and registered nurses, who want to change fields or specialize in CT or MRI. A bachelor's or master's degree in one of the radiologic technologies is desirable for supervisory, administrative, or teaching positions.

The Joint Review Committee on Education in Radiologic Technology accredits most formal training programs for the field. The committee accredited 587 radiography programs in 2003. Radiography programs require, at a minimum, a high school diploma or the equivalent. High school courses in mathematics, physics, chemistry, and biology are helpful. The programs provide both classroom and clinical instruction in anatomy and physiology, patient care procedures, radiation physics, radiation protection, principles of imaging, medical terminology, positioning of patients, medical ethics, radiobiology, and pathology.

Federal legislation protects the public from the hazards of unnecessary exposure to medical and dental radiation by ensuring operators of radiologic equipment are properly trained. Under this legislation, the Federal Government sets voluntary standards that the States, in turn, may use for accrediting training programs and certifying individuals who engage in medical or dental radiography.

In 2003, about 38 States licensed radiologic technologists and technicians. Voluntary registration is offered by the American Registry of Radiologic Technologists. To be eligible for registration, technologists generally must have graduated from an accredited program and pass an examination. Many employers prefer to hire registered radiographers. To be recertified, radiographers must complete 24 hours of continuing education every other year.

Radiologic technologists and technicians should be sensitive to patients' physical and psychological needs. They must pay attention to detail, follow instructions, and work as part of a team. In addition, operating complicated equipment requires mechanical ability and manual dexterity.

With experience and additional training, staff technologists may become specialists, performing CT scanning, angiography,

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and magnetic resonance imaging. Experienced technologists also may be promoted to supervisor, chief radiologic technologist, and, ultimately, department administrator or director. Depending on the institution, courses or a master's degree in business or health administration may be necessary for the director's position. Some technologists progress by leaving the occupation to become instructors or directors in radiologic technology programs; others take jobs as sales representatives or instructors with equipment manufacturers.

Job Outlook

Job opportunities are expected to be favorable. Some employers report difficulty hiring sufficient numbers of radiologic technologists and technicians. Imbalances between the demand for, and supply of, qualified workers should spur efforts to attract and retain qualified radiologic technologists and technicians. As an example of such efforts, employers may provide more flexible training programs or improve compensation and working conditions.

Radiologic technologists who also are experienced in more complex diagnostic imaging procedures, such as CT or MRI, will have better employment opportunities, as employers seek to control costs by using multiskilled employees.

Employment of radiologic technologists and technicians is expected to grow faster than the average for all occupations through 2012, as the population grows and ages, increasing the demand for diagnostic imaging. Although healthcare providers are enthusiastic about the clinical benefits of new technologies, the extent to which they are adopted depends largely on cost and reimbursement considerations. For example, digital imaging technology can improve quality and efficiency, but remains expensive. Some promising new technologies may not come into widespread use because they are too expensive and third-party payers may not be willing to pay for their use.

Hospitals will remain the principal employer of radiologic technologists and technicians. However, a greater number of new jobs will be found in offices of physicians and diagnostic imaging centers. Health facilities such as these are expected to grow rapidly through 2012, due to the strong shift toward outpatient care, encouraged by third-party payers and made possible by technological advances that permit more procedures to be performed outside the hospital. Some job openings also will arise from the need to replace technologists and technicians who leave the occupation.

Earnings

Median annual earnings of radiologic technologists and technicians were $38,970 in 2002. The middle 50 percent earned between $32,370 and $46,510. The lowest 10 percent earned less than $27,190, and the highest 10 percent earned more than $55,430. Median annual earnings in the industries employing the largest numbers of radiologic technologists and technicians in 2002 were as follows:

Medical and diagnostic laboratories	$42,470
General medical and surgical hospitals	39,580
Offices of physicians	36,490

Related Occupations

Radiologic technologists and technicians operate sophisticated equipment to help physicians, dentists, and other health practitioners diagnose and treat patients. Workers in related occupations include cardiovascular technologists and technicians, clinical laboratory technologists and technicians, diagnostic medical sonographers, nuclear medicine technologists, radiation therapists, and respiratory therapists.

Sources of Additional Information

For career information, send a stamped, self-addressed business-size envelope with your request to:

➤ American Society of Radiologic Technologists, 15000 Central Ave. SE., Albuquerque, NM 87123-3917. Telephone (tollfree): 800-444-2778. Internet: **http://www.asrt.org**

For the current list of accredited education programs in radiography, write to:

➤ Joint Review Committee on Education in Radiologic Technology, 20 N. Wacker Dr., Suite 900, Chicago, IL 60606-2901. Internet: **http://www.jrcert.org**

For information on certification, contact:

➤ American Registry of Radiologic Technologists, 1255 Northland Dr., St. Paul, MN 55120-1155. Internet: **http://www.arrt.org**

Surgical Technologists

(0*NET 29-2055.00)

Significant Points

- Training programs last 9 to 24 months and lead to a certificate, diploma, or associate degree.
- Job opportunities are expected to be favorable.
- Hospitals will continue to be the primary employer, although much faster employment growth is expected in offices of physicians and in outpatient care centers, including ambulatory surgical centers.

Nature of the Work

Surgical technologists, also called scrubs and surgical or operating room technicians, assist in surgical operations under the supervision of surgeons, registered nurses, or other surgical personnel. Surgical technologists are members of operating room teams, which most commonly include surgeons, anesthesiologists, and circulating nurses. Before an operation, surgical technologists help prepare the operating room by setting up surgical instruments and equipment, sterile drapes, and sterile solutions. They assemble both sterile and nonsterile equipment, as well as adjust and check it to ensure it is working properly. Technologists also get patients ready for surgery by washing, shaving, and disinfecting incision sites. They transport patients to the operating room, help position them on the operating table, and cover them with sterile surgical "drapes." Technologists also observe patients' vital signs, check charts, and assist the surgical team with putting on sterile gowns and gloves.

During surgery, technologists pass instruments and other sterile supplies to surgeons and surgeon assistants. They may hold retractors, cut sutures, and help count sponges, needles, supplies, and instruments. Surgical technologists help prepare, care for, and dispose of specimens taken for laboratory analysis and help apply dressings. Some operate sterilizers, lights, or suction machines, and help operate diagnostic equipment.

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During surgery, surgical technologists pass instruments and other sterile supplies to surgeons and surgeon assistants.

After an operation, surgical technologists may help transfer patients to the recovery room and clean and restock the operating room.

Working Conditions

Surgical technologists work in clean, well-lighted, cool environments. They must stand for long periods and remain alert during operations. At times they may be exposed to communicable diseases and unpleasant sights, odors, and materials.

Most surgical technologists work a regular 40-hour week, although they may be on call or work nights, weekends and holidays on a rotating basis.

Employment

Surgical technologists held about 72,000 jobs in 2002. About three-quarters of jobs for surgical technologists were in hospitals, mainly in operating and delivery rooms. Other jobs were in offices of physicians or dentists who perform outpatient surgery and in outpatient care centers, including ambulatory surgical centers. A few, known as private scrubs, are employed directly by surgeons who have special surgical teams, like those for liver transplants.

Training, Other Qualifications, and Advancement

Surgical technologists receive their training in formal programs offered by community and junior colleges, vocational schools, universities, hospitals, and the military. In 2002, the Commission on Accreditation of Allied Health Education Programs (CAAHEP) recognized 361 accredited programs. High school graduation normally is required for admission. Programs last 9 to 24 months and lead to a certificate, diploma, or associate degree.

Programs provide classroom education and supervised clinical experience. Students take courses in anatomy, physiology, microbiology, pharmacology, professional ethics, and medical terminology. Other studies cover the care and safety of patients during surgery, sterile techniques, and surgical procedures. Students also learn to sterilize instruments; prevent and control infection; and handle special drugs, solutions, supplies, and equipment.

Most employers prefer to hire certified technologists. Technologists may obtain voluntary professional certification from the Liaison Council on Certification for the Surgical Technologist by graduating from a CAAHEP-accredited program and passing a national certification examination. They may then use the Certified Surgical Technologist (CST) designation. Continuing education or reexamination is required to maintain certification, which must be renewed every 4 years.

Certification may also be obtained from the National Center for Competency Testing. To qualify to take the exam, candidates follow one of three paths: complete an accredited training program, undergo a 2-year hospital on-the-job training program, or acquire seven years of experience working in the field. After passing the exam, individuals may use the designation Tech in Surgery-Certified, TS-C (NCCT). This certification may be renewed every 5 years through either continuing education or reexamination.

Surgical technologists need manual dexterity to handle instruments quickly. They also must be conscientious, orderly, and emotionally stable to handle the demands of the operating room environment. Technologists must respond quickly and know procedures well to have instruments ready for surgeons without having to be told. They are expected to keep abreast of new developments in the field. Recommended high school courses include health, biology, chemistry, and mathematics.

Technologists advance by specializing in a particular area of surgery, such as neurosurgery or open heart surgery. They also may work as circulating technologists. A circulating technologist is the "unsterile" member of the surgical team who prepares patients; helps with anesthesia; obtains and opens packages for the "sterile" persons to remove the sterile contents during the procedure; interviews the patient before surgery; keeps a written account of the surgical procedure; and answers the surgeon's questions about the patient during the surgery. With additional training, some technologists advance to first assistants, who help with retracting, sponging, suturing, cauterizing bleeders, and closing and treating wounds. Some surgical technologists manage central supply departments in hospitals, or take positions with insurance companies, sterile supply services, and operating equipment firms.

Job Outlook

Job opportunities are expected to be favorable. Employment of surgical technologists is expected to grow faster than the average for all occupations through the year 2012 as the volume of surgery increases. The number of surgical procedures is expected to rise as the population grows and ages. As members of the baby boom generation approach retirement age, the over-50 population, who generally require more surgical procedures, will account for a larger portion of the general population. Technological advances, such as fiber optics and laser technology, will also permit new surgical procedures to be performed.

Hospitals will continue to be the primary employer of surgical technologists, although much faster employment growth is expected in offices of physicians and in outpatient care centers, including ambulatory surgical centers.

Earnings

Median annual earnings of surgical technologists were $31,210 in 2002. The middle 50 percent earned between $26,000 and $36,740. The lowest 10 percent earned less than $21,920, and the highest 10 percent earned more than $43,470. Median annual earnings of surgical technologists in 2002 were $33,790 in

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offices of physicians and $30,590 in general medical and surgical hospitals.

Related Occupations

Other health occupations requiring approximately 1 year of training after high school include dental assistants, licensed practical and licensed vocational nurses, medical and clinical laboratory technicians, and medical assistants.

Sources of Additional Information

For additional information on a career as a surgical technologist and a list of CAAHEP-accredited programs, contact:

➤ Association of Surgical Technologists, 7108-C South Alton Way, Centennial, CO 80112. Internet: **http://www.ast.org**

For information on becoming a Certified Surgical Technologist, contact:

➤ Liaison Council on Certification for the Surgical Technologist, 128 S. Tejon St., Suite 301, Colorado Springs, CO 80903. Internet: **http://www.lcc-st.org**

For information on becoming a Tech in Surgery-Certified, contact:

➤ National Center for Competency Testing, 7007 College Blvd., Suite 250, Overland Park, KS 66211.

Veterinary Technologists and Technicians

(0*NET 29-2056.00)

Significant Points

- Animal lovers get satisfaction in this occupation, but aspects of the work can sometimes be unpleasant and physically and emotionally demanding.
- Entrants generally complete a 2-year or 4-year veterinary technology program, and must pass a State examination.
- Employment is expected to grow much faster than average.
- Keen competition is expected for jobs in zoos.

Nature of the Work

Owners of pets and other animals today expect state-of-the-art veterinary care. To provide this service, veterinarians use the skills of veterinary technologists and technicians, who perform many of the same duties for a veterinarian that a nurse would for a physician, including routine laboratory and clinical procedures. Although specific job duties vary by employer, there often is little difference between the tasks done by technicians and by technologists, despite some differences in formal education and training. As a result, most workers in this occupation are called technicians.

Veterinary technologists and technicians typically conduct clinical work in a private practice under the supervision of a veterinarian—often performing various medical tests along with treating and diagnosing medical conditions and diseases in animals. For example, they may perform laboratory tests such as urinalysis and blood counts, assist with dental prophylaxis, prepare tissue samples, take blood samples, or assist veterinarians in a variety of tests and analyses in which they often utilize various items of medical equipment, such as test tubes and diagnostic equipment. While most of these duties are performed in a laboratory setting, many tasks are not. For example, some veterinary technicians obtain and record patient case histories, expose and develop x-rays, and provide specialized nursing care. Additionally, experienced veterinary technicians may discuss a pet's condition with its owners and train new clinic personnel. Veterinary technologists and technicians assisting small-animal practitioners usually care for companion animals, such as cats and dogs, but can perform a variety of duties with mice, rats, sheep, pigs, cattle, monkeys, birds, fish, and frogs. Very few veterinary technologists work in mixed animal practices where they care for both small companion animals and larger, nondomestic animals.

In addition to working in private clinics and animal hospitals, veterinary technologists and technicians also may work in research facilities. There, they may administer medications orally or topically, prepare samples for laboratory examinations, and record information on genealogy, diet, weight, medications, food intake, and clinical signs of pain and distress. Some may be required to sterilize laboratory and surgical equipment and provide routine postoperative care. At research facilities, veterinary technologists typically work under the guidance of veterinarians, physicians, and other laboratory technicians. Some veterinary technologists vaccinate newly admitted ani-



Many veterinary technologists and technicians assist veterinarians in routine laboratory and clinical procedures.

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mals and occasionally are required to euthanize seriously ill, severely injured, or unwanted animals.

While the goal of most veterinary technologists and technicians goal is to promote animal health, some contribute to human health as well. Veterinary technologists occasionally assist veterinarians as they work with other scientists in medical-related fields such as gene therapy and cloning. Some find opportunities in biomedical research, wildlife medicine, the military, livestock management, or pharmaceutical sales.

Working Conditions

People who love animals get satisfaction from working with and helping them. However, some of the work may be unpleasant, physically and emotionally demanding, and sometimes dangerous. Veterinary technicians sometimes must clean cages and lift, hold, or restrain animals, risking exposure to bites or scratches. These workers must take precautions when treating animals with germicides or insecticides. The work setting can be noisy.

Veterinary technologists and technicians who witness abused animals or who euthanize unwanted, aged, or hopelessly injured animals may experience emotional stress. Those working for humane societies and animal shelters often deal with the public, some of whom might react with hostility to any implication that the owners are neglecting or abusing their pets. Such workers must maintain a calm and professional demeanor while they enforce the laws regarding animal care. In some animal hospitals, research facilities, and animal shelters, a veterinary technician is on duty 24 hours a day, which means some may work night shifts. Most full-time veterinary technologists and technicians work about 40 hours a week, while some work 50 or more hours a week.

Employment

Veterinary technologists and technicians held about 53,000 jobs in 2002. Most worked in veterinary services. The remainder worked in boarding kennels, animal shelters, stables, grooming shops, zoos, and local, State, and Federal agencies.

Training, Other Qualifications, and Advancement

There are primarily two levels of education and training for entry to this occupation—a 2-year program for veterinary technicians and a 4-year program for veterinary technologists. Most entry-level veterinary technicians have a 2-year degree, usually an associate degree, from an accredited community college program in veterinary technology, in which courses are taught in clinical and laboratory settings using live animals. A few colleges offer veterinary technology programs that are longer and that may culminate in a 4-year bachelor's degree in veterinary technology. These 4-year colleges, in addition to some vocational schools, also offer 2-year programs in laboratory animal science.

In 2003, more than 80 veterinary technology programs in 41 States were accredited by the American Veterinary Medical Association (AVMA). Graduation from an AVMA-accredited veterinary technology program allows students to take the credentialing exam in any State in the country. Each State regulates veterinary technicians and technologists differently; however, all States require them to pass a credentialing exam following coursework. Passing the State exam assures the public that the technician or technologist has sufficient knowledge to work in a veterinary clinic or hospital. Candidates are tested for competency through an examination that includes oral, written, and practical portions. This process is regulated by the State Board of Veterinary Examiners, or the appropriate State agency. Depending on the State, candidates may become registered, licensed, or certified. Most States, however, use the National Veterinary Technician (NVT) exam. Prospects usually can have their passing scores transferred from one State to another, so long as both States utilize the same exam.

Employers recommend American Association for Laboratory Animal Science (AALAS) certification for those seeking employment in a research facility. AALAS offers certification for three levels of technician competence, with a focus on three principle areas—animal husbandry and welfare, facility administration and management, and animal health. Those who wish to become certified must satisfy a combination of education and experience requirements prior to taking an exam. Work experience must be directly related to the maintenance, health, and well-being of laboratory animals and must be gained in a laboratory animal facility as defined by AALAS. Candidates who meet the necessary criteria can begin pursuing the desired certification, based on their qualifications. The lowest level of certification is Animal Laboratory Assistant Technician (ALAT); the second level is Laboratory Animal Technician (LAT); and the highest level of certification is Laboratory Animal Technologist (LATG). The examination consists of multiple-choice questions and is longer and more difficult for higher levels of certification.

Persons interested in careers as veterinary technologists and technicians should take as many high school science, biology, and math courses as possible. Science courses taken beyond high school, in an associate or bachelor's degree program, should emphasize practical skills in a clinical or laboratory setting. Because veterinary technologists and technicians often deal with pet owners, communication skills are very important. Additionally, technologists and technicians should be able to work well with others, because teamwork with veterinarians is common. Organizational ability and the ability to pay attention to detail also are important.

Technologists and technicians usually begin work as trainees in routine positions under the direct supervision of a veterinarian. Entry-level workers whose training or educational background encompasses extensive hands-on experience with a variety of laboratory equipment, including diagnostic and medical equipment, usually require a shorter period of on-the-job training. As they gain experience, technologists and technicians take on more responsibility and carry out more assignments under only general veterinary supervision, and some eventually may become supervisors.

Job Outlook

Employment of veterinary technologists and technicians is expected to grow much faster than the average for all occupations through the year 2012. Job openings also will stem from the need to replace veterinary technologists and technicians who leave the occupation over the 2002-12 period. Keen competition is expected for veterinary technologist and technician jobs in zoos, due to expected slow growth in zoo capacity, low turnover among workers, the limited number of positions, and the fact that the occupation attracts many candidates.

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Pet owners are becoming more affluent and more willing to pay for advanced care because many of them consider their pet to be part of the family, spurring employment growth for veterinary technologists and technicians. The number of dogs as pets, which also drives employment growth, is expected to increase more slowly during the projection period than in the previous decade. However, the rapidly growing number of cats as pets is expected to boost the demand for feline medicine, offsetting any reduced demand for veterinary care for dogs. The availability of advanced veterinary services, such as preventive dental care and surgical procedures, may provide opportunities for workers specializing in those areas. Biomedical facilities, diagnostic laboratories, wildlife facilities, humane societies, animal control facilities, drug or food manufacturing companies, and food safety inspection facilities will provide more jobs for veterinary technologists and technicians. Furthermore, demand for these workers will stem from the desire to replace veterinary assistants with more highly skilled technicians and technologists in animal clinics and hospitals, shelters, kennels, and humane societies.

Employment of veterinary technicians and technologists is relatively stable during periods of economic recession. Layoffs are less likely to occur among veterinary technologists and technicians than in some other occupations because animals will continue to require medical care.

Earnings

Median hourly earnings of veterinary technologists and technicians were $22,950 in 2002. The middle 50 percent earned between $19,210 and $27,890. The bottom 10 percent earned less than $16,170, and the top 10 percent earned more than $33,750.

Related Occupations

Others who work extensively with animals include animal care and service workers. Like veterinary technologists and technicians, they must have patience and feel comfortable with animals. However, the level of training required for these occupations is less than that needed by veterinary technologists and technicians. Veterinarians also work extensively with animals. They prevent, diagnose, and treat diseases, disorders, and injuries in animals.

Sources of Additional Information

For information on certification as a laboratory animal technician or technologist, contact:

➤ American Association for Laboratory Animal Science, 9190 Crestwyn Hills Dr., Memphis, TN 38125. Internet: **http://www.aalas.org**

For information on careers in veterinary medicine and a listing of AVMA-accredited veterinary technology programs, contact:

➤ American Veterinary Medical Assocation, 1931 N. Meacham Rd., Suite 100, Schaumburg, IL 60173-4360. Internet: **http://www.avma.org**

For information on veterinary technology programs, contact:

➤ Association of American Veterinary Medical Colleges, 1101 Vermont Ave. NW., Suite 710, Washington DC 20005. Internet: **http://www.aavmc.org**

For information on becoming a veterinary technician, contact:

➤ National Association of Veterinary Technicians in America, P.O. Box 224, Battle Ground, IN 47920. Internet: **http://www.navta.net**

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Dental Assistants

(0*NET 31-9091.00)

Significant Points

- Job prospects should be excellent.
- Dentists are expected to hire more assistants to perform routine tasks so that they may devote their own time to more profitable procedures.
- Most assistants learn their skills on the job, although an increasing number are trained in dental-assisting programs; most programs take 1 year or less to complete.

Nature of the Work

Dental assistants perform a variety of patient care, office, and laboratory duties. They work chairside as dentists examine and treat patients. They make patients as comfortable as possible in the dental chair, prepare them for treatment, and obtain their dental records. Assistants hand instruments and materials to dentists and keep patients' mouths dry and clear by using suction or other devices. Assistants also sterilize and disinfect instruments and equipment, prepare trays of instruments for dental procedures, and instruct patients on postoperative and general oral health care.

Some dental assistants prepare materials for impressions and restorations, take dental x rays, and process x-ray film as directed by a dentist. They also may remove sutures, apply topical anesthetics to gums or cavity-preventive agents to teeth, remove excess cement used in the filling process, and place rubber dams on the teeth to isolate them for individual treatment.

Those with laboratory duties make casts of the teeth and mouth from impressions, clean and polish removable appliances, and make temporary crowns. Dental assistants with office duties schedule and confirm appointments, receive patients, keep treatment records, send bills, receive payments, and order dental supplies and materials.

Dental assistants should not be confused with dental hygienists, who are licensed to perform different clinical tasks. (See the statement on dental hygienists elsewhere in the *Handbook*.)

Working Conditions

Dental assistants work in a well-lighted, clean environment. Their work area usually is near the dental chair so that they can arrange instruments, materials, and medication and hand them to the dentist when needed. Dental assistants must wear gloves, masks, eyewear, and protective clothing to protect themselves and their patients from infectious diseases. Following safety procedures also minimizes the risks associated with the use of x-ray machines.

About half of dental assistants have a 35- to 40-hour workweek, which may include work on Saturdays or evenings.

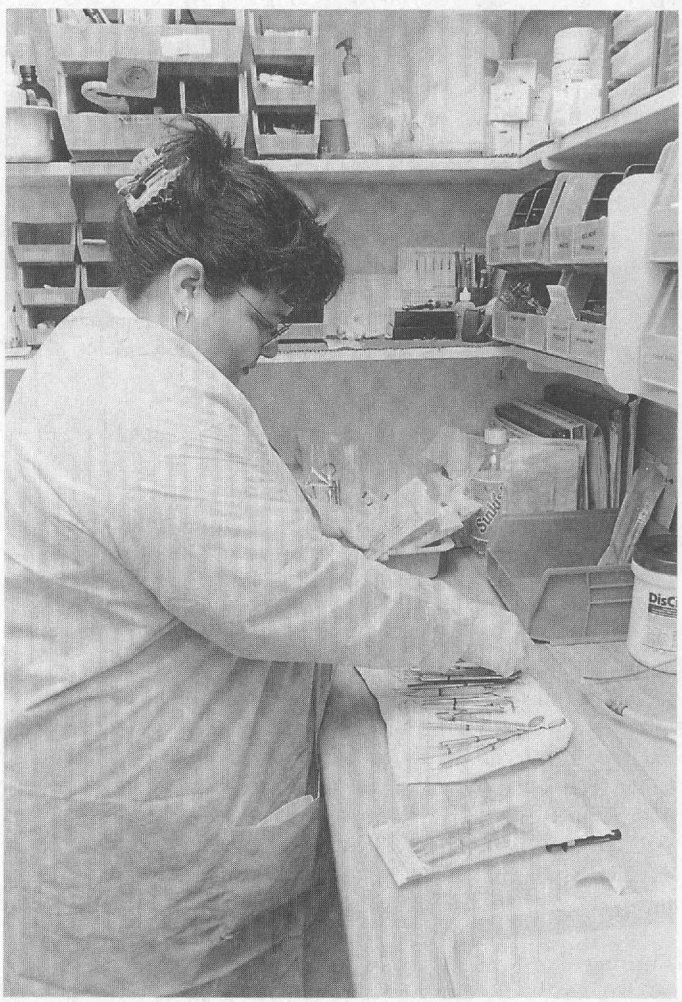
Employment

Dental assistants held about 266,000 jobs in 2002. Almost all jobs for dental assistants were in offices of dentists. A small number of jobs were in offices of physicians, educational services, and hospitals. About a third of dental assistants worked part time, sometimes in more than one dental office.

Training, Other Qualifications, and Advancement

Most assistants learn their skills on the job, although an increasing number are trained in dental-assisting programs offered by community and junior colleges, trade schools, technical institutes, or the Armed Forces. Assistants must be a second pair of hands for a dentist; therefore, dentists look for people who are reliable, can work well with others, and have good manual dexterity. High school students interested in a career as a dental assistant should take courses in biology, chemistry, health, and office practices.

The American Dental Association's Commission on Dental Accreditation approved 259 dental-assisting training programs in 2002. Programs include classroom, laboratory, and preclinical instruction in dental-assisting skills and related theory. In addition, students gain practical experience in dental schools, clinics, or dental offices. Most programs take 1 year or less to complete and lead to



Most dental assistants learn their skills on the job, although some are trained in dental-assisting programs.

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a certificate or diploma. Two-year programs offered in community and junior colleges lead to an associate degree. All programs require a high school diploma or its equivalent, and some require science or computer-related courses for admission. A number of private vocational schools offer 4- to 6-month courses in dental assisting, but the Commission on Dental Accreditation does not accredit these programs.

Most States regulate the duties that dental assistants are allowed to perform through licensure or registration. Licensure or registration may require passing a written or practical examination. States offering licensure or registration have a variety of schools offering courses—approximately 10 to 12 months in length—that meet their State's requirements. Many States require continuing education to maintain licensure or registration. A few States allow dental assistants to perform any function delegated to them by the dentist.

Individual States have adopted different standards for dental assistants who perform certain advanced duties, such as radiological procedures. The completion of the Radiation Health and Safety examination offered by the Dental Assisting National Board (DANB) meets those standards in more than 30 States. Some States require the completion of a State-approved course in radiology as well.

Certification is available through DANB and is recognized or required in more than 30 States. Other organizations offer registration, most often at the State level. Certification is an acknowledgment of an assistant's qualifications and professional competence and may be an asset when one is seeking employment. Candidates may qualify to take the DANB certification examination by graduating from an accredited training program or by having 2 years of full-time, or 4 years of part-time, experience as a dental assistant. In addition, applicants must have current certification in cardiopulmonary resuscitation. For annual recertification, individuals must earn continuing education credits.

Without further education, advancement opportunities are limited. Some dental assistants become office managers, dental-assisting instructors, or dental product sales representatives. Others go back to school to become dental hygienists. For many, this entry-level occupation provides basic training and experience and serves as a steppingstone to more highly skilled and higher paying jobs.

Job Outlook

Job prospects for dental assistants should be excellent. Employment is expected to grow much faster than the average for all occupations through the year 2012. In fact, dental assistants is expected to be one of the fastest growing occupations through the year 2012.

In addition to job openings due to employment growth, numerous job openings will arise out of the need to replace assistants who transfer to other occupations, retire, or leave the labor force for other reasons. Many opportunities are for entry-level positions offering on-the-job training.

Population growth and greater retention of natural teeth by middle-aged and older people will fuel demand for dental services. Older dentists, who have been less likely to employ assistants, are leaving the occupation and will be replaced by recent graduates, who are more likely to use one or even two assistants. In addition, as dentists' workloads increase, they are expected to hire more assistants to perform routine tasks, so that they may devote their own time to more profitable procedures.

Earnings

Median hourly earnings of dental assistants were $13.10 in 2002. The middle 50 percent earned between $10.35 and $16.20 an hour. The lowest 10 percent earned less than $8.45, and the highest 10 percent earned more than $19.41 an hour.

Benefits vary substantially by practice setting and may be contingent upon full-time employment. According to the American Dental Association, almost all full-time dental assistants employed by private practitioners received paid vacation time. The ADA also found that 9 out of 10 full-time and part-time dental assistants received dental coverage.

Related Occupations

Other workers supporting health practitioners include medical assistants, occupational therapist assistants and aides, pharmacy aides, pharmacy technicians, and physical therapist assistants and aides.

Sources of Additional Information

Information about career opportunities and accredited dental assistant programs is available from:

➤ Commission on Dental Accreditation, American Dental Association, 211 E. Chicago Ave., Suite 1814, Chicago, IL 60611. Internet: **http://www.ada.org**

For information on becoming a Certified Dental Assistant and a list of State boards of dentistry, contact:

➤ Dental Assisting National Board, Inc., 676 North Saint Clair, Suite 1880, Chicago, IL 60611. Internet: **http://www.danb.org**

For more information on a career as a dental assistant and general information about continuing education, contact:

➤ American Dental Assistants Association, 35 East Wacker Drive, Suite 1730, Chicago, IL 60601. Internet: **http://www.dentalassistant.org**

For more information about continuing education courses, contact:

➤ National Association of Dental Assistants, 900 S. Washington Street, Suite G-13, Falls Church, VA 22046.

Medical Assistants

(0*NET 31-9092.00)

Significant Points

- Some medical assistants are trained on the job, but many complete 1- or 2-year programs in vocational-technical high schools, postsecondary vocational schools, and community and junior colleges.
- Medical assistants is projected to be the fastest growing occupation over the 2002-12 period.
- Job prospects should be best for medical assistants with formal training or experience, particularly those with certification.

Nature of the Work

Medical assistants perform routine administrative and clinical tasks to keep the offices of physicians, podiatrists, chiropractors, and other health practitioners running smoothly. They should not be confused with physician assistants, who examine, diagnose, and treat patients under the direct supervision of a physician. (Physician assistants are discussed elsewhere in the *Handbook*.)

The duties of medical assistants vary from office to office, depending on the location and size of the practice and the practitioner's specialty. In small practices, medical assistants usually are "generalists," handling both administrative and clinical duties and reporting directly to an office manager, physician, or other health practitioner. Those in large practices tend to specialize in a particular area, under the supervision of department administrators.

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Medical assistants perform many administrative duties, including answering telephones, greeting patients, updating and filing patients' medical records, filling out insurance forms, handling correspondence, scheduling appointments, arranging for hospital admission and laboratory services, and handling billing and bookkeeping.

Clinical duties vary according to State law and include taking medical histories and recording vital signs, explaining treatment procedures to patients, preparing patients for examination, and assisting the physician during the examination. Medical assistants collect and prepare laboratory specimens or perform basic laboratory tests on the premises, dispose of contaminated supplies, and sterilize medical instruments. They instruct patients about medications and special diets, prepare and administer medications as directed by a physician, authorize drug refills as directed, telephone prescriptions to a pharmacy, draw blood, prepare patients for x rays, take electrocardiograms, remove sutures, and change dressings.

Medical assistants also may arrange examining-room instruments and equipment, purchase and maintain supplies and equipment, and keep waiting and examining rooms neat and clean.

Assistants who specialize have additional duties. *Podiatric medical assistants* make castings of feet, expose and develop x rays, and assist podiatrists in surgery. *Ophthalmic medical assistants* help ophthalmologists provide eye care. They conduct diagnostic tests, measure and record vision, and test eye muscle function. They also show patients how to insert, remove, and care for contact lenses, and they apply eye dressings. Under the direction of the physician, ophthalmic medical assistants may administer eye medications. They also maintain optical and surgical instruments and may assist the ophthalmologist in surgery.

Working Conditions

Medical assistants work in well-lighted, clean environments. They constantly interact with other people and may have to handle several responsibilities at once.

Most full-time medical assistants work a regular 40-hour week. Some work part time, evenings, or weekends.

Employment

Medical assistants held about 365,000 jobs in 2002. Almost 60 percent worked in offices of physicians; about 14 percent worked in public and private hospitals, including inpatient and outpatient facilities; and almost 10 percent worked in offices of other health practitioners, such as chiropractors and podiatrists. The rest worked mostly in outpatient care centers, public and private educational services, other ambulatory healthcare services, State and local government agencies, medical and diagnostic laboratories, nursing care facilities, and employment services.

Training, Other Qualifications, and Advancement

Most employers prefer graduates of formal programs in medical assisting. Such programs are offered in vocational-technical high schools, postsecondary vocational schools, and community and junior colleges. Postsecondary programs usually last either 1 year, resulting in a certificate or diploma, or 2 years, resulting in an associate degree. Courses cover anatomy, physiology, and medical terminology, as well as typing, transcription, recordkeeping, accounting, and insurance processing. Students learn laboratory techniques, clinical and diagnostic procedures, pharmaceutical principles, the administration of medications, and first aid. They study office practices, patient relations, medical law, and ethics. Accredited programs include an internship that provides practical experience in physicians' offices, hospitals, or other healthcare facilities.

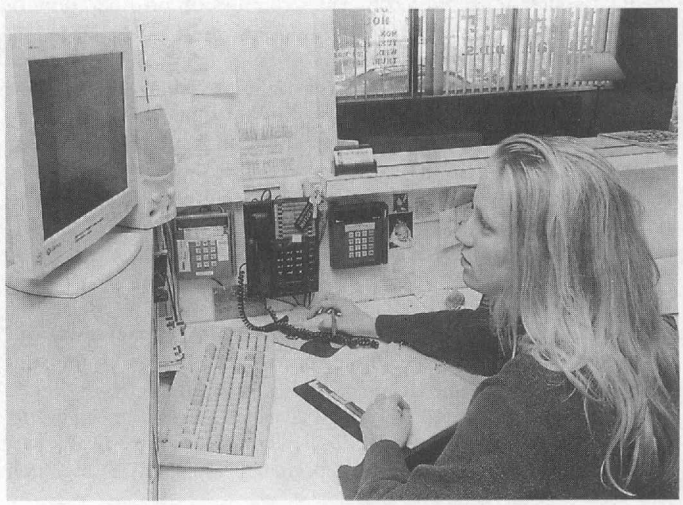
Two agencies recognized by the U.S. Department of Education accredit programs in medical assisting: The Commission on Accreditation of Allied Health Education Programs (CAAHEP) and the Accrediting Bureau of Health Education Schools (ABHES). In 2002, there were 495 medical assisting programs accredited by CAAHEP and about 170 accredited by ABHES. The Committee on Accreditation for Ophthalmic Medical Personnel approved 14 programs in ophthalmic medical assisting.

Formal training in medical assisting, while generally preferred, is not always required. Some medical assistants are trained on the job, although this practice is less common than in the past. Applicants usually need a high school diploma or the equivalent. Recommended high school courses include mathematics, health, biology, typing, bookkeeping, computers, and office skills. Volunteer experience in the healthcare field also is helpful.

Although medical assistants are not licensed, some States require them to take a test or a course before they can perform certain tasks, such as taking x rays. Employers prefer to hire experienced workers or certified applicants who have passed a national examination, indicating that the medical assistant meets certain standards of competence. The American Association of Medical Assistants awards the Certified Medical Assistant credential; the American Medical Technologists awards the Registered Medical Assistant credential; the American Society of Podiatric Medical Assistants awards the Podiatric Medical Assistant Certified credential; and the Joint Commission on Allied Health Personnel in Ophthalmology awards credentials at three levels: Certified Ophthalmic Assistant, Certified Ophthalmic Technician, and Certified Ophthalmic Medical Technologist.

Medical assistants deal with the public; therefore, they must be neat and well groomed and have a courteous, pleasant manner. Medical assistants must be able to put patients at ease and explain physicians' instructions. They must respect the confidential nature of medical information. Clinical duties require a reasonable level of manual dexterity and visual acuity.

Medical assistants may be able to advance to office manager. They may qualify for a variety of administrative support occupations or may teach medical assisting. With additional education, some enter other health occupations, such as nursing and medical technology.



Medical assistants perform administrative and clinical duties in offices of physicians or other healthcare professionals.

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Job Outlook

Employment of medical assistants is expected to grow much faster than the average for all occupations through the year 2012 as the health services industry expands because of technological advances in medicine, and a growing and aging population. Increasing utilization of medical assistants in the rapidly-growing healthcare industries will result in fast employment growth for the occupation. In fact, medical assistants is projected to be the fastest growing occupation over the 2002-12 period.

Employment growth will be driven by the increase in the number of group practices, clinics, and other healthcare facilities that need a high proportion of support personnel, particularly the flexible medical assistant who can handle both administrative and clinical duties. Medical assistants work primarily in outpatient settings, which are expected to exhibit much faster-than-average growth.

In view of the preference of many healthcare employers for trained personnel, job prospects should be best for medical assistants with formal training or experience, and particularly for those with certification.

Earnings

The earnings of medical assistants vary, depending on their experience, skill level, and location. Median annual earnings of medical assistants were $23,940 in 2002. The middle 50 percent earned between $20,260 and $28,410. The lowest 10 percent earned less than $17,640, and the highest 10 percent earned more than $34,130. Median annual earnings in the industries employing the largest numbers of medical assistants in 2002 were as follows:

General medical and surgical hospitals	$24,460
Offices of physicians	24,260
Outpatient care centers	23,980
Other ambulatory health care services	23,440
Offices of other health practitioners	21,620

Related Occupations

Workers in other medical support occupations include dental assistants, medical records and health information technicians, medical secretaries, occupational therapist assistants and aides, pharmacy aides, and physical therapist assistants and aides.

Sources of Additional Information

Information about career opportunities, educational programs in medical assisting accredited by the Commission on Accreditation of Allied Health Education Programs, and the Certified Medical Assistant exam is available from:

➤ American Association of Medical Assistants, 20 North Wacker Dr., Suite 1575, Chicago, IL 60606. Internet: **http://www.aama-ntl.org**

Information about career opportunities and the Registered Medical Assistant certification exam is available from:

➤ Registered Medical Assistants of American Medical Technologists, 710 Higgins Rd., Park Ridge, IL 60068-5765.

For a list of ABHES-accredited educational programs in medical assisting, contact:

➤ Accrediting Bureau of Health Education Schools, 7777 Leesburg Pike, Suite 314 N., Falls Church, VA 22043. Internet: **http://www.abhes.org**

Information about career opportunities, training programs, and the Certified Ophthalmic Assistant exam is available from:

➤ Joint Commission on Allied Health Personnel in Ophthalmology, 2025 Woodlane Dr., St. Paul, MN 55125-2998. Internet: **http://www.jcahpo.org**

Information about careers for podiatric assistants is available from:

➤ American Society of Podiatric Medical Assistants, 2124 S. Austin Blvd., Cicero, IL 60804. Internet: **http://www.aspma.org**

Medical Transcriptionists

(0*NET 31-9094.00)

Significant Points

- Job opportunities will be good.
- Employers prefer medical transcriptionists who have completed a postsecondary training program at a vocational school or community college.
- Many medical transcriptionists telecommute from home-based offices as employees or subcontractors for hospitals and transcription services or as self-employed, independent contractors.
- About 4 out of 10 worked in hospitals and another 3 out of 10 worked in offices of physicians.

Nature of the Work

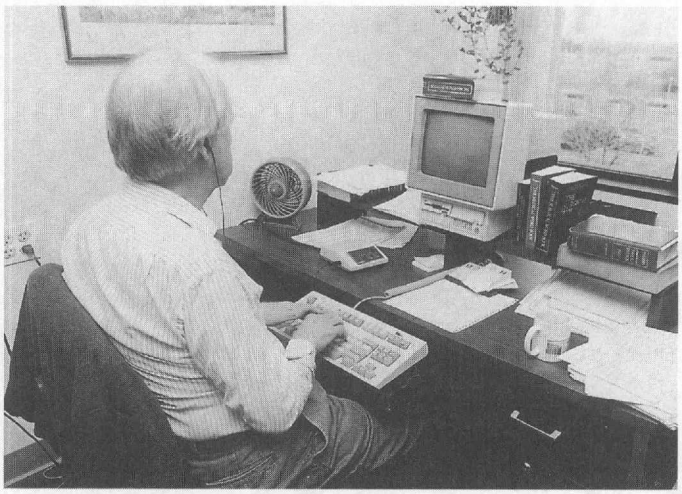
Medical transcriptionists listen to dictated recordings made by physicians and other healthcare professionals and transcribe them into medical reports, correspondence, and other administrative material. They generally listen to recordings on a headset, using a foot pedal to pause the recording when necessary, and key the text into a personal computer or word processor, editing as necessary for grammar and clarity. The documents they produce include discharge summaries, history and physical examination reports, operative reports, consultation reports, autopsy reports, diagnostic imaging studies, progress notes, and referral letters. Medical transcriptionists return transcribed documents to the physicians or other healthcare professionals who dictated them for review and signature, or correction. These documents eventually become part of patients' permanent files.

To understand and accurately transcribe dictated reports into a format that is clear and comprehensible for the reader, medical transcriptionists must understand medical terminology, anatomy and physiology, diagnostic procedures, pharmacology, and treatment assessments. They also must be able to translate medical jargon and abbreviations into their expanded forms. To help identify terms appropriately, transcriptionists refer to standard medical reference materials—both printed and electronic; some of these are available over the Internet. Medical transcriptionists must comply with specific standards that apply to the style of medical records, in addition to the legal and ethical requirements involved with keeping patient information confidential.

Experienced transcriptionists spot mistakes or inconsistencies in a medical report and check to correct the information. Their ability to understand and correctly transcribe patient assessments and treatments reduces the chance of patients receiving ineffective or even harmful treatments and ensures high quality patient care.

Currently, most healthcare providers transmit dictation to medical transcriptionists using either digital or analog dictating equipment. The Internet has grown to be a popular mode for transmitting documentation. Many transcriptionists receive dictation over the Internet and are able to quickly return transcribed documents to clients for approval. Another emerging trend is the implementation of speech recognition technology, which electronically translates sound into text and creates drafts of reports. Reports are then formatted; edited for mistakes in translation, punctuation, or grammar; and checked for consistency and possible medical errors. Transcriptionists working in areas with standardized terminology, such as

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Medical transcriptionists listen to dictated recordings made by physicians and other healthcare professionals and transcribe them into medical reports, correspondence, and other administrative material.

radiology or pathology, are more likely to encounter speech recognition technology. However, use of speech recognition technology will become more widespread as the technology becomes more sophisticated.

Medical transcriptionists who work in physicians' offices and clinics may have other office duties, such as receiving patients, scheduling appointments, answering the telephone, and handling incoming and outgoing mail. Medical secretaries, discussed in the statement on secretaries and administrative assistants elsewhere in the *Handbook*, may also transcribe as part of their jobs. Court reporters, also discussed elsewhere in the *Handbook*, have similar duties, but with a different focus. They take verbatim reports of speeches, conversations, legal proceedings, meetings, and other events when written accounts of spoken words are necessary for correspondence, records, or legal proof.

Working Conditions

The majority of these workers are employed in comfortable settings, such as hospitals, physicians' offices, transcription service offices, clinics, laboratories, medical libraries, government medical facilities, or at home. Many medical transcriptionists telecommute from home-based offices as employees or subcontractors for hospitals and transcription services or as self-employed, independent contractors.

Work in this occupation presents hazards from sitting in the same position for long periods, and workers can suffer wrist, back, neck, or eye problems due to strain and risk repetitive motion injuries such as carpal tunnel syndrome. The pressure to be accurate and productive also can be stressful.

Many medical transcriptionists work a standard 40-hour week. Self-employed medical transcriptionists are more likely to work irregular hours—including part time, evenings, weekends, or on-call at any time.

Employment

Medical transcriptionists held about 101,000 jobs in 2002. About 4 out of 10 worked in hospitals and another 3 out of 10 worked in offices of physicians. Others worked for business support services, offices of other health practitioners, medical and diagnostic laboratories, outpatient care centers, and home healthcare services.

Training, Other Qualifications, and Advancement

Employers prefer to hire transcriptionists who have completed postsecondary training in medical transcription, offered by many vocational schools, community colleges, and distance-learning programs. Completion of a 2-year associate degree or 1-year certificate program—including coursework in anatomy, medical terminology, legal issues relating to healthcare documentation, and English grammar and punctuation—is highly recommended, but not always required. Many of these programs include supervised on-the-job experience. Some transcriptionists, especially those already familiar with medical terminology due to previous experience as a nurse or medical secretary, become proficient through on-the-job training.

The American Association for Medical Transcription (AAMT) awards the voluntary designation, Certified Medical Transcriptionist (CMT), to those who earn passing scores on written and practical examinations. As in many other fields, certification is recognized as a sign of competence. Because medical terminology is constantly evolving, medical transcriptionists are encouraged to regularly update their skills. Every 3 years, CMTs must earn continuing education credits to be recertified.

In addition to understanding medical terminology, transcriptionists must have good English grammar and punctuation skills, as well as proficiency with personal computers and word processing software. Normal hearing acuity and good listening skills also are necessary. Employers often require applicants to take pre-employment tests.

With experience, medical transcriptionists can advance to supervisory positions, home-based work, editing, consulting, or teaching. With additional education or training, some become medical records and health information technicians, medical coders, or medical records and health information administrators.

Job Outlook

Job opportunities will be good. Employment of medical transcriptionists is projected to grow faster than the average for all occupations through 2012. Demand for medical transcription services will be spurred by a growing and aging population. Older age groups receive proportionately greater numbers of medical tests, treatments, and procedures that require documentation. A high level of demand for transcription services also will be sustained by the continued need for electronic documentation that can be easily shared among providers, third-party payers, regulators, and consumers. Growing numbers of medical transcriptionists will be needed to amend patients' records, edit for grammar, and identify discrepancies in medical records.

Contracting out transcription work overseas and advancements in speech recognition technology are not expected to significantly reduce the need for well-trained medical transcriptionists domestically. Contracting out transcription work abroad—to countries such as India—has grown more popular as transmitting confidential health information over the Internet has become more secure; however, the demand for overseas transcription services is expected to supplement the demand for well-trained domestic medical transcriptionists. Speech-recognition technology allows physicians and other health professionals to dictate medical reports to a computer that immediately creates an electronic document. In spite of the advances in this technology, it has been difficult for the software to grasp and analyze the human voice and the English language with all its diversity. As a result, there will continue to be a need for skilled medical transcriptionists to identify and appropriately edit the inevitable errors created by speech recognition systems, and create a final document.

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Hospitals will continue to employ a large percentage of medical transcriptionists, but job growth there will not be as fast as in other industries. Increasing demand for standardized records should result in rapid employment growth in offices of physicians or other health practitioners, especially in large group practices.

Earnings

Medical transcriptionists had median hourly earnings of $13.05 in 2002. The middle 50 percent earned between $10.87 and $15.63. The lowest 10 percent earned less than $9.27, and the highest 10 percent earned more than $17.97. Median hourly earnings in the industries employing the largest numbers of medical transcriptionists in 2002 were as follows:

General medical and surgical hospitals	$13.20
Offices of physicians	13.00
Business support services	12.42

Compensation methods for medical transcriptionists vary. Some are paid based on the number of hours they work or on the number of lines they transcribe. Others receive a base pay per hour with incentives for extra production. Employees of transcription services and independent contractors almost always receive production-based pay. Independent contractors earn more than transcriptionists who work for others but have higher expenses than their corporate counterparts, receive no benefits, and may face higher risk of termination than employed transcriptionists.

Related Occupations

A number of other workers type, record information, and process paperwork. Among these are court reporters; human resources assistants, except payroll and timekeeping; receptionists and information clerks; and secretaries and administrative assistants. Other workers who provide medical support include medical assistants and medical records and health information technicians.

Sources of Additional Information

For information on a career as a medical transcriptionist, send a self-addressed, stamped envelope to:

➤ American Association for Medical Transcription, 100 Sycamore Ave., Modesto, CA 95354-0550. Internet: **http://www.aamt.org**

State employment service offices can provide information about job openings for medical transcriptionists.

Nursing, Psychiatric, and Home Health Aides

(0*NET 31-1011.00, 31-1012.00, 31-1013.00)

Significant Points

- Most jobs are in nursing and residential care facilities, hospitals, and home healthcare services.
- Modest entry requirements, low pay, high physical and emotional demands, and lack of advancement opportunities characterize this occupation.
- Numerous job openings and excellent job opportunities are expected.

Nature of the Work

Nursing and psychiatric aides help care for physically or mentally ill, injured, disabled, or infirm individuals confined to hospitals, nursing care facilities, and mental health settings. Home health aides' duties are similar, but they work in patients' homes or residential care facilities.

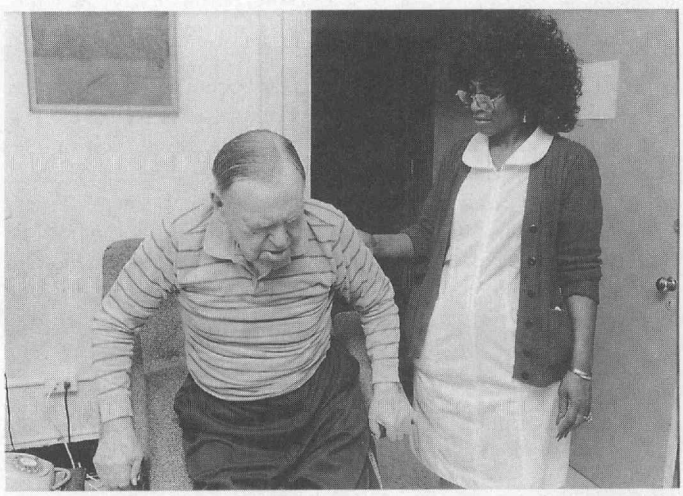
Nursing aides, also known as nursing assistants, geriatric aides, unlicensed assistive personnel, or hospital attendants, perform routine tasks under the supervision of nursing and medical staff. They answer patients' call lights, deliver messages, serve meals, make beds, and help patients eat, dress, and bathe. Aides also may provide skin care to patients; take their temperatures, pulse rate, respiration rate, and blood pressure; and help patients get in and out of bed and walk. They also may escort patients to operating and examining rooms, keep patients' rooms neat, set up equipment, store and move supplies, or assist with some procedures. Aides observe patients' physical, mental, and emotional conditions and report any change to the nursing or medical staff.

Nursing aides employed in nursing care facilities often are the principal caregivers, having far more contact with residents than other members of the staff. Because some residents may stay in a nursing care facility for months or even years, aides develop ongoing relationships with them and interact with them in a positive, caring way.

Home health aides help elderly, convalescent, or disabled persons live in their own homes instead of in a health facility. Under the direction of nursing or medical staff, they provide health-related services, such as administering oral medications. (*Personal and home care aides*, who provide mainly housekeeping and routine personal care services, are discussed elsewhere in the *Handbook.*) Like nursing aides, home health aides may check patients' pulse rates, temperatures, and respiration rates; help with simple prescribed exercises; keep patients' rooms neat; and help patients move from bed, bathe, dress, and groom. Occasionally, they change nonsterile dressings, give massages and alcohol rubs, or assist with braces and artificial limbs. Experienced home health aides also may assist with medical equipment such as ventilators, which help patients breathe.

Most home health aides work with elderly or disabled persons who need more extensive care than family or friends can provide. Some help discharged hospital patients who have relatively short-term needs.

In home health agencies, a registered nurse, physical therapist, or social worker usually assigns specific duties and supervises home health aides, who keep records of the services they perform and record patients' condition and progress. They report changes in patients' conditions to the supervisor or case manager.



Aides spend many hours standing and walking, and they often face heavy workloads.

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Psychiatric aides, also known as mental health assistants or psychiatric nursing assistants, care for mentally impaired or emotionally disturbed individuals. They work under a team that may include psychiatrists, psychologists, psychiatric nurses, social workers, and therapists. In addition to helping patients dress, bathe, groom, and eat, psychiatric aides socialize with them and lead them in educational and recreational activities. Psychiatric aides may play games such as cards with the patients, watch television with them, or participate in group activities, such as sports or field trips. They observe patients and report any physical or behavioral signs that might be important for the professional staff to know. They accompany patients to and from examinations and treatment. Because they have such close contact with patients, psychiatric aides can have a great deal of influence on their patients' outlook and treatment.

Working Conditions

Most full-time aides work about 40 hours a week, but because patients need care 24 hours a day, some aides work evenings, nights, weekends, and holidays. Many work part time. Aides spend many hours standing and walking, and they often face heavy workloads. Because they may have to move patients in and out of bed or help them stand or walk, aides must guard against back injury. Aides also may face hazards from minor infections and major diseases, such as hepatitis, but can avoid infections by following proper procedures.

Aides often have unpleasant duties, such as emptying bedpans and changing soiled bed linens. The patients they care for may be disoriented, irritable, or uncooperative. Psychiatric aides must be prepared to care for patients whose illness may cause violent behavior. While their work can be emotionally demanding, many aides gain satisfaction from assisting those in need.

Home health aides may go to the same patient's home for months or even years. However, most aides work with a number of different patients, each job lasting a few hours, days, or weeks. Home health aides often visit multiple patients on the same day.

Home health aides generally work alone, with periodic visits by their supervisor. They receive detailed instructions explaining when to visit patients and what services to perform. Aides are individually responsible for getting to patients' homes, and they may spend a good portion of the working day traveling from one patient to another. Because mechanical lifting devices available in institutional settings are seldom available in patients' homes, home health aides are particularly susceptible to injuries resulting from overexertion when they assist patients.

Employment

Nursing, psychiatric, and home health aides held about 2.0 million jobs in 2002. Nursing aides held the most jobs—approximately 1.4 million. Home health aides held roughly 580,000 jobs and psychiatric aides held about 59,000 jobs. Around 2 in 5 nursing aides worked in nursing care facilities, and about one-fourth worked in hospitals. Most home health aides (about one-third) were employed by home healthcare services. Others were employed in social assistance agencies, nursing and residential care facilities, and employment services. More than half of all psychiatric aides worked in hospitals, primarily in psychiatric and substance abuse hospitals—although some also worked in the psychiatric units of general medical and surgical hospitals. Others were employed in State government agencies; residential mental retardation, mental health, and substance abuse facilities; individual and family services; and outpatient care centers.

Training, Other Qualifications, and Advancement

In many cases, neither a high school diploma nor previous work experience is necessary for a job as a nursing, psychiatric, or home health aide. A few employers, however, require some training or experience. Hospitals may require experience as a nursing aide or home health aide. Nursing care facilities often hire inexperienced workers who must complete a minimum of 75 hours of mandatory training and pass a competency evaluation program within 4 months of their employment. Aides who complete the program are certified and placed on the State registry of nursing aides. Some States require psychiatric aides to complete a formal training program.

The Federal Government has guidelines for home health aides whose employers receive reimbursement from Medicare. Federal law requires home health aides to pass a competency test covering 12 areas: Communication skills; documentation of patient status and care provided; reading and recording vital signs; basic infection control procedures; basic body functions; maintenance of a healthy environment; emergency procedures; physical, emotional, and developmental characteristics of patients; personal hygiene and grooming; safe transfer techniques; normal range of motion and positioning; and basic nutrition.

A home health aide may receive training before taking the competency test. Federal law suggests at least 75 hours of classroom and practical training, supervised by a registered nurse. Training and testing programs may be offered by the employing agency, but must meet the standards of the Center for Medicare and Medicaid Services. Training programs vary with State regulations.

The National Association for Home Care offers national certification for home health aides. The certification is a voluntary demonstration that the individual has met industry standards.

Nursing aide training is offered in high schools, vocational-technical centers, some nursing care facilities, and some community colleges. Courses cover body mechanics, nutrition, anatomy and physiology, infection control, communication skills, and resident rights. Personal care skills, such as how to help patients bathe, eat, and groom, also are taught.

Some employers other than nursing care facilities provide classroom instruction for newly hired aides, while others rely exclusively on informal on-the-job instruction from a licensed nurse or an experienced aide. Such training may last several days to a few months. From time to time, aides also may attend lectures, workshops, and inservice training.

These occupations can offer individuals an entry into the world of work. The flexibility of night and weekend hours also provides high school and college students a chance to work during the school year.

Applicants should be tactful, patient, understanding, emotionally stable, and dependable and should have a desire to help people. They also should be able to work as part of a team, have good communication skills, and be willing to perform repetitive, routine tasks. Home health aides should be honest and discreet, because they work in private homes.

Aides must be in good health. A physical examination, including State-regulated tests such as those for tuberculosis, may be required.

Opportunities for advancement within these occupations are limited. To enter other health occupations, aides generally need additional formal training. Some employers and unions provide opportunities by simplifying the educational paths to advancement. Experience as an aide also can help individuals decide whether to pursue a career in the health-care field.

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Job Outlook

Numerous job openings for nursing, psychiatric, and home health aides will arise from a combination of fast employment growth and high replacement needs. High replacement needs in this large occupation reflect modest entry requirements, low pay, high physical and emotional demands, and lack of opportunities for advancement. For these same reasons, many people are unwilling to perform the kind of work required by the occupation. Therefore, persons who are interested in, and suited for, this work should have excellent job opportunities.

Overall employment of nursing, psychiatric, and home health aides is projected to grow faster than the average for all occupations through the year 2012, although individual occupational growth rates will vary. Employment of *home health aides* is expected to grow the fastest, as a result of both growing demand for home healthcare services from an aging population and efforts to contain healthcare costs by moving patients out of hospitals and nursing care facilities as quickly as possible. Consumer preference for care in the home and improvements in medical technologies for in-home treatment also will contribute to faster-than-average employment growth for home health aides.

Nursing aide employment will not grow as fast as home health aide employment, largely because nursing aides are concentrated in slower growing nursing care facilities. Nevertheless, employment of nursing aides is expected to grow faster than the average for all occupations in response to an increasing emphasis on rehabilitation and the long-term care needs of an increasing elderly population. Financial pressures on hospitals to discharge patients as soon as possible should produce more admissions to nursing care facilities. Modern medical technology also will increase the employment of nursing aides, because, as the technology saves and extends more lives, it increases the need for long-term care provided by aides.

Employment of *psychiatric aides*—the smallest of the three occupations—is expected to grow about as fast as the average for all occupations. The number of jobs for psychiatric aides in hospitals, where half of those in the occupation work, will grow slower than the average due to attempts to contain costs by limiting inpatient psychiatric treatment. Employment in other sectors will rise in response to growth in the number of older persons—many of whom will require mental health services, increasing public acceptance of formal treatment for substance abuse, and a lessening of the stigma attached to those receiving mental health care.

Earnings

Median hourly earnings of nursing aides, orderlies, and attendants were $9.59 in 2002. The middle 50 percent earned between $8.06 and $11.39 an hour. The lowest 10 percent earned less than $6.98, and the highest 10 percent earned more than $13.54 an hour. Median hourly earnings in the industries employing the largest numbers of nursing aides, orderlies, and attendants in 2002 were as follows:

Employment services	$11.38
Local government	10.33
General medical and surgical hospitals	10.09
Nursing care facilities	9.27
Community care facilities for the elderly	8.98

Nursing and psychiatric aides in hospitals generally receive at least 1 week's paid vacation after 1 year of service. Paid holidays and sick leave, hospital and medical benefits, extra pay for late-shift work, and pension plans also are available to many hospital, and some nursing care facility, employees.

Median hourly earnings of home health aides were $8.70 in 2002. The middle 50 percent earned between $7.54 and $10.37 an hour. The lowest 10 percent earned less than $6.56, and the highest 10 percent earned more than $12.34 an hour. Median hourly earnings in the industries employing the largest numbers of home health aides in 2002 were as follows:

Employment services	$9.21
Residential mental retardation, mental health, and substance abuse facilities	8.91
Home health care services	8.46
Community care facilities for the elderly	8.36
Individual and family services	8.20

Home health aides receive slight pay increases with experience and added responsibility. Usually, they are paid only for the time worked in the home; normally, they are not paid for travel time between jobs. Most employers hire only on-call hourly workers and provide no benefits.

Median hourly earnings of psychiatric aides were $11.04 in 2002. The middle 50 percent earned between $8.97 and $13.74 an hour. The lowest 10 percent earned less than $7.52, and the highest 10 percent earned more than $16.16 an hour. Median hourly earnings in the industries employing the largest numbers of psychiatric aides in 2002 were as follows:

State government	$13.14
Psychiatric and substance abuse hospitals	11.32
General medical and surgical hospitals	11.04

Related Occupations

Nursing, psychiatric, and home health aides help people who need routine care or treatment. So do childcare workers, medical assistants, occupational therapist assistants and aides, personal and home care aides, and physical therapist assistants and aides.

Sources of Additional Information

Information about employment opportunities may be obtained from local hospitals, nursing care facilities, home health-care agencies, psychiatric facilities, State boards of nursing, and local offices of the State employment service.

General information about training, referrals to State and local agencies about job opportunities, a list of relevant publications, and information on certification of home health aides are available from:
➤ National Association for Home Care, 228 7th St. SE., Washington, DC 20003. Internet: **http://www.nahc.org**

Occupational Therapist Assistants and Aides

(0*NET 31-2011.00, 31-2012.00)

Significant Points

- Occupational therapist assistants generally must complete an associate degree or a certificate program; in contrast, occupational therapist aides usually receive most of their training on the job.
- Occupational therapists are expected to delegate more hands-on therapy work to occupational therapist assistants and aides.
- Employment is projected to increase much faster than the average, reflecting growth in the number of individuals with disabilities or limited function who require therapeutic services.

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Nature of the Work

Occupational therapist assistants and aides work under the direction of occupational therapists to provide rehabilitative services to persons with mental, physical, emotional, or developmental impairments. The ultimate goal is to improve clients' quality of life and ability to perform daily activities. For example, occupational therapist assistants help injured workers re-enter the labor force by teaching them how to compensate for lost motor skills or help individuals with learning disabilities increase their independence.

Occupational therapist assistants help clients with rehabilitative activities and exercises outlined in a treatment plan developed in collaboration with an occupational therapist. Activities range from teaching the proper method of moving from a bed into a wheelchair to the best way to stretch and limber the muscles of the hand. Assistants monitor an individual's activities to make sure that they are performed correctly and to provide encouragement. They also record their client's progress for the occupational therapist. If the treatment is not having the intended effect, or the client is not improving as expected, the therapist may alter the treatment program in hopes of obtaining better results. In addition, occupational therapist assistants document the billing of the client's health insurance provider.

Occupational therapist aides typically prepare materials and assemble equipment used during treatment. They are responsible for a range of clerical tasks, including scheduling appointments, answering the telephone, restocking or ordering depleted supplies, and filling out insurance forms or other paperwork. Aides are not licensed, so the law does not allow them to perform as wide a range of tasks as occupational therapist assistants.

Working Conditions

The hours and days that occupational therapist assistants and aides work vary with the facility and with whether they are full- or part-time employees. Many outpatient therapy offices and clinics have evening and weekend hours, to help coincide with patients' personal schedules.

Occupational therapist assistants and aides need to have a moderate degree of strength, due to the physical exertion required in assisting patients with their treatment. For example, assistants and aides may need to lift patients. Constant kneeling, stooping, and standing for long periods also are part of the job.



Occupational therapist assistants and aides provide rehabilitative services to persons with mental, physical, emotional, or developmental impairments.

Employment

Occupational therapist assistants and aides held about 27,000 jobs in 2002. Occupational therapist assistants held about 18,000 jobs, and occupational therapist aides held approximately 8,300. Over 30 percent of jobs for assistants and aides were in hospitals, 23 percent were in offices of other health practitioners (which includes offices of occupational therapists), and 18 percent were in nursing care facilities. The rest were primarily in community care facilities for the elderly, home healthcare services, individual and family services, and State government agencies.

Training, Other Qualifications, and Advancement

An associate degree or a certificate from an accredited community college or technical school is generally required to qualify for occupational therapist assistant jobs. In contrast, occupational therapist aides usually receive most of their training on the job.

There were 161 accredited occupational therapist assistant programs in 2003. The first year of study typically involves an introduction to healthcare, basic medical terminology, anatomy, and physiology. In the second year, courses are more rigorous and usually include occupational therapist courses in areas such as mental health, adult physical disabilities, gerontology, and pediatrics. Students also must complete 16 weeks of supervised fieldwork in a clinic or community setting. Applicants to occupational therapist assistant programs can improve their chances of admission by taking high school courses in biology and health and by performing volunteer work in nursing care facilities, occupational or physical therapists' offices, or other healthcare settings.

Occupational therapist assistants are regulated in most States and must pass a national certification examination after they graduate. Those who pass the test are awarded the title "Certified Occupational Therapist Assistant."

Occupational therapist aides usually receive most of their training on the job. Qualified applicants must have a high school diploma, strong interpersonal skills, and a desire to help people in need. Applicants may increase their chances of getting a job by volunteering their services, thus displaying initiative and aptitude to the employer.

Assistants and aides must be responsible, patient, and willing to take directions and work as part of a team. Furthermore, they should be caring and want to help people who are not able to help themselves.

Job Outlook

Employment of occupational therapist assistants and aides is expected to grow much faster than the average for all occupations through 2012. The impact of proposed Federal legislation imposing limits on reimbursement for therapy services may adversely affect the job market for occupational therapist assistants and aides in the near term. However, over the long run, demand for occupational therapist assistants and aides will continue to rise, due to growth in the number of individuals with disabilities or limited function. Job growth will result from an aging population, including the baby-boom generation, which will need more occupational therapy services. Increasing demand also will result from advances in medicine that allow more people with critical problems to survive and then need rehabilitative therapy. Third-party payers, concerned with rising healthcare costs, are expected to encourage occupational therapists to delegate more hands-on therapy work to occupational therapist assistants and aides. By having assistants and aides work more closely with clients under the guidance of a therapist, the cost of therapy should decline.

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Earnings

Median annual earnings of occupational therapist assistants were $36,660 in 2002. The middle 50 percent earned between $31,090 and $43,030. The lowest 10 percent earned less than $25,600, and the highest 10 percent earned more than $48,480.

Median annual earnings of occupational therapist aides were $22,040 in 2002. The middle 50 percent earned between $18,040 and $29,130. The lowest 10 percent earned less than $15,400, and the highest 10 percent earned more than $38,170.

Related Occupations

Occupational therapist assistants and aides work under the supervision and direction of occupational therapists. Other workers in the healthcare field who work under similar supervision include dental assistants, medical assistants, pharmacy aides, pharmacy technicians, and physical therapist assistants and aides.

Sources of Additional Information

For information on a career as an occupational therapist assistant or aide, and a list of accredited programs, contact:

➤ American Occupational Therapy Association, 4720 Montgomery Lane, Bethesda, MD 20824-1220. Internet: **http://www.aota.org**

Pharmacy Aides

(0*NET 31-9095.00)

Significant Points

- Many pharmacy aides work evenings, weekends, and holidays.
- Eighty percent of jobs are in retail pharmacies.
- Job opportunities are expected to be good, especially for those with related work experience.

Nature of the Work

Pharmacy aides help licensed pharmacists with administrative duties in running a pharmacy. Aides often are clerks or cashiers who primarily answer telephones, handle money, stock shelves, and perform other clerical duties. They work closely with pharmacy technicians. *Pharmacy technicians* usually perform more complex tasks than do aides, although, in some States, the duties and titles of the jobs overlap. (See the statement on pharmacy technicians elsewhere in the *Handbook.*) Aides refer any questions regarding prescriptions, drug information, or health matters to a pharmacist. (See the statement on pharmacists elsewhere in the *Handbook.*)

Aides have several important duties that help the pharmacy to function smoothly. They may establish and maintain patient profiles, prepare insurance claim forms, and stock and take inventory of prescription and over-the-counter medications. Accurate recordkeeping is necessary to help avert a potentially dangerous drug interaction. Because many people have medical insurance to help pay for the prescription, it is essential that pharmacy aides efficiently and correctly correspond with the third-party insurance providers to obtain payment. Pharmacy aides also maintain the inventory and inform the supervisor of stock needs so that the pharmacy has the vital medications for those who need them. Some also clean pharmacy equipment, help with the maintenance of equipment and supplies, and manage the cash register.

Working Conditions

Pharmacy aides work in clean, organized, well-lighted, and well-ventilated areas. Most of their workday is spent on their feet. They may be required to lift heavy boxes or to use stepladders to retrieve supplies from high shelves.

Aides work the same hours that pharmacists work. These include evenings, nights, weekends, and some holidays. Because some hospital and retail pharmacies are open 24 hours a day, aides may work varying shifts. There are many opportunities for part-time work in both retail and hospital settings.

Employment

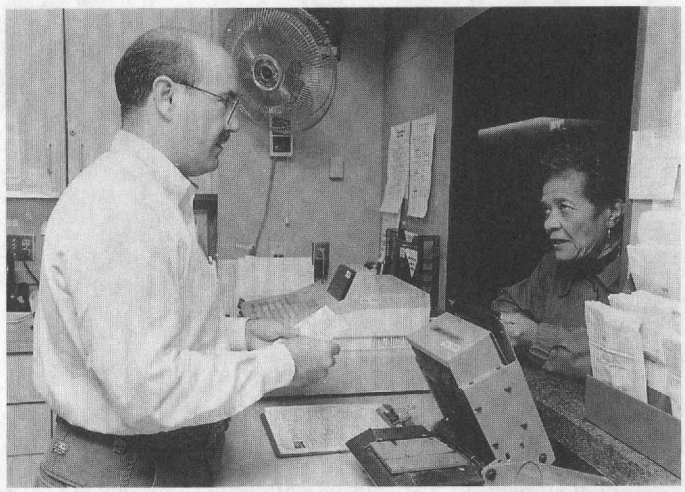
Pharmacy aides held about 60,000 jobs in 2002. About 80 percent work in retail pharmacies either independently owned or part of a drug store chain, grocery store, department store, or mass retailer; the vast majority of these are in drug stores. About 1 in 10 work in hospitals, and the rest work in mail-order pharmacies, clinics, and pharmaceutical wholesalers.

Training, Other Qualifications, and Advancement

Most pharmacy aides receive informal on-the-job training, but employers favor those with at least a high school diploma. Prospective pharmacy aides with experience working as a cashier may have an advantage when applying for jobs. Employers also prefer applicants with strong customer service and communication skills and experience managing inventories and using a computer. Aides entering the field need strong spelling, reading, and mathematics skills.

Successful pharmacy aides are organized, dedicated, friendly, and responsible. They should be willing and able to take directions. Candidates interested in becoming pharmacy aides cannot have prior records of drug or substance abuse. Strong interpersonal and communication skills are needed because there is a lot of interaction with patients, coworkers, and healthcare professionals. Teamwork is very important because aides are often required to work with technicians and pharmacists.

Pharmacy aides almost always are trained on the job. They may begin by observing a more experienced worker. After they become familiar with the store's equipment, policies, and procedures, they begin to work on their own. Once they become experienced workers, they are not likely to receive additional training, except when new equipment is introduced or when policies or procedures change.



Pharmacy aides often take prescription orders from patients and ring up purchases.

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To become a pharmacy aide, one should be able to perform repetitious work accurately. Aides need good basic mathematics skills and good manual dexterity. Because they deal constantly with the public, pharmacy aides should be neat in appearance and able to deal pleasantly and tactfully with customers. Some employers may prefer people with experience typing, handling money, or operating specialized equipment, including computers.

Advancement usually is limited, although some aides may decide to become pharmacy technicians or to enroll in pharmacy school to become pharmacists.

Job Outlook

Job opportunities for full-time and part-time work are expected to be good, especially for aides with related work experience in pharmacies, or as cashiers or stock clerks in other retail settings. Job openings will be created by employment growth and by the need to replace workers who transfer to other occupations or leave the labor force.

Employment of pharmacy aides is expected to grow about as fast as the average for all occupations through 2012 due to the increased use of medication in treating patients. In addition, a greater number of middle-aged and elderly people—who, on average, use more prescription drugs than do younger people—will spur demand for aides in all practice settings.

Cost-conscious insurers, pharmacies, and health systems will continue to employ aides. As a result, pharmacy aides will assume some responsibility for routine tasks previously performed by pharmacists and pharmacy technicians, thereby giving pharmacists more time to interact with patients and affording technicians more time to prepare medications. The number of pharmacy aides will not grow as fast as those of pharmacists and pharmacy technicians, however, because of legal limitations regarding their duties. Many smaller pharmacies that can afford only a small staff will favor pharmacy technicians because of their more extensive training and job skills.

Earnings

Median hourly wage and salary earnings of pharmacy aides were $8.86 in 2002. The middle 50 percent earned between $7.41 and $11.00; the lowest 10 percent earned less than $6.36, and the highest 10 percent earned more than $13.71. Median hourly earnings of pharmacy aides were $8.33 in health and personal care stores, $11.77 in general medical and surgical hospitals, and $9.08 in grocery stores in 2002.

Related Occupations

The work of pharmacy aides is closely related to that of pharmacy technicians, cashiers, and stock clerks and order fillers. Workers in other medical support occupations include dental assistants, licensed practical and licensed vocational nurses, medical transcriptionists, medical records and health information technicians, occupational therapist assistants and aides, physical therapist assistants and aides, and surgical technologists.

Sources of Additional Information

For information on employment opportunities, contact local employers or local offices of the State employment service.

Physical Therapist Assistants and Aides

(0*NET 31-2021.00, 31-2022.00)

Significant Points

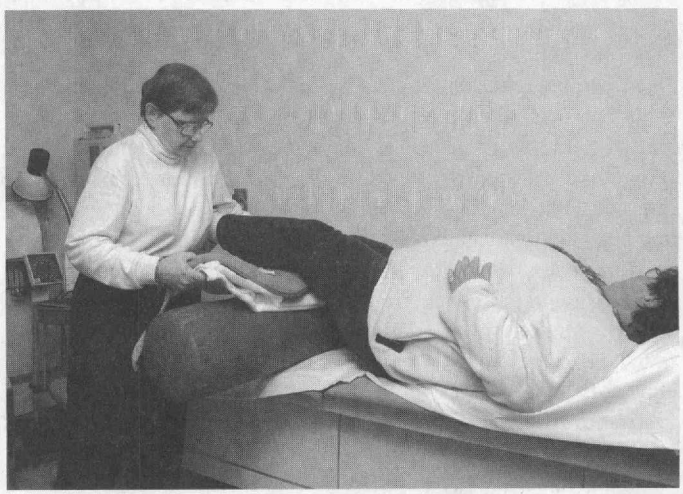
- Employment in the occupation is projected to increase much faster than the average, reflecting the growing number of individuals with disabilities or limited function and the increasing use of physical therapist assistants to reduce the cost of therapeutic services.
- Physical therapist assistants generally have an associate degree, but physical therapist aides usually learn skills on the job.
- Almost three-fourths of all jobs were in hospitals or offices of physical therapists.

Nature of the Work

Physical therapist assistants and aides perform components of physical therapy procedures and related tasks selected by a supervising physical therapist. These workers assist physical therapists in providing services that help improve mobility, relieve pain, and prevent or limit permanent physical disabilities of patients suffering from injuries or disease. Patients include accident victims and individuals with disabling conditions such as low-back pain, arthritis, heart disease, fractures, head injuries, and cerebral palsy.

Physical therapist assistants perform a variety of tasks. Components of treatment procedures performed by these workers, under the direction and supervision of physical therapists, involve exercises, massages, electrical stimulation, paraffin baths, hot and cold packs, traction, and ultrasound. Physical therapist assistants record the patient's responses to treatment and report the outcome of each treatment to the physical therapist.

Physical therapist aides help make therapy sessions productive, under the direct supervision of a physical therapist or physical therapist assistant. They usually are responsible for keeping the treatment area clean and organized and for preparing for each patient's therapy. When patients need assistance moving to or from a treatment area, aides push them in a wheelchair or



Physical therapist assistants and aides perform physical therapy procedures and related tasks.

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provide them with a shoulder to lean on. Because they are not licensed, aides do not perform the clinical tasks of a physical therapist assistant.

The duties of aides include some clerical tasks, such as ordering depleted supplies, answering the phone, and filling out insurance forms and other paperwork. The extent to which an aide or an assistant performs clerical tasks depends on the size and location of the facility.

Working Conditions

The hours and days that physical therapist assistants and aides work vary with the facility and with whether they are full- or part-time employees. Many outpatient physical therapy offices and clinics have evening and weekend hours, to help coincide with patients' personal schedules.

Physical therapist assistants and aides need a moderate degree of strength because of the physical exertion required in assisting patients with their treatment. In some cases, assistants and aides need to lift patients. Constant kneeling, stooping, and standing for long periods also are part of the job.

Employment

Physical therapist assistants and aides held about 87,000 jobs in 2002. Physical therapist assistants held about 50,000 jobs, physical therapist aides approximately 37,000. Both work alongside physical therapists in a variety of settings. Almost three-fourths of all jobs were in hospitals or in offices of other health practitioners (which includes offices of physical therapists). Others worked primarily in nursing care facilities, offices of physicians, home healthcare services, and outpatient care centers.

Training, Other Qualifications, and Advancement

Physical therapist aides are trained on the job, but physical therapist assistants typically earn an associate degree from an accredited physical therapist assistant program. Not all States require licensure or registration in order for the physical therapist assistant to practice. The States that require licensure stipulate specific educational and examination criteria. Complete information on practice acts and regulations can be obtained from the State licensing boards. Additional requirements may include certification in cardiopulmonary resuscitation (CPR) and other first aid and a minimum number of hours of clinical experience.

According to the American Physical Therapy Association, there were 245 accredited physical therapist assistant programs in the United States as of 2003. Accredited physical therapist assistant programs are designed to last 2 years, or 4 semesters, and culminate in an associate degree. Programs are divided into academic study and hands-on clinical experience. Academic course work includes algebra, anatomy and physiology, biology, chemistry, and psychology. Many programs require that students complete a semester of anatomy and physiology and have certifications in CPR and other first aid even before they begin their clinical field experience. Both educators and prospective employers view clinical experience as integral to ensuring that students understand the responsibilities of a physical therapist assistant.

Employers typically require physical therapist aides to have a high school diploma, strong interpersonal skills, and a desire to assist people in need. Most employers provide clinical on-the-job training.

Job Outlook

Employment of physical therapist assistants and aides is expected to grow much faster than the average through the year 2012. The impact of proposed Federal legislation imposing limits on reimbursement for therapy services may adversely affect the short-term job outlook for physical therapist assistants and aides. However, over the long run, demand for physical therapist assistants and aides will continue to rise, in accordance with growth in the number of individuals with disabilities or limited function. The growing elderly population is particularly vulnerable to chronic and debilitating conditions that require therapeutic services. These patients often need additional assistance in their treatment, making the roles of assistants and aides vital. The large baby-boom generation is entering the prime age for heart attacks and strokes, further increasing the demand for cardiac and physical rehabilitation. In addition, future medical developments should permit an increased percentage of trauma victims to survive, creating added demand for therapy services.

Physical therapists are expected to increasingly utilize assistants to reduce the cost of physical therapy services. Once a patient is evaluated and a treatment plan is designed by the physical therapist, the physical therapist assistant can provide many aspects of treatment, as prescribed by the therapist.

Earnings

Median annual earnings of physical therapist assistants were $36,080 in 2000. The middle 50 percent earned between $30,260 and $42,780. The lowest 10 percent earned less than $23,530, and the highest 10 percent earned more than $48,910. Median annual earnings of physical therapist assistants in 2002 were $35,870 in general medical and surgical hospitals and $35,750 in offices of other health practitioners.

Median annual earnings of physical therapist aides were $20,670 in 2002. The middle 50 percent earned between $17,430 and $24,560. The lowest 10 percent earned less than $15,290, and the highest 10 percent earned more than $29,990. Median annual earnings of physical therapist aides in 2002 were $20,690 in general medical and surgical hospitals and $19,840 in offices of other health practitioners.

Related Occupations

Physical therapist assistants and aides work under the supervision of physical therapists. Other workers in the healthcare field who work under similar supervision include dental assistants, medical assistants, occupational therapist assistants and aides, pharmacy aides, and pharmacy technicians.

Sources of Additional Information

Career information on physical therapist assistants and a list of schools offering accredited programs can be obtained from:

➤ The American Physical Therapy Association, 1111 North Fairfax St., Alexandria, VA 22314-1488. Internet: **http://www.apta.org**

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