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Occupational Outlook Handbook

2010-11 Edition January 2010 Bulletin 2800



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Guide to the *Handbook*

- The job outlook between 2008 and 2018 is discussed in **Overview of the 2008-2018 Projections**, page 1.
- Additional sources of information on careers and State occupational employment projections are described in **Sources of Career Information**, page 12.
- Additional sources of information are described in **Sources of Education, Training, and Financial Aid**, page 17.
- Job search methods and tips on applying for a job and evaluating a job offer are discussed in **Finding and Applying for Jobs and Evaluating Offers**, page 20.
- Highlights and an explanation of information presented in the *Handbook*, how the information was acquired, and hints on how to interpret this information, appear in **Occupational Information Included in the *Handbook***, page 25.
- Brief descriptions of the nature of the work, the number of jobs in 2008, the projected employment change over the 2008-18 period, and the most significant source of postsecondary education or training, are presented in **Data for Occupations Not Covered in Detail**, page 823.
- The assumptions and methods underlying BLS projections are described in **Assumptions and Methods Used in Preparing Employment Projections**, page 834.
- O*NET titles and codes that are related to *Handbook* occupations are listed in ***Occupational Information Network* (*O*NET*) Coverage**, page 836.
- An alphabetical list of of occupations found in the *Handbook* is presented in the **Index**, page 847.
- A description of BLS employment outlook information on the Internet appears at the end of the *Handbook*.
- Information about a publication closely related to the *Handbook*—*Occupational Outlook Quarterly*—appears on the inside back cover.

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Occupational Outlook Handbook

2010-11 Edition

U.S. Department of Labor
Hilda L. Solis, Secretary

U.S. Bureau of Labor Statistics
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Dedication

This edition of the *Occupational Outlook Handbook* is dedicated to the memory of **Michael J. Pilot**, who retired in 2005 after 42 years of Federal Government service. Mike's leadership significantly contributed to the quality of many editions of the *Handbook*.

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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.

The *Handbook* describes the job outlook over a projected 10-year period for occupations across the Nation; consequently, short-term labor market fluctuations and regional differences in job outlook generally are not discussed. Similarly, the *Handbook* provides a general, composite description of jobs and cannot be expected to reflect work situations in specific establishments or localities. The *Handbook*, therefore, is not intended and should never be used for any legal purpose. For example, the *Handbook* should not be used as a guide for determining wages, hours of work, the right of a particular union to represent workers, appropriate bargaining units, or formal job evaluation systems. Nor should earnings data in the *Handbook* be used to compute future loss of earnings in adjudication proceedings involving work injuries or accidental deaths.

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Additional Information About the 2008–18 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 November 2009 *Monthly Labor Review*, or the Winter 2009–10 *Occupational Outlook Quarterly.*

More information about employment change, job openings, earnings, and training requirements by occupation is available on the Bureau's Employment Projections homepage at **http://www.bls.gov/emp**. The *Career Guide to Industries*, which presents occupational information from an industry perspective, is also accessible.

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Overview of the 2008–2018 Projections

Job openings result from the relationship between the population, labor force, and demand for goods and services. The population restricts the size of the labor force, which consists of working individuals and those looking for work. The size and productivity of the labor force limits the quantity of goods and services that can be produced. In addition, changes in the demand for goods and services influence which industries expand or contract. Industries respond by hiring the workers necessary to produce goods and provide services. However, improvements to technology and productivity, changes in which occupations perform certain tasks, and changes to the supply of workers all affect which occupations will be employed by those industries. Examining past and present changes to these relationships in order to project future shifts is the foundation of the Employment Projections Program. This chapter presents highlights of population, labor force, and occupational and industry employment projections for 2008–2018. Sources of additional information about the projections appear on the preceding page.

Population

Shifts in the size and composition of the population can create a number of changes to the U.S. economy. Most importantly, population trends produce corresponding changes in the size and composition of the labor force. The U.S. civilian noninstitutional population, including individuals aged 16 and older, is expected to increase by 25.1 million from 2008 to 2018 (chart 1). The projected 2008–18 growth rate of 10.7 percent is less than the 11.2-percent growth rate for the 1988–98 period and the 13.9-percent rate for the 1998–2008 period. As in the past few decades, population growth will vary by age group, race, and ethnicity.

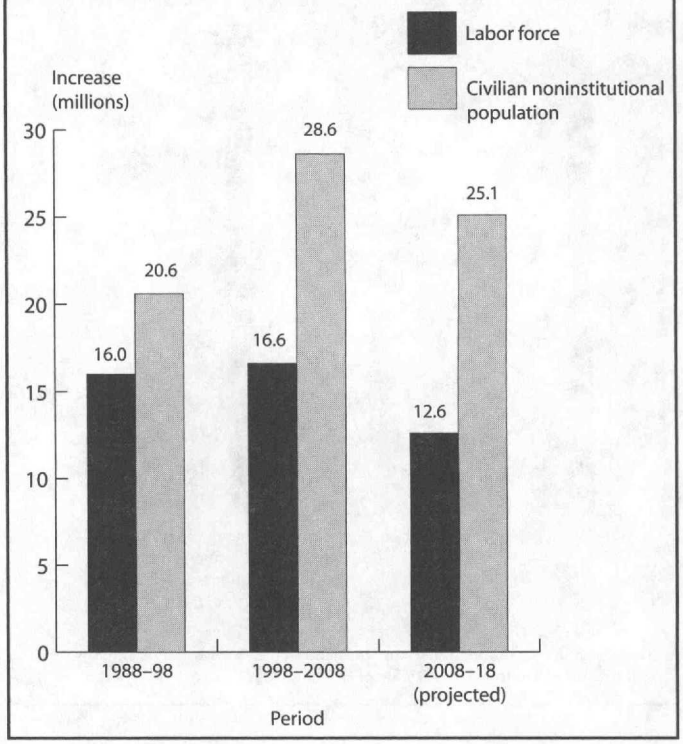
As the baby boomers continue to age, the 55 and older age group is projected to increase by 29.7 percent, more than any other age group. Meanwhile, the 45 to 54 age group is expected to decrease by 4.4 percent, reflecting the slower birth rate following the baby-boom generation. The 35 to 44 age group is anticipated to experience little change, with a growth rate of 0.2 percent, while the population aged 16 to 24 will grow 3.4 percent over the projection period. Minorities and immigrants are expected to constitute a larger share of the U.S. population in 2018. The numbers of Asians and people of Hispanic origin are projected to continue to grow much faster than other racial and ethnic groups.

Labor force

Population is the single most important factor in determining the size and composition of the labor force. The civilian labor force is projected to reach 166.9 million by 2018, which is an increase of 8.2 percent.

The U.S. workforce is expected to become more diverse by 2018. Among racial groups, Whites are expected to make up a decreasing share of the labor force, while Blacks, Asians, and

Chart 1. **Numeric change in the population and labor force**



all other groups will increase their share (chart 2). Among ethnic groups, persons of Hispanic origin are projected to increase their share of the labor force from 14.3 percent to 17.6 percent, reflecting 33.1 percent growth.

The number of women in the labor force will grow at a slightly faster rate than the number of men. The male labor force is projected to grow by 7.5 percent from 2008 to 2018, compared with 9.0 percent for the female labor force.

The share of the youth labor force, workers aged 16 to 24, is expected to decrease from 14.3 percent in 2008 to 12.7 percent by 2018. The primary working-age group, those between 25 and 54 years old, is projected to decline from 67.7 percent of the labor force in 2008 to 63.5 percent by 2018. Workers aged 55 years and older, by contrast, are anticipated to leap from 18.1 percent to 23.9 percent of the labor force during the same period (chart 3).

Employment

Total employment is expected to increase by 10 percent from 2008 to 2018. However, the 15.3 million jobs expected to be added by 2018 will not be evenly distributed across major industry and occupational groups. Changes in consumer demand, improvements in technology, and many other factors will contribute to the continually changing employment structure of the U.S. economy.

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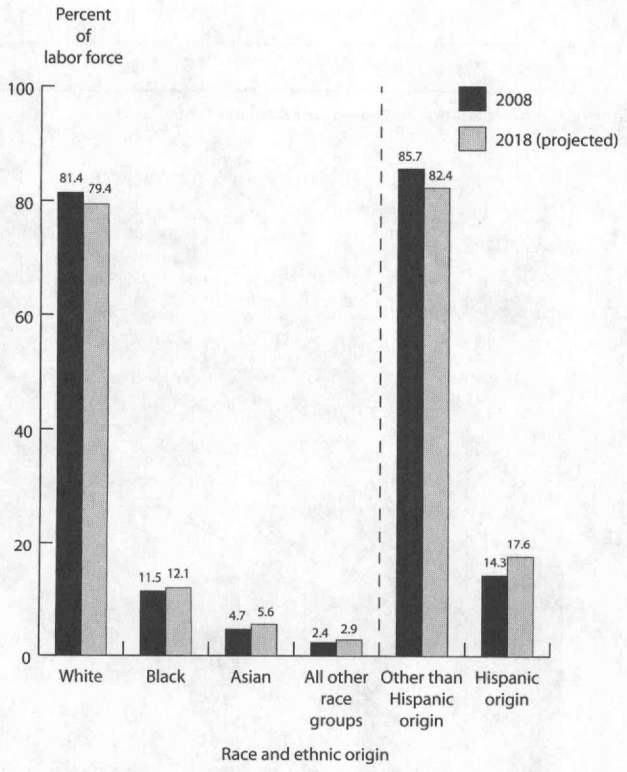
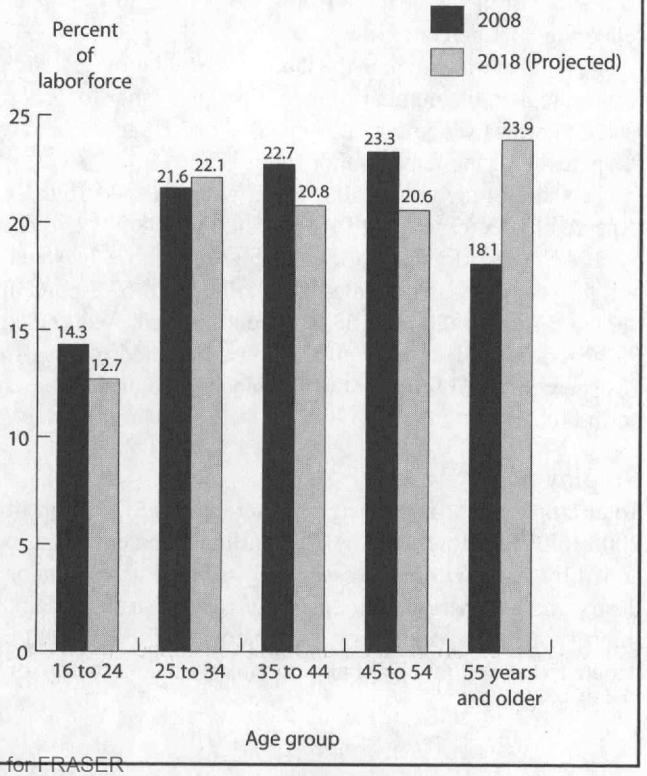
Chart 2. **Percent of labor force, by race and ethnic origin**



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

Chart 3. **Percent of labor force, by age group**



The next two sections examine projected employment change within industries and occupations. The industry perspective is discussed in terms of wage and salary employment. The exception is employment in agriculture, which includes the self-employed and unpaid family workers in addition to wage and salary workers. The occupational profile is viewed in terms of total employment—including wage and salary, self-employed, and unpaid family workers.

Employment change by industry

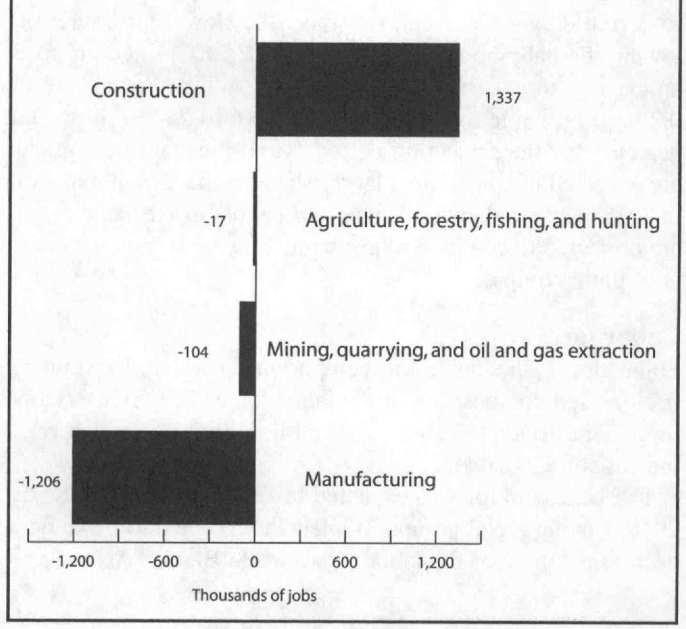
Goods-producing industries. Employment in goods-producing industries has declined since the 1990s. Although overall employment is expected to change little, projected growth among goods-producing industries varies considerably (chart 4).

Mining, quarrying, and oil and gas extraction. Employment in mining, quarrying, and oil and gas extraction is expected to decrease by 14 percent by 2018. Employment in support activities for mining will be responsible for most of the job loss in this industry with a decline of 23 percent. Other mining industries, such as nonmetallic mineral mining and quarrying and coal mining, are expected to see little or no change or a small increase in employment. Employment stagnation in these industries is attributable mainly to strict environmental regulations and technology gains that boost worker productivity.

Construction. Employment in construction is expected to rise 19 percent. Demand for commercial construction and an increase in road, bridge, and tunnel construction will account for the bulk of job growth.

Manufacturing. Overall employment in this sector will decline by 9 percent as productivity gains, automation, and international competition adversely affect employment in most manufacturing industries. Employment in household appliance manufacturing is expected to decline by 24 percent over the decade. Similarly, employment in machinery manufacturing, apparel manufacturing, and computer and electronic product

Chart 4. **Numeric change in wage and salary employment in goods-producing industries, 2008–18 (projected)**



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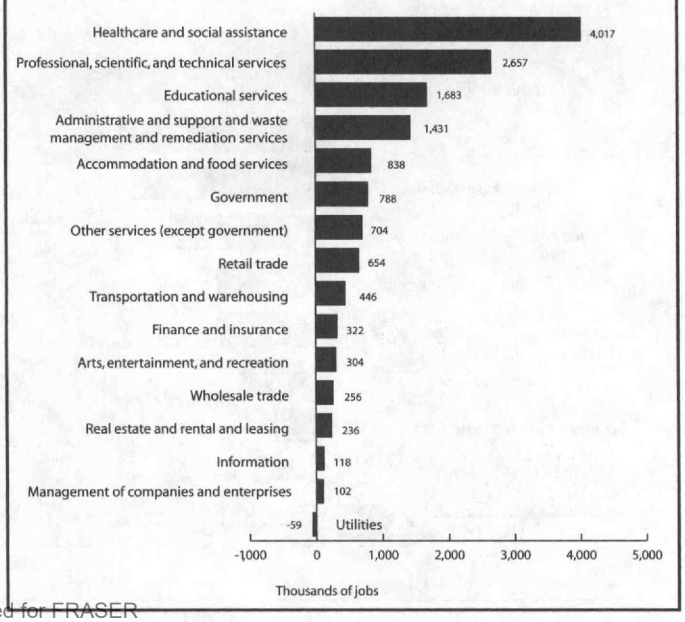
manufacturing will decline as well. However, employment in a few manufacturing industries will increase. For example, employment in pharmaceutical and medicine manufacturing is expected to grow by 6 percent by 2018; however, this increase is expected to add only 17,600 new jobs.

Agriculture, forestry, fishing, and hunting. Overall employment in agriculture, forestry, fishing, and hunting is expected to decrease by 1 percent. Employment is projected to continue to decline because of rising costs of production, increasing consolidation, and more imports of food and lumber. Within this sector, the only industry that is expected to add jobs is support activities for agriculture and forestry, which includes farm labor contractors and farm management services. This industry is anticipated to grow by 13 percent, but this corresponds to an increase of only 13,800 new jobs.

Service-providing industries. The shift in the U.S. economy away from goods-producing in favor of service-providing is expected to continue. Service-providing industries are anticipated to generate approximately 14.5 million new wage and salary jobs. As with goods-producing industries, growth among service-providing industries will vary (chart 5).

Utilities. Employment in utilities is projected to decrease by 11 percent through 2018. Despite increased output, employment in electric power generation, transmission, and distribution and in natural gas distribution is expected to decline because of improved technology that will increase worker productivity. However, employment in the water, sewage, and other systems industry is anticipated to increase 13 percent by 2018. As the population continues to grow, more water treatment facilities are being built. Further, changing Federal and State Government water quality regulations may require more workers to ensure that water is safe to drink and to release into the environment.

Chart 5. **Numeric change in wage and salary employment in service-providing industries, 2008–18 (projected)**



Wholesale trade. The number of workers in wholesale trade is expected to increase by 4 percent, adding about 255,900 jobs. The consolidation of wholesale trade firms into fewer and larger companies will contribute to slower-than-average employment growth in the industry.

Retail trade. Employment in retail trade is expected to increase by 4 percent. Despite slower-than-average growth, this industry is projected to add about 654,000 new jobs over the 2008–18 period. Slower job growth reflects both continued consolidation and slower growth in personal consumption than in the previous decade.

Transportation and warehousing. Employment in transportation and warehousing is expected to increase by 10 percent, adding about 445,500 jobs to the industry total. Truck transportation is anticipated to grow by 10 percent, and the warehousing and storage sector is projected to grow by 12 percent. 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.

Information. Employment in the information sector is expected to increase by 4 percent, adding 118,100 jobs by 2018. The sector contains fast-growing computer-related industries. The data-processing, hosting, and related services industry, which is expected to grow by 53 percent, includes establishments that provide Web and application hosting and streaming services. Internet publishing and broadcasting is expected to grow rapidly as it gains market share from newspapers and other more traditional media. Software publishing is projected to grow by 30 percent as organizations of all types continue to adopt the newest software products.

The information sector also includes the telecommunications industry, whose employment is projected to decline 9 percent. Despite an increase in demand for telecommunications services, more reliable networks along with consolidation among organizations will lead to productivity gains, reducing the need for workers. In addition, employment in the publishing industry is expected to decline by 5 percent, which is the result of increased efficiency in production, declining newspaper revenues, and a trend towards using more freelance workers.

Finance and insurance. The finance and insurance industry is expected to increase by 5 percent from 2008 to 2018. Employment in the securities, commodity contracts, and other financial investments and related activities industry is projected to expand 12 percent by 2018, which reflects the number of baby boomers in their peak savings years, the growth of tax-favorable retirement plans, and the globalization of securities markets. Employment in the credit intermediation and related activities industry, which includes banks, will grow by about 5 percent, adding 42 percent of all new jobs within the finance and insurance sector. Employment in the insurance carriers and related activities industry is expected to grow by 3 percent, translating into 67,600 new jobs by 2018. The number of jobs in the agencies, brokerages, and other insurance-related activities industry is expected to grow by 14 percent. Growth will stem from both the needs of an increasing population and new insurance products on the market.

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Real estate and rental and leasing. The real estate and rental and leasing industry is expected to grow by 11 percent through 2018. Growth will be due, in part, to increased demand for housing as the population expands. The fastest growing industry in the real estate and rental and leasing services sector will be lessors of nonfinancial intangible assets (except copyrighted works), increasing by 34 percent over the projection period.

Professional, scientific, and techncal services. Employment in professional, scientific, and technical services is projected to grow by 34 percent, adding about 2.7 million new jobs by 2018. Employment in computer systems design and related services is expected to increase by 45 percent, accounting for nearly one-fourth of all new jobs in this industry sector. Employment growth will be driven by growing demand for the design and integration of sophisticated networks and Internet and intranet sites. Employment in management, scientific, and technical consulting services is anticipated to expand at a staggering 83 percent, making up about 31 percent of job growth in this sector. Demand for these services will be spurred by businesses' continued need for advice on planning and logistics, the implementation of new technologies, and compliance with workplace safety, environmental, and employment regulations.

Management of companies and enterprises. Management of companies and enterprises is projected to grow relatively slowly, by 5 percent, as companies focus on reorganization to increase efficiency.

Administrative and support and waste management and remediation services. Employment in this sector is expected to grow by 18 percent by 2018. The largest growth will occur in employment services, an industry that is anticipated to account for 42 percent of all new jobs in the administrative and support and waste management and remediation services sector. The employment services industry ranks fifth among industries with the most new employment opportunities in the Nation over the 2008–18 period and is expected to grow faster than the average for all industries. Projected growth stems from the strong need for seasonal and temporary workers and for specialized human resources services.

Educational services. Employment in public and private educational services is anticipated to grow by 12 percent, adding about 1.7 million new jobs through 2018. Rising student enrollments at all levels of education will create demand for educational services.

Healthcare and social assistance. About 26 percent of all new jobs created in the U.S. economy will be in the healthcare and social assistance industry. This industry—which includes public and private hospitals, nursing and residential care facilities, and individual and family services—is expected to grow by 24 percent, or 4 million new jobs. Employment growth will be driven by an aging population and longer life expectancies.

Arts, entertainment, and recreation. The arts, entertainment, and recreation industry is expected to grow by 15 percent by 2018. Most of the growth will be in 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. Employment in accommodation and food services is expected to grow by 7 percent, adding about 838,200 new jobs through 2018. Job growth will be concentrated in food services and drinking places, reflecting an increase in the population and the convenience of many new food establishments.

Other services (except government and private households). Employment is expected to grow by 13 percent in other services. Personal care services comprise the fastest growing industry in this sector, at 32 percent. This industry includes barbers, salons, and spas, which have experienced growing demand as individuals increasingly are seeking to improve their personal appearance.

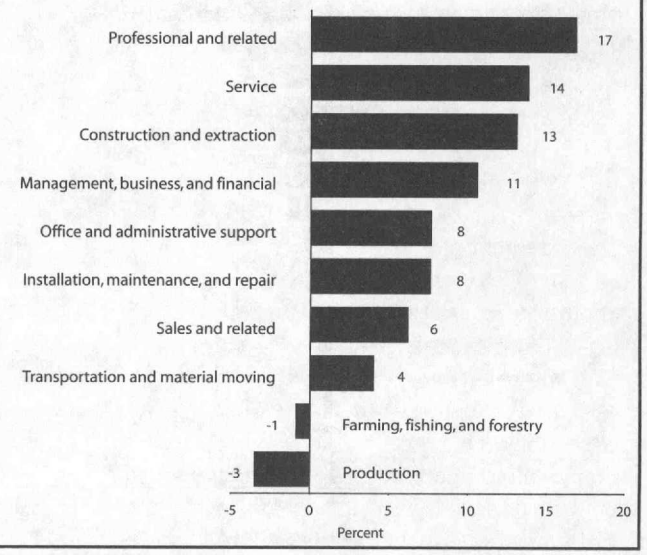
Government. Between 2008 and 2018, government employment, excluding employment in public education and hospitals, is expected to increase by 7 percent. Growth in government employment will be fueled by expanding demand for public safety services and assistance provided to the elderly, but dampened by budgetary constraints and the outsourcing of government jobs to the private sector. State and local governments, excluding education and hospitals, are anticipated to grow by 8 percent as a result of the continued shift of responsibilities from the Federal Government to State and local governments. Federal Government employment, including the Postal Service, is expected to increase by 3 percent.

Employment change by occupation

Industry growth or decline will affect demand for occupations. However, job growth is projected to vary among major occupational groups (chart 6).

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 11 percent by 2018. These workers will be needed to help organizations navigate the increasingly complex and competitive business

Chart 6. **Percent change in total employment, by major occupational group, 2008–18 (projected)**



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environment. A large portion of these jobs will arise in the management, scientific, and technical consulting industry sector. A substantial number, in addition, are expected in several other large or rapidly growing industries, including government, healthcare and social assistance, finance and insurance, and construction.

Employment in management occupations is projected to grow slowly over the projection period, increasing by 5 percent, an addition of 454,300 new jobs. Growth is being affected by declines in several occupations, including farmers and ranchers. Employment of farmers and ranchers is projected to decline as the agricultural industry produces more output with fewer workers.

Employment in business and financial operations occupations is projected to grow by 18 percent, resulting in 1.2 million new jobs. Increasing financial regulations and the need for greater accountability will drive demand for accountants and auditors, adding roughly 279,400 jobs to this occupation from 2008 to 2018. Further, an increasingly competitive business environment will grow demand for management analysts, an occupation that is expected to add 178,300 jobs. Together, these two occupations are anticipated to account for 38 percent of new business and financial operations jobs.

Professional and related occupations. This occupational group, which includes a wide variety of skilled professions, is expected to be the fastest growing major occupational group, at 17 percent, and is projected to add the most new jobs—about 5.2 million.

Employment among healthcare practitioners and technical occupations, a subgroup of the professional and related category, is expected to increase by 21 percent. This growth, resulting in a projected 1.6 million new jobs, will be driven by increasing demand for healthcare services. As the number of older people continues to grow, and as new developments allow for the treatment of more medical conditions, more healthcare professionals will be needed.

Education, training, and library occupations are anticipated to add more than 1.3 million jobs, representing a growth rate of more than 14 percent. As the U.S. population increases, and as a larger share of adults seeks educational services, demand for these workers will increase.

Computer and mathematical science occupations are projected to add almost 785,700 new jobs from 2008 to 2018. As a group, these occupations are expected to grow more than twice as fast as the average for all occupations in the economy. Demand for workers in computer and mathematical occupations will be driven by the continuing need for businesses, government agencies, and other organizations to adopt and utilize the latest technologies.

Employment in community and social services occupations is projected to increase by 16 percent, growing by roughly 448,400 jobs. As health insurance providers increasingly cover mental and behavioral health treatment, and as a growing number of elderly individuals seek social services, demand for these workers will increase.

Employment in arts, design, entertainment, sports, and media occupations is expected to grow by 12 percent from 2008 to 2018, resulting in almost 332,600 new jobs. Growth will be spread broadly across different occupations within the group. Media and communications occupations will add a substantial number of jobs, led by rapid growth among public relations specialists, who will be needed in greater numbers as firms place a greater emphasis on managing their public image. Employment among entertainers and performers and those in sports and related occupations also will increase, partly as a result of increasing demand for coaches and scouts. Furthermore, art and design occupations will see substantial growth, with demand increasing for graphic and interior designers. As more advertising is conducted over the Internet, a medium that generally includes many graphics, and as businesses and households increasingly seek professional design services, a greater number of these workers will be needed.

Employment in life, physical, and social science occupations is projected to increase by nearly 277,200 jobs over the 2008–18 projection period. This increase represents a growth rate of 19 percent, almost twice the average for all occupations across the economy. About 116,700 of these jobs are expected to be created among social science and related occupations, led by strong growth among market and survey researchers, as businesses increase their marketing efforts in order to remain competitive and as public policy firms and government agencies utilize more public opinion research. Employment in life science occupations, in addition, will increase rapidly as developments from biotechnology research continue to be used to create new medical technologies, treatments, and pharmaceuticals.

Architecture and engineering occupations are projected to add roughly 270,600 jobs, representing a growth rate of 10 percent. Much of this growth will occur among engineering occupations, especially civil engineers. As greater emphasis is placed on improving the Nation's infrastructure, these specialists will be needed to design, implement, or upgrade municipal transportation, water supply, and pollution control systems.

Legal occupations will add the fewest new jobs among all professional and related subgroups, increasing by about 188,400. However, with a growth rate of 15 percent, this group will grow faster than the average for all occupations in the economy. Of the new jobs created, lawyers will account for 98,500 while paralegals and legal assistants will account for 74,100. Paralegals and legal assistants are expected to grow by 28 percent as legal establishments begin to expand the role of these workers and assign them more tasks once performed by lawyers.

Service occupations. The duties of service workers range from fighting fires to cooking meals. Employment in service occupations is projected to increase by 4.1 million, or 14 percent, which is both the second-largest numerical gain and the second-largest growth rate among the major occupational groups.

Among service occupation subgroups, the largest number of new jobs will occur in healthcare support occupations. With more than 1.1 million new jobs, employment in this subgroup is expected to increase by 29 percent. Much of the growth will be the result of increased demand for healthcare services as the expanding elderly population requires more care.

Employment in personal care and service occupations is anticipated to grow by 20 percent over the projection period, adding more than 1 million jobs. As consumers become more concerned with health, beauty, and fitness, the number of cos-

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metic and health spas will increase, causing an increase in demand for workers in this group. However, the personal care and service group contains a wide variety of occupations, and two of them—personal and home care aides, and child care workers—will account for most of this group's new jobs. Personal and home care aides will experience increased demand as a growing number of elderly individuals require assistance with daily tasks. Child care workers, in addition, will add jobs as formal preschool programs, which employ child care workers alongside preschool teachers, become more prevalent.

Employment in food preparation and serving and related occupations is projected to increase by roughly 1 million jobs from 2008 to 2018, representing a growth rate of 9 percent. Growth will stem from time-conscious consumers patronizing fast-food establishments and full-service restaurants.

Employment in building and grounds cleaning and maintenance occupations is expected to grow by almost 483,900 jobs over the projection period, representing a growth rate of 8 percent. As businesses place a larger emphasis on grounds aesthetics, and as households increasingly rely on contract workers to maintain their yards, grounds maintenance workers will see rapid growth. In addition, more building cleaning workers will be needed to maintain an increasing number of residential and commercial structures.

Protective service occupations are expected to gain the fewest new jobs among all service subgroups: about 400,100, or 12-percent growth. These workers protect businesses and other organizations from crime and vandalism. In addition, there will be increased demand for law enforcement officers to support the growing U.S. population.

Sales and related occupations. Sales and related workers solicit goods and services for businesses and consumers. Sales and related occupations are expected to add 980,400 new jobs by 2018, growing by 6 percent. As organizations offer a wider array of products and devote an increasing share of their resources to customer service, many new retail salesworkers will be needed. Job growth in this group will be spread across a wide variety of industries, but almost half will occur in retail sales establishments.

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 8 percent, adding 1.8 million new jobs by 2018. Customer service representatives are anticipated to add the most new jobs, 399,500, as businesses put an increased emphasis on building customer relationships. Other office and administrative support occupations will experience declines as advanced technology improves productivity, decreasing the number of workers necessary to perform some duties.

Farming, fishing, and forestry occupations. Farming, fishing, and forestry workers cultivate plants, breed and raise livestock, and catch animals. These occupations are projected to decline by about 1 percent, losing 9,100 jobs, by 2018. Productivity increases in agriculture will lead to declining employment among agricultural workers, offsetting small gains among forest, conservation, and logging workers.

Construction and extraction occupations. Construction and extraction workers build new residential and commercial buildings and also work in mines, quarries, and oil and gas fields. Employment of these workers is expected to grow 13 percent, adding about 1 million new jobs. Construction trades and related workers will account for about 808,400 of these jobs. Growth will result from increased construction of homes, office buildings, and infrastructure projects. Declines in extraction occupations will reflect overall employment stagnation 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 are projected to add 440,200 jobs by 2018, growing by 8 percent. More than 1 in 3 new jobs in this group will occur in the construction industry, because these workers are integral to the development of buildings, communication structures, transportation systems, and other types of infrastructure. As construction on these types of projects increases over the projection period, installation, maintenance and repair workers will be needed in greater numbers.

Production occupations. Production workers are employed mainly in manufacturing, where they assemble goods and operate plants. Production occupations are expected to decline by 3 percent, losing 349,200 jobs by 2018. As productivity improvements reduce the need for workers, and as a growing number of these jobs are offshored, demand for production workers will decline. Some jobs will be created in production occupations, mostly in food processing and woodworking.

Transportation and material moving occupations. Transportation and material moving workers transport people and materials by land, sea, or air. Employment of these workers is anticipated to increase by 4 percent, accounting for 391,100 new jobs. As the economy grows over the projection period, and the demand for goods increases, truck drivers will be needed to transport those goods to businesses, consumers, and other entities. In addition, a substantial number of jobs will arise among bus drivers, as well as taxi drivers and chauffeurs, as a growing number of people utilize public transportation.

Employment change by detailed occupation

Occupational growth can be considered in two ways: by the rate of growth and by the number of new jobs created by growth. Some occupations both have a fast growth rate and create a large number of new jobs. However, an occupation that employs few workers may experience rapid growth, although the resulting number of new jobs may be small. For example, a small occupation that employs just 1,000 workers and is projected to grow 50 percent over a 10-year period will add only 500 jobs. By contrast, a large occupation that employs 1.5 million workers may experience only 10 percent growth, but will add 150,000 jobs. As a result, in order to get a complete picture of employment growth, both measures must be considered.

Occupations with the fastest growth. Of the 20 fastest growing occupations in the economy (table 1), half are related to healthcare. Healthcare is experiencing rapid growth, due in large part to the aging of the baby-boom generation, which will require more medical care. In addition, some healthcare occupations will be in greater demand for other reasons. As health-

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Table 1. Occupations with the fastest growth

Occupations	Percent change	Number of new jobs (in thousands)	Wages (May 2008 median)	Education/training category
Biomedical engineers	72	11.6	$77,400	Bachelor's degree
Network systems and data communications analysts	53	155.8	71,100	Bachelor's degree
Home health aides	50	460.9	20,460	Short-term on-the-job training
Personal and home care aides	46	375.8	19,180	Short-term on-the-job training
Financial examiners	41	11.1	70,930	Bachelor's degree
Medical scientists, except epidemiologists	40	44.2	72,590	Doctoral degree
Physician assistants	39	29.2	81,230	Master's degree
Skin care specialists	38	14.7	28,730	Postsecondary vocational award
Biochemists and biophysicists	37	8.7	82,840	Doctoral degree
Athletic trainers	37	6.0	39,640	Bachelor's degree
Physical therapist aides	36	16.7	23,760	Short-term on-the-job training
Dental hygienists	36	62.9	66,570	Associate degree
Veterinary technologists and technicians	36	28.5	28,900	Associate degree
Dental assistants	36	105.6	32,380	Moderate-term on-the-job training
Computer software engineers, applications	34	175.1	85,430	Bachelor's degree
Medical assistants	34	163.9	28,300	Moderate-term on-the-job training
Physical therapist assistants	33	21.2	46,140	Associate degree
Veterinarians	33	19.7	79,050	First professional degree
Self-enrichment education teachers	32	81.3	35,720	Work experience in a related occupation
Compliance officers, except agriculture, construction, health and safety, and transportation	31	80.8	48,890	Long-term on-the-job training

care costs continue to rise, work is increasingly being delegated to lower paid workers in order to cut costs. For example, tasks that were previously performed by doctors, nurses, dentists, or other healthcare professionals increasingly are being performed by physician assistants, medical assistants, dental hygienists, and physical therapist aides. In addition, patients increasingly are seeking home care as an alternative to costly stays in hospitals or residential care facilities, causing a significant increase in demand for home health aides. Although not classified as healthcare workers, personal and home care aides are being affected by this demand for home care as well.

Two of the fastest growing detailed occupations are in the computer specialist occupational group. Network systems and data communications analysts are projected to be the second-fastest-growing occupation in the economy. Demand for these workers will increase as organizations continue to upgrade their information technology capacity and incorporate the newest technologies. The growing reliance on wireless networks will result in a need for more network systems and data communications analysts as well. Computer applications software engineers also are expected to grow rapidly from 2008 to 2018. Expanding Internet technologies have spurred demand for these workers, who can develop Internet, intranet, and Web applications.

Developments from biotechnology research will continue to be used to create new medical technologies, treatments, and pharmaceuticals. As a result, demand for medical scientists and for biochemists and biophysicists will increase. However, although employment of biochemists and biophysicists is projected to grow rapidly, this corresponds to only 8,700 new jobs over the projection period. Increased medical research and demand for new medical technologies also will affect biomedical engineers. The aging of the population and a growing focus on health issues will drive demand for better medical devices and equipment designed by these workers. In fact, biomedical engineers are projected to be the fastest growing occupation in the economy. However, because of its small size, the occupation is projected to add only about 11,600 jobs.

Increasing financial regulations will spur employment growth both of financial examiners and of compliance officers, except agriculture, construction, health and safety, and transportation.

Self-enrichment teachers and skin care specialists will experience growth as consumers become more concerned with self-improvement. Self-enrichment teachers are growing rapidly as more individuals seek additional training to make themselves more appealing to prospective employers. Skin care specialists will experience growth as consumers increasingly care about their personal appearance.

Of the 20 fastest growing occupations, 12 are in the associate degree or higher category. Of the remaining 8, 6 are in an on-the-job training category, 1 is in the work experience in a related occupation category, and 1 is in the postsecondary vocational degree category. Eleven of these occupations earn at least $10,000 more than the National annual median wage,

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Table 2. Occupations with the largest numerical growth

Occupations	Number of new jobs (in thousands)	Percent change	Wages (May 2008 median)	Education/training category
Registered nurses	581.5	22	$62,450	Associate degree
Home health aides	460.9	50	20,460	Short-term on-the-job training
Customer service representatives	399.5	18	29,860	Moderate-term on-the-job training
Combined food preparation and serving workers, including fast food	394.3	15	16,430	Short-term on-the-job training
Personal and home care aides	375.8	46	19,180	Short-term on-the-job training
Retail salespersons	374.7	8	20,510	Short-term on-the-job training
Office clerks, general	358.7	12	25,320	Short-term on-the-job training
Accountants and auditors	279.4	22	59,430	Bachelor's degree
Nursing aides, orderlies, and attendants	276.0	19	23,850	Postsecondary vocational award
Postsecondary teachers	256.9	15	58,830	Doctoral degree
Construction laborers	255.9	20	28,520	Moderate-term on-the-job training
Elementary school teachers, except special education	244.2	16	49,330	Bachelor's degree
Truck drivers, heavy and tractor-trailer	232.9	13	37,270	Short-term on-the-job training
Landscaping and groundskeeping workers	217.1	18	23,150	Short-term on-the-job training
Bookkeeping, accounting, and auditing clerks	212.4	10	32,510	Moderate-term on-the-job training
Executive secretaries and administrative assistants	204.4	13	40,030	Work experience in a related occupation
Management analysts	178.3	24	73,570	Bachelor's or higher degree, plus work experience
Computer software engineers, applications	175.1	34	85,430	Bachelor's degree
Receptionists and information clerks	172.9	15	24,550	Short-term on-the-job training
Carpenters	165.4	13	38,940	Long-term on-the-job training

which was $32,390 as of May 2008. In fact, 9 of the occupations earned at least twice the National median in May 2008.

Occupations with the largest numerical growth. The 20 occupations listed in table 2 are projected to account for more than one-third of all new jobs—5.8 million combined—over the 2008–18 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 will occupations in education, sales, and food service. Office and administrative support services occupations are expected to grow by 1.3 million jobs, accounting for about one-fifth of the job growth among the 20 occupations with the largest growth. Many of the occupations listed in the table are very large and will create more new jobs than occupations with high growth rates. Only 3 out of the 20 fastest growing occupations—home health aides, personal and home care aides, and computer software application engineers—also are projected to be among the 20 occupations with the largest numerical increases in employment.

The education or training categories and wages of the occupations with the largest numbers of new jobs are significantly different than those of the fastest growing occupations. Twelve of these occupations are in an on-the-job training category, and just 7 are in a category that indicates any postsecondary education. Ten of the 20 occupations with the largest numbers of new jobs earned less than the National median wage in May 2008.

Occupations with the fastest decline. Declining occupational employment stems from falling industry employment, technological advances, changes in business practices, and other factors. For example, technological developments and the continued movement of textile production abroad are expected to contribute to a decline of 71,500 sewing machine operators over the projection period (table 3). Fifteen of the 20 occupations with the largest numerical decreases are either production occupations or office and administrative support occupations, both of which are adversely affected by increasing plant and factory automation or the implementation of office technology, reducing the need for workers in those occupations. The difference between the office and administrative support occupations that are expected to experience the largest declines and those which are expected to see the largest increases is the extent to which job functions can be easily automated or performed by

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Table 3. Occupations with the fastest decline

Occupation	Percent change	Number of jobs lost (in thousands)	Wages (May 2008 median)	Education/training category
Textile bleaching and dyeing machine operators and tenders	-45	-7.2	$23,680	Moderate-term on-the-job training
Textile winding, twisting, and drawing out machine setters, operators, and tenders	-41	-14.2	23,970	Moderate-term on-the-job training
Textile knitting and weaving machine setters, operators, and tenders	-39	-11.5	25,400	Long-term on-the-job training
Shoe machine operators and tenders	-35	-1.7	25,090	Moderate-term on-the-job training
Extruding and forming machine setters, operators, and tenders, synthetic and glass fibers	-34	-4.8	31,160	Moderate-term on-the-job training
Sewing machine operators	-34	-71.5	19,870	Moderate-term on-the-job training
Semiconductor processors	-32	-10.0	32,230	Postsecondary vocational award
Textile cutting machine setters, operators, and tenders	-31	-6.0	22,620	Moderate-term on-the-job training
Postal Service mail sorters, processors, and processing machine operators	-30	-54.5	50,020	Short-term on-the-job training
Fabric menders, except garment	-30	-0.3	28,470	Moderate-term on-the-job training
Wellhead pumpers	-28	-5.3	37,860	Moderate-term on-the-job training
Fabric and apparel patternmakers	-27	-2.2	37,760	Long-term on-the-job training
Drilling and boring machine tool setters, operators, and tenders, metal and plastic	-27	-8.9	30,850	Moderate-term on-the-job training
Lathe and turning machine tool setters, operators, and tenders, metal and plastic	-27	-14.9	32,940	Moderate-term on-the-job training
Order clerks	-26	-64.2	27,990	Short-term on-the-job training
Coil winders, tapers, and finishers	-25	-5.6	27,730	Short-term on-the-job training
Photographic processing machine operators	-24	-12.5	20,360	Short-term on-the-job training
File clerks	-23	-49.6	23,800	Short-term on-the-job training
Derrick operators, oil and gas	-23	-5.8	41,920	Moderate-term on-the-job training
Desktop publishers	-23	-5.9	36,600	Postsecondary vocational award

other workers. For instance, the duties of executive secretaries and administrative assistants involve a great deal of personal interaction that cannot be automated, whereas the duties of file clerks—adding, locating, and removing business records—can be automated or performed by other workers.

Only 2 of the occupations with the fastest percent decline are in a category that indicates workers have any postsecondary education, while the rest are in an on-the-job training category. Eleven of these occupations earned less than $30,000 in May 2008, below the National median wage of $32,390.

Employment change by education and training category

In general, occupations in a category with some postsecondary education are expected to experience higher rates of growth than those in an on-the-job training category. Occupations in the associate degree category are projected to grow the fastest, at about 19 percent. In addition, occupations in the master's and first professional degree categories are anticipated to grow by about 18 percent each, and occupations in the bachelor's and doctoral degree categories are expected to grow by about 17 percent each. However, occupations in the on-the-job training categories are expected to grow by 8 percent each (chart 7).

Total job openings

Job openings stem from both employment growth and replacement needs (chart 8). 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 67 percent of the approximately 50.9 million job openings between 2008 and 2018. Thus, even occupations that are projected to experi-

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Chart 7. **Percent change in employment, by education or training category, 2008–18 (projected)**

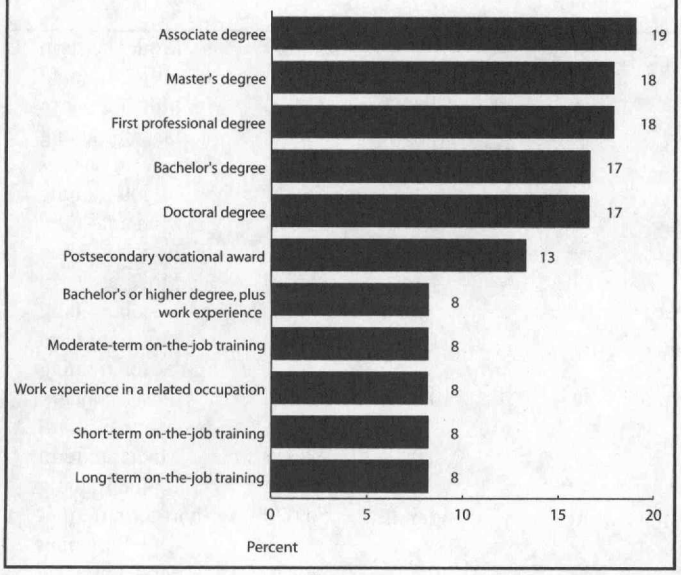
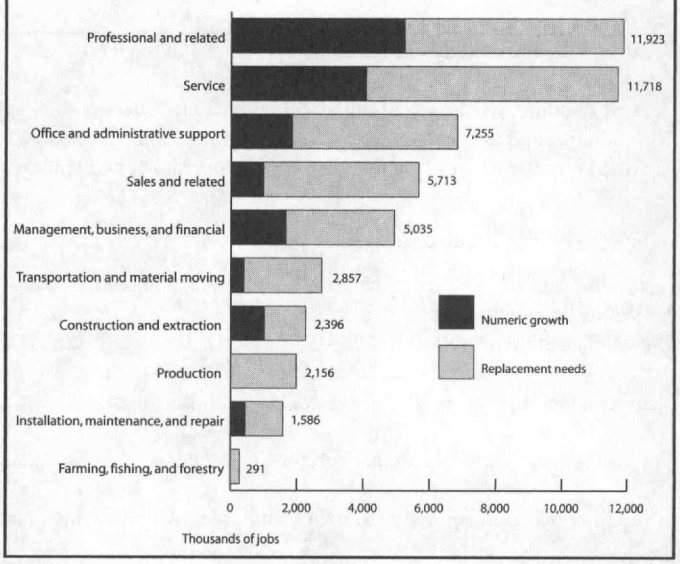


Chart 8. **Number of jobs due to growth and replacement needs, by major occupational group, 2008–18 (projected)**



ence slower-than-average growth or to decline in employment still may offer many job openings.

Professional and related occupations are projected to have the largest number of total job openings, 11.9 million, and 56 percent of those will be due to replacement needs. Replacement needs generally are greatest in the largest occupations and in those with relatively low pay or limited training requirements. As a result, service occupations are projected to have the greatest number of job openings due to replacements, about 7.6 million.

Office automation will significantly affect many individual office and administrative support occupations. Although these occupations are projected to grow about as fast as average, some are projected to decline rapidly. Office and administrative support occupations are expected to create 7.3 million total job openings from 2008 to 2018, ranking third behind professional and related occupations and service occupations.

Farming, fishing, and forestry occupations and production occupations should offer job opportunities despite overall declines in employment. These occupations will lose 9,100 and 349,200 jobs, respectively, but are expected to provide more than 2.4 million total job openings. Job openings will be due solely to the replacement needs of a workforce characterized by high levels of retirement and job turnover.

The analysis underlying BLS employment projections uses currently available information to focus on long-term structural changes in the economy. The 2008–18 projections assume a full-employment economy in 2018. The impact of the recent recession, which began in December of 2007, on long-term structural changes in the economy will not be fully known until some point during or after the recovery. Because the 2008 starting point is a recession year, the projected growth to an assumed full-employment economy in 2018 will generally be stronger than if the starting point were not a recession year.

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Classification of occupations by most significant source of education or training

Postsecondary awards

First professional degree. Completion of the degree usually requires at least 3 years of full-time academic study beyond a bachelor's degree. Examples are lawyers; and physicians and surgeons.

Doctoral degree. Completion of a Ph.D. or other doctoral degree usually requires at least 3 years of full-time academic study beyond a bachelor's degree. Examples are postsecondary teachers; and medical scientists, except epidemiologists.

Master's degree. Completion of the degree usually requires 1 or 2 years of full-time academic study beyond a bachelor's degree. Examples are educational, vocational, and school counselors; and clergy.

Bachelor's or higher degree, plus work experience. Most occupations in this category are management occupations. All require experience in a related nonmanagement position for which a bachelor's or higher degree is usually required. Examples are general and operations managers; and judges, magistrate judges, and magistrates.

Bachelor's degree. Completion of the degree generally requires at least 4 years, but not more than 5 years, of full-time academic study. Examples are accountants and auditors; and elementary school teachers, except special education.

Associate degree. Completion of the degree usually requires at least 2 years of full-time academic study. Examples are paralegals and legal assistants; and medical records and health information technicians.

Postsecondary vocational award. Some programs last only a few weeks, others more than a year. Programs lead to a certificate or other award, but not a degree. Examples are nursing aides, orderlies, and attendants; and hairdressers, hairstylists, and cosmetologists.

Work-related training

Work experience in a related occupation. Most of the occupations in this category are first-line supervisors or managers of service, sales and related, production, or other occupations; or are management occupations.

Long-term on-the-job training. Occupations in this category generally require more than 12 months of on-the-job training or combined work experience and formal classroom instruction for workers to develop the skills necessary to be fully qualified in the occupation. These occupations include formal and informal apprenticeships that may last up to 5 years. Long-term on-the-job training also includes intensive occupation-specific, employer-sponsored programs that workers must complete. Among such programs are those conducted by fire and police academies and by schools for air traffic controllers and flight attendants. In other occupations—insurance sales and securities sales, for example—trainees take formal courses, often provided on the jobsite, to prepare for the required licensing exams. Individuals undergoing training generally are considered to be employed in the occupation. Also included in this category is the development of a natural ability—such as that possessed by musicians, athletes, actors, and other entertainers—that must be cultivated over several years, frequently in a nonwork setting.

Moderate-term on-the-job training. In this category of occupations, the skills needed to be fully qualified in the occupation can be acquired during 1 to 12 months of combined on-the-job experience and informal training. Examples are truckdrivers, heavy and tractor-trailer; and secretaries, except legal, medical, and executive.

Short-term on-the-job training. In occupations in this category, the skills needed to be fully qualified in the occupation can be acquired during a short demonstration of job duties or during 1 month or less of on-the-job experience or instruction. Examples of these occupations are retail salespersons; and waiters and waitresses.

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Sources of Career Information

This section identifies some major sources of information on careers. These sources are meant to be used in addition to those listed at the end of each *Handbook* statement, and they may provide additional information.

How to best use this information. The sources mentioned in this section offer different types of information. For example, people you know may provide very specific information because they have knowledge of you, your abilities and interests, and your qualifications. Other sources, such as those found in the State Sources below, provide information on occupations in each State. Gathering information from a wide range of sources is the best way to determine what occupations may be appropriate for you, and in what geographic regions these occupations are found. The sources of information discussed in this section are not exhaustive, and other sources could prove equally valuable in your career search.

Career information

Like any major decision, selecting a career involves a lot of fact finding. Fortunately, some of the best informational resources are easily accessible. You should assess career guidance materials carefully. Information that seems out of date or glamorizes an occupation—overstates its earnings or exaggerates the demand for workers, for example—should be evaluated with skepticism. Gathering as much information as possible will help you make a more informed decision.

People you know. One of the best resources can be your friends and family. They may answer some questions about a particular occupation or put you in touch with someone who has some experience in the field. This personal networking can be invaluable in evaluating an occupation or an employer. These people will be able to tell you about their specific duties and training, as well as what they did or did not like about a job. People who have worked in an occupation locally also may be able to give you a recommendation and get you in touch with specific employers.

Employers. This is the primary source of information on specific jobs. Employers may post lists of job openings and application requirements, including the exact training and experience required, starting wages and benefits, and advancement opportunities and career paths.

Informational interviews. People already working in a particular field often are willing to speak with people interested in joining their field. An informational interview will allow you to get good information from experts in a specific career without the pressure of a job interview. These interviews allow you to determine how a certain career may appeal to you while helping you build a network of personal contacts.

Professional societies, trade groups, and labor unions. These groups have information on an occupation or various related occupations with which they are associated or which they actively represent. This information may cover training requirements, earnings, and listings of local employers. These groups may train members or potential members themselves, or they may be able to put you in contact with organizations or individuals who perform such training.

Each occupational statement in the *Handbook* concludes with a "Sources of Additional Information" section, which lists organizations that may be contacted for more information. Another valuable source for finding organizations associated with occupations is the *Encyclopedia of Associations*, an annual publication that lists trade associations, professional societies, labor unions, and other organizations.

Guidance and career counselors. Counselors can help you make choices about which careers might suit you best. They can help you establish what occupations suit your skills by testing your aptitude for various types of work and determining your strengths and interests. Counselors can help you evaluate your options and search for a job in your field or help you select a new field altogether. They can also help you determine which educational or training institutions best fit your goals, and then assist you in finding ways to finance them. Some counselors offer other services such as interview coaching, résumé building, and help in filling out various forms. Counselors in secondary schools and postsecondary institutions may arrange guest speakers, field trips, or job fairs.

You can find guidance and career counselors at many common institutions, including:

- 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

When using a private counselor, check to see that the counselor is experienced. One way to do so is to ask people who have used their services in the past. The National Board of Certified Counselors and Affiliates is an institution which accredits career counselors. To verify the credentials of a career counselor and to find a career counselor in your area, contact:

➤ National Board for Certified Counselor and Affiliates, 3 Terrace Way, Suite D, Greensboro, NC 27403-3660. Internet: **http://www.nbcc.org/directory/FindCounselors.aspx**

Postsecondary institutions. Colleges, universities, and other postsecondary institutions typically put a lot of effort into helping place their graduates in good jobs, because the success of their graduates may indicate the quality of their institution and may affect the institution's ability to attract new students. Postsecondary institutions commonly have career centers with libraries of information on different careers, listings of related jobs, and alumni contacts in various professions. Career cen-

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ters frequently employ career counselors who generally provide their services only to their students and alumni. Career centers can help you build your résumé, find internships and co-ops—which can lead to full-time positions—and tailor your course selection or program to make you a more attractive job applicant.

Local libraries. Libraries can be an invaluable source of information. Since most areas have libraries, they can be a convenient place to look for information. Also, many libraries provide access to the Internet and email.

Libraries may have information on job openings, locally and nationally; potential contacts within occupations or industries; colleges and financial aid; vocational training; individual businesses or careers; and writing résumés. Libraries frequently have subscriptions to various trade magazines that can provide information on occupations and industries. Your local library also may have video materials. These sources often have references to organizations that can provide additional information about training and employment opportunities.

If you need help getting started or finding a resource, ask your librarian for assistance.

Internet resources. A wide variety of career information is easily accessible on the Internet. Many online resources include job listings, résumé posting services, and information on job fairs, training, and local wages. Many of the resources listed elsewhere in this section have Internet sites that include valuable information on potential careers. No single source contains all information on an occupation, field, or employer; therefore you will likely need to use a variety of sources.

When using Internet resources, be sure that the organization is a credible, established source of information on the particular occupation. Individual companies may include job listings on their Web sites, and may include information about required credentials, wages and benefits, and the job's location. Contact information, such as whom to call or where to send a résumé, is usually included.

Some sources exist primarily as a Web service. These services often have information on specific jobs, and can greatly aid in the job hunting process. Some commercial sites offer these services, as do Federal, State, and some local governments. *Career OneStop*, a joint program by the Department of Labor and the States as well as local agencies, provides these services free of charge.

Online Sources from the Department of Labor. A major portion of the U.S. Department of Labor's Labor Market Information System is the *Career OneStop* site. This site includes links to the following:

- *State job banks* allow you to search over a million job openings listed with State employment agencies.
- *America's Career InfoNet* provides data on employment growth and wages by occupation; the knowledge, skills, and abilities required by an occupation; and links to employers.
- *America's Service Locator* is a comprehensive database of career centers and information on unemployment benefits, job training, youth programs, seminars, educational opportunities, and disabled or older worker programs.

Career OneStop, along with the National Toll-Free Jobs Helpline (877-USA-JOBS) and the local One-Stop Career Centers in each State, combine to provide a wide range of workforce assistance and resources:

➤ Career OneStop. Internet: **http://www.careeronestop.org**

Use the O*NET numbers at the start of each *Handbook* statement to find more information on specific occupations:

➤ O*NET Online. Internet: **http://www.onetcenter.org**

Provided in collaboration with the U.S. Department of Education, *Career Voyages* has information on certain high-demand occupations:

➤ Career Voyages. Internet: **http://www.careervoyages.gov**

The Department of Labor's Bureau of Labor Statistics publishes a wide range of labor market information, from regional wages for specific occupations to statistics on National, State, and area employment.

➤ Bureau of Labor Statistics. Internet: **http://www.bls.gov**

While the *Handbook* discusses careers from an occupational perspective, a companion publication—*Career Guide to Industries*—discusses careers from an industry perspective. The *Career Guide* is also available at your local career center and library:

➤ *Career Guide to Industries*. Internet: **http://www.bls.gov/oco/cg**

For information on occupational wages:

➤ Wage Data. Internet: **http://www.bls.gov/bls/blswage.htm**

For information on training, workers' rights, and job listings:

➤ Employment and Training Administration.
Internet: **http://www.doleta.gov/jobseekers**

Organizations for specific groups. Some organizations provide information designed to help specific groups of people. Consult directories in your library's reference center or a career guidance office for information on additional organizations associated with specific groups.

Disabled workers:

Information on employment opportunities, transportation, and other considerations for people with a wide variety of disabilities is available from:

➤ National Organization on Disability, 888 Sixteenth St. NW., Suite 800, Washington, DC 20006. Telephone: (202) 293-5960. TTY: (202) 293-5968. Internet: **http://www.nod.org/economic**

For information on making accommodations in the work place for people with disabilities:

➤ Job Accommodation Network (JAN), P.O. Box 6080, Morgantown, WV 26506. Internet: **http://www.jan.wvu.edu**

A comprehensive Federal Web site of disability-related resources is accessible at:

➤ **http://www.disability.gov**

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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, 1901 L St. NW., 4th Floor., Washington, DC 20036. 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's Veterans Employment and Training Service or:

- Credentialing Opportunities Online (COOL), which explains how military personnel can meet civilian certification and license requirements related to their Military Occupational Specialty (MOS). Internet: **http://www.cool.army.mil**

Women:

- Department of Labor, Women's Bureau, 200 Constitution Ave. NW., Washington, DC 20210. Telephone: (800) 827-5335. Internet: **http://www.dol.gov/wb**

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: (800) 669-6820. Internet: **http://www.eeoc.gov**

Office of Personnel Management. Information on obtaining civilian positions within the Federal Government is available from the U.S. Office of Personnel Management through USAJobs, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404.

- USA Jobs: **http://www.usajobs.opm.gov**

Military. The military employs and has information on hundreds of occupations. Information is available on tuition assistance programs, which provide money for school and educational debt repayments. Information on military service can be provided by your local recruiting office. Also see the *Handbook* statement on Job Opportunities in the Armed Forces. You can find more information on careers in the military at:

- Today's Military. Internet: **http://www.todaysmilitary.com**

State Sources. Most States have career information delivery systems (CIDS), which may be found in secondary and postsecondary institutions, as well as libraries, job training sites, vocational-technical schools, and employment offices. A wide range of information is provided, from employment opportunities to unemployment insurance claims.

Whereas the *Handbook* provides information for occupations on a national level, each State has detailed information on occupations and labor markets within their respective jurisdictions. State occupational projections are available at:

- **http://www.projectionscentral.com**

Alabama
Labor Market Information Division, Alabama Department of Industrial Relations, 649 Monroe St., Room 422, Montgomery, AL 36131. Telephone: (334) 242-8859. Internet: **http://dir.alabama.gov**

Alaska
Research and Analysis Section, Department of Labor and Workforce Development, P.O. Box 25501, Juneau, AK 99802-5501. Telephone: (907) 465-4500. Internet: **http://almis.labor.state.ak.us**

Arizona
Arizona Department of Economic Security, P.O. Box 6123 SC 733A, Phoenix, AZ 85005-6123. Telephone: (602) 542-5984. Internet: **https://www.azdes.gov**

Arkansas
Labor Market Information, Department of Workforce Services, #2 Capital Mall, Little Rock, AR 72201. Telephone: (501) 682-3198. Internet: **http://www.discoverarkansas.net**

California
State of California Employment Development Department, Labor Market Information Division, P.O. Box 826880, Sacramento, CA 94280-0001. Telephone: (916) 262-2162. Internet: **http://www.labormarketinfo.edd.ca.gov**

Colorado
Labor Market Information, Colorado Department of Labor and Employment, 633 17th St., Suite 600, Denver, CO 80202-3660. Telephone: (303) 318-8850. Internet: **http://lmigateway.coworkforce.com**

Connecticut
Office of Research, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109-1114. Telephone: (860) 263-6275. Internet: **http://www.ctdol.state.ct.us/lmi**

Delaware
Office of Occupational and Labor Market Information, Department of Labor, 19 West Lea Blvd., Wilmington, DE 19802. Telephone: (302) 761-8069. Internet: **http://www.delawareworks.com/oolmi/**

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District of Columbia
DC Department of Employment Services, 64 New York Ave. NE., Suite 3000, Washington, D.C. 20002. Telephone: (202) 724-7000. Internet: **http://www.does.dc.gov/does**

Florida
Labor Market Statistics, Agency for Workforce Innovation, 107 E. Madison St., MSC 110 - Caldwell Building, Tallahassee, FL 32399-4111. Telephone: (850) 245-7105.
Internet: **http://www.labormarketinfo.com**

Georgia
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/em/get_labor_market_information.htm

Guam
Guam Department of Labor, 504 D St., Tiyan, Guam 96910. Telephone: (671) 475-0101. Internet: **http://guamdol.net**

Hawaii
Research and Statistics Office, Department of Labor and Industrial Relations, 830 Punchbowl St., Room 304, Honolulu, HI 96813. Telephone: (808) 586-9013. Internet: **http://www.hiwi.org**

Idaho
Research and Analysis Bureau, Department of Commerce and Labor, 317 West Main St., Boise, ID 83735-0670. Telephone: (208) 332-3570. Internet: **http://lmi.idaho.gov**

Illinois
Illinois Department of Employment Security, Economic Information and Analysis Division, 33 S. State St., 9th Floor, Chicago, IL 60603. Telephone: (312) 793-6521. Internet: **http://lmi.ides.state.il.us**

Indiana
Research and Analysis—Indiana Workforce Development, Indiana Government Center South, 10 North Senate Ave., Indianapolis, IN 46204. Telephone: (800) 891-6499. Internet: **http://www.in.gov/dwd**

Iowa
Policy and Information Division, Iowa Workforce Development, 1000 East Grand Ave., Des Moines, IA 50319-0209. Telephone: (515) 281-5387. Internet: **http://www.iowaworkforce.org/lmi**

Kansas
Kansas Department of Labor, Labor Market Information Services, 401 SW Topeka Blvd., Topeka, KS 66603-3182. Telephone: (785) 296-5000. Internet: **http://laborstats.dol.ks.gov**

Kentucky
Research and Statistics Branch, Office of Employment and Training, 275 East Main St., Frankfort, KY 40621. Telephone: (502) 564-7976. Internet: **http://www.workforcekentucky.ky.gov**

Louisiana
Research and Statistics Division, Department of Labor, 1001 North 23rd St., Baton Rouge, LA 70802-3338. Telephone: (225) 342-3111. Internet: **http://www.laworks.net**

Maine
Labor Market Information Services Division, Maine Department of Labor, 45 Commerce Dr., State House Station 118, Augusta, ME 04330. Telephone: (207) 623-7900. Internet: **http://maine.gov/labor/lmis**

Maryland
Maryland Department of Labor Licensing and Regulation, Office of Labor Market Analysis and Information, 1100 N. Eutaw, Baltimore, MD 21201. Telephone: (410) 767-2250.
Internet: **http://www.dllr.state.md.us/lmi/index.shtml**

Massachusetts
Executive Office of Labor and Workforce Development, Division of Career Services, 19 Staniford St., Boston, MA 02114. Telephone: (617) 626-5300. Internet: **http://www.detma.org/LMIdataprog.htm**

Michigan
Bureau of Labor Market Information and Strategic Initiatives, Department of Labor and Economic Growth, 3032 West Grand Blvd., Suite 9-100, Detroit, MI 48202. Telephone: (313) 456-3100. Internet: **http://www.milmi.org**

Minnesota
Department of Employment and Economic Development, Labor Market Information Office, 1st National Bank Building, 332 Minnesota St., Suite E200, St. Paul, MN 55101-1351. Telephone: (888) 234-1114. Internet: **http://www.deed.state.mn.us/lmi**

Mississippi
Labor Market Information Division, Mississippi Department of Employment Security, 1235 Echelon Pkwy., P.O. Box 1699, Jackson, MS 39215. Telephone: (601) 321-6000. Internet: **http://mdes.ms.gov**

Missouri
Missouri Economic Research and Information Center, P.O. Box 3150, Jefferson City, MO 65102-3150. Telephone: (866) 225-8113. Internet: **http://www.missourieconomy.org**

Montana
Research and Analysis Bureau, P.O. Box 1728, Helena, MT 59624. Telephone: (800) 541-3904.
Internet: **http://www.ourfactsyourfuture.org**

Nebraska
Nebraska Workforce Development—Labor Market Information, Nebraska Department of Labor, 550 South 16th St., P.O. Box 94600, Lincoln, NE 68509. Telephone: (402) 471-2600. Internet: **www.dol.nebraska.gov/nwd/center.cfm?PRICAT=3&SUBCAT=4Z0**

Nevada
Research and Analysis, Department of Employment Training and Rehabilitation, 500 East Third St., Carson City, NV 89713. Telephone: (775) 684-0450. Internet: **http://www.nevadaworkforce.com**

New Hampshire
Economic and Labor Market Information Bureau, New Hampshire Employment Security, 32 South Main St., Concord, NH 03301-4857. Telephone: (603) 228-4124. Internet: **http://www.nh.gov/nhes/elmi**

New Jersey
Division of Labor Market and Demographic Research, Department of Labor and Workforce Development, P.O. Box 388, Trenton, NJ 08625-0388. Telephone: (609) 984-2593. Internet: **http://www.wnjpin.net**

New Mexico
New Mexico Department of Labor , Economic Research and Analysis, 401 Broadway NE., Albuquerque, NM 87102. Telephone: (505) 222-4683. Internet: **http://www.dws.state.nm.us/dws-lmi.html**

New York
Research and Statistics, New York State Department of Labor, W. Averell Harriman State Office Campus, Building 12, Albany, NY 12240. Telephone: (518) 457-9000.
Internet: **http://www.labor.state.ny.us**

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

North Dakota
Labor Market Information Manager, Job Service North Dakota, 1000 East Divide Ave., Bismarck, ND 58506. Telephone: (800) 732-9787. Internet: **http://www.ndworkforceintelligence.com**

Ohio
Bureau of Labor Market Information, Ohio Department of Job and Family Services, 420 East 5th Ave., Columbus, OH 43219. Telephone: (614) 752-9494. Internet: **http://ohiolmi.com**

Oklahoma
Labor Market Information, Oklahoma Employment Security Commission, P.O. Box 52003., Oklahoma City, OK 73152. Telephone: (405) 557-7172. Internet:
http://www.ok.gov/oesc_web/Services/Find_Labor_Market_Statistics/index.html

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Oregon
Oregon Employment Department, Research Division, 875 Union St. NE., Salem, OR 97311. Telephone: (503) 947-1200. Internet: **http://www.qualityinfo.org/olmisj/OlmisZine**

Pennsylvania
Center for Workforce Information & Analysis, Pennsylvania Department of Labor and Industry, 220 Labor and Industry Building, Seventh and Forster Sts., Harrisburg, PA 17121. Telephone: (877) 493-3282. Internet: **http://www.paworkstats.state.pa.us**

Puerto Rico
Department of Work and Human Resources, Ave. Muñoz Rivera 505, Hato Rey, PR 00918. Telephone: (787) 754-5353.
Internet: **http://www.dtrh.gobierno.pr**

Rhode Island
Labor Market Information, Rhode Island Department of Labor and Training, 1511 Pontiac Ave., Cranston, RI 02920. Telephone: (401) 462-8740. Internet: **http://www.dlt.ri.gov/lmi**

South Carolina
Labor Market Information Department, South Carolina Employment Security Commission, 631 Hampton St., Columbia, SC 29202. Telephone: (803) 737-2660. Internet: **http://www.sces.org/lmi/index.asp**

South Dakota
Labor Market Information Center, Department of Labor, P.O. Box 4730, Aberdeen, SD 57402-4730. Telephone: (605) 626-2314. Internet: **http://dol.sd.gov/lmic**

Tennessee
Research and Statistics Division, Department of Labor and Workforce Development, 220 French Landing Dr., Nashville, TN 37245. Telephone: (615) 741-1729.
Internet: **http://www.state.tn.us/labor-wfd/lmi.htm**

Texas
Labor Market Information, Texas Workforce Commission, 9001 North IH-35, Suite 103A, Austin, TX 75753. Telephone: (866) 938-4444. Internet: **http://www.tracer2.com**

Utah
Director of Workforce Information, Utah Department of Workforce Services, P.O. Box 45249, Salt Lake City, UT 84145-0249. Telephone: (801) 526-9675. Internet: **http://jobs.utah.gov/opencms/wi**

Vermont
Economic and Labor Market Information, Vermont Department of Labor, P.O. Box 488, Montpelier, VT 05601-0488. Telephone: (802) 828-4000. Internet: **http://www.vtlmi.info**

Virgin Islands
Bureau of Labor Statistics, Department of Labor, 53A & 54AB Kronprindsens Gade, St Thomas, VI 00803-2608. Telephone: (340) 776-3700. Internet: **http://www.vidol.gov**

Virginia
Virginia Employment Commission, P.O. Box 1358, Richmond, VA 23218-1358. Telephone: (800) 828-1140.
Internet: **http://www.vec.virginia.gov/vecportal/index.cfm**

Washington
Labor Market and Economic Analysis, Washington Employment Security Department, P.O. Box 9046, Olympia, WA 98507-9046. Telephone: (360) 438-4833.
Internet: **http://www.workforceexplorer.com**

West Virginia
Workforce West Virginia, Research, Information and Analysis Division, 112 California Ave., Charleston, WV 25303-0112. Telephone: (304) 558-2660. Internet: **http://workforcewv.org/lmi**

Wisconsin
Bureau of Workforce Information, Department of Workforce Development, P.O. Box 7944, Madison, WI 53707-7944. Telephone: (608) 266-7034. Internet: **http://worknet.wisconsin.gov/worknet**

Wyoming
Research and Planning, Wyoming Department of Employment, 246 S. Center St., Casper, WY 82602. Telephone: (307) 473-3807. Internet: **http://doe.state.wy.us/lmi**

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Sources of Education, Training, and Financial Aid

Education can present opportunities for those looking to start a new career or change specialty within their current occupation. This section outlines some major sources of education and training required to enter many occupations, as well as some ways to finance that education or training.

For information on the specific training and educational requirements for a particular occupation, and what training is typically provided by an employer, consult the "Training, Other Qualifications, and Advancement" section of the appropriate *Handbook* statement.

Sources of Education and Training

Four-year colleges and universities. These institutions provide detailed information on theory and practice for a wide variety of subjects. Colleges and universities can provide students with the knowledge and background necessary to be successful in many fields. They also can help to place students in cooperative education programs (often called "co-ops") or internships. Co-ops and internships are short-term jobs with firms related to a student's field of study that lead to college credit. In co-ops and internships, students learn the specifics of a job while making valuable contacts that can lead to a permanent position.

For more information on colleges and universities, go to your local library, consult your high school guidance counselor, or contact individual colleges. Also check with your State's higher education agency. A list of these agencies is available on the Internet: **http://www.ed.gov/erod**.

Junior and community colleges. Junior and community colleges offer a variety of programs that lead to associate degrees and training certificates. Community colleges tend to be less expensive than 4-year colleges and universities. They usually are more willing to accommodate part-time students than colleges and universities, and their programs are more tailored to the needs of local employers. Many community colleges have an open admissions policy, and they often offer weekend and night classes.

Community colleges often form partnerships with local businesses that allow students to gain job-specific training. Many students may not be able to enroll in a college or university because of their academic record, limited finances, or distance from such an institution, so they attend junior or community colleges to earn credits that can be applied toward a degree at a 4-year college. Junior and community colleges also are noted for their extensive role in continuing and adult education.

For more information on junior and community colleges, go to your local library, consult your high school guidance counselor, or contact individual schools. Also check with your State's higher education agency. A list of these agencies is available on the Internet: **http://www.ed.gov/erod**.

Online colleges and universities. Online colleges and universities cover most of the same material as their traditional classroom counterparts, but they offer classes over the Internet. Offering classes on the Internet provides a great deal of flexibility to students, allowing many who work, travel frequently, or lack the ability or means to attend a traditional university to earn a degree from an accredited institution.

A prospective student should talk to a guidance counselor or advisor before deciding to enroll in an online college or university. Additionally, the prospective student should check the college or university's accreditation with the U.S. Department of Education. This can be done online at: **http://ope.ed.gov/accreditation**.

Vocational and trade schools. These institutions train people in specific trades. They offer courses designed to provide hands-on experience. Vocational and trade schools tend to concentrate on trades, services, and other types of skilled work.

Vocational and trade schools frequently engage students in real-world projects, allowing them to apply field methods while learning theory in classrooms. Graduates of vocational and trade schools have an advantage over informally trained or self-trained jobseekers because graduates have an independent organization certifying that they have the knowledge, skills, and abilities necessary to perform the duties of a particular occupation. These schools also help students to acquire any license or other credentials needed to enter the job market.

For more information on vocational and trade schools, go to your local library, consult your high school guidance counselor, or contact individual schools. Also check with your State's director of vocational-technical education. A list of State directors of vocational-technical education is available on the Internet: **http://www.ed.gov/erod**.

Apprenticeships. An apprenticeship provides work experience as well as education and training for people entering certain occupations. Apprenticeships are offered by sponsors, who employ and train the apprentice. The apprentice follows a training course under close supervision and receives some formal education to learn the theory related to the job.

Apprenticeships, which generally last between 1 and 4 years, are a way for inexperienced people to become skilled workers. Some apprenticeships allow the apprentice to earn an associate degree. An *Apprenticeship Completion Certificate* is granted to those completing programs. This certificate is administered by federally approved State agencies.

For more information on apprenticeships and for assistance finding a program, go to the Office of Apprenticeship Training, Employer, and Labor Services on the Internet: **http://www.doleta.gov/atels_bat.**

Professional societies, trade associations, and labor unions. These groups are made up of people with common interests, usually in related occupations or industries. The groups frequently

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are able to provide training, access to training through their affiliates, or information on acceptable sources of training for their field. If licensing or certification is required, they also may be able to assist you in meeting those requirements.

For a listing of professional societies, trade associations, and labor unions related to an occupation, check the "Sources of Additional Information" section at the end of that occupational statement in the *Handbook*.

Employers. Many employers provide on-the-job training, which can range from spending a few minutes watching another employee demonstrate a task to participating in formal training programs that may last for several months. In some jobs, employees may continually undergo training to stay up to date with new developments and technologies or to add new skills.

Military. The United States Armed Forces trains and employs people in more than 4,100 different occupations. For more information, see the *Handbook* statement on "Job Opportunities in The Armed Forces." For detailed answers to specific questions, contact your local recruiting office. Valuable resources also are available on the Internet: **http://www.todaysmilitary.com**.

Sources of Financial Aid

Many people fund their education or training through financial aid or tuition assistance programs. Federal student aid comes in three forms: grants, work-study programs, and loans. All Federal student aid applicants must first fill out a Free Application for Federal Student Aid (FAFSA), which provides a Student Aid Report (SAR) and eligibility rating. Forms must be submitted to desired institutions of study, which determine the amount of aid you will receive.

For information on applying for Federal financial aid, visit the FAFSA Internet site: **http://www.fafsa.ed.gov.**

A U.S. Department of Education publication describing Federal financial aid programs, called *Funding Education Beyond High School: The Guide to Federal Student Aid*, is available at **http://www.studentaid.ed.gov/students/publications/student_guide/index.html.**

Information on Federal programs is available from **http://www.studentaid.ed.gov** and **www.students.gov**.

Information on State programs is available from your State's higher education agency. A list of these agencies is available at **http://www.ed.gov/erod**.

Grants. A grant is money that is given to students or the institution they are attending to pay for the student's education or training and any associated expenses. Grants are usually given on the basis of financial need. Grants are considered gifts and are not paid back. Federal grants are almost exclusively for undergraduate students. They include Pell Grants, which can be worth up to $5,350 annually. The maximum amount given out can change each year, however. Federal Supplemental Educational Opportunity Grants (FSEOG) can be worth up to $4,000 annually. Priority for FSEOG awards is given to those who have also received the Pell Grant and have exceptional financial need.

Additional information on grants is available on the Internet: **http://www.studentaid.ed.gov**. Information also is available from your State Higher Education agency. A list of these agencies is available at **http://www.ed.gov/erod**.

Federal Work-Study program. The Federal Work-Study program is offered at most institutions and consists of Federal sponsorship of a student who works part time at the institution he or she is attending. The money a student earns through this program goes directly toward the cost of attending the institution. There are no set minimum or maximum amounts for this type of aid, although, on average, a student can expect to earn about $2,000 per school year.

For additional information on work-study opportunities offered, check with individual institutions. General information on the Federal Work-Study program is available at **http://studentaid.ed.gov/PORTALSWebApp/students/english/campusaid.jsp**.

Scholarships. A scholarship is a sum of money donated to a student to help pay for his or her education or training and any associated costs. Scholarships can range from small amounts up to the full cost of schooling. They are based on financial need, academic merit, athletic ability, or a wide variety of other criteria set by the organizations that provide the scholarships. Frequently, students must meet minimum academic requirements to be considered for a scholarship. Other qualifying requirements—such as intended major field of study, heritage, or group membership—may be added by the organization providing the scholarship.

Scholarships are provided by a wide variety of institutions, including educational institutions, State and local governments, private associations, social groups, and individuals. There are no federally awarded scholarships based on academic merit. Most large scholarships are awarded to students by the institution they plan to attend. Students who have received State scholarships and plan to attend a school in another State should check with their State to see if the scholarship can be transferred.

Information on scholarships is typically available from high school guidance counselors and local libraries. Additional scholarship information is available from State higher education agencies. A list of these agencies is available at **http://www.ed.gov/erod**. The College Board has information on available scholarships at **http://www.collegeboard.com/pay**.

Student loans. Many institutions, both public and private, provide low-interest loans to students and their parents or guardians. The Federal Government also provides several types of student loans based on the applicant's level of financial need. The amount of money a student can receive in loans varies by the distributing institution and depends on whether the student is claimed by a parent or guardian as a dependent. Since the process of applying for a loan may take several months, it is a good idea to start applying for Federal student loans well in advance.

The available Federal loan programs can accommodate prospective undergraduate, graduate, vocational, and disabled students. Federal loans can be distributed through the school that the student is attending, from the Federal Government

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directly, or from a third-party private lender or bank. Perkins loans are distributed through the school the student is attending. Loans coming from the Federal Government directly from the William D. Ford Federal Direct Loan Program are dispersed by the Department of Education. Third-party loans through a private lender or bank are from the Federal Family Education Loan (FFEL) program. For all federally funded loans, payments are made to the institution that originally dispersed the funds.

For those with financial need, Federal Perkins loans and both Direct and FFEL-subsidized Stafford loans are available. Perkins loans have no minimum amount; they are capped at $5,500 per year for undergraduates. Students should visit the Department of Education's Web site (**http://www.studentaid.ed.gov/PORTALSWebApp/students/english/fafsa.jsp**) to learn about the current level of aid available because it will vary by year and a student's status (married, single, dependent, or independent). Subsidized Stafford loans vary in size and can increase as a student completes more years of undergraduate, graduate, or professional education. Interest rates for both loans will be gradually decreasing until 2012. Information on specific interest rates is available through the school's financial aid officer or the Department of Education's Web site. Individuals who receive Perkins loans are not responsible for starting to repay the loan until they have been out of school for 9 months. Those with subsidized Stafford loans must begin payments within 6 to 9 months of leaving school but are not charged monthly interest while in school.

For those who do not demonstrate financial need, Direct and FFEL-unsubsidized Stafford Loans and Federal Parent Loans for Students (PLUS) are available. Unsubsidized Stafford loans vary in value and are capped at the cost of attendance. With Federal unsubsidized Stafford Loans, interest payments start almost immediately and can be paid monthly or accrued until the completion of studies. The latter option results in a larger total loan cost but may be more convenient for some students. With PLUS loans, the parent must pay interest and principal payments while the student is enrolled in school and must continue payments after completion. Check with your lender for available repayment schedules. Students usually have 10 years to repay Perkins loans and from 10 to 30 years for unsubsidized Stafford loans.

Subsidized and unsubsidized Stafford loans are only available to students who are enrolled in an academic program at least half time. As with any loan, be sure to investigate different lenders, and understand what your loan contract requires of you before agreeing to any loan. Check with established financial institutions to compare the terms of available private student loans. Comparisons of the various types of loans are available on the Internet: **http://www.studentaid.ed.gov/students/publications/student_guide/index.html**. The College Board has information on available loans at **http://www.collegeboard.com/pay**.

Employer tuition support programs. Some employers offer tuition assistance programs as part of their employee benefits package. The terms of these programs depend on the firm and can vary by the type and amount of training subsidized, as well as by eligibility requirements. Consult your human resources department for information on tuition support programs offered by your employer.

Military tuition support programs. The United States Armed Forces offer various tuition assistance and loan repayment programs for military personnel. See the *Handbook* statement on "Job Opportunities in the Armed Forces" for more information, or go to **http://www.todaysmilitary.com/benefits/tuition-support**.

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Finding and Applying for Jobs and Evaluating Offers

Finding—and getting—the job you want can be a challenging process, but knowing more about job search methods and application techniques can increase your chances of success. And knowing how to judge the job offers you receive makes it more likely that you will end up with the best possible job.

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 resources
Professional associations
Labor unions
State employment service offices
Federal Government
Community agencies
Private employment agencies and career consultants
Internships

Job search methods

Finding a job can take months of time and effort. But you can speed the process by using many methods to find job openings. Data from the Bureau of Labor Statistics suggest that people who use many job search methods find jobs faster than people who use only one or two.

In the box above, some sources of job openings are listed. Those sources are described more fully below.

Personal contacts. Many jobs are never advertised. People get them by talking to friends, family, neighbors, acquaintances, teachers, former coworkers, and others who know of an opening. Be sure to tell people that you are looking for a job because the people you know may be some of the most effective resources for your search. To develop new contacts, join student, community, or professional organizations.

School career planning and placement offices. High school and college placement services help their students and alumni find jobs. Some invite recruiters to use their facilities for interviews or career fairs. They also may have lists of open jobs. Most also offer career counseling, career testing, and job search advice. Some have career resource libraries; host workshops on job search strategy, resume writing, letter writing, and effective interviewing; critique drafts of resumes; conduct mock interviews; and sponsor job fairs.

Employers. Directly contacting employers is one of the most successful means of job hunting. Through library and Internet research, develop a list of potential employers in your desired career field. Then call these employers and check their Web sites for job openings. Web sites and business directories can tell you how to apply for a position or whom to contact. Even if no open positions are posted, do not hesitate to contact the employer: You never know when a job might become available. Consider asking for an informational interview with people working in the career you want to learn more about. Ask them how they got started, what they like and dislike about the work, what type of qualifications are necessary for the job, and what type of personality succeeds in that position. In addition to giving you career information, they may be able to put you in contact with other employers who may be hiring, and they can keep you in mind if a position opens up.

Classified ads. The "Help Wanted" ads in newspapers and the Internet list numerous jobs, and many people find work by responding to these ads. But when using classified ads, keep the following in mind:

- Follow all leads to find a job; do not rely solely on the classifieds.
- 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.
- Keep a record of all ads to which you have responded, including the specific skills, educational background, and personal qualifications required for the position. You may want to follow up on your initial inquiry.

Internet resources. The Internet includes many job hunting Web sites with job listings. Some job boards provide National listings of all kinds; others are local. Some relate to a specific type of work; others are general. To find good prospects, begin with an Internet search using keywords related to the job you want. Also look for the Web sites of related professional associations.

Also consider checking Internet forums, also called message boards. These are online discussion groups where anyone may post and read messages. Use forums specific to your profession or to career-related topics to post questions or messages and to read about the job searches or career experiences of other people. Although these message boards may seem helpful, carefully evaluate all advice before acting; it can be difficult to determine the reliability of information posted on message boards.

In online job databases, remember that job listings may be posted by field or discipline, so begin your search using keywords. Many Web sites allow job seekers to post their resumes online for free.

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

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

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 job seekers 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 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.

Services for special groups. By law, veterans are entitled to priority 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 also refer people to opportunities available under the Workforce Investment Act (WIA) of 1998. Educational and career services and referrals are provided to employers and job seekers, including adults, dislocated workers, and youth. 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.

Federal Government. Information on obtaining a position with the Federal Government is available from the U.S. Office of Personnel Management (OPM) through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.gov** or through an interactive voice response telephone system at (703) 724-1850, (866) 204-2858, or TDD (978) 461-8404. These numbers are not all toll free, and telephone charges may result.

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.

Private employment agencies and career consultants. Private agencies can save you time and they will contact employers who otherwise might be difficult to locate. Such agencies may be called recruiters, head hunters, or employment placement agencies. These agencies may charge for their services. Most operate on a commission basis, charging a percentage of the first-year 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. When determining if the service is worth the cost, consider any guarantees that the agency offers.

Internships. Many people find jobs with business and organizations with whom they have interned or volunteered. Look for internships and volunteer opportunities on job boards, school career centers, and company and association Web sites, but also check community service organizations and volunteer opportunity databases. Some internships and long-term volunteer positions come with stipends and all provide experience and the chance to meet employers and other good networking contacts.

Applying for a job

After you have found some jobs that interest you, the next step is to apply for them. Many potential employers require complete resumes or application forms and cover letters. Later, you will probably need to go on interviews to meet with employers face to face.

Resumes and application forms. Resumes and application forms give employers written evidence of your qualifications and skills. The goal of these documents is to prove—as clearly and directly as possible—how your qualifications match the job's requirements. Do this by highlighting the experience, accomplishments, education, and skills that most closely fit the job you want.

Gathering information. Resumes and application forms both include the same information. As a first step, gather the following facts:

- Contact information, including your name, mailing address, e-mail address (if you have one you check often), and telephone number.
- Type of work or specific job you are seeking or a qualifications summary, which describes your best skills and experience in just a few lines.
- Education, including school name and its city and State, months and years of attendance, highest grade completed or diploma or degree awarded, and major subject or subjects studied. Also consider listing courses and awards that might be relevant to the position. Include a grade point average if you think it would help in getting the job.
- 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 and major accomplishments. In a resume, use phrases instead of sentences to describe your work; write, for example, "Supervised 10 children" instead of writing "I supervised 10 children."
- Special skills. You might list computer skills, proficiency in foreign languages, achievements, or membership in organizations in a separate section.
- References. Be ready to provide references if requested. Good references could be former employers, coworkers, or teachers or anyone else who can describe your abilities and job-related traits. You will be asked to provide contact information for the people you choose.

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Throughout the application or resume, focus on accomplishments that relate most closely to the job you want. You can even use the job announcement as a guide, using some of the same words and phrases to describe your work and education.

Look for concrete examples that show your skills. When describing your work experience, for instance, you might say that you increased sales by 10 percent, finished a task in half the usual time, or received three letters of appreciation from customers.

Choosing a format. After gathering the information you want to present, the next step is to put it in the proper format. In an application form, the format is set. Just fill in the blanks. But make sure you fill it out completely and follow all instructions. Do not omit any requested information. Consider making a copy of the form before filling it out, in case you make a mistake and have to start over. If possible, have someone else look over the form before submitting it.

In a resume, there are several acceptable ways of organizing the information you want to include. It is common to place the most important information first. One format is to list the applicant's past jobs in reverse chronological order, describing the most recent employment first and working backward. But some applicants use a functional format, organizing their work experience under headings that describe their major skills. They then include a brief work history section that lists only job titles, employers, and dates of employment. Still other applicants choose a format that combines these two approaches in some way. Choose the style that best showcases your skills and experience. Examples of resume formats can be found on the Web sites of career centers, job boards, and State employment services.

Whatever format you choose, keep your resume short. Many experts recommend that new workers use a one-page resume. Avoid long blocks of text and italicized material. Consider using bullets to highlight duties or key accomplishments.

Before submitting your resume, make sure that it is easy to read. Are the headings clear and consistently formatted with bold or some other style of type? Is the type face large enough? Much like application forms, it is useful to ask someone to proofread your resume for spelling and other errors. In addition, use your computer's spell checker.

Keep in mind that some employers scan resumes into databases, which they then search for specific keywords or phrases. The keywords are usually nouns referring to experience, education, personal characteristics, or industry buzz words. Identify keywords by reading the job description and qualifications in the job ad; use these same words in your resume. For example, if the job description includes customer service tasks, use the words "customer service" on your resume. Scanners sometimes misread paper resumes, which could mean some of your keywords don't get into the database. So, if you know that your resume will be scanned, and you have the option, e-mail an electronic version. If you must submit a paper resume, make it scannable by using a simple font and avoiding underlines, italics, and graphics. It is also a good idea to send a traditionally formatted resume along with your scannable resume, with a note on each marking its purpose.

Cover letters. When sending a resume, most people include a cover letter to introduce themselves to the prospective employer. Most cover letters are no more than three short paragraphs. Your cover letter should capture the employer's attention, follow a business letter format, and usually should include the following information:

- Name and address of the specific person to whom the letter is addressed.
- Reason for your interest in the company or position.
- Your main qualifications for the position.
- Request for an interview.
- Your home and work telephone numbers.

If you send a scannable resume, you should also include a scannable cover letter, which avoids graphics, fancy fonts, italics, and underlines.

As with your resume, it may be helpful to look for examples and common formats of cover letters on the Internet or in books at your local library or bookstore, but do not copy letters directly from other sources.

Interviewing. An interview gives you the opportunity to showcase your qualifications to an employer, so it pays to be well prepared. 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.
Be ready to briefly describe your experience, showing how it relates it the job.
Be ready to answer broad questions, such as "Why should I hire you?" "Why do you want this job?" "What are your strengths and weaknesses?"
Practice an interview with a friend or relative.

Personal appearance:

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

The interview:

Be early.
Learn the name of your interviewer and greet him or her with a firm handshake.
Use good manners with everyone you meet.
Relax and answer each question concisely.
Use proper English—avoid slang.
Be cooperative and enthusiastic.
Use body language to show interest—use eye contact and don't slouch.
Ask questions about the position and the organization, but avoid questions whose answers can easily be found on the company Web site.
Also avoid asking questions about salary and benefits unless a job offer is made.
Thank the interviewer when you leave and shake hands.
Send a short thank you note following the interview.

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Information to bring to an interview:

Social Security card.

Government-issued identification (driver's license).

Resume or application. Although not all employers require 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.

Transcripts. Employers may require an official copy of transcripts to verify grades, coursework, dates of attendance, and highest grade completed or degree awarded.

Evaluating a job offer

Once you receive a job offer, you must decide if you want the job. Fortunately, most organizations will give you a few days to accept or reject an offer.

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? Now is the time to ask the potential employer about these issues—and to do some checking on your own.

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 Web 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 either in print or as online databases include:

- *Dun & Bradstreet's Million Dollar Directory*
- *Standard and Poor's Register of Corporations*
- *Mergent's Industry Review* (formerly *Moody's Industrial Manual)*
- *Thomas Register of American Manufacturers*
- *Ward's 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, or by using one of the Internet's search engines. 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 *Career Guide to Industries*, online at **http://www.bls.gov/oco/cg**.) 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.

During your research consider the following questions:

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.

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.

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. Consider the following questions:

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.

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How important is the job to the company or organization?

An explanation of where you fit in the organization and how you are supposed to contribute to its overall goals should give you an idea of the job's importance.

What will the hours be?

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.

Some companies develop training plans for their employees. 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. When an employer makes a job offer, information about earnings and benefits are usually included. You will want to research to determine if the offer is fair. If you choose to negotiate for higher pay and better benefits, objective research will help you strengthen your case.

You may have to go to several sources for information. One of the best places to start is the information from the Bureau of Labor Statistics. 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**.

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/eci**.

You should also look for additional information, specifically tailored to your job offer and circumstances. 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 may be unable to 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.

For more information

To learn more about finding and applying for jobs, visit your local library and career center. You can find career centers that are part of the U.S. Department of Labor One-Stop Career system by calling toll free (877) 348-0502 or visiting their Web site at **http://www.careeronestop.org**.

The *Occupational Outlook Quarterly*, a career magazine published by the Bureau of Labor Statistics, is one of the resources available at many libraries and career centers. The magazine includes many articles about finding, applying for, and choosing jobs. See, for example:

➤ "Career myths and how to debunk them," online at **http://www.bls.gov/opub/ooq/2005/fall/art01.pdf**.

➤ "Getting back to work: Returning to the labor force after an absence," online at **http://www.bls.gov/opub/ooq/2004/winter/art03.pdf**.

➤ "Job search in the age of the Internet: Six job seekers in search of employers," online at **http://www.bls.gov/opub/ooq/2003/summer/art01.pdf**.

➤ "Internships: Previewing a profession," online at **http://www.bls.gov/opub/ooq/2006/summer/art02.pdf**.

➤ "Resumes, applications, and cover letters," online at **http://www.bls.gov/opub/ooq/2009/summer/art03.pdf**.

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Occupational Information Included in the *Handbook*

The *Occupational Outlook Handbook* is a career guidance resource that provides information on hundreds of occupations that provide the overwhelming majority of jobs in the United States. Each occupation is presented in its own chapter, or "statement," that discusses the type of work performed, the work environment, the education and training requirements, the possibilities for advancement, job outlook, and the typical earnings. Each statement is presented in a standard format, making it easy to compare occupations.

Because the *Handbook* covers so many occupations, it is best used as a reference, and is not meant to be read from cover to cover. Readers can navigate the *Handbook* by browsing the table of contents, in which similar occupations are grouped in clusters, or the reader can look at the index to find specific occupations.

About the Occupational Information Network

The Occupational Information Network (O*NET) is 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. At the end of each detailed occupational statement, the *Handbook* provides the Internet address of the online version of the statement. This online version provides links to O*NET information related to the particular occupation.

You can use O*NET to search for occupations that match your skills, or you may search by keyword or O*NET code. For each occupation, O*NET reports information about different aspects of the job, including tasks performed, knowledge, skills, abilities, and work activities. It also lists interests, work styles, such as independence, and work values, such as achievement, that are well suited to the occupation. O*NET ranks and scores the descriptors in each category by their importance to the occupation.

The *Handbook* chapter on "Occupational Information Network Coverage" cross-references O*NET codes to occupations covered in the *Handbook*. You can access O*NET on the Internet at **http://www.online.onetcenter.org**.

Sections of Occupational Statements

Significant Points

This section highlights key occupational characteristics discussed in the statement.

Nature of the Work

This section describes the typical tasks and responsibilities of workers in the occupation, including what tools and equipment they use and how closely they are supervised. The statement on fire fighting occupations, for example, gives a detailed account of the responsibilities of a fire fighter, which include operating the fire hose, providing emergency medical care, and cleaning and maintaining equipment. Some statements mention common alternative job titles or occupational specialties. The statement on accountants and auditors, for example, discusses several specialties, including public accountants, management accountants, and internal auditors.

The *Handbook* is revised every 2 years. This section may be revised 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 scientists and database administrators. Another reason for revision is a change in technology that affects the way in which a job is performed. The Internet, for example, 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 new government regulations. An example is paralegals and legal assistants, who increasingly are being used by law firms in order to lower costs and increase the efficiency of legal services.

Work environment. This subsection describes the workplace, the level of physical activity expected, and typical hours of workers in the occupation. It may also describe opportunities for part-time work, the extent of travel required, any special equipment that is used, and the risk of injury that workers may face.

In some occupations, people work regular business hours—40 hours a week, Monday through Friday. However, many establishments like restaurants, stores, and hospitals are open evenings, weekends, and in some cases 24 hours a day, seven days a week. The work settings can range from indoors at a comfortable desk to outdoors in every kind of weather. For example, radiologic technologists and technicians may use protective clothing or equipment, some construction laborers do physically demanding work, truck drivers might be susceptible to injury on the road, and paramedics have high job-related stress.

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 the Bureau of Labor Statistics (BLS).

Economists in BLS consult many sources before making changes to the nature of the work section, or any other section, of a *Handbook* statement. Usual sources include articles from newspapers, magazines, and professional journals, as well as the Web sites of professional associations, unions, and trade groups. Information found on the Internet or in periodicals is

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verified through interviews with individuals employed in the occupation, professional associations, unions, and others with occupational knowledge, such as university professors and career counselors.

Training, Other qualifications, and Advancement

After gathering your initial impressions of what a job is all about, it is important to understand how to prepare for it. The training, other qualifications, and advancement section explains typical paths to entry and advancement in each occupation.

Education and training. This subsection describes the most significant sources of education and training, the type education or training preferred by employers, and the typical length of training. Some common forms of education and training include a high school diploma, informal on-the-job training, previous work experience, formal training (including internships), and various postsecondary awards and degrees. The type of education or training required for each occupation in the *Handbook* varies, and two seemingly similar occupations can have very different requirements. For example, respiratory therapists typically need an associate degree for entry-level employment while occupational therapists typically need a master's degree or higher for entry-level employment.

Licensure. Some States regulate the practice of certain occupations, typically through licensure. This subsection discusses the number of States that regulate a given occupation and some of the typical requirements for such licenses. The requirements for licensure vary according to State law. Some common requirements for licensure are some minimum level of education, passage of an occupation-specific examination that demonstrates competency, and continuing education credits to maintain valid licensure. Examples of occupations that may require State licensure include child care workers, cosmetologists, electricians, occupational therapists, architects, and lawyers.

Credentialing is discussed in this subsection when it is a mandatory requirement for an occupation, much like licensure. For example, accountants who file reports with the Securities and Exchange Commission are required by law to be a Certified Public Accountant (CPA). A number of occupations have voluntary credentialing, often offered by professional organizations. If credentialing is voluntary, it may be addressed in this subsection or under the other qualifications or advancement subsections. When voluntary credentialing is relevant, the statement typically includes information on the type of credential, the credentialing organization, and some typical requirements for credentialing.

Other qualifications. Any additional qualifications that are not included in the previous subsections, such as the desirable skills, aptitudes, and personal characteristics that employers look for would be discussed in this section. For example, meeting and convention planners must have excellent interpersonal and organizational skills, the ability to work under pressure, and must pay attention to detail. 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. This subsection may also include information about voluntary, entry-level credentialing.

Advancement. This subsection details possible advancement opportunities after gaining experience in an occupation. Advancement can come in several forms, including advancement within the occupation, such as promotion to a management position; advancement into other occupations, such as leaving a job as a lawyer to become a judge; and advancement to self-employment, such as an automotive technician opening his or her own repair shop.

Certain types of certification can also serve as a form of advancement. Voluntary certification often demonstrates a level of competency to employers, and can result in more responsibility, higher pay, or a new job. Radiologic technologists may, for example, become specialists in magnetic resonance imaging (MRI) with voluntary certification.

Information in the training, other qualifications, and advancement section comes from personal interviews with individuals employed in the occupation, Web sites, published training materials, and interviews with the organizations that grant degrees, certifications, or licenses, or are otherwise associated with the occupation.

Employment

This section reports the number of jobs that the occupation provided in 2008, the key industries in which those jobs were found, and, if significant, the number or proportion of self-employed workers in the occupation.

The source of estimated employment in a particular occupation in the *Handbook* is the Bureau's National Employment Matrix, which presents current and projected employment for 276 industries and 750 occupations over the 2008–2018 period. Data in the matrix come primarily from the establishment-based Occupational Employment Statistics (OES) Survey, which reports employment of wage and salary workers for each occupation in every industry except agriculture and private households. The household-based Current Population Survey (CPS) provides input for matrix data on the number of self-employed and unpaid family workers in each occupation. The matrix also incorporates CPS data on total employment—wage and salary, self-employed, and unpaid family workers—in the agriculture and private household industries.

The estimate of total employment in each *Handbook* occupation thus combines data from several different sources. Furthermore, some *Handbook* occupations combine several matrix occupations. For these reasons, employment numbers cited in the *Handbook* may differ from employment data provided by OES, CPS, and other employment surveys.

When significant, the geographic distribution of jobs is mentioned, reflecting CPS data. On the basis of OES survey data, some *Handbook* statements, such as textile, apparel, and furnishings occupations, list States that employ substantial numbers of workers in the occupation.

Job Outlook

In planning for the future, it is important to consider potential job growth and job opportunities. This section describes the factors that affect employment growth or decline, and in some

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instances, describes the relationship between the number of job seekers and the number of job openings.

Employment change. This subsection reflects the occupational projections in the National Employment Matrix. Each occupation is assigned a descriptive phrase based on its projected percent change in employment over the 2008–2018 period. This phrase describes the occupation's projected employment change relative to the projected average employment change for all occupations combined. (These phrases are listed at the end of this chapter.)

Many factors are examined in projecting the employment change for each occupation. One such factor is changes in technology. New technology can either create new job opportunities or eliminate jobs by making an occupation 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 that influences employment trends is demographic change. By affecting the services demanded, demographic change can influence occupational growth or decline. For example, an aging population will demand more healthcare services, leading to occupational growth in healthcare occupations.

Another factor affecting job growth or decline is changes in business practices, such as restructuring businesses or outsourcing (contracting out) work. Corporate restructuring has made many organizations "flatter," resulting in fewer middle management positions. Also, 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. Jobs in some occupations, such as computer programmers and customer service representatives, have been "offshored"—moved to lower-wage foreign countries.

The substitution of one product or service for another can also affect employment projections. For example, consumption of plastic products has grown as they have been substituted for metal goods in 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 affect on employment. Often, foreign manufacturers can produce goods more cheaply than they can be produced in the United States, and the cost savings can be passed on in the form of lower prices with which U.S. manufacturers cannot compete. Increased international competition is a major reason for the decline in employment among textile, apparel, and furnishings workers.

Another factor is job growth or decline in key industries. If an occupation is concentrated in an industry that is growing rapidly, it is likely that that occupation will grow rapidly as well. For example, the growing need for business expertise is fueling demand for consulting services. This is expected to cause rapid growth in the management, scientific, and technical consulting services industry, which, in turn, will lead to rapid growth in the employment of management analysts.

Job prospects. In some cases, the *Handbook* mentions that an occupation is likely to provide numerous job openings or, in others, that an occupation likely will have relatively few openings. This information reflects the projected change in employment, as well as replacement needs. Large occupations in which workers frequently enter and leave, 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 job seekers and the number of job openings. Job opportunities are affected by several factors, including the creation of new jobs, the number of people who apply for jobs, and the number of people who leave the occupation. In some occupations, there is a rough balance between job seekers 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. (These phrases used to describe the relationship between job seekers and job opportunities appear at the end of this section.) Variation in job opportunities by industry, educational attainment, size of firm, or geographic location also may be discussed. Even in crowded occupations, job openings do exist. Good students or highly qualified individuals should not be deterred from undertaking training for, or seeking entry into, those occupations.

Employment projections table. The employment projections table lists employment statistics from the National Employment Matrix. It includes 2008 employment, projected 2018 employment, and the 2008–2018 change in employment in both numerical and percent forms. Current and projected employment and the numerical change in employment are rounded to the nearest hundred, and the percent change in employment is rounded to the nearest whole number. Numerical and percent changes are calculated using non-rounded 2008 and 2018 employment figures, and then are rounded for presentation in the employment projections table.

Earnings

This section discusses typical earnings and how workers are compensated—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 2008 OES-survey wage estimates 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 2009 data from the U.S. Office of Personnel Management. The National Association of Colleges and Employers supplies information on average salary offers in 2009 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

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insurance, and sick leave might not be mentioned, because they are widespread. In some occupational statements, the absence of these traditional benefits is pointed out. 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 child care, 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.

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 wage estimates from the OES survey, and some include data from outside sources. OES data may be used to compare wages among occupations; outside data, however, may not be used in this manner, because characteristics of these data vary widely.

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, toll free 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 chapters, "Sources of Career Information" and "Sources of Education, Training, and Financial Aid."

Abbreviated occupational statements

At the end of some major occupational groups—office and administrative support occupations, for example—the *Handbook* includes selected occupational statements under headings such as "other office and administrative support occupations" or "other professional and related occupations." These statements provide the same career guidance information as the more-detailed occupational statements, but in an abbreviated format.

Key phrases in the *Handbook*

This box explains how to interpret key phrases used to describe projected changes in employment. Also explained are the terms used to describe the relationship between the number of job openings and the number of job seekers. 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 2008 and 2018

If the statement reads:	Employment is projected to:
Grow much faster than average	Increase 20 percent or more
Grow faster than average	Increase 14 to 19 percent
Grow about as fast as average	Increase 7 to 13 percent
Grow more slowly than average	Increase 3 to 6 percent
Little or no change	Decrease 2 percent to increase 2 percent
Decline slowly or moderately	Decrease 3 to 9 percent
Decline rapidly	Decrease 10 percent or more

Opportunities and competition for jobs

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

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Management, Business, and Financial Occupations

Management Occupations

Administrative Services Managers

Significant Points

- Applicants for the limited number of higher-level management jobs will face keen competition; less severe competition is expected for lower-level management jobs.
- Administrative services managers work throughout private industry and government and have a wide range of responsibilities, experience, earnings, and education.
- Like other managers, administrative services managers should be analytical, detail-oriented, flexible, decisive, and have good leadership and communication skills.

Nature of the Work

Administrative services managers plan, coordinate, and direct a broad range of services that allow organizations to operate efficiently. They might, for example, coordinate space allocation, facilities maintenance and operations, and major property and equipment procurement. They also may oversee centralized operations that meet the needs of multiple departments, such as information and data processing, mail, materials scheduling and distribution, printing and reproduction, records management, telecommunications management, security, recycling, wellness, and transportation services. Administrative services managers also ensure that contracts, insurance requirements, and government regulations and safety standards are followed and up to date. They may examine energy consumption patterns, technology usage, and personal property needs to plan for their long-term maintenance, modernization, and replacement.

Specific duties for these managers vary by size of company or office and degree of responsibility and authority. In small organizations, a single administrative services manager, sometimes called an *office manager*, may oversee all support services. (See the statement on office and administrative support worker supervisors and managers elsewhere in the *Handbook*.) In larger ones, however, there may be several layers of administrative services managers that may specialize in different areas and report to directors of administration, or vice presidents of administration who oversee all administrative services.

The nature of these managerial jobs varies as significantly as the range of administrative services required by organizations. For example, administrative services managers who work as *contract administrators* oversee the preparation, analysis, negotiation, and review of contracts related to the purchase or sale of equipment, materials, supplies, products, or services. Other administrative services managers handle the acquisition, distribution, and storage of equipment and supplies, while others oversee the disposal of surplus or unclaimed property.

Administrative services managers who work as *facility managers* plan, design, and manage buildings, grounds, equipment, and supplies. Increasingly, they develop and implement plans that incorporate energy efficiency into a facility's operations and structures. These tasks require integrating the principles of business administration, information technology, architecture, and engineering. 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, facility function, technology integration, 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



Administrative services managers review plans and contracts to ensure smooth implementation.

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may oversee renovation projects to improve efficiency or ensure that facilities meet government regulations and environmental, health, and security standards. For example, they may influence building renovation projects by recommending energy-saving alternatives or production efficiencies that reduce waste. Additionally, facility managers continually monitor the facility to ensure that it remains safe, secure, and well-maintained. Often, facility managers are responsible for directing staff, including maintenance, grounds, and custodial workers.

Work environment. Administrative services managers spend much of their day in an office, but site visits around the building, outdoors to supervise groundskeeping activities, or to other facilities under their management are common. If overseeing a construction project, travel to the construction site is typical. Technology allows many facility managers to monitor equipment remotely and teleconferencing has reduced the need to travel as frequently to meet with off-site staff and vendors.

About half of administrative services managers work a standard 40-hour week; most of the remaining workforce work longer hours. 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 nonworking hours.

Training, Other Qualifications, and Advancement

Education and experience requirements for these managers vary widely, depending on the size and complexity of the organization. In small organizations, experience may be the only requirement. In large organizations, however, administrative services managers may need a bachelor's degree and appropriate experience.

Education and training. Specific education and training requirements vary by job responsibility. Office mangers in smaller operations or lower-level administrative services managers with fewer responsibilities may only need a high school diploma combined with appropriate experience, but an associate degree is increasingly preferred.

In larger companies with multiple locations, equipment, and technologies to coordinate, higher-level administrative services managers need at least a bachelor's degree. Managers of highly complex services, such as contract, insurance, and regulatory compliance, generally need at least a bachelor's degree in business administration, human resources, accounting, or finance. Lower-level managers may also need a bachelor's degree, but related postsecondary technical training may also be substituted for managers of printing, security, communications, or information technology. Those involved in building management should take a drafting class. Regardless of major, courses in office technology, accounting, computer applications, human resources, and business law are highly recommended.

Most facility managers have an undergraduate or graduate degree in engineering, architecture, construction management, business administration, or facility management. Many also have backgrounds in real estate, construction, or interior design, in addition to managerial experience. Whatever the educational background, it must be accompanied by related work experience reflecting managerial and leadership abilities. Many administrative services managers obtained their experience by specializing in one area at first, then augmenting their qualifications by acquiring work experience in other specialties before assuming managerial duties.

Managers of property acquisition and disposal need experience in purchasing and sales, and knowledge of the variety of supplies, machinery, and equipment used by the organization. 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.

Other qualifications. Persons interested in becoming administrative services managers should have good leadership and 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 be able to coordinate several activities at once, quickly analyze and resolve specific problems, and cope with deadlines.

Certification and advancement. Most administrative services managers in small organizations advance by moving to other management positions or to larger organizations. The Association of Professional Office Managers offers online training geared towards small businesses that indicate a level of professionalism and commitment to office management.

Advancement is easier in large firms that employ several levels and types of administrative services managers. A master's degree in business administration or a related field can enhance a manager's opportunities to advance to higher-level positions, such as director of administrative services. Some experienced managers may join or establish a management consulting firm to provide administrative management services to other companies on a contract basis.

Advancement of facility managers is based on the practices and size of individual companies. Some facility managers transfer among departments within an 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 the Certified Facility Manager (CFM) designation, applicants must meet certain educational and experience requirements. People entering the profession also may obtain the Facility Management Professional (FMP) credential, a stepping stone to the CFM.

Employment

Administrative services managers held about 259,400 jobs in 2008. They are found in all industries, but several industries have a greater share of these managers than others. They are the education services industry with 15 percent, the health care industry with 12 percent, State and local government with 12 percent, and finance and insurance with 9 percent.

Job Outlook

The number of jobs is projected to grow about as fast as average. Applicants for the limited number of higher-level management jobs will face keen competition; less severe competition is

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Administrative services managers	11-3011	259,400	291,700	32,300	12

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

expected for lower-level management jobs. Demand should be strong for facility managers.

Employment change. Employment of administrative services managers is projected to grow by 12 percent over the 2008-18 decade, about as fast as the average for all occupations. Continued downsizing by companies and increasing use of office technology may result in a more streamlined organizational structure with fewer levels of management, reducing the need for some positions. Demand should be strong for facility managers because businesses increasingly realize the importance of maintaining, securing, and efficiently operating their facilities. Cost-cutting measures to improve profitability, streamline operations, and compete globally will continue to be addressed by many organizations, resulting in more firms outsourcing facility management services or hiring qualified facility managers who are capable of achieving these goals in-house.

Administrative services managers employed in management services and management consulting should grow as companies increasingly look to outside specialists to handle a myriad of administrative tasks that have become increasingly complex and expensive. Administrative services managers specializing in contract administration will also be in demand as outsourcing of administrative tasks becomes increasingly prevalent for activities such as food and janitorial services, space planning and design, energy, telecommunications, and grounds and equipment maintenance and repair. Other areas that administrative services managers will increasingly plan and coordinate include information technology, data and personal security, records management, wellness, and energy conservation.

Job prospects. Applicants will face keen competition for the limited number of higher-level administrative services management jobs; competition should be less severe for lower-level management jobs. Job prospects will also be better for those who can manage a wide range of responsibilities, than for those who specialize in particular functions. In addition to the new administrative services management jobs due to growth in the occupation, many job openings will stem from the need to replace workers who transfer to other jobs, retire, or leave the occupation for other reasons.

Job opportunities may vary from year to year because the strength of the economy affects demand for administrative services managers. Industries least likely to be affected by economic fluctuations tend to be the most stable places for employment.

Earnings

Wages of administrative services managers vary greatly depending on the employer, the specialty, and the geographic area. In general, however, median annual wages of salaried administrative services managers in May 2008 were $73,520. The middle 50 percent earned between $52,240 and $98,980. The lowest 10 percent earned less than $37,430, and the highest 10 percent earned more than $129,770. Median annual wages in the industries employing the largest numbers of these managers were:

Management of companies and enterprises $85,980
General medical and surgical hospitals 77,870
Local government 74,860
Colleges, universities, and professional schools 72,460
State government 65,690

In the Federal Government, industrial specialists averaged $82,169 a year in March 2009. Corresponding averages were $78,995 for facility operations services managers, $79,457 for industrial property managers, $70,386 for property disposal specialists, $78,562 for administrative officers, and $71,049 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:

	Page
Cost estimators	100
Office and administrative support worker supervisors and managers	594
Property, real estate, and community association managers	76
Purchasing managers, buyers, and purchasing agents	79
Top executives	83

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**

For information on training and classes for professional office management personnel, contact:

➤ Association of Professional Office Managers, P. O. Box 1926, Rockville, MD 20849. Internet: **http://www.apomonline.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos002.htm**

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

Significant Points

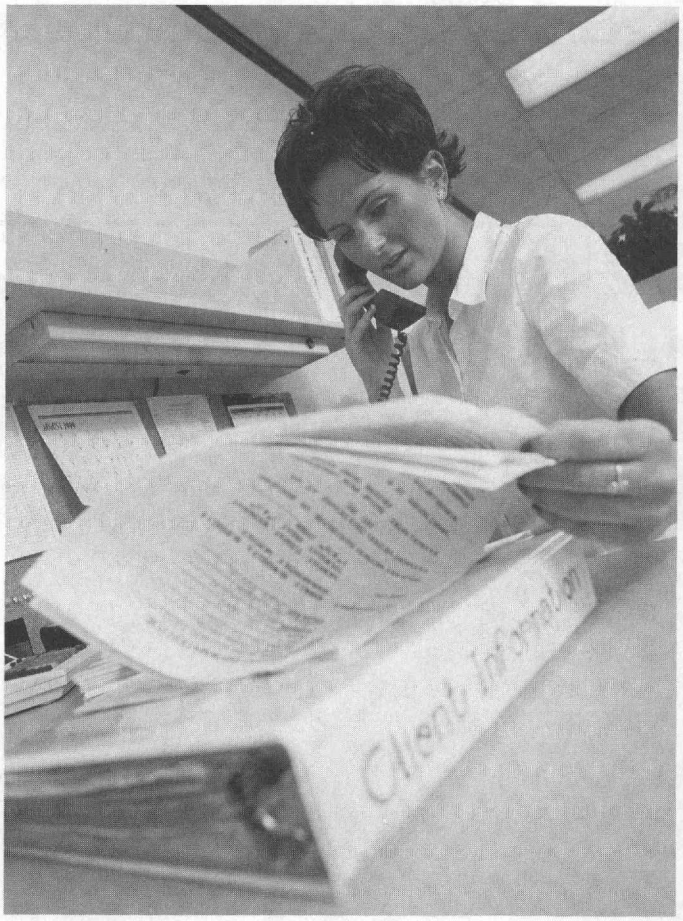
- Keen competition is expected for these highly coveted jobs.
- College graduates with related experience, a high level of creativity, and strong communication and computer skills should have the best job opportunities.
- High earnings, substantial travel, and long hours, including evenings and weekends, are common.
- Because of the importance and high visibility of their jobs, these managers often are prime candidates for advancement to the highest ranks.

Nature of the Work

Advertising, marketing, promotions, public relations, and sales managers coordinate their companies' market research, marketing strategy, sales, advertising, promotion, pricing, product development, and public relations activities. 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, marketing, promotions, sales, and public relations policies. (Executive vice presidents are included in the *Handbook* statement on top executives.)

Advertising managers. Advertising managers direct a firm's or group's advertising and promotional campaign. They can be found in advertising agencies that put together advertising campaigns for clients, in media firms that sell advertising space or time, and in companies that advertise heavily. They work with sales staff and others to generate ideas for the campaign, oversee a creative staff that develops the advertising, and work with the finance department to prepare a budget and cost estimates for the campaign. Often, these managers serve as liaisons between the firm requiring the advertising and an advertising or promotion agency that actually develops and places the ads. In larger firms with an extensive advertising department, different advertising managers may oversee in-house accounts and creative and media services departments. The *account executive* manages account services departments in companies and assesses the need for advertising. In advertising agencies, account executives maintain the accounts of clients whereas 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 medium—for example, radio, television, newspapers, magazines, the Internet, or outdoor signs—that will disseminate the advertising.

Marketing managers. Marketing managers work with advertising and promotion managers to promote the firm's or organization's products and services. With the help of lower level managers, including *product development managers* and *market research managers*, marketing managers estimate the demand for products and services offered by the firm and its competitors and identify potential markets for the firm's products. Marketing managers also develop pricing strategies to help firms maximize profits and market share while ensuring that the firms' 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 they oversee product development.



Advertising, marketing, promotions, public relations, and sales managers often serve as liaisons between the firm requiring the advertising and an advertising or promotion agency that develops and places the ads.

Promotions managers. Promotions managers direct promotions programs that combine advertising with purchasing incentives to increase sales. Often, the programs are executed through the use of direct mail, inserts in newspapers, Internet advertisements, in-store displays, product endorsements, or other special events. Purchasing incentives may include discounts, samples, gifts, rebates, coupons, sweepstakes, and contests.

Public relations managers. Public relations managers plan and direct public relations programs designed to create and maintain a favorable public image for the employer or client. For example, they might write press releases or sponsor corporate events to help maintain and improve the image and identity of the company or client. They also help to clarify the organization's point of view to their main constituency. They observe social, economic, and political trends that might ultimately affect the firm, and they make recommendations to enhance the firm's image on the basis of those trends. Public relations managers

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often specialize in a specific area, such as crisis management, or in a specific industry, such as healthcare.

In large organizations, public relations managers may supervise a staff of public relations specialists. (See the *Handbook* statement on public relations specialists.) They also work with advertising and marketing staffs to make sure that the advertising campaigns are compatible with the image the company or client is trying to portray. In addition, public relations managers may handle internal company communications, such as company newsletters, and may help financial managers produce company reports. They may assist company executives in drafting speeches, arranging interviews, and maintaining other forms of public contact; oversee company archives; and respond to requests for information. Some of these managers handle special events as well, such as the sponsorship of races, parties introducing new products, or other activities that the firm supports in order to gain public attention through the press without advertising directly.

Sales managers. Sales managers direct the distribution of the product or service to the customer. They assign sales territories, set sales goals, and establish training programs for the organization's sales representatives. (See the *Handbook* statement on sales representatives, wholesale and manufacturing). Sales 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, and analyze sales statistics gathered by their staffs to determine sales potential and inventory requirements and to monitor customers' preferences. Such information is vital in the development of products and the maximization of profits.

Work environment. Advertising, marketing, promotions, public relations, and sales managers work in offices close to those of top managers. Working under pressure is unavoidable when schedules change and problems arise, but deadlines and goals still must be met.

Substantial travel may be required in order to meet with customers and consult with others in the industry. Sales managers travel to national, regional, and local offices and to the offices of 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.

Long hours, including evenings and weekends are common. In 2008, over 80 percent of advertising, marketing, promotions, public relations, and sales managers worked 40 hours or more a week.

Training, Other Qualifications, and Advancement

A wide range of educational backgrounds is suitable for entry into advertising, marketing, promotions, public relations, and sales manager jobs, but many employers prefer college graduates with experience in related occupations.

Education and training. For marketing, sales, and promotions management positions, employers often prefer a bachelor's or master's degree in business administration with an emphasis on marketing. Courses in business law, management, economics, accounting, finance, mathematics, and statistics are advantageous. In addition, the completion of an internship while the candidate is in school is highly recommended. 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 relevant course of study might include classes in marketing, consumer behavior, market research, sales, communication methods and technology, visual arts, art history, and photography.

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.

Most advertising, marketing, promotions, public relations, and sales management positions are filled through promotions of 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, in which the number of positions is limited, advancement to a management position usually comes slowly. In large firms, promotion may occur more quickly.

Other qualifications. Computer skills are necessary for recordkeeping and data management, and the ability to work in an Internet environment is becoming increasingly vital as more marketing, product promotion, and advertising is done through the Internet. Also, the ability to communicate in a foreign language may open up employment opportunities in many rapidly growing areas around the country, especially cities with large Spanish-speaking populations.

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.

Certification and advancement. Some associations offer certification programs for these managers. Certification—an indication of competence and achievement—is particularly important in a competitive job market. Although relatively few advertising, marketing, promotions, public relations, and sales managers currently are certified, the number of managers who seek certification is expected to grow. Today, there are numerous management certification programs based on education and job performance. In addition, the Public Relations Society of America offers a certification program for public relations practitioners that is based on years of experience and performance on an examination.

Although experience, ability, and leadership are emphasized for promotion, advancement can be accelerated by participation in management training programs conducted by larger firms. Many firms also provide their employees with continuing

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education opportunities—either in-house or at local colleges and universities—and encourage employee participation in seminars and conferences, often held 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; product promotion; marketing communication; market research; organizational communication; and data-processing systems, procedures, and management. Many firms pay all or part of the cost for employees who complete courses.

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, and successful managers may be promoted to higher positions in their own or another firm; some become top executives. Managers with extensive experience and sufficient capital may open their own businesses.

Employment

Advertising, marketing, promotions, public relations, and sales managers held about 623,800 jobs in 2008. The following tabulation shows the distribution of jobs by occupational specialty:

Sales managers	346,900
Marketing managers	175,600
Public relations managers	56,700
Advertising and promotions managers	44,600

These managers were found in virtually every industry. Sales managers held about 56 percent of the jobs; about 62 percent of sales managers were employed in wholesale trade, retail trade, manufacturing, and the finance and insurance industries. Marketing managers held approximately 28 percent of the jobs; the professional, scientific, and technical services, and the finance and insurance industries employed around 32 percent of marketing managers. About 27 percent of advertising and promotions managers worked in the professional, scientific, and technical services industries and wholesale trade. Around 48 percent of public relations managers were employed in service-providing industries, such as professional, scientific, and technical services; public and private educational services; finance and insurance; and healthcare and social assistance.

Job Outlook

Employment is projected to grow about as fast as average. As with most managerial jobs, keen competition is expected for these highly coveted positions.

Employment change. Overall employment of advertising, marketing, promotions, public relations, and sales managers is expected to increase by 13 percent through 2018. Job growth will be spurred by competition for a growing number of goods and services, both foreign and domestic, and the need to make one's product or service stand out in the crowd. In addition, as the influence of traditional advertising in newspapers, radio, and network television wanes, marketing professionals are being asked to develop new and different ways to advertise and promote products and services to better reach potential customers.

Sales and marketing managers and their departments constitute some of the most important personnel in an organization and are less subject to downsizing or outsourcing than are other types of managers, except in the case of companies that are consolidating. Employment of these managers, therefore, will vary primarily on the basis of the growth or contraction in the industries that employ them. For example, if, as is expected, the number of automobile dealers declines over the next decade, these major employers of sales managers will need fewer of them. Employment of marketing managers will grow 12 percent between 2008 and 2018, and that of sales managers will grow 15 percent over the same period.

Advertising and promotions managers are expected to experience little or no change in employment from 2008 to 2018. Despite large declines in the number of advertising managers in recent years, due mainly to the sharp reduction in the number of advertising agencies and newspaper and periodical publishers, which employ the greatest numbers of these managers, advertising and promotions managers are not expected to experience similar declines in the future. Because advertising is the primary source of revenue for most media, advertising departments are less affected in a downturn. An expected increase in the number of television and radio stations and a sharp increase in the amount of advertising in digital media, such as the Internet and wireless devices will generate a need for advertising managers to oversee new and innovative advertising programs. A number of these advertising managers will be self-employed.

Public relations managers are expected to see an increase in employment of 13 percent between 2008 and 2018, as organizations increasingly emphasize community outreach and

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Advertising, marketing, promotions, public relations, and sales managers	11-2000	623,800	704,100	80,300	13
Advertising and promotions managers	11-2011	44,600	43,900	-800	-2
Marketing and sales managers	11-2020	522,400	596,200	73,700	14
Marketing managers	11-2021	175,600	197,500	21,900	12
Sales managers	11-2022	346,900	398,700	51,800	15
Public relations managers	11-2031	56,700	64,100	7,300	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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customer relations as a way to enhance their reputation and visibility. Especially among the growing number of nonprofit organizations, such as education services, business and professional associations, and hospitals, where many of these workers are employed, public relations managers will be charged with promoting the mission of the organization and encouraging membership or use of the organization's services.

Job prospects. Most job openings for this occupation will be due to the need to replace workers who leave the occupation or retire. However, advertising, marketing, promotions, public relations, and sales manager jobs are highly coveted and are often 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 and computer skills should have the best job opportunities. In particular, employers will seek those who have the skills to conduct new types of advertising, marketing, promotions, public relations, and sales campaigns involving new media, particularly the Internet.

Earnings

Median annual wages in May 2008 were $80,220 for advertising and promotions managers, $108,580 for marketing managers, $97,260 for sales managers, and $89,430 for public relations managers.

Median annual wages of advertising and promotions managers in May 2008 in the advertising, public relations, and related services industry were $105,960.

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

Computer systems design and related services	$127,870
Management of companies and enterprises	115,650
Management, scientific, and technical consulting services	111,130
Insurance carriers	103,210
Depository credit intermediation	98,510

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

Professional and commercial equipment and supplies merchant wholesalers	$125,130
Wholesale, electronic markets, and agents and brokers	114,670
Automobile dealers	107,500
Management of companies and enterprises	106,980
Department stores	54,560

Wages vary substantially, depending upon the employee's level of managerial responsibility, length of service, and education; the size and location of the firm; and the industry in which the firm operates. For example, manufacturing firms usually pay these managers higher salaries than 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.

According to a survey by the National Association of Colleges and Employers, starting salaries for marketing majors graduating in 2009 averaged $43,325.

Related Occupations

Advertising, marketing, promotions, public relations, and sales managers direct the sale of products and services offered by their firms and communicate information about their firm's activities. Other workers involved with advertising, marketing, promotions, public relations, and sales include the following:

	Page
Actors, producers, and directors	318
Advertising sales agents	527
Artists and related workers	301
Authors, writers and editors	333
Demonstrators and product promoters	532
Market and survey researchers	212
Models	537
Public relations specialists	350
Sales representatives, wholesale and manufacturing	547

Sources of Additional Information

For information about careers in advertising management, contact:

➤ American Association of Advertising Agencies, 405 Lexington Ave., 18th Floor, 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 Maiden Lane, 11th Floor, New York, NY 10038-5150. Internet: **http://www.prsa.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos020.htm**

Computer and Information Systems Managers

Significant Points

- Employment is expected to grow faster than the average for all occupations.
- A bachelor's degree in a computer-related field usually is required for management positions, although employers often prefer a graduate degree, especially an MBA with technology as a core component.
- Many managers possess advanced technical knowledge gained from working in a computer occupation.
- Job prospects should be excellent.

Nature of the Work

In the modern workplace, it is imperative that Information Technology (IT) works both effectively and reliably. *Computer and information systems managers* play a vital role in the implementation and administration of technology within their organizations. They plan, coordinate, and direct research on the computer-related activities of firms. In consultation with other

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managers, they help determine the goals of an organization and then implement technology to meet those goals. They oversee all technical aspect of an organization, such as software development, network security, and Internet operations.

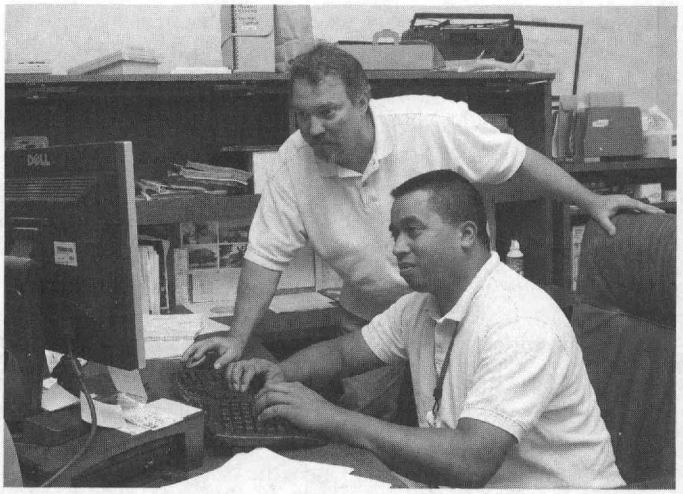
Computer and information systems managers direct the work of other IT professionals, such as computer software engineers and computer programmers, computer systems analysts, and computer support specialists (information on these occupations can be found elsewhere in the *Handbook*). They plan and coordinate activities such as installing and upgrading hardware and software, programming and systems design, the implementation of computer networks, and the development of Internet and intranet sites. They are increasingly involved with the upkeep, maintenance, and security of networks. They analyze the computer and information needs of their organizations 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 to ensure that the organization remains competitive.

Computer and information systems managers can have additional duties, depending on their role within an organization. *Chief technology officers (CTOs)*, for example, evaluate the newest and most innovative technologies and determine how these can help their organizations. They develop technical standards, deploy technology, and supervise workers who deal with the daily information technology issues of the firm. When a useful new tool has been identified, the CTO determines one or more possible implementation strategies, including cost-benefit and return on investment analyses, and presents those strategies to top management, such as the *chief information officer* (CIO). (Chief information officers are covered in a separate *Handbook* section on top executives.)

Management information systems (MIS) directors or *information technology (IT) directors* manage computing resources for their organizations. They often work under the chief information officer and plan and direct the work of subordinate information technology employees. These managers ensure the availability, continuity, and security of data and information technology services in their organizations. In this capacity, they oversee a variety of technical departments, develop and monitor performance standards, and implement new projects.

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

Work environment. Computer and information systems managers generally work in clean, comfortable offices. Long hours are common, and some may have to work evenings and weekends to meet deadlines or solve unexpected problems; in 2008, about 25 percent worked more than 50 hours per week. Some computer and information systems managers may experience considerable pressure in meeting technical goals with short deadlines or tight budgets. As networks continue to expand and more work is done remotely, computer and information systems managers have to communicate with and oversee offsite employees using laptops, e-mail, and the Internet.



Computer and information systems managers oversee a variety of workers, including systems analysts, support specialists, and software engineers.

Injuries in this occupation are uncommon, but like other workers who spend considerable time using computers, computer and information systems managers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Training, Other Qualifications, and Advancement

Computer and information systems managers generally have technical expertise from working in a computer occupation, as well as an understanding of business and management principles. A strong educational background and experience in a variety of technical fields is needed.

Education and training. A bachelor's degree in a computer-related field usually is required for management positions, although employers often prefer a graduate degree, especially an MBA with technology as a core component. Common majors for undergraduate degrees are computer science, information science, or management information systems (MIS).

A bachelor's degree in a computer-related field generally takes 4 years to complete, and includes courses in computer science, computer programming, computer engineering, mathematics, and statistics. Most also include general education courses such as English and communications. MIS programs usually are part of the business school or college, and contain courses such as finance, marketing, accounting, and management, as well as systems design, networking, database management, and systems security.

MBA programs usually require 2 years of study beyond the undergraduate degree, and, like undergraduate business programs, include courses on finance, marketing, accounting, and management, as well as database management, electronic business, and systems management and design.

A few computer and information systems managers attain their positions with only an associate or trade school degree, but they must have sufficient experience and must have acquired additional skills on the job. To aid their professional advancement, many managers with an associate degree eventually earn a bachelor's or master's degree while working.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Computer and information systems managers	11-3021	293,000	342,500	49,500	17

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

Certification and other qualifications. Computer and information systems managers need a broad range of skills. Employers look for individuals who can demonstrate an understanding of the specific software or technology used on the job. Generally, this knowledge is gained through years of experience working with that particular product. Another way to demonstrate this trait is with professional certification. Although not required for most computer and information system management positions, certification demonstrates an area of expertise, and can increase an applicant's chances of employment. These high-level certifications are often product-specific, and are generally administered by software or hardware companies rather than independent organizations.

Computer and information systems managers also need a thorough understanding of business practices. Because information technology is a central component of many organizations, these workers often must make important business decisions. Consequently, many firms seek managers with a background in business management, consulting, or sales. These workers also must possess good leadership and communication skills, as one of their main duties is to assign work and monitor employee performance. They also must be able to explain technical subjects to people without technical expertise, such as clients or managers of other departments.

Advancement. Computer and information systems managers may advance to progressively higher leadership positions in an information technology department. A project manager, for instance, might be promoted to the chief technology officer position and then to chief information officer. On occasion, some may become managers in non-technical areas such as marketing, human resources, or sales because in high technology firms an understanding of technical issues is helpful in those areas.

Employment

Computer and information systems managers held about 293,000 jobs in 2008. About 16 percent worked in the computer systems design and related services industry. This industry provides IT services on a contract basis, including custom computer programming services; computer systems design and integration services; and computer facilities management services. Other large employers include insurance and financial firms, government agencies, business management organizations, and manufacturers.

Job Outlook

Faster than average employment growth is expected, and job prospects should be excellent.

Employment change. Employment of computer and information systems managers is expected to grow 17 percent over the 2008-18 decade, which is faster than the average for all occupations. New applications of technology in the workplace will continue to drive demand for workers, fueling the need for more managers. To remain competitive, firms will continue to install sophisticated computer networks and set up more complex intranets and websites. They will need to adopt the most efficient software and systems and troubleshoot problems when they occur. Computer and information systems managers will be needed to oversee these functions.

Because so much business is carried out over computer networks, security will continue to be an important issue for businesses and other organizations, and will lead to strong growth for computer managers. Firms will increasingly hire security experts to fill key leadership roles in their information technology departments because the integrity of their computing environments is of utmost importance.

The growth of computer and information systems managers should be closely related to the growth of the occupations they supervise. For information on these occupations, see the *Handbook* sections on computer software engineers and computer programmers; computer systems analysts; computer network, systems, and database administrators; computer scientists; and computer support specialists.

Among computer and information systems managers, job growth is expected to be the fastest in computer systems design establishments; software publishing firms; data processing and hosting companies; management, scientific, and technical consulting services; and healthcare organizations. Increased consolidation of IT services may reduce growth to some extent in other industries.

Job prospects. Prospects for qualified computer and information systems managers should be excellent. Workers with specialized technical knowledge and strong communications and business skills, as well as those with an MBA with a concentration in information systems, will have the best prospects. Job openings will be the result of employment growth and the need to replace workers who transfer to other occupations or leave the labor force.

Earnings

Wages of computer and information systems managers vary by specialty and level of responsibility. Median annual wages of these managers in May 2008 were $112,210. The middle 50 percent earned between $88,240 and $141,890. Median annual wages in the industries employing the largest numbers of computer and information systems managers in May 2008 were as follows:

Software publishers	$126,840
Computer systems design and related services	118,120
Management of companies and enterprises	115,150
Depository credit intermediation	113,380
Insurance carriers	109,810

In addition to salaries, computer and information systems managers, especially those at higher levels, often receive employment-related benefits, such as expense accounts, stock-option plans, and bonuses.

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Related Occupations

Other occupations that manage workers, deal with information technology, or make business or technical decisions include:

	Page
Advertising, marketing, promotions, public relations, and sales managers	32
Computer network, systems, and database administrators	128
Computer scientists	132
Computer software engineers and computer programmers	134
Computer support specialists	138
Computer systems analysts	140
Engineering and natural sciences managers	46
Financial managers	52
Marketing managers	32
Top executives	83

Sources of Additional Information

Additional information on a career in information technology is available from the following organizations:

➤ Association for Computing Machinery (ACM), 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: **http://www.computingcareers.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW., Suite 700 Washington, DC 20036-4910. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: **http://www.cs.washington.edu/WhyCSE**

➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: **http://www.ncwit.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos258.htm**

Construction Managers

Significant Points

- About 61 percent of construction managers are self-employed.
- Jobseekers who combine construction work experience with a bachelor's degree in a construction-related field should enjoy the best prospects.
- Certification, although not required, is increasingly important for construction managers.

Nature of the Work

Construction managers plan, direct, coordinate, and budget a wide variety of construction projects, including the building of all types of residential, commercial, and industrial structures, roads, bridges, wastewater treatment plants, and schools and hospitals. Construction managers may supervise an entire project or just part of one. They schedule and coordinate all design and construction processes, including the selection, hiring, and oversight of specialty trade contractors, such as carpentry, plumbing, or electrical, but they usually do not do any actual construction of the structure.

Construction managers are salaried or self-employed managers who oversee construction supervisors and personnel. They are often called *project managers, constructors, construction superintendents, project engineers, construction supervisors,* or *general contractors*. Construction managers may be owners or salaried employees of a construction management or contracting firm, or they may work under contract or as a salaried employee of the property owner, developer, or contracting firm managing the construction project.

These managers coordinate and supervise the construction process from the conceptual development stage through final construction, making sure that the project gets completed on time and within budget. They often work with owners, engineers, architects, and others who are involved in the process. Given the designs for buildings, roads, bridges, or other projects, construction managers supervise the planning, scheduling, and implementation of those designs.

Large construction projects, such as an office building or an industrial complex, are often too complicated for one person to manage. Accordingly, these projects are divided into various segments: site preparation, including clearing and excavation of the land, installing sewage systems, and landscaping and road construction; building construction, including laying foundations and erecting the structural framework, floors, walls, and roofs; and building systems, including protecting against fire and installing electrical, plumbing, air-conditioning, and heating systems. Construction managers may be in charge of one or several of these activities.

Construction managers determine the best way to get materials to the building site and the most cost-effective plan and schedule for completing the project. They divide all required construction site activities into logical steps, estimating and budgeting the time required to meet established deadlines. Doing this may require sophisticated scheduling and cost-estimating techniques using computers with specialized software. (See the section on cost estimators elsewhere in the *Handbook.*)

Construction managers also manage the selection of general contractors and trade contractors to complete specific phases of the project—which could include everything from structural metalworking and plumbing, to painting, to installing electricity and carpeting. Construction managers determine the labor requirements of the project 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, occasionally through construction su-

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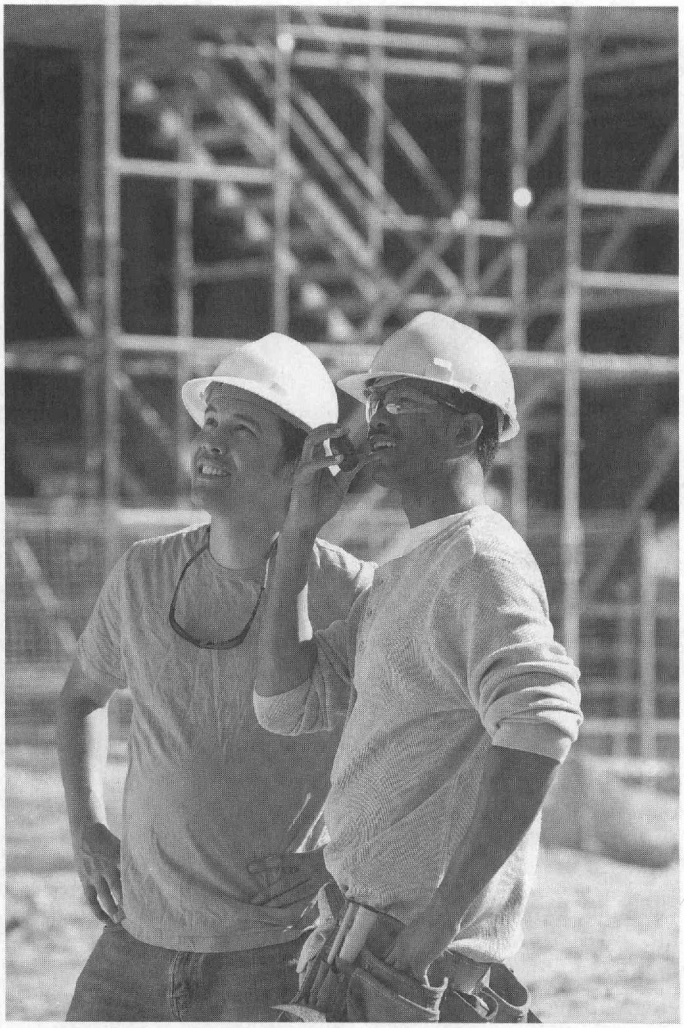

Construction managers direct and monitor the progress of construction activities, occasionally through construction supervisors or other construction managers.

pervisors or other construction managers. They are responsible for obtaining all necessary permits and licenses and, depending upon the contractual arrangements, for directing or monitoring compliance with building and safety codes, other regulations, and requirements set by the project's insurers. They also oversee the delivery and use of materials, tools, and equipment; worker safety and productivity; and the quality of the construction.

Work environment. Working out of a main office or out of a field office at the construction site, construction managers monitor the overall construction project. Decisions regarding daily construction activities generally are made at the jobsite. Managers might travel considerably when the construction site is not close to their main office or when they are responsible for activities at two or more sites. Management of overseas construction projects usually entails temporary residence in the country in which the project is being carried out.

Often on call 24 hours a day, construction managers deal with delays, such as the effects of bad weather, or emergencies at the jobsite. More than one-third worked a standard 40-hour week in 2008, and some construction projects continue around the clock. Construction managers may need to work this type of schedule for days or weeks to meet special project deadlines, especially if there are delays.

Although the work usually is not inherently dangerous, injuries can occur and construction managers must be careful while performing onsite services.

Training, Other Qualifications, and Advancement

Employers increasingly are hiring construction managers with a bachelor's degree in a construction-related field, although it is also possible for construction workers to become construction managers after many years of experience. Construction managers must understand contracts, plans, specifications, and regulations. Certification, although not required, is increasingly important.

Education and training. For construction manager jobs, a bachelor's degree in construction science, construction management, building science, or civil engineering, plus work experience, is becoming the norm. However, years of experience, in addition to taking classes in the field or getting an associate's degree, can substitute for a bachelor's degree. Practical construction experience is very important for entering this occupation, whether earned through an internship, a cooperative education program, a job in the construction trades, or another job in the industry. Some people 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. However, as construction processes become increasingly complex, employers are placing more importance on specialized education after high school.

More than 100 colleges and universities offer bachelor's degree programs in construction science, building 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.

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 construction management or construction science to work in the construction industry. Some construction managers obtain a master's degree in business administration or finance to further their career prospects.

A number of 2-year colleges throughout the country offer construction management or construction technology programs.

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Many individuals also attend training and educational programs sponsored by industry associations, often in collaboration with postsecondary institutions.

Other qualifications. 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 events or delays. The ability to manage several major activities at once, while analyzing and resolving specific problems, is essential, as is an understanding of engineering, architectural, and other construction drawings. Familiarity with computers and software programs for job costing, online collaboration, scheduling, and estimating also is important.

Good oral and written communication skills are important as well, 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. The ability to converse fluently in Spanish is increasingly becoming an asset, because Spanish is the first language of many workers in the construction industry.

Certification and advancement. There is a growing movement toward certification of construction managers. Although certification is not required to work in the construction industry, it can be valuable because it provides evidence of competence and experience. Both the American Institute of Constructors and the Construction Management Association of America have established voluntary certification programs for construction managers. Requirements combine written examinations with verification of education and professional experience. The American Institute of Constructors awards the Associate Constructor (AC) and Certified Professional Constructor (CPC) designations to candidates who meet its requirements and pass the appropriate construction examinations. The Construction Management Association of America awards the Certified Construction Manager (CCM) designation to workers who have the required experience and who pass a technical examination. Applicants for this designation also must complete a self-study course that covers the professional role of a construction manager, legal issues, the allocation of risk, and other topics related to construction management.

Advancement opportunities for construction managers vary with the individual's performance and the size and type of company for which the person works. 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 firms.

Employment

Construction managers held 551,000 jobs in 2008. About 61 percent were self-employed, many as owners of general or specialty trade construction firms. Most salaried construction managers were employed in the construction industry—11 percent by specialty trade contractor businesses (for example, plumbing, heating, air-conditioning, and electrical contractors), 10 percent in nonresidential building construction, and 7 percent in residential building construction. Others were employed by architectural, engineering, and related services firms.

Job Outlook

Faster than average employment growth is expected. Jobseekers who combine construction work experience with a bachelor's degree in a construction-related field should enjoy the best prospects.

Employment change. Employment of construction managers is projected to increase by 17 percent during the 2008–18 decade, faster than average for all occupations. Construction managers will be needed as the level and variety of construction activity expands, but at a slower rate than in the past. Modest population and business growth will result in new and renovated construction of residential dwellings, office buildings, retail outlets, hospitals, schools, restaurants, and other structures that require construction managers. A growing emphasis on making buildings more energy efficient should create additional jobs for construction managers involved in retrofitting buildings. In addition, the need to replace portions of the Nation's infrastructure, such as roads, bridges, and water and sewer pipes, along with the need to increase energy supply lines, will further increase demand for construction managers.

The increasing complexity of construction projects requires specialized management-level personnel within the construction industry. Sophisticated technology; the proliferation of laws setting standards for buildings and construction materials, worker safety, energy efficiency, and environmental protection; and the potential for adverse litigation have complicated the construction process. In addition, advances in building materials, technology, and construction methods requires continual learning and expertise.

Job prospects. Prospects should be best for people who have a bachelor's or higher degree in construction science, construction management, or civil engineering, plus practical work experience in construction. A strong background in building technology is beneficial as well. Construction managers also will have many opportunities to start their own firms.

In addition to job openings arising from employment growth, many openings should result annually from the need to replace workers who transfer to other occupations or leave the labor force for other reasons. A number of seasoned managers are

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Construction managers	11-9021	551,000	645,800	94,800	17

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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expected to retire over the next decade, resulting in a number of job openings.

Employment of construction managers, like that of many other construction workers, is sensitive to the fluctuations of the economy. On the one hand, workers in these trades may experience periods of unemployment when the overall level of construction falls. On the other hand, shortages of these workers may occur in some areas during peak periods of building activity.

Earnings

Wages of salaried construction managers and self-employed independent construction contractors vary with the size and nature of the construction project, its geographic location, and economic conditions. In addition to receiving typical benefits, many salaried construction managers earn bonuses and are allowed the use of company motor vehicles.

Median annual wages of salaried construction managers in May 2008 were $79,860. The middle 50 percent earned between $60,650 and $107,140. The lowest paid 10 percent earned less than $47,000, and the highest paid 10 percent earned more than $145,920. Median annual wages in the industries employing the largest numbers of construction managers were as follows:

Building equipment contractors	$81,590
Nonresidential building construction	79,950
Other specialty trade contractors	78,410
Foundation, structure, and building exterior contractors	76,880
Residential building construction	74,770

The earnings of self-employed workers are not included in these numbers.

According to a July 2009 salary survey by the National Association of Colleges and Employers, people with a bachelor's degree in construction science or construction management received job offers averaging $53,199 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 the following:

	Page
Architects, except landscape and naval	151
Civil engineers	161
Cost estimators	100
Engineering and natural sciences managers	46
Landscape architects	154

Sources of Additional Information

For information about constructor certification, contact:

➤ American Institute of Constructors, P.O. Box 26334, Alexandria, VA 22314. Internet: **http://www.aicnet.org**

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

➤ Construction Management Association of America, 7926 Jones Branch Dr., Suite 800, McLean, VA 22102. Internet: **http://www.cmaanet.org**

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

➤ American Council for Construction Education, 1717 North Loop 1604 E, Suite 320, San Antonio, TX 78232. Internet: **http://www.acce-hq.org**

➤ National Center for Construction Education and Research, 3600 NW. 43rd St., Building G, Gainesville, FL 32606. Internet: **http://www.nccer.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos005.htm**

Education Administrators

Significant Points

- Many jobs require a master's or doctoral degree and experience in a related occupation, such as teaching or admissions counseling.
- Strong interpersonal and communication skills are essential because much of an administrator's job involves working and collaborating with others.
- Excellent opportunities are expected for most jobs.

Nature of the Work

Successful operation of an educational institution requires competent administrators. *Education administrators* provide instructional leadership and manage the day-to-day activities in schools, preschools, day care 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 required to achieve them. They also supervise managers, support staff, teachers, counselors, librarians, coaches, and other employees. They develop academic programs, monitor students' educational progress, train and motivate teachers and other staff, manage career counseling and other student services, administer recordkeeping, prepare budgets, and perform many other duties. They also handle relations with parents, prospective and current students, employers, and the community. In a smaller organization such as a small day care 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.

Educational administrators who manage elementary, middle, and secondary schools are called *principals*. They set the academic tone and work actively with teachers to develop and maintain high curriculum standards, formulate mission statements, and establish performance goals and objectives. Principals confer with staff to advise, explain, or answer procedural questions. They hire and evaluate teachers and other staff. They

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visit classrooms, observe teaching methods, review instructional objectives, and examine learning materials. Principals must use clear, objective guidelines for teacher appraisals, because principals' pay often is based on performance ratings.

Principals also meet with other administrators and students, parents, and representatives of community organizations. Decisionmaking authority increasingly has shifted from school district central offices to individual schools. School principals have greater flexibility in setting school policies and goals, but when making administrative decisions, they must pay attention to the concerns of parents, teachers, and other members of the community.

Principals also are responsible for preparing budgets and reports on various subjects, such as finances, attendance and student performance. 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 ensure that students meet national, State, and local academic standards. Many principals develop partnerships with local businesses and school-to-work transition programs for students. Principals must be sensitive to the needs of a rising number of non-English-speaking students and a culturally diverse student body. In some areas, growing enrollments are a cause for concern, because they lead to overcrowding at many schools. When addressing problems of inadequate resources, administrators serve as advocates for the building of new schools or the repair of existing ones. During the 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 make sure that the school has adequate staff for the upcoming school year.

Schools continue to be involved with students' emotional welfare as well as their academic achievement. As a result, principals face responsibilities outside of academics. For example, many schools have a large number of students from single-parent families, families in which both parents work outside the home or students who are teenage parents. To support these students and their families, some schools have established before- and after-school child care 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.

Assistant principals aid the principal in the overall administration of the school. Some assistant principals hold the position for only a few years, during which time they prepare for advancement to principal; others are assistant principals throughout their careers. They are primarily responsible for scheduling student classes and ordering textbooks and supplies. They also coordinate transportation, custodial, cafeteria, and other support services. They usually handle student discipline and attendance problems, social and recreational programs, and matters of health and safety. In addition, they may counsel students on personal, educational, or vocational matters. With the advent of site-based management, assistant principals play a greater role in academic planning by helping to develop new curricula, 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 with the number of students.

Administrators in school district central offices oversee public schools under their jurisdiction. This group of administrators 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 curricula and teaching techniques and to develop programs and strategies to improve them. (Instructional coordinators are covered elsewhere in the *Handbook*.) Some administrators may oversee career counseling programs. Others may administer testing that measures students' abilities and helps to place them in appropriate classes. Some may direct programs such as school psychology, athletics, curriculum and instruction, and professional development. With site-based management, administrators have transferred the primary responsibility for many of these programs to the principals, assistant principals, teachers, instructional coordinators, and other staff in the schools.

In preschools and child care centers, which are usually much smaller than other educational institutions, the *director* or *supervisor* of the school or center often serves as the sole administrator. The director's or supervisor's job is similar to that of other school administrators in that he or she oversees the school's daily activities and operation, hires and develops staff, and ensures that the school meets required regulations and educational standards.

In colleges and universities, *provosts*, also known as *chief academic officers*, assist presidents, make faculty appointments and tenure decisions, develop budgets, and establish academic



Education administrators manage the day-to-day activities in schools, preschools, day care centers, and colleges and universities.

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policies and programs. With the assistance of *academic deans* and *deans of faculty*, provosts also direct and coordinate the activities of deans of individual colleges and chairpersons of academic departments. Fundraising is the chief responsibility of the *director of development* and also is becoming an essential part of the job for all administrators.

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 exercises, 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 college catalogs, schedules, and other information on the Internet, knowledge of online resources, imaging, and other computer skills is important. *Athletic directors* plan and direct intramural and intercollegiate athletic activities, overseeing the publicity for athletic events, preparing budgets, and supervising coaches. Other increasingly important administrators direct public relations, distance learning, and technology.

Work environment. 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 duties include disciplining students, may find working with difficult students challenging. They also are increasingly being held accountable for their schools meeting State and Federal guidelines for student performance and teacher qualifications.

About 35 percent of education administrators worked more than 40 hours a week in 2008; they often supervise school activities at night and on weekends. Most administrators work year round, although some work only during the academic year.

Training, Other Qualifications, and Advancement

Most education administrators begin their careers as teachers and prepare for advancement into education administration by completing a master's or doctoral degree. Because of the diversity of duties and levels of responsibility, educational backgrounds and experience vary considerably among these workers.

Education and training. 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 administrative jobs at either the school or district level in positions such as department head, curriculum specialist, or subject matter advisor.

In most public schools, principals, assistant principals, and school district administrators need a master's degree in education administration or educational leadership. Some principals and central office administrators have a doctorate or specialized degree in education administration. In private schools, some principals and assistant principals hold only a bachelor's degree, but the majority of principals have a master's or doctoral degree.

Educational requirements for administrators of preschools and child care centers vary with the setting of the program and the State of employment. Administrators who oversee preschool programs in public schools often are required to have at least a bachelor's degree. Child care directors who supervise private programs typically are not required to have a degree; however, most States require a preschool education credential, which often includes some postsecondary coursework.

College and university academic deans and chairpersons usually advance from professorships in their departments, for which they need a master's or doctoral degree; further education is not typically necessary. 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 leadership, and college student affairs are offered in many colleges and universities. 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. The National Council for Accreditation of Teacher Education (NCATE) and the Educational Leadership Constituent Council (ELCC) accredit programs designed for elementary and secondary school administrators. Although completion of an accredited program is not required, it may assist in fulfilling licensure requirements.

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Licensure and certification. Most States require principals to be licensed as school administrators. License requirements vary by State, but nearly all States require either a master's degree or some other graduate-level training. Some States also require candidates for licensure to pass a test. On-the-job training, often with a mentor, is increasingly required or recommended 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. Principals in private schools are not subject to State licensure requirements.

Nearly all States require child care and preschool center directors to be licensed. Licensing usually requires a number of years of experience or hours of coursework or both. Sometimes, it requires a college degree. Often, directors also are required to earn a general preschool education credential, such as the Child Development Associate credential (CDA) sponsored by the Council for Professional Recognition, or some other credential designed specifically for directors. One credential designed specifically for directors is the National Administration Credential, offered by the National Child Care Association. The credential requires experience and training in child care center management.

There usually are no licensing requirements for administrators at postsecondary institutions.

Other qualifications. 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, 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 many of these workers as computers are used to perform their basic job duties and they may be responsible for coordinating technical resources for students, teachers, and classrooms.

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

Employment

Education administrators held about 445,400 jobs in 2008. Of these, about 58,900 were held by preschool or child care administrators, about 230,600 by elementary or secondary school administrators, and 124,600 by postsecondary administrators. The great majority—more than 81 percent—worked in public or private educational institutions. Most of the remainder worked in child day care centers.

Job Outlook

Employment is projected to grow about as fast as the average for all occupations. Job opportunities should be excellent due to a large number of expected retirements and fewer applicants for some positions.

Employment change. Employment of education administrators is expected to grow by about 8 percent between 2008 and 2018, which is about as fast as the average for all occupations. Expected growth is primarily the result of growth in enrollments of school-aged children. Enrollment of students in elementary and secondary schools is expected to grow relatively slowly over the next decade, limiting the growth of principals and other administrators in these schools. However, the number of administrative positions will continue to increase as more administrative responsibilities are placed on individual schools, particularly with regard to monitoring student achievement. Preschool and child care center administrators are expected to experience substantial growth because of increasing enrollments in formal child care programs as fewer young children are cared for in private homes. In addition, as more States implement or expand public preschool programs, more preschool directors will be needed.

The number of students at the postsecondary level is projected to grow more rapidly than other student populations. Many of these schools cater to working adults who might not ordinarily participate in postsecondary education. Such 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.

Job prospects. Job opportunities should be excellent due to a large number of expected retirements and fewer applicants for some positions. Principals and assistant principals should have

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Education administrators	11-9030	445,400	482,500	37,000	8
Education administrators, preschool and child care center/ program	11-9031	58,900	65,800	6,900	12
Education administrators, elementary and secondary school	11-9032	230,600	250,400	19,800	9
Education administrators, postsecondary	11-9033	124,600	127,400	2,800	2
Education administrators, all other	11-9039	31,400	38,900	7,500	24

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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excellent job prospects because a sharp increase in responsibilities in recent years has made the job more stressful and has discouraged some teachers from taking 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 are creating additional stress for administrators. Many teachers feel that the increase in pay for becoming an administrator is not high enough to compensate for the greater responsibilities.

Opportunities may vary by region of the country. Enrollments are expected to increase the fastest in the West and South, where the population is growing faster, 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.

Fewer applicants are expected for nonacademic administrative jobs, such as director of admissions or director of 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 May 2008, preschool and child care program administrators had median annual wages of $39,940. The middle 50 percent earned between $31,290 and $54,680. The lowest 10 percent earned less than $25,910 and the highest 10 percent earned more than $77,150.

In May 2008, elementary and secondary school administrators had median annual wages of $83,880. The middle 50 percent earned between $68,360 and $102,830. The lowest 10 percent earned less than $55,580 and the highest 10 percent earned more than $124,250.

In May 2008, postsecondary school administrators had median annual wages of $80,670. The middle 50 percent earned between $58,940 and $113,860. The lowest 10 percent earned less than $45,050 and the highest 10 percent earned more than $160,500.

Salaries of education administrators depend on several factors, including the location and enrollment level of the school or school district.

According to a survey of public schools conducted by Educational Research Service, average salaries for principals and assistant principals in the 2007-2008 school year were as follows:

Principals:	
Senior high school	$97,486
Jr. high/middle school	91,334
Elementary school	85,907
Assistant principals:	
Senior high school	79,391
Jr. high/middle school	76,053
Elementary school	71,192

According to the College and University Professional Association for Human Resources, median annual salaries for selected administrators in higher education during the 2008–2009 school year were as follows:

Chief academic officer	$158,000
Academic deans:	
Business	150,000
Arts and sciences	134,632
Graduate programs	130,000
Education	128,550
Nursing	125,400
Health-related professions	120,980
Continuing education	109,925
Occupational studies/vocational education	92,622
Other administrators:	
Chief development officer	141,712
Dean of students	88,280
Director, student financial aid	74,261
Registrar	71,764
Director, student activities	54,931

Benefits for education administrators are generally very good. Many get 4 or 5 weeks of 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:

	Page
Administrative services managers	29
Human resources, training, and labor relations managers and specialists	61
Office and administrative support worker supervisors and managers	594

Education administrators also work with students and have backgrounds similar to those of :

Counselors	234
Instructional coordinators	268
Librarians	270
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—preschool, except special education	286
Teachers—postsecondary	282
Teachers—vocational	298

Sources of Additional Information

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 Dr., Reston, VA 20191-1537. Internet: **http://www.nassp.org**

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For a list of nationally recognized programs in elementary and secondary educational administration, contact:
➤ The Educational Leadership Constituent Council, 1904 Association Dr., Reston, VA 20191. Internet: **http://www.npbea.org/ncate.php**

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**

For information on the National Administrator Credential for child care directors, contact:
➤ National Child Care Association, 1325 G St. NW., Suite 500, Washington, DC 20005. Internet: **http://www.nccanet.org**

For information on the Child Development Associate Credential, contact:
➤ Council for Professional Recognition, 2460 16th St. NW., Washington, DC 20009. Internet: **http://www.cdacouncil.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos007.htm**

Engineering and Natural Sciences Managers

Significant Points

- Most engineering and natural sciences managers have formal education and work experience as engineers, scientists, or mathematicians.
- Opportunities will be best for scientists and engineers with strong communication and business management skills.
- Thirty-six percent of jobs are in manufacturing industries, and 33 percent are in professional, scientific, and technical services.

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 their knowledge of engineering and natural sciences to oversee a variety of activities. They 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, these managers also must apply knowledge of administrative procedures, such as budgeting, hiring, and supervision. They 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, check the technical accuracy of their work and the soundness of their methods, review their output, and establish administrative procedures, policies or standards—such as environmental standards, for example.

In addition, engineering and natural science 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 may supervise people who design and develop machinery, products, systems, and processes. They might also direct and coordinate production, operations, quality assurance, testing, or maintenance in industrial plants. Many manage research and development teams that produce new products and processes or improve existing ones. Others are plant engineers, who direct and coordinate the design, installation, operation, and maintenance of equipment and machinery in industrial plants.

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 com-



In addition to technical knowledge, engineering and natural sciences managers need administrative and communication skills.

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mercial activities. Science managers sometimes conduct their own research in addition to managing the work of others.

Work environment. 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. Managers tend to work long hours in order to meet project deadlines; in 2008, almost half worked over 40 hours per week. They may also experience considerable pressure to meet technical or scientific goals on a short deadline or within a tight budget.

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, most managers have formal education and work experience as an engineer, scientist, or mathematician.

Education and training. Engineering and natural sciences managers usually advance to management positions after years of employment as engineers or scientists. Nearly all engineering managers therefore have at least a bachelor's degree in some specialty of engineering. Many also gain business management skills by completing a master's degree in engineering management (MEM) or business administration (MBA), either before or after advancing to management positions. Employers often pay for such training. In large firms, some courses required in these degree programs may be offered onsite. Typically, engineers who prefer to manage in technical areas pursue an MEM, and those interested in less technical management earn an MBA.

Similarly, since most science managers begin their careers as scientists, they may have a bachelor's, master's or Ph.D. degree in a scientific discipline. Graduate programs allow scientists to augment their undergraduate training with instruction in other fields, such as management or computer technology. Future natural science managers interested in more technical management may earn traditional master's or Ph.D. degrees in natural sciences or master's degrees in science that incorporate business management skills. Those interested in more general management may pursue an MBA. Given the rapid pace of scientific developments, science managers must continuously upgrade their knowledge.

Other qualifications. Engineering and natural sciences managers must be specialists in the work they supervise. To advance to these positions, engineers and scientists generally must gain experience and assume management responsibility. To fill management positions, employers seek engineers and scientists who possess administrative and communication skills in addition to technical knowledge in their specialty, since they must effectively lead groups and coordinate projects.

Advancement. Engineering and natural sciences managers may advance to progressively higher leadership positions within their disciplines. 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 can eventually advance to jobs as sales managers.

Employment

Engineering and natural sciences managers held about 228,700 jobs in 2008. Manufacturing industries employed 36 percent of engineering and natural sciences managers. Another 33 percent worked in professional, scientific, and technical services industries, primarily for firms providing architectural, engineering, and related services, and scientific research and development services. Other large employers include Federal, State, and local government agencies.

Job Outlook

Employment of engineering and natural sciences managers is projected to grow as fast as the average for all occupations. Opportunities will be best for engineers and scientists with strong communication and business management skills.

Employment change. Employment of engineering and natural sciences managers is expected to grow 8 percent over the 2008–18 decade, as fast as the average for all occupations. Employment growth should be affected by many of the same factors that affect the growth of the engineers and scientists that these managers supervise. However, job growth for managers will be somewhat slower than for engineers and scientists because the increasing tendency to outsource research and development to specialized engineering and scientific research services firms will lead to some consolidation of management.

Job prospects. Opportunities for engineering managers should be better in rapidly growing areas of engineering, such as environmental and biomedical engineering, than in more slowly growing areas, such as electrical and mechanical engineering. Opportunities for natural sciences managers should be best in the rapidly growing medical and environmental sci-

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Engineering and natural sciences managers	–	228,700	246,900	18,200	8
Engineering managers	11-9041	184,000	195,400	11,300	6
Natural sciences managers	11-9121	44,600	51,500	6,900	15

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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ences. (See the statements on engineers and life and physical scientists elsewhere in the *Handbook*.) Engineers and scientists with advanced technical knowledge and strong communication skills will be in the best position to become managers. Because engineering and natural sciences managers are involved in the financial, production, and marketing activities of their firm, business management skills are also advantageous for those seeking management positions. In addition to those openings resulting from employment growth, job openings will result from the need to replace managers who retire or move into other occupations.

Earnings

Earnings for engineering and natural sciences managers vary by specialty and by level of responsibility. Median annual wages of engineering managers were $115,270 in May 2008. The middle 50 percent earned between $91,870 and $141,730. Median annual wages in the industries employing the largest numbers of engineering managers were:

Scientific research and development services	$141,030
Navigational, measuring, electromedical, and control instruments manufacturing	128,630
Semiconductor and other electronic component manufacturing	127,790
Aerospace product and parts manufacturing	118,430
Architectural, engineering, and related services	114,110

Median annual wages of natural sciences managers were $112,800 in May 2008. The middle 50 percent earned between $85,910 and $151,400. Median annual wages in the industries employing the largest numbers of natural sciences managers were:

Pharmaceutical and medicine manufacturing	$144,640
Scientific research and development services	136,310
Federal Executive Branch	102,410
Architectural, engineering, and related services	98,980
State government	69,220

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:

	Page
Agricultural and food scientists	177
Atmospheric scientists	192
Biological scientists	181
Chemists and materials scientists	195
Engineers	161
Environmental scientists and specialists	199
Geoscientists and hydrologists	202
Mathematicians	143
Medical scientists	189
Physicists and astronomers	206
Top executives	83

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 the statements on these occupations elsewhere in the *Handbook*.

Information on engineering management programs accredited by the Accreditation Board for Engineering and Technology is available from:

➤ ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202. Internet: **http://www.abet.org**

To learn more about managing scientists and engineers in research and development, see the *Occupational Outlook Quarterly* article, "Careers for scientists—and others—in scientific research and development," online at **http://www.bls.gov/opub/ooq/2005/summer/art04.htm** and in print at many libraries and career centers.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos009.htm**

Farmers, Ranchers, and Agricultural Managers

Significant Points

- Modern farming requires knowledge of new developments in agriculture, often gained through growing up on a farm or through postsecondary education.
- Overall employment is projected to decline because of increasing productivity and consolidation of farms.
- Small-scale, local farming, particularly horticulture and organic farming, offer the best opportunities for entering the occupation.

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 for export. *Farmers and ranchers* own and operate mainly family-owned farms. They also may lease land from a landowner and operate it as a working farm. *Agricultural managers* manage the day-to-day activities of one or more farms, ranches, nurseries, timber tracts, greenhouses, or other agricultural establishments for farmers, absentee landowners, or corporations. While their duties and responsibilities vary widely, all farmers, ranchers, and agricultural managers focus on the business aspects of running a farm. On small farms, they may oversee the entire operation; on larger farms, they may oversee a single activity, such as marketing.

Farm output and income are strongly influenced by the weather, disease, fluctuations in prices of domestic farm products, and Federal farm programs. In crop-production opera-

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tions, farmers and managers usually determine the best time to plant seed, apply fertilizer and chemicals, and harvest and market the crops. Many carefully plan the combination of crops they grow, so that if the price of one crop drops, they will have sufficient income from another crop to make up the loss. Farmers, ranchers, and managers monitor the constantly changing prices for their products. They use different strategies to protect themselves from unpredictable changes in the markets for agricultural products. If they plan ahead, they may be able to store their crops or keep their livestock to take advantage of higher prices later in the year. Those who participate in the futures market enter contracts on future delivery of agricultural goods. These contracts can minimize the risk of sudden price changes by guaranteeing a certain price for farmers' and ranchers' agricultural goods when they are ready to sell.

While most farm output is sold to food-processing companies, some farmers—particularly operators of smaller farms—may choose to sell their goods directly to consumers through farmers' markets. Some use cooperatives to reduce their financial risk and to gain a larger share of the prices consumers pay. For example, in community-supported agriculture, cooperatives sell shares of a harvest to consumers prior to the planting season. This frees the farmer from having to bear all the financial risks and ensures 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, livestock, and seed.

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.

The type of farm managers operate determines their specific tasks. On crop farms—farms growing grain, cotton, other fibers, fruit, and vegetables—farmers are responsible for preparing, tilling, planting, fertilizing, cultivating, spraying, and harvesting. After the harvest, they make sure that the crops are properly packaged, stored, and marketed. Livestock, dairy, and poultry farmers and ranchers feed and care for animals and keep barns, pens, coops, and other farm buildings clean and in good condition. They also plan and oversee breeding and marketing activities. Both farmers and ranchers operate machinery and maintain equipment and facilities, and both track technological improvements in animal breeding and seeds, and choose new or existing products.

The size of the farm or ranch often determines which of these tasks farmers and ranchers 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, by contrast, have employees who help with the physical work. 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 the employees are in nonfarm occupations, working as truck drivers, sales representatives, bookkeepers, and computer specialists.

Agricultural managers usually do not plant, harvest, or perform other production activities; instead, they hire and supervise farm and livestock workers, who perform most daily production tasks. 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.

Horticultural specialty farmers oversee the production of fruits, vegetables, flowers, and ornamental plants used in landscaping, including turf. They also grow nuts, berries, and grapes for wine. *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.

Work environment. Farmers and farm managers on crop farms usually work from sunrise to sunset during the planting and harvesting seasons. The rest of the year, they plan next season's crops, market their output, and repair machinery.

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 and farm managers rarely get the chance to get away, unless they hire an assistant or arrange for a temporary substitute.

Farmers and farm managers who grow produce and perishables have different demands on their time depending on the crop grown and the season. They may work very long hours during planting and harvesting season, but shorter hours at other times. Some farmers maintain cover crops during the cold months, which keep them busy beyond the typical growing season.

On very large farms, farmers and farm managers spend substantial time meeting farm supervisors in charge of various activities. Professional farm managers overseeing several farms may divide their time between traveling to meet farmers or



A farmer bails hay for feeding cows during the winter.

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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 on computers, where they electronically manage many aspects of their businesses. Some farmers also attend conferences exchanging information, particularly during the winter months.

Farm work 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 are necessary to avoid accidents, safeguard health, and protect the environment.

Training, Other Qualifications, and Advancement

Experience gained from growing up on or working on a family farm is the most common way farmers learn their trade. However, modern farming requires making increasingly complex scientific, business, and financial decisions, so postsecondary education in agriculture is important, even for people who were raised on farms.

Education and training. Most farmers receive their training on the job, often by being raised on a farm. However, the completion of a 2-year associate degree or a 4-year bachelor's degree at a college of agriculture is becoming increasingly important for farm managers and for farmers and ranchers who expect to make a living at farming.

Students should select the college most appropriate to their interests and location. All State university systems have at least one land-grant college or university with a school of agriculture. Common programs of study include business with a concentration in agriculture, farm management, 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.

Agricultural colleges teach technical knowledge of crops, growing conditions, and plant diseases. They also teach prospective ranchers and dairy farmers the basics of veterinary science and animal husbandry. Students also study how the environment is affected by farm operations, such as the impact of various pesticides on local animals.

New farmers, ranchers, and agricultural managers often spend time working under an experienced farmer to learn how to apply the skills learned through academic training. Those without academic training often take many years to learn how weather, fertilizers, seed, feeding or breeding affect the growth of crops or the raising of animals in addition to other aspects of farming. A small number of farms offer formal apprenticeships to help young people learn the practical skills of farming and ranching.

Other qualifications. Farmers, ranchers, and agricultural managers need managerial skills to organize and operate a business. A basic knowledge of accounting and bookkeeping is essential in keeping financial records, and knowledge of credit sources is vital for buying seed, fertilizer, and other needed inputs. Workers must also be familiar with safety regulations and requirements of governmental agricultural support programs. Computer skills are becoming increasingly important, especially on large farms, where they are widely used for recordkeeping and business analysis. In addition, skills in personnel management, communication, and conflict resolution are important in the operation of a farm or ranch business.

Mechanical aptitude and the ability to work with tools of all kinds also are valuable skills for a small-farm operator, who often maintains and repairs machinery or farm structures.

Certification and advancement. Because of rapid changes in the industry, farmers, ranchers, and agricultural managers need to stay informed about continuing advances in agricultural methods, both in the United States and abroad. They need to monitor changes in governmental regulations that may affect production methods or markets for particular crops. Agricultural managers can enhance their professional status through voluntary certification as an Accredited Farm Manager (AFM) by the American Society of Farm Managers and Rural Appraisers. Accreditation 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 passing courses and examinations related to the business, financial, and legal aspects of farm and ranch management.

Employment

Farmers, ranchers, and agricultural managers held more than 1.2 million jobs in 2008. Nearly 80 percent were self-employed farmers and ranchers, and the remainder were wage and salary agricultural managers. Most farmers, ranchers, and agricultural managers oversee crop production activities, while others manage livestock and dairy production.

The soil, topography of the land, and climate often determine the type of farming and ranching done in a particular area. California, Texas, Iowa, Nebraska, and Minnesota are the leading agricultural States in terms of agricultural output measured in dollars. Texas, Missouri, Iowa, Oklahoma, and Kentucky are the leading agricultural States in terms of numbers of farms.

Job Outlook

Overall employment is projected to decline, reflecting the decline of self-employed farmers because of the consolidation of farms and increasing productivity; however, employment of salaried agricultural managers is expected to increase.

Employment change. Employment of self-employed farmers is expected to decline moderately by 8 percent over the 2008–18 decade. The continuing ability of the agriculture sector to produce more with fewer workers will cause some farmers to go out of business as market pressures leave little room for the marginally successful farmer. As land, machinery, seed, and chemicals become more expensive, only well-capitalized farmers and corporations will be able to buy many of the farms that become available. These larger, more productive farms are better able to withstand the adverse effects of climate and price fluctuations on farm output and income. Larger farms also have advantages in obtaining government subsidies and payments because these payments are usually based on acreage owned and per-unit production.

In contrast, agricultural managers are projected to gain jobs, growing by about 6 percent, slower than the average for all occupations. Owners of large tracts of land, who often do not live

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Agricultural managers	11-9010	1,234,000	1,169,400	-64,600	-5
Farm, ranch, and other agricultural managers	11-9011	248,100	262,700	14,600	6
Farmers and ranchers	11-9012	985,900	906,700	-79,200	-8

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

on the property they own, increasingly will seek the expertise of agricultural managers to run their farms and ranches in a business-like manner.

Despite the expected continued consolidation of farmland and the projected decline in overall employment of this occupation, 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 horticulture and organic food production, which are among the fastest growing segments of agriculture. 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 belong to collectively owned marketing cooperatives that process and sell their product. Other farmers participate in community-supported agriculture cooperatives that allow consumers to buy a share of the farmer's harvest directly.

Job prospects. Fewer jobs are expected for farmers and ranchers than in the past; better prospects are expected for wage and salary agricultural managers. Small-scale, local farming, particularly horticulture and organic farming, offer the best opportunities for entering the occupation. With fewer people wanting to become farmers and a large number of farmers expected to retire or give up their farms in the next decade, there will be some opportunities to own or lease a farm. Additionally, the market for agricultural products is projected to be good for most products over the next decade, so many farmers who retire will need to be replaced. Farmers who grow crops used in landscaping, such as trees, shrubs, turf, and other ornamentals, also will have better job prospects, as people put more money into landscaping their homes and businesses.

Some private organizations are helping to make farmland available and affordable for new farmers through a variety of institutional innovations. Land Link programs, coordinated by the International Farm Transition Network, operate in 20 States. They help match up young farmers with farmers approaching retirement so that arrangements can be made to pass along their land to young farmers wishing to keep the land under cultivation. Often beginning farmers lease some or all of their farmland. Sometimes, a new farmer will work on a farm for a few years, while the farm owner gradually transfers ownership to the new farmer.

Earnings

Incomes of farmers and ranchers vary greatly from year to year, because prices of farm products fluctuate with weather conditions and other factors that influence the quantity and quality of farm output and the demand for those products. In addition to farm business income, farmers often receive government subsidies or other payments that supplement their incomes and reduce some of the risk of farming. Many farmers—primarily operators of small farms—have recently been relying more and more on off-farm sources of income.

Full-time, salaried agricultural managers had median weekly earnings of $775 in 2008. The middle half earned between $570 and $1,269 per week. The lowest paid 10 percent earned less than $358, and the highest paid 10 percent earned more than $1,735 per week.

Self-employed farmers must procure their own health and life insurance. As members of farm organizations, they may receive 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 relates to agriculture include:

	Page
Agricultural and food scientists	177
Agricultural inspectors	612
Agricultural workers, other	609
Engineers	161
Farm and home management advisors	824
Purchasing managers, buyers, and purchasing agents	79

Sources of Additional Information

For general information about farming and agricultural occupations, contact:

➤ National FFA Organization, 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 80246- 2664. 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, National Institute of Food and Agriculture, 1400 Independence Avenue SW, Stop 2201, Washington, DC 20250-2201. Internet: **http://www.csrees.usda.gov/smallfarms.cfm**

For information on Land Link Programs, contact:

➤ The Beginning Farm Center, 10861 Douglas Avenue, Suite B, Urbandale, IA 50322-2042. Internet: **http://www.farmtransition.org/netwpart.html**

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➤ Center for Rural Affairs, 145 Main Street PO Box 136, Lyons, NE 68038-2677. Internet: **http://www.cfra.org/resources/beginning_farmer**

For information on organic farming, horticulture, and internships, contact:

➤ Alternative Farming System Information Center, NAL, 10301 Baltimore Ave., Room 132, Beltsville, MD 20705-2326. Internet: **http://www.nal.usda.gov**

➤ ATTRA, National Sustainable Agriculture Information Service, P.O. Box 3657, Fayetteville, AR 72702-3657. Internet: **http://www.attra.ncat.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos176.htm**

Financial Managers

Significant Points

- Jobseekers are likely to face competition.
- About 3 out of 10 work in finance and insurance industries.
- Most financial managers need a bachelor's degree, and many have a master's degree or professional certification.
- Experience may be more important than formal education for some financial manager positions—most notably, branch managers in banks.

Nature of the Work

Almost every firm, government agency, and other type of organization employs one or more financial managers. *Financial managers* oversee the preparation of financial reports, direct investment activities, and implement cash management strategies. Managers also develop strategies and implement 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, risk and insurance manager, and manager of international banking. *Controllers* direct the preparation of financial reports, such as income statements, balance sheets, and analyses of future earnings or expenses, that summarize and forecast the organization's financial position. 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 their organization's budgets to meet its financial goals. They oversee the investment of funds, manage associated risks, supervise cash management activities, execute capital-raising strategies to support the firm's expansion, and deal with mergers and acquisitions. *Credit managers* oversee the firm's issuance of credit, establishing credit-rating criteria, determining credit ceilings, and monitoring the collections of past-due accounts.

Cash managers monitor and control the flow of cash receipts and disbursements to meet the business and investment needs of their firm. For example, cash flow projections are needed to determine whether loans must be obtained to meet cash requirements or whether surplus cash can be invested. *Risk* and *insurance managers* oversee programs to minimize risks and losses that might arise from financial transactions and business operations. Insurance managers decide how best to limit a company's losses by obtaining insurance against risks such as the need to make disability payments for an employee who gets hurt on the job or costs imposed by a lawsuit against the company. Risk managers control financial risk by using hedging and other techniques to limit a company's exposure to currency or commodity price changes. Managers specializing in international finance develop financial and accounting systems for the banking transactions of multinational organizations. Risk managers are also responsible for calculating and limiting potential operations risk. Operations risk includes a wide range of risks, such as a rogue employee damaging the company's finances or a hurricane damaging an important factory. (Chief financial officers and other executives are included with top executives elsewhere in the *Handbook*.)

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 solicit business, authorize loans, and direct the investment of funds, always adhering to Federal and State laws and regulations.

Branch managers of financial institutions administer and manage all of the functions of a branch office. Job duties may include hiring personnel, approving loans and lines of credit, establishing a rapport with the community to attract business, and assisting customers with account problems. Branch mangers also are becoming more oriented toward sales and marketing. As a result, it is important that they have substantial knowledge about the types of products that the bank sells. Financial managers who work for financial institutions must keep abreast of the rapidly growing array of financial services and products.

In addition to the preceding duties, 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 health care financing. Moreover, financial managers must be aware of special tax laws and regulations that affect their industry.

Financial managers play an important role in mergers and consolidations and in global expansion and related financing. These areas require extensive, specialized knowledge 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 their accounting and financial functions to companies that provide such services.

The role of the financial manager, particularly in business, is changing in response to technological advances that have sig-

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Financial managers oversee the preparation of financial reports and investment activities.

nificantly reduced the amount of time it takes to produce financial reports. Technological improvements have made it easier to produce financial reports, and, as a consequence, financial managers now perform more data analysis that allows them to offer senior managers profit-maximizing ideas. They often work on teams, acting as business advisors to top management.

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

Training, Other Qualifications, and Advancement

Most financial managers need a bachelor's degree, and many have a master's degree or professional certification. Bank managers often have experience as loan officers or in other sales positions. Financial managers also need strong interpersonal, math, and business skills.

Education and training. 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, finance, or economics. These academic programs develop analytical skills and teach financial analysis methods and technology.

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

Licensure. Many financial managers work in accounting departments. Accounting positions normally require workers to be certified public accountants (CPAs). (See the statement on accountants and auditors elsewhere in the *Handbook*.)

Other qualifications. Candidates for financial management positions need many different 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 skills to explain complex financial data. Because financial managers work extensively with various departments in their firm, a broad understanding of business is essential.

Financial managers should be creative thinkers and problem-solvers, applying their analytical skills to business. Financial managers must have knowledge of international finance because financial operations are increasingly being affected by the global economy. In addition, a good knowledge of regulatory compliance procedures is essential.

Certification and advancement. Financial managers may broaden their skills and exhibit their competency by attaining professional certification. Many associations offer professional certification programs. For example, the CFA Institute confers the Chartered Financial Analyst designation on investment professionals who have at least a bachelor's degree, work experience, and pass three difficult exams. The Association for Financial Professionals confers the Certified Treasury Professional credentials to those who pass a computer-based exam and have a minimum of 2 years of relevant experience. Continuing education is required to maintain these credentials. Also, financial managers who specialize in accounting or budgeting sometimes earn the Certified Management Accountant (CMA) designation. The CMA is offered by the Institute of Management Accountants to its members who have a bachelor's degree, at least 2 years of work experience, pass the institute's four-part examination, and fulfill continuing education requirements. (See accountants and auditors elsewhere in the *Handbook* for additional information on the CMA designation.)

Continuing education is vital to 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 them to take graduate courses and 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. Subjects covered by training programs

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include 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 the courses. Although experience, ability, and leadership are emphasized for promotion, advancement may be accelerated by this type of special study.

Because financial management is so important to 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.

Employment

Financial managers held about 539,300 jobs in 2008. Although they can be found in every industry, approximately 31 percent were employed by finance and insurance establishments, such as banks, savings institutions, finance companies, credit unions, insurance carriers, and securities dealers. About 7 percent worked for Federal, State, or local government.

Job Outlook

Employment growth for financial managers is expected is to be as fast as the average for all occupations. However, applicants will likely face keen competition for jobs. Those with a master's degree and certification will have the best opportunities.

Employment change. Employment of financial managers over the 2008–18 decade is expected to grow by 8 percent, which is as fast as the average for all occupations. Regulatory changes and the expansion and globalization of finance and companies will increase the need for financial expertise and drive job growth. As the economy expands, both the growth of established companies and the creation of new businesses will spur demand for financial managers. Employment of bank branch managers is expected to increase because banks are creating new branches. However, mergers, acquisitions, and corporate downsizing are likely to restrict the employment growth of financial managers to some extent.

Long-run demand for financial managers in the securities and commodities industry will continue to be driven by the need 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. Employment of risk managers, who assess risks for insurance and investment purposes, also will grow.

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.

Job prospects. As with other managerial occupations, jobseekers are likely to face competition because 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 or certification—should enjoy the best job prospects. An understanding of international finance, derivatives, and complex financial instruments is important. Excellent communication skills are essential because financial managers must explain and justify complex financial transactions.

As banks expand the range of products and services they offer to include wealth management, 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 more favorable prospects. (See the *Handbook* statements on insurance sales agents; personal financial advisors; and securities, commodities, and financial services sales agents.)

Earnings

Median annual wages, excluding annual bonuses and stock options, of wage and salary financial managers were $99,330 in May 2008. The middle 50 percent earned between $72,030 and $135,070. Median annual wages in the industries employing the largest numbers of financial managers were:

Securities and commodity contracts intermediation and brokerage	$134,940
Management of companies and enterprises	115,520
Insurance carriers	110,750
Local government	78,650
Depository credit intermediation	77,280

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, like salaries, vary substantially by size of firm. Deferred compensation in the form of stock options is 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

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Financial managers	11-3031	539,300	580,500	41,200	8

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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risk and loss control. Workers in other occupations requiring similar training and skills include:

	Page
Accountants and auditors	86
Budget analysts	93
Financial analysts	103
Insurance sales agents	534
Insurance underwriters	106
Loan officers	109
Personal financial advisors	118
Real estate brokers and sales agents	540
Securities, commodities, and financial services sales agents	553

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, 4202 East Fowler Ave., BSN 3331, Tampa, FL 33620. Internet: **http://www.fma.org**

For information about careers in financial and treasury management and the Certified Treasury Professional program, contact:

➤ Association for Financial Professionals, 4520 East-West Hwy., Suite 750, Bethesda, MD 20814. Internet: **http://www.afponline.org**

For information about the Chartered Financial Analyst program, contact:

➤ CFA Institute, 560 Ray Hunt Dr., Charlottesville, VA 22903. Internet: **http://www.cfainstitute.org**

For information on The American Institute of Banking and its programs, contact:

➤ American Bankers Association, 1120 Connecticut Ave. NW, Washington, DC 20036. Internet: **http://www.aba.com**

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

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

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos010.htm**

Food Service Managers

Significant Points

- Although most food service managers qualify for their position based on their restaurant-related experience, an increasing number of employers prefer managers with a 2- or 4-year degree in a related field.
- Food service managers coordinate a wide range of activities, but their most difficult tasks may be dealing with irate customers and motivating employees.
- Job opportunities for food service managers should be good, as the number of managers who change jobs or leave this occupation is typically high and, in the long run, as more are hired to meet the growing demand for convenient food service.

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's equipment and facilities. Managers are generally responsible for all administrative and human-resource functions of the business, including recruiting new employees and monitoring employee performance and training.

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 and at schools that offer academic programs in hospitality management 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. 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 and 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 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, 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.

Managers tally the cash and charge receipts received and balance them against the record of sales, 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.

Technology influences the jobs of food service managers in many ways, enhancing efficiency and productivity. Many restaurants use computers and business software to place orders and track inventory and sales. They also allow food service

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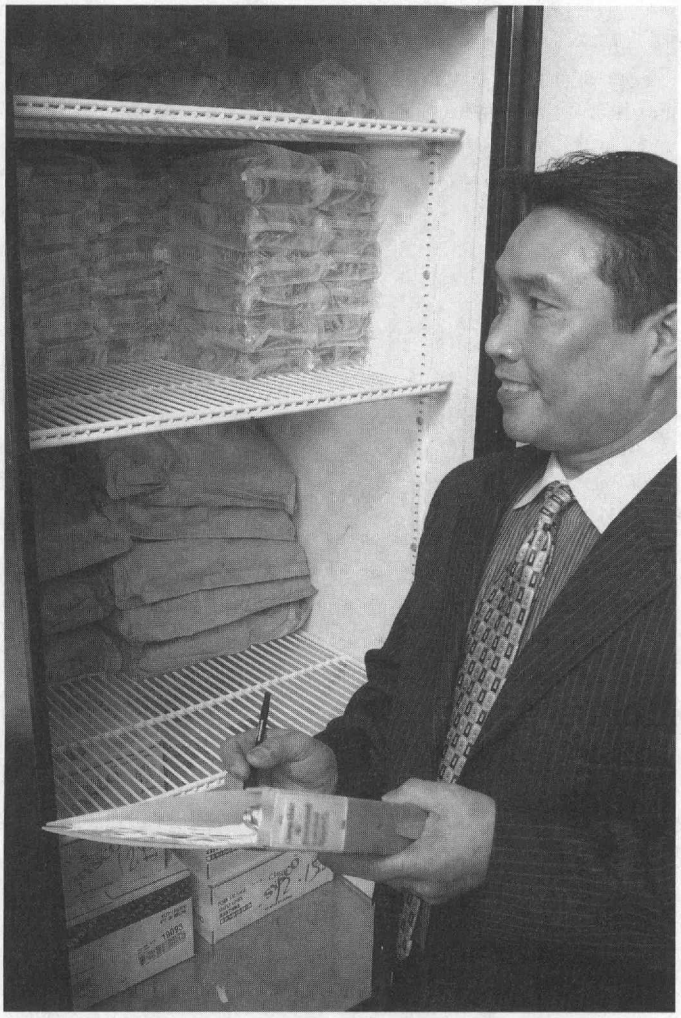
managers to monitor expenses, employee schedules, and payroll matters more efficiently.

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 some cases, the executive chef is also the general manager or owner of the restaurant. General managers may employ several assistant managers that oversee certain areas, such as the dining or banquet rooms, or supervise different shifts of workers. In limited-service eating places, such as sandwich and coffee shops or fast-food restaurants, managers or food preparation or serving supervisors, not executive chefs, are responsible for supervising routine food preparation operations. (For additional information on these other workers, see material on top executives or on chefs, head cooks, and food preparation and serving supervisors elsewhere in the *Handbook*.)

In restaurants, mainly full-service independent ones where there are both food service managers and executive chefs, the managers often help the chefs select menu items. Managers or executive chefs at independent restaurants select menu items, taking into account the past popularity of dishes, the ability to reuse any food not served the previous day, 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, work out the portion size and nutritional content of each plate, and assign prices to various menu items. Menus must be developed far enough in advance that supplies can be ordered and received in time.



Food service managers ensure that food is in adequate supply and stored at the appropriate temperature.

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.

Work environment. Many food service managers work long hours—12 to 15 per day, 50 or more per week, and sometimes 7 days a week. Such schedules are common for fine dining restaurants and those, such as fast-food restaurants, that operate extended hours. 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, many managers oversee multiple locations of a chain or franchise or may be called in on short notice, making hours unpredictable.

Managers should be calm, flexible, and able to work through emergencies, such as a fire or flood, to ensure everyone's safety. They 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. Although injuries generally do not require prolonged absences from work, the incidence of injuries requiring at least one day's absence from work exceeds that of about 60 percent of all occupations.

Training, Other Qualifications, and Advancement

Experience in the food services industry, whether as a cook, waiter or waitress, or counter attendant, is the most common training for food service managers. Many restaurant and food service manager positions, particularly self-service and fast-food, are filled by promoting experienced food and beverage preparation and service workers.

Education and training. Most food service managers have less than a bachelor's degree; however, some postsecondary education, including a college degree, is increasingly preferred for many food service manager positions. Many food service man-

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agement companies and national or regional restaurant chains recruit management trainees from 2- and 4-year college hospitality or food service management programs, which require internships and real-life experience to graduate. While these specialized degrees are often preferred, graduates with degrees in other fields who have demonstrated experience, interest, and aptitude are also recruited.

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, recordkeeping, and preparation of reports. Training on the use of the restaurant's computer system is increasingly important as well. Usually, after several months of training, trainees receive their first permanent assignment as an assistant manager.

Almost 1,000 colleges and universities offer 4-year programs in restaurant and hospitality management or institutional food service management; a growing number of university programs offer graduate degrees in hospitality management or similar fields. 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 careers as cooks or chefs and provide a foundation for advancement to executive chef positions.

Many larger food service operations will provide or offer to pay for technical training, such as computer or business courses, so that employees can acquire the business skills necessary to read spreadsheets or understand the concepts and practices of running a business. Generally, this requires a long-term commitment on the employee's part to both the employer and to the profession.

Other qualifications. Most employers emphasize personal qualities when hiring managers. Workers who are reliable, show initiative, and have leadership qualities are highly sought after for promotion. Other qualities that managers look for are good problem-solving skills and the ability to concentrate on details. A neat and clean appearance is important, because food service managers must convey self-confidence and show respect in dealing with the public. Because food service management can be physically demanding, good health and stamina are important.

Managers must be good communicators as they deal with customers, employees, and suppliers for most of the day. They must be able to motivate employees to work as a team, to ensure that food and service meet appropriate standards. Additionally, the ability to speak multiple languages is helpful to communicate with staff and patrons.

Certification and advancement. The certified Foodservice Management Professional (FMP) designation is a measure of professional achievement for food service managers. Although not a requirement for employment or necessary for advancement, voluntary certification can provide 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 is often essential for advancement to positions with greater responsibility. Managers typically advance to larger or more prominent establishments or regional management positions within restaurant chains. Some may open their own food service establishments or franchise operation.

Employment

Food service managers held about 338,700 jobs in 2008. The majority of managers are salaried, but 42 percent are self-employed as owners of independent restaurants or other small food service establishments. Forty-one percent of all salaried jobs for food service managers are in full-service restaurants or limited-service eating places, such as fast-food restaurants and cafeterias. Other salaried jobs are in special food services—an industry that includes food service contractors who supply food services at institutional, governmental, commercial, or industrial locations, and educational services, which primarily supply elementary and secondary schools. A smaller number of salaried jobs are in hotels; amusement, gambling, and recreation industries; nursing care facilities; and hospitals. Jobs are located throughout the country, with large cities and resort areas providing more opportunities for full-service dining positions.

Job Outlook

Food service manager jobs are expected to grow 5 percent, or more slowly than the average for all occupations through 2018. However, job opportunities should be good because many openings will arise from the need to replace managers who leave the occupation.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Food service managers	11-9051	338,700	356,700	18,000	5

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Employment change. Employment of food service managers is expected to grow 5 percent, or more slowly than the average for all occupations, during the 2008-18 decade, as the number of eating and drinking establishments opening is expected to decline from the previous decade. Despite these reductions in the number of new eating and drinking places, new employment opportunities for food service managers will emerge in grocery and convenience stores and other retail and recreation industries to meet the growing demand for quick food in a variety of settings. Employment growth is projected to vary by industry. Most new jobs will be in full-service restaurants and limited service eating places. Manager jobs will also increase in healthcare and elder care facilities. Self-employment of these workers will generate nearly 40 percent of new jobs.

Job prospects. In addition to job openings from employment growth, the need to replace managers who transfer to other occupations or stop working will create good job opportunities. Although practical experience is an integral part of finding a food service management position, applicants with a degree in restaurant, hospitality, or institutional food service management will have an edge when competing for jobs at upscale restaurants and for advancement in a restaurant chain or into corporate management.

Earnings

Median annual wages of salaried food service managers were $46,320 in May 2008. The middle 50 percent earned between $36,670 and $59,580. The lowest 10 percent earned less than $29,450, and the highest 10 percent earned more than $76,940. Median annual wages in the industries employing the largest numbers of food service managers were as follows:

Traveler accommodation	$54,710
Special food services	52,680
Full-service restaurants	49,420
Limited-service eating places	41,320

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. Some food service managers, especially those in full-service restaurants, may earn bonuses depending on sales volume or revenue.

Related Occupations

Other managers and supervisors in hospitality-related businesses include:

	Page
First-line supervisors or managers of food preparation and serving workers	484
Gaming services occupations	520
Lodging managers	70
Sales worker supervisors	551

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:

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

Career information about food service managers, as well as a directory of 2- and 4-year colleges that offer courses or programs that prepare persons for food service careers is available from:

➤ National Restaurant Association, 1200 17th St. NW., Washington, DC 20036-3097. Internet: **http://www.restaurant.org**

General information on hospitality careers may be obtained from:

➤ The International Council on Hotel, Restaurant, and Institutional Education, 2810 North Parham Rd., Suite 230, 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.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos024.htm**

Funeral Directors

Significant Points

- Job opportunities should be good, particularly for those who also embalm.
- Some mortuary science graduates relocate to get a job.
- Funeral directors are licensed by the State in which they practice.
- Funeral directors need the ability to communicate easily and compassionately and to comfort people in a time of sorrow.

Nature of the Work

Funeral practices and rites vary greatly among cultures and religions. However, 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 carrying out final disposition of the deceased. *Funeral directors* arrange and direct these tasks for grieving families, taking great pride in their ability to provide comfort to family and friends of the deceased and in providing appropriate services.

Funeral directors, also called *morticians* and *undertakers*, arrange the details and handle the logistics of funerals, taking into account the wishes of the deceased and family members. 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.

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Funeral directors 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 deceased, mourners, and flowers between sites. They also direct preparation and shipment of bodies 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 elapse 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 bodies using materials such as clay, cotton, plaster of Paris, and wax. They also may apply cosmetics to provide a natural appearance, 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, funeral home, or at the gravesite or crematory. Some services are not religious, but many are. 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 deceased embalmed or cremated.

Burial in a casket is the most common method of disposing of remains in the United States, 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 allows for the memorial service to be held at a more convenient time in the future when relatives and friends can come together. 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, including submitting papers to State authorities so that a formal death certificate may be issued and copies distributed to the heirs. They may help family members apply for veterans' burial benefits or 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 work with those who want to plan their own funerals in advance. This ensures that the client's wishes will be taken care of to their satisfaction.

Most funeral homes are small, family-run businesses, and many funeral directors are owner-operators or employees with managerial responsibilities. Funeral directors, therefore, are responsible for the success and the profitability of their businesses. Directors must keep records of expenses, purchases, and services rendered; prepare and send invoices for services; and file all required State and Federal employment reports and tax forms. Funeral directors increasingly use computers for billing, bookkeeping, and marketing. Some are beginning to use the Internet to communicate with clients who are planning their funerals in advance or to assist them by developing electronic obituaries and guest books. Directors strive to foster a cooperative spirit and friendly attitude among employees and a compassionate demeanor toward the families. Increasingly, funeral directors also help individuals adapt to changes in their lives following a death through aftercare services and support groups.

Work environment. Most funeral directors work in funeral homes that have one or more viewing rooms, a casket-selection room, a preparation room, and sometimes a chapel. Some may also have a crematory on the premises.

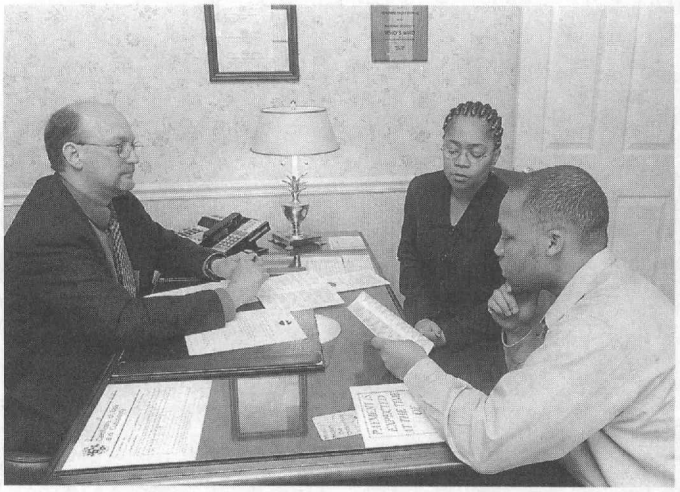
In general, the occupation is safe, but funeral directors occasionally come into contact with bodies that had contagious diseases, but when the appropriate safety and health regulations are followed the possibility of infection is remote.

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

Training, Other Qualifications, and Advancement

Funeral directors are licensed in all States. State licensing laws vary, but most require applicants to be 21 years old, have 2 years of formal education, serve a 1-year apprenticeship, and pass an examination.

Education and training. College programs in mortuary science usually last from 2 to 4 years. The American Board of Funeral Service Education accredits about 60 mortuary science programs. The majority are two-year associate degree programs offered at community colleges. About 6 colleges and universities offer programs that culminate in a bachelor's degree. In ad-



Funeral directors, also called morticians and undertakers, arrange the details of funerals, taking into account the wishes of the deceased and family members.

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dition, many specialized, stand alone funeral service institutions offer two-year programs, although some are 4 years in length. 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 in legal, ethical, and regulatory subjects such as psychology, grief counseling, oral and written communication, funeral service law, business law, and ethics.

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 to maintain their licenses.

Apprenticeships must be completed under the direction of an experienced and licensed funeral director. Some States require apprenticeships. 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.

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 also provide good experience. These jobs consist mostly of maintenance and cleanup tasks, such as washing and polishing limousines and hearses, but they can help students become familiar with the operation of funeral homes.

Licensure. All States require funeral directors to be licensed. Licensing laws vary by 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.

Some States require all funeral directors to be licensed in embalming. Others have separate licenses for directors and embalmers, but in those States funeral directors who embalm need to be licensed in embalming, and most of these professionals obtain both licenses.

State board licensing examinations vary, but they usually consist of written and oral parts and include a demonstration of practical skills. People 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. People interested in a career as a funeral director should contact their State licensing board for specific requirements.

Other qualifications. Funeral directors need composure, tact, and the ability to communicate easily and compassionately with the public. Funeral directors also should have the desire and ability to comfort people in a time of sorrow.

To show proper respect and consideration for the families and the dead, funeral directors must dress appropriately. The professions usually require short, neat haircuts and trim beards, if any, for men. Suits and ties for men and comparable business attire, for women are customary.

Advancement. Advancement opportunities generally are best in companies with multiple funeral homes. Funeral directors working for these companies 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.

Employment

Funeral directors held about 30,000 jobs in 2008. About 13 percent were self-employed. Nearly all worked in the death care services industry.

Job Outlook

Employment growth is expected to be as fast as average for all occupations. Job opportunities are expected to be good, particularly for funeral directors who also embalm.

Employment change. Employment of funeral directors is expected to increase by 12 percent during the 2008–18 decade, about as fast as the average for all occupations. Projected job growth reflects growth in the death care services industry overall due to the aging of the population.

Job prospects. In addition to employment growth, the need to replace funeral directors who retire or leave the occupation for other reasons will result in good job opportunities. Funeral directors are older, on average, than workers in most other occupations and are expected to retire in greater numbers over the coming decade. In addition, some funeral directors leave the profession because of the long and irregular hours. Job prospects may also be better for some mortuary science graduates who can relocate to get a job.

Earnings

Median annual wages for funeral directors were $52,210 in May 2008. The middle 50 percent earned between $38,980 and $69,680. The lowest 10 percent earned less than $29,910 and the top 10 percent earned more than $92,940.

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, and the director's level of formal education. Funeral directors in large cities usually earn more than their counterparts in small towns and rural areas.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Funeral directors	11-9061	30,000	33,600	3,600	12

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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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:

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Physicians and surgeons	381
Psychologists	215
Social workers	246

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 scholarships and educational programs in funeral service and mortuary science, contact:

➤ The American Board of Funeral Service Education, 3414 Ashland Ave., Suite G, St. Joseph, MO 64506. Internet: **http://www.abfse.org**

For information on specific State licensing requirements, contact the State's licensing board.

For more information about funeral directors and their work, see the *Occupational Outlook Quarterly* article, "Jobs in weddings and funerals: Working with the betrothed and the bereaved," available in many libraries and career centers and online at **http://www.bls.gov/opub/ooq/2006/winter/art03.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos011.htm**

Human Resources, Training, and Labor Relations Managers and Specialists

Significant Points

- The educational backgrounds of these workers vary considerably, reflecting the diversity of duties and levels of responsibility.
- College graduates and those who have earned certification should have the best job and advancement opportunities.
- Human resources occupations require strong interpersonal skills.
- Much faster than average growth is expected during the projection period.

Nature of the Work

Every organization wants to attract, motivate, and retain the most qualified employees and match them to jobs for which they are best suited. Human resources, training, and labor relations managers and specialists provide this connection. In the past, these workers performed the administrative function of an organization, such as handling employee benefits questions or recruiting, interviewing, and hiring new staff in accordance with policies established by top management. Today's human resources workers manage these tasks, but, increasingly, they consult with top executives regarding strategic planning. They have moved from behind-the-scenes staff work to leading the company in suggesting and changing policies.

In an effort to enhance morale and productivity, limit job turnover, and help organizations increase performance and improve results, these workers also help their companies effectively use employee skills, provide training and development opportunities to improve those skills, and increase employees' satisfaction with their jobs and working conditions. Although some jobs in the human resources field require only limited contact with people outside the human resources office, dealing with people is an important part of the job.

There are many types of human resources, training, and labor relations managers and specialists. In a small organization, a *human resources generalist* may handle all aspects of human resources work, and thus require an extensive range of knowledge. The responsibilities of human resources generalists can vary widely, depending on their employer's needs.

In a large corporation, the *director of human resources* may supervise several departments, each headed by an experienced manager who most likely specializes in one human resources activity, such as employment and placement, compensation and benefits, training and development, or labor relations. The director may report to a top human resources executive. (See top executives elsewhere in the *Handbook.*)

Employment and placement. *Employment and placement managers* supervise the recruitment, hiring, and separation of employees. They also supervise employment, recruitment, and placement specialists, including employment interviewers. *Employment, recruitment, and placement specialists* recruit and place workers.

Recruitment specialists maintain contacts within the community and may travel considerably, often to job fairs and college campuses, to search for promising job applicants. Recruiters screen, interview, and occasionally test applicants. They also may check references and extend job offers. These workers must be thoroughly familiar with their organization, the work that is done, and the human resources policies of their company in order to discuss wages, working conditions and advancement opportunities with prospective employees. They also must stay informed about equal employment opportunity (EEO) and affirmative action guidelines and laws, such as the Americans with Disabilities Act.

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

Compensation, benefits, and job analysis. *Compensation, benefits, and job analysis specialists* administer compensation

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Human resources, training, and labor relations managers and specialists explain company procedures and benefits to new employees.

programs for employers and may specialize in specific areas such as pensions or position classifications. For example, *job analysts*, occasionally 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 job analysts.

Occupational analysts research occupational classification systems and study the effects of industry and occupational trends on worker relationships. They may serve as technical liaisons between companies or departments, government, and labor unions.

Establishing and maintaining a firm's pay structure is the principal job of *compensation managers*. Assisted by compensation analysts or specialists, compensation managers devise ways to ensure fair and equitable pay rates. They may participate in or purchase salary surveys to see how their firm's pay compares with others, and they ensure that the firm's pay scale complies with changing laws and regulations. In addition, compensation managers often oversee the compensation side of their company's performance management system. They may design reward systems such as pay-for-performance plans, which might include setting merit pay guidelines and bonus or incentive pay criteria. Compensation managers also might administer executive compensation programs or determine commission rates and other incentives for corporate sales staffs.

Employee benefits managers and specialists administer a company's employee benefits program, notably its health insurance and retirement plans. Expertise in designing, negotiating, 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, retirement benefits might include defined benefit pension plans, defined contribution plans, such as 401(k) or thrift savings plans and profit-sharing or stock ownership plans. Health benefits might include medical, dental, and vision insurance and protection against catastrophic illness. Familiarity with health benefits is a top priority for employee benefits managers and specialists, because of the rising cost of providing healthcare benefits to employees and retirees. In addition to health insurance and retirement coverage, many firms offer employees life and accidental death and dismemberment insurance, disability insurance, and benefits designed to meet the needs of a changing workforce, such as parental leave, long-term nursing or home care insurance, wellness programs, and flexible benefits plans. Benefits managers must keep abreast of changing Federal and State regulations and legislation that may affect employee benefits. Working with employee assistance plan managers or work-life coordinators, many benefits managers work to integrate the growing number of programs that deal with mental and physical health, such as employee assistance, obesity, and smoking cessation, into their health benefits programs.

Employee assistance plan managers, also called *employee welfare managers* or *work-life managers*, are responsible for a wide array of programs to enhance employee safety and wellness and improve work-life balance. These may include occupational safety and health standards and practices, health promotion and physical fitness, medical examinations and minor health treatment, such as first aid, flexible work schedules, food service and recreation activities, carpooling and transportation programs such as transit subsidies, employee suggestion systems, child care and elder care, and counseling services. Child care and elder care are increasingly significant because of growth in the number of dual-income households and the older population. Counseling may help employees deal with emotional disorders, alcoholism, or marital, family, consumer, legal, and financial problems. Some employers offer career counseling and outplacement services. In some companies, certain programs, such as those dealing with physical security or information technology, may be coordinated in separate departments by other managers. (See administrative services managers elsewhere in the *Handbook*.)

Training and development. *Training and development managers and specialists* create, procure, and conduct training and development programs for employees. Managers typically supervise specialists and make budget-impacting decisions in exchange for a reduced training portfolio. Increasingly, executives recognize that training offers a way of developing skills, enhancing productivity and quality of work, and building worker loyalty. Enhancing employee skills can increase individual and organizational performance and help to achieve business results. Increasingly, executives realize that developing the skills and knowledge of its workforce is a business imperative that can give them a competitive edge in recruiting and retaining high quality employees and can lead to business growth.

Other factors involved in determining whether training is needed 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 and, thus, require new skills. In addition, advances in learning theory have provided insights into how people learn and how training can be organized most effectively.

Training managers oversee development of training programs, contracts, and budgets. They may perform needs assessments of the types of training needed, determine the best means

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of delivering training, and create the content. They may provide employee training in a classroom, computer laboratory, or on-site production facility, or through a training film, Web video-on-demand, or self-paced or self-guided instructional guides. For live or in-person training, training managers ensure that teaching materials are prepared and the space appropriately set, training and instruction stimulate the class, and completion certificates are issued at the end of training. For computer-assisted or recorded training, trainers ensure that cameras, microphones, and other necessary technology platforms are functioning properly and that individual computers or other learning devices are configured for training purposes. They also have the responsibility for the entire learning process, and its environment, to ensure that the course meets its objectives and is measured and evaluated to understand how learning impacts performance.

Training specialists plan, organize, and direct a wide range of training activities. Trainers consult with training managers and employee supervisors to develop performance improvement measures, conduct orientation sessions, and arrange on-the-job training for new employees. They help employees maintain and improve their job skills and prepare for jobs requiring greater skill. They work with supervisors to improve their interpersonal skills and to deal effectively with employees. They may set up individualized training plans to strengthen employees' existing skills or teach new ones. Training specialists also may set up leadership or executive development programs for employees who aspire to move up in the organization. These programs are designed to develop or "groom" leaders to replace those leaving the organization and as part of a corporate succession plan. Trainers also lead programs to assist employees with job transitions as a result of mergers or consolidation, as well as retraining programs to develop new skills that may result from technological changes in the work place. In government-supported job-training programs, training specialists serve as case managers and provide basic job skills to prepare participants to function in the labor force. They assess the training needs of clients and guide them through the most appropriate training. After training, clients may either be referred to employer relations representatives or receive job placement assistance.

Planning and program development is an essential part of the training specialist's job. In order to identify and assess training needs, trainers may confer with managers and supervisors or conduct surveys. They also evaluate training effectiveness to ensure that employees actually learn and that the training they receive helps the organization meet its strategic goals and achieve results.

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 also vary by whether the training predominantly is knowledge-based or skill-based or sometimes a combination of the two. For example, much knowledge-based training is conducted in a classroom setting. Most skill training provides some combination of hands-on instruction, demonstration, and practice at doing something and usually is conducted on a shop floor, studio, or laboratory where trainees gain experience and confidence. Some on-the-job training methods could apply equally to knowledge or skill training and formal apprenticeship training programs combine classroom training and work experience. Increasingly, training programs involve interactive Internet-based training modules that can be downloaded for either individual or group instruction, for dissemination to a geographically dispersed class, or to be coordinated with other multimedia programs. These technologies allow participants to take advantage of distance learning alternatives and to attend conferences and seminars through satellite or Internet communications hookups, or use other computer-aided instructional technologies, such as those for the hearing-impaired or sight-impaired.

Employee relations. 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 employees. The director of industrial relations also advises and collaborates with the director of human resources, other managers, and members of their staffs, because all aspects of human resources policy—such as wages, benefits, pensions, and work practices—may be involved in drawing up a new or revised work rules that comply with a union contract.

Labor relations managers and their staffs implement industrial labor relations programs. Labor relations specialists prepare information for management to use during collective bargaining agreement negotiations, 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 procedures. 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. In the absence of a union, industrial relations personnel may work with employees individually or with employee association representatives.

Dispute resolution—attaining tacit or contractual agreements—has become increasingly significant 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. *Mediators* advise and counsel labor and management to prevent and, when necessary, resolve disputes over labor agreements or other labor relations issues. *Arbitrators*, occasionally 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.

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

Other emerging specialties in human resources include *international human resources managers*, who handle human resources issues related to a company's overseas operations and *human resources information system specialists*, who develop and apply computer programs to process human resources information, match jobseekers with job openings, and handle

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other human resources matters; and *total compensation* or *total rewards specialists*, who determine an appropriate mix of compensation, benefits, and incentives.

Work environment. Human resources personnel usually work in clean, pleasant, and comfortable office settings. Arbitrators and mediators many of whom work independently may work out of home offices. 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, participate in job fairs, and visit college campuses to interview prospective employees. Arbitrators and mediators often must travel to the site chosen for negotiations. Trainers and other specialists may travel to regional, satellite, or international offices of a company to meet with employees who work outside of the main corporate office.

Many human resources, training, and labor relations managers and specialists work a standard 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 or dispute resolutions are being negotiated.

Training, Other Qualifications, and Advancement

The educational backgrounds of human resources, training, and labor relations managers and specialists vary considerably, reflecting the diversity of duties and levels of responsibility. In filling entry-level jobs, many employers seek college graduates who have majored in human resources, human resources 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.

Education and training. Although a bachelor's degree is a typical path of entry into these occupations, many colleges and universities do not offer degree programs in personnel administration, human resources, or labor relations until the graduate degree level. However, many offer individual courses in these subjects at the undergraduate level in addition to concentrations in human resources administration or human resources management, training and development, organizational development, and compensation and benefits.

Because an interdisciplinary background is appropriate in this field, a combination of courses in the social sciences, business administration, and behavioral sciences is useful. Some jobs may require more technical or specialized backgrounds in engineering, science, finance, or law. Most prospective human resources specialists should take courses in principles of management, organizational structure, and industrial psychology; however, courses in accounting or finance are becoming increasingly important. Courses in labor law, collective bargaining, labor economics, and labor history also provide a valuable background for the prospective labor relations specialist. As in many other fields, knowledge of computers and information systems 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 have law degrees. 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.

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 by performing administrative duties—helping to enter data into computer systems, compiling employee handbooks, researching information for a supervisor, or answering phone calls and handling routine questions. Entry-level workers often enter 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 human resources department to gain experience. Later, they may advance to supervisory positions, overseeing a major element of the human resources program—compensation or training, for example.

Other qualifications. Experience is an asset for many specialties in the human resources area, and is essential for advancement to senior-level positions, including managers, arbitrators, and mediators. Many employers prefer entry-level workers who have gained some experience through an internship or work-study program while in school. Employees in human resources administration and human resources development need the ability to work well with individuals and a commitment to organizational goals. This field demands skills that people may have developed elsewhere—teaching, supervising, and volunteering, among others. Human resources work also offers clerical workers opportunities to advance to more responsible or professional positions. Some positions occasionally are filled by experienced individuals from other backgrounds, 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. Ever-changing technologies and the growing complexities inherent to the many services human resources personnel provide require that they be knowledgeable about computer systems, storage and retrieval software, and how to use a wide array of digital communications devices.

The growing diversity of the workforce requires that human resources managers and specialists work with or supervise people of various ages, cultural backgrounds, levels of education, and experience. Ability to speak a foreign language is an asset, especially if working in an industry with a large immigrant workforce or for a company with many overseas operations. Human resources employees must be able to cope with conflicting points of view, function under pressure, and demonstrate discretion, integrity, fair-mindedness, and a persuasive, genial personality. Because much of the information collected by these employees is confidential, they must also show the character and responsibility of dealing with sensitive employee information.

Certification and advancement. Most professional associations that specialize in human resources offer classes intended to enhance the skills of their members. Some organizations offer certification programs, which are signs of competence and

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credibility and can enhance advancement opportunities. For example, the International Foundation of Employee Benefit Plans confers a designation in three distinct areas of specialization—group benefit, retirement, and compensation—to persons who complete a series of college-level courses and pass exams. Candidates can earn a designation in each of the specialty tracks and, simultaneously, receive credit toward becoming a Certified Employee Benefits Specialist (CEBS). The American Society for Training and Development (ASTD) Certification Institute offers professional certification in the learning and performance field. Addressing nine areas of expertise, certification requires passing a knowledge-based exam and successful work experience. In addition, ASTD offers 16 short-term certificate and workshop programs covering a broad range of professional training and development topics. The Society for Human Resource Management offers two levels of certification, including the Professional in Human Resources (PHR) and the Senior Professional in Human Resources (SPHR). Additionally, the organization offers the Global Professional in Human Resources certification for those with international and cross-border responsibilities and the California Certification in Human Resources for those who plan to work in that State and become familiar with California's labor and human resources laws. All designations require experience and a passing score on a comprehensive exam. The WorldatWork Society of Certified Professionals offers four distinct designations in the areas of compensation, benefits, work-life, and global remuneration that comprise the total rewards management practice. Candidates obtain the designation of Certified Compensation Professional (CCP), Certified Benefits Professional (CBP), Global Remuneration Professional (GRP), and Work-Life Certified Professional (WLCP). Certification is achieved after passing a series of knowledge-based exams within each designation. Additionally, WorldatWork offers online and classroom education covering a broad range of total rewards topics.

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

Employment

Human resources, training, and labor relations managers and specialists held about 904,900 jobs in 2008. The following tabulation shows the distribution of jobs by occupational specialty:

Training and development specialists 216,600
Employment, recruitment, and placement specialists 207,900
Compensation, benefits, and job analysis specialists 121,900
Compensation and benefits managers 40,500
Training and development managers 30,400
Human resources, training, and labor relations specialists, all other 224,600
Human resources managers, all other 63,100

Human resources, training, and labor relations managers and specialists were employed in virtually every industry. About 13 percent of human resources, training, and labor relations managers and specialists were employed in administrative and support services, 11 percent in professional, scientific, and technical services, 10 percent in healthcare and social assistance, and 9 percent in finance and insurance firms. About 12,900 managers and specialists were self-employed, working as consultants to public and private employers.

Job Outlook

Employment is expected to grow much faster than the average for all human resources, training, and labor relations managers and specialists occupations. College graduates and those who have earned certification should have the best job opportunities.

Employment change. Overall employment is projected to grow by 22 percent between 2008 and 2018, much faster than the average for all occupations. Legislation and court rulings revising standards in various areas—occupational safety and health, equal employment opportunity, wages, healthcare, retirement plans, and family leave, among others—will increase demand for human resources, training, and labor relations experts. Rising healthcare costs and a growing number of healthcare coverage options should continue to spur demand for specialists to develop creative compensation and benefits packages that companies can offer prospective employees.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Human resources, training, and labor relations managers and specialists	–	904,900	1,102,300	197,400	22
Human resources managers	11-3040	133,900	146,800	12,900	10
Compensation and benefits managers	11-3041	40,500	43,900	3,400	9
Training and development managers	11-3042	30,400	34,000	3,600	12
All other human resources managers	11-3049	63,100	68,900	5,800	9
Human resources, training, and labor relations specialists	13-1070	770,900	955,500	184,500	24
Employment, recruitment, and placement specialists	13-1071	207,900	265,900	58,000	28
Compensation, benefits, and job analysis specialists	13-1072	121,900	150,600	28,700	24
Training and development specialists	13-1073	216,600	267,100	50,500	23
Human resources, training, and labor relations specialists, all other	13-1079	224,600	271,900	47,200	21

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Employment of labor relations staff, including arbitrators and mediators, should grow as companies 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.

Job growth could be limited by the widespread use of computerized human resources information systems that make workers more productive. Like other workers, employment of human resources, training, and labor relations managers and specialists, particularly in larger companies, may be adversely affected by corporate downsizing, restructuring, and mergers; however, as companies once again expand operations, additional workers may be needed to manage company growth.

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 and technological advances that can leave employees with obsolete skills. Additionally, as highly trained and skilled baby boomers retire, there should be strong demand for training and development specialists to impart needed skills to their replacements. 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 human resources functions or hire human resources specialists on a temporary basis to deal with increasing costs and complexity of training and development programs. Demand for specialists also should increase in outsourcing firms that develop and administer complex employee benefits and compensation packages for other organizations.

Job prospects. College graduates and those who have earned certification should have the best job opportunities, particularly graduates with a bachelor's degree in human resources, human resources administration, or industrial and labor relations. Those with a technical or business background or a well-rounded liberal arts education also should find opportunities. Demand for human resources, training, and labor relations managers and specialists depends on general economic conditions and the business cycle as well as staffing needs of the companies in which they work. A rapidly expanding business is likely to hire additional human resources workers—either as permanent employees or consultants—while businesses that have consolidated operations or merged with another company may require fewer of these 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 separate human resources departments may assign various human resources responsibilities to some employees in addition to their usual responsibilities; others may contract with consulting firms to establish formal procedures and train current employees to administer programs on a long-term basis.

In addition to new human resources management and specialist jobs created over the 2008-2018 projection period, many job openings will arise from the need to replace workers who transfer to other occupations, retire, or leave the labor force for other reasons.

Earnings

Annual salary rates for human resources workers vary according to occupation, level of experience, training, location, and firm size.

Median annual wages of compensation and benefits managers were $86,500 in May 2008. The middle 50 percent earned between $64,930 and $113,480. The lowest 10 percent earned less than $49,350, and the highest 10 percent earned more than $147,050. Median annual wages in the industries employing the largest numbers of compensation and benefits managers were:

Computer systems design and related services	$97,630
Insurance carriers	94,340
Management of companies and enterprises	94,230
General medical and surgical hospitals	86,060
Depository credit intermediation	84,980

Median annual wages of training and development managers were $87,700 in May 2008. The middle 50 percent earned between $64,770 and $115,570. The lowest 10 percent earned less than $48,280, and the highest 10 percent earned more than $149,050. Median annual wages in the industries employing the largest numbers of training and development managers were:

Management of companies and enterprises	$93,140
Insurance carriers	92,210
General medical and surgical hospitals	86,820
Local government	70,430
Employment services	69,170

Median annual wages of human resources managers, all other were $96,130 in May 2008. The middle 50 percent earned between $73,480 and $126,050. The lowest 10 percent earned less than $56,770, and the highest 10 percent earned more than $163,220. Median annual wages in the industries employing the largest numbers of human resources managers, all other were:

Management of companies and enterprises	$107,280
General medical and surgical hospitals	91,580
Local government	89,240
Colleges, universities, and professional schools	86,920
State government	76,570

Median annual wages of employment, recruitment, and placement specialists were $45,470 in May 2008. The middle 50 percent earned between $35,020 and $63,110. The lowest 10 percent earned less than $28,030, and the highest 10 percent earned more than $85,760. Median annual wages in the industries employing the largest numbers of employment, recruitment, and placement specialists were:

Management, scientific, and technical consulting services	$56,110
Computer systems design and related services	55,600
Management of companies and enterprises	51,320
Local government	42,950
Employment services	42,670
State government	38,970

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Median annual wages of compensation, benefits, and job analysis specialists were $53,860 in May 2008. The middle 50 percent earned between $42,050 and $67,730. The lowest 10 percent earned less than $34,080, and the highest 10 percent earned more than $84,310. Median annual wages in the industries employing the largest numbers of compensation, benefits, and job analysis specialists were:

Management, scientific, and technical consulting services	$59,810
Local government	56,930
Management of companies and enterprises	54,930
Agencies, brokerages, and other insurance related activities	53,490
Insurance carriers	51,890
State government	43,880

Median annual wages of training and development specialists were $51,450 in May 2008. The middle 50 percent earned between $38,550 and $67,450. The lowest 10 percent earned less than $29,470, and the highest 10 percent earned more than $85,160. Median annual wages in the industries employing the largest numbers of training and development specialists were:

Computer systems design and related services	$61,110
General medical and surgical hospitals	56,540
Insurance carriers	55,190
Management of companies and enterprises	54,800
Local government	52,080
State government	48,480

According to a July 2009 salary survey conducted by the National Association of Colleges and Employers, bachelor's degree candidates majoring in human resources, including labor and industrial relations, received starting offers averaging $45,170 a year.

Related Occupations

Human resources occupations require strong interpersonal skills. Other occupations that demand these skills include:

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Counselors	234
Education administrators	41
Lawyers	257
Psychologists	215
Public relations specialists	350
Social and human service assistants	244
Social workers	246

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 22313-2043. 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., Brookfield, WI 53045. Internet: **http://www.ifebp.org**

➤ WorldatWork, 14040 N. Northsight Blvd., Scottsdale, AZ 85260. Internet: **http://www.worldatwork.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos021.htm**

Industrial Production Managers

Significant Points

- Industrial production managers coordinate all the people and equipment involved in the manufacturing process.
- Most employers prefer to hire workers with a college degree; experience in some part of production operations usually is required as well.
- Employment is expected to decline as overall employment in manufacturing declines.

Nature of the Work

Industrial production managers plan, direct, and coordinate the production activities required to produce the vast array of goods manufactured every year in the United States. They make sure that production meets output and quality goals while remaining within budget. Depending on the size of the manufacturing plant, industrial production managers may oversee the entire plant or just one area of it.

Industrial production managers devise methods to use the plant's personnel and capital resources to best meet production goals. They may determine 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 they correct any problems that may arise.

Part of an industrial production manager's job is to come up with ways to make the production process more efficient. Traditional factory methods, such as mass assembly lines, have given way to "lean" production techniques, which give managers more flexibility. In a traditional assembly line, each worker was responsible for only a small portion of the assembly, repeating that task on every product. Lean production, by contrast, employs teams to build and assemble products in stations or cells. Thus, 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, industrial production managers can more easily change production levels and staffing on different product lines to minimize inventory levels and more quickly react to changing customer demands.

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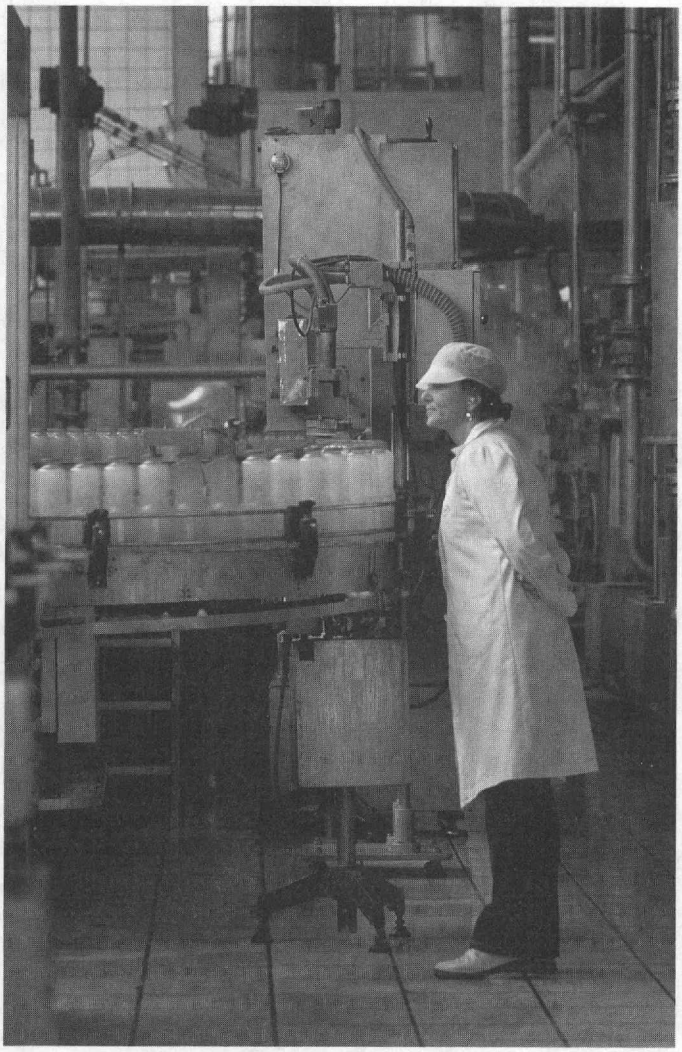

Industrial production managers oversee all stages of the production process.

Industrial production managers also monitor product standards and implement quality control programs. They make sure that the finished product meets a certain level of quality, and if it doesn't, they try to find out what the problem is and solve it. Although 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 on the basis of the suggestions of employee teams. If the cause is substandard materials or parts from outside suppliers, the industrial production manager may work with the supplier to improve their quality.

Industrial production managers work closely with other managers of the firm to implement the company's policies and goals. They also must work with the firm's financial departments in order to come up with a budget and spending plan. They work the closest with the heads of the sales, procurement, and logistics departments. Sales managers relay the client's needs and the price the client is willing to pay to the production department, which must then fill the order. The logistics or distribution department handles the delivery of the goods, often coordinating with the production department. The procurement department orders the supplies that the production department needs to make its products. The procurement department also is responsible for making sure that the inventories of supplies are maintained at proper levels so that production proceeds without interruption. A breakdown in communications between the production manager and the procurement department can cause slowdowns and a failure to meet production schedules. Just-in-time production techniques have reduced inventory levels, making constant communication among managers, suppliers, and procurement departments even more important.

Work environment. 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.

Many industrial production managers work extended hours, especially when production deadlines must be met. In 2008, about a third of all workers worked more than 50 hours a week, on average. 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 the stress.

Training, Other Qualifications, and Advancement

Because of the diversity of manufacturing operations and job requirements, there is no standard preparation for this occupation. Most employers prefer to hire workers with a college degree. Experience in some part of production operations is also usually is required also.

Education and training. Many industrial production managers have a college degree in business administration, management, industrial technology, or industrial engineering. However, although employers may prefer candidates with a business or engineering background, some companies will hire well-rounded graduates from other fields who are willing to spend time in a production-related job, because experience in some aspect of production operations is needed before one advances to upper management positions.

Some industrial production managers enter the occupation after working their way up through the ranks, starting as production workers and then advancing to supervisory positions before being selected for management. These workers already have an intimate knowledge of the production process and the firm's organization. To increase one's chances of promotion, workers can expand their skills by obtaining a college degree, demonstrating leadership qualities, or taking company-sponsored courses to learn the additional skills needed in management positions.

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As production operations become more sophisticated, an increasing number of employers are looking for candidates with graduate degrees in industrial management or business administration, particularly for positions at larger plants where managers have more oversight responsibilities. 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 statistical formulas that can be used to maximize efficiency and improve quality.

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 promote them to management positions later.

Other qualifications. Today, companies 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. Strong computer skills also are essential.

Industrial production managers must continually keep informed of new production technologies and management practices. Many belong to professional organizations and attend trade shows or industry conferences where new equipment is displayed and new production methods and technologies discussed.

Certification and advancement. Some industrial production managers earn certifications that show their competency in various quality and management systems. Although certification is not required for industrial production manager jobs, it may improve job prospects.

One credential, Certified in Production and Inventory Management (CPIM), is offered by APICS, the Association for Operations Management, and requires passing a series of exams that cover supply chain management, resource planning, scheduling, production operations, and strategic planning. Those certified must complete a set number of professional development activities every 3 years to maintain their certification.

The American Society for Quality offers the Certified Manager of Quality/Organizational Excellence (CMQ/OE) credential. This certification is open to managers who pass an exam and who have at least 10 years of experience or education, 5 of which must be in a decisionmaking position. It is intended for managers who lead process improvement initiatives. To maintain certification, workers must complete a set number of professional development units every 3 years.

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

Employment

Industrial production managers held about 156,100 jobs in 2008. About 80 percent are employed in manufacturing industries, including fabricated metal product, transportation equipment, and computer and electronic product manufacturing. Production managers work in all parts of the country, but jobs are most plentiful in areas where manufacturing is concentrated.

Job Outlook

Employment is expected to decline moderately. Applicants with experience in production occupations, along with a college degree in industrial engineering, management, or a related field, will enjoy the best job prospects.

Employment change. Employment of industrial production managers is expected to decline moderately by 8 percent over the 2008–18 decade. Overall manufacturing employment is expected to decline as the production process becomes more automated. However, because industrial production managers coordinate the use of both workers and machines in the production process, they will not be as affected as other occupations by automation. Nevertheless, the employment decline will result from improved productivity and increased imports of manufactured goods.

Efforts to increase efficiency at the management level have led companies to ask production managers to assume more responsibilities, particularly as computers and production management software allow managers to coordinate scheduling, planning, and communication more easily among departments. 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. However, most of the decisionmaking work of production managers cannot be automated, a factor that will limit the decline in their employment.

Job prospects. Despite the projected employment decline, a number of jobs are expected to open because of the need to replace workers who retire or transfer to other occupations. Applicants with experience in production occupations, along with a college degree in industrial engineering, management, or business administration (particularly those with an undergraduate engineering degree and a master's degree in business

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Industrial production managers	11-3051	156,100	144,100	-11,900	-8

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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administration or industrial management), will enjoy the best job prospects. Employers also are likely to seek candidates who have excellent communication skills and related work experience and who are personable, flexible, and eager to enhance their knowledge and skills through ongoing training.

Earnings

Median annual wages for industrial production managers were $83,290 in May 2008. The middle 50 percent earned between $64,390 and $108,710. The lowest 10 percent earned less than $50,330, and the highest 10 percent earned more than $140,530. Median annual wages in the manufacturing industries employing the largest numbers of industrial production managers were as follows:

Navigational, measuring, electromedical, and control instruments manufacturing	$97,860
Pharmaceutical and medicine manufacturing	96,620
Motor vehicle parts manufacturing	83,720
Printing and related support activities	80,080
Plastics product manufacturing	78,090

Related Occupations

Industrial production managers oversee production staff and equipment, ensure that production goals and quality standards are met, and implement company policies. Other managerial occupations with similar responsibilities include the following:

	Page
Advertising, marketing, promotions, public relations, and sales managers	32
Construction managers	38
Top executives	83

Occupations requiring comparable training and problem-solving skills include the following:

Engineers	161
Management analysts	111
Operations research analysts	145

Sources of Additional Information

General information on careers in industrial production management is available from local manufacturers and schools with programs in industrial management.

For more information on careers in production management and information on the CPIM certification, contact:

➤ APICS, the Association for Operations Management, 8430 West Bryn Mawr Ave., Suite 1000, Chicago, IL 60631. Internet: **http://www.apics.org**

For more information on quality management and the CMQ/OE certification, contact:

➤ American Society for Quality, 600 North Plankinton Ave., Milwaukee, WI 53203. Internet: **http://www.asq.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos016.htm**

Lodging Managers

Significant Points

- Long hours, including night and weekend work, are common.
- Employment is projected to grow more slowly than the average for all occupations.
- College graduates with degrees in hotel or hospitality management should have better opportunities for jobs at full-service hotels and for advancement than those without a degree.

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. *Lodging managers* make sure that these conveniences are provided, while also ensuring that the establishments are run efficiently and profitably. Most lodging managers work in traditional hotels and motels, but some work in other lodging establishments, such as recreational camps and RV parks, inns, boardinghouses, and youth hostels.

Lodging establishments can vary significantly in size and in the number of services they provide, which can range from supplying a simple in-room television and a continental breakfast to operating a casino and accommodating conventions. These factors affect the number and type of lodging managers employed at each property.

The one person who oversees all lodging operations at a property is usually called a *general manager*. At larger hotels with several departments and multiple layers of management, the general manager and multiple *assistant managers* coordinate the activities of separate departments. (See related sections elsewhere in the *Handbook* on supervisors and managers of housekeeping and janitorial workers; human resources, training, and labor relations managers and specialists; financial managers; advertising, marketing, promotions, public relations, and sales managers; and food service managers.) In smaller limited-service hotels—mainly those without food and beverage service—one lodging manager may direct all the activities of the property.

Lodging managers have overall responsibility for the operation and profitability of the hotel. Depending on the hotel and the size of its staff, lodging managers may either perform or direct housekeeping, personnel, office administration, marketing and sales, purchasing, security, maintenance, oversight of recreation facilities, and other activities. They may hire and train staff, set schedules, and lend a hand when needed.

Within guidelines established by the owners of the hotel or executives of the hotel chain, lodging managers set room rates, allocate funds to departments, approve expenditures, and ensure that standards for guest service, decor, housekeeping, food quality, and banquet operations are met. Increasingly, lodging managers also are responsible for ensuring that the information technology common in today's hotels is operational. Some lodging managers, often called *revenue managers*, work in financial management, monitoring room sales and reservations,

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overseeing accounting and cash-flow matters at the hotel, projecting occupancy levels, and deciding which rooms to discount and when to offer rate specials.

Front office managers, a category of lodging manager, coordinate reservations and room assignments and 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. At some hotels, they may greet the guests personally and provide them individual attention to see their needs are met. Any adjustments to bills often are referred to front office managers for resolution.

Convention services managers coordinate the activities of various departments to accommodate meetings, conventions, and special events. They meet with representatives of groups or organizations to plan the number of conference rooms to reserve, the configuration of the meeting space, and determine what other services the group will need, such as catering or banquets and audio, visual, or other electronic requirements. During the meeting or event, they resolve unexpected problems and monitor activities to ensure that hotel operations conform to the group's expectations.

Lodging managers may work with hotel sales and marketing directors and public relations directors to manage and coordinate the advertising and promotion of the hotel. They help develop lodging and dining specials and coordinate special events, such as holiday or seasonal specials. They may direct their staff to purchase advertising and to market their property to organizations or groups seeking a venue for conferences, conventions, business meetings, trade shows, and special events.

Lodging managers who oversee the personnel functions of a hotel or serve as human resource directors ensure that all accounting, payroll, and employee relations matters are handled in compliance with hotel policy and applicable laws. They also oversee hiring practices and standards and ensure that training and promotion programs reflect appropriate employee development guidelines.

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. Many hotels also provide extensive information technology services for their guests. Managers work with computer specialists and other information technology specialists to ensure that the hotel's computer systems, Internet, and communications networks function properly.



Lodging managers may oversee individual departments, such as housekeeping.

Work environment. Because hotels are open around the clock, night and weekend work is common. Many lodging managers work more than 40 hours per week and are often on-call, which means they may be called back to work at any time. In some hotels and resort properties where work is seasonal, managers may have other duties less related to guest services during the off season or they may find work in other hotels or occupations.

The pressures of coordinating a wide range of activities, turning a profit for investors, and dealing with guests who sometimes are angry can be stressful. Managing conferences and working at the front desk during check-in and check-out times can be particularly hectic.

Training, Other Qualifications, and Advancement

Management trainees for larger upscale hotel chains almost always need a bachelor's or master's degree, preferably in hospitality or hotel management. If not coming from such a college background, experience working at a hotel is generally required to get a position as a lodging manager.

Education and training. Most large, full-service hotel chains usually hire people who have a bachelor's degree in business, hotel, or hospitality management for management trainee positions; however, a liberal arts degree coupled with experience in the hospitality field may be sufficient. At other hotels, especially those with fewer services, employers look for applicants with an associate degree or certificate in hotel, restaurant, or hospitality management along with experience. Formal internships or part-time or summer work in a hotel are an asset. Most degree programs include work-study opportunities.

Community colleges, junior colleges, and many universities offer certificate or degree programs in hotel, restaurant, or hospitality management leading to an associate, bachelor, or graduate degree. Technical institutes, vocational and trade schools, and other academic institutions also offer courses leading to formal recognition in hospitality management. More than 500 educational facilities across the United States provide academic training for prospective lodging managers. About 100 hospitality management programs are accredited by the Accreditation Commission for Programs in Hospitality Administration. Hotel management programs include instruction in hotel administration, accounting, economics, marketing, housekeeping, food service management and catering, and hotel maintenance and engineering. Computer training also is an integral part of hotel management training due to the widespread use of computers and hospitality-specific software in reservations, billing, and housekeeping management. Lodging managers also need to know how to generate and read profit-and-loss reports and other business and economic data.

More than 450 high schools in 45 States offer the Lodging Management Program created by the Educational Institute of the American Hotel and Lodging Association. This 2-year program offered to high school juniors and seniors teaches management principles and leads to a professional certification called

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Lodging managers	11-9081	59,800	62,600	2,800	5

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

the "Certified Rooms Division Specialist." Many colleges and universities grant participants in this program credit towards a postsecondary degree in hotel management.

Hotel employees who do not have hospitality training or a college degree but who do demonstrate leadership potential and possess sufficient experience may be invited to participate in a management training program sponsored by the hotel or a hotel chain's corporate parent. Those who already possess the people skills and service orientation needed to succeed in hotel management can usually train for technical expertise in areas such as computer use and accounting principles while on the job. Trainees usually begin as assistant managers and may rotate assignments among the hotel's departments to gain a wide range of experiences. Relocation to another property may be required to help round out the experience and to help a trainee grow into a more responsible management position in a larger or busier hotel.

Other qualifications. Lodging managers must be able to get along with many different types of people, even in stressful situations. They must be able to solve problems quickly and concentrate on details. Initiative, self-discipline, effective communication skills, and the ability to organize and direct the work of others are essential for lodging managers. Managers must have a good knowledge of hotel operations, including safety and security measures, repair and maintenance, and personnel practices. Knowledge of hotel financing is essential to operate a hotel profitably.

Certification and advancement. Large hotel chains may offer better opportunities for advancement than small, independently owned establishments, but relocation every several years often is necessary for advancement. Large chains have more extensive career ladder programs and offer managers the opportunity to transfer to another hotel in the chain or to a regional or central office. Career advancement can be accelerated by the completion of certification programs offered by various hotel and lodging associations. Certification usually requires a combination of course work, examinations, and experience.

Employment

Most lodging managers work in the traveler accommodation industry, including hotels and motels, although they can work for any business that provides room or shelter for people. Companies that manage hotels under contract also employ lodging managers. Lodging managers held about 59,800 jobs in 2008. Most lodging managers—almost half—worked in hotels and motels; almost as many lodging managers were self-employed, primarily as owners of small hotels and bed-and-breakfast inns.

Job Outlook

Slower than average growth in employment will result as the lodging industry shifts to building more limited service hotels and fewer full-service properties that have more departments to manage. Those seeking jobs at hotels with the highest level of guest services will face keen competition as these jobs are highly sought after by people trained in hospitality.

Employment change. Employment of lodging managers is expected to grow 5 percent from 2008 to 2018, which is slower than the average for all occupations. Over the decade, travel and tourism is expected to grow, however, more new hotels will be smaller limited-service hotels that will not have large staffs or need many managers. In addition, in order to cut expenses, some lodging places are streamlining operations and either eliminating some managers or requiring fewer to be available at all times. Chain hotels are increasingly assigning a single manager to oversee multiple properties within a region. Despite these cutbacks in management, larger full-service hotels, including resort, casino, and convention hotels that provide a wider range of services to a much larger customer base will continue to generate job openings for experienced managers and management trainees.

Job prospects. Job openings are expected to occur as experienced managers leave the labor force or transfer to other occupations, in part because of the long hours and stressful working conditions. Job opportunities are expected to be best for people with good customer service skills and experience in the food service or hospitality industries. People with a college degree in hotel or hospitality management are expected to have better opportunities, particularly at upscale and luxury hotels.

Earnings

Median annual wages of lodging managers were $45,800 in May 2008. The middle 50 percent earned between $34,970 and $62,880. The lowest 10 percent earned less than $28,160 and the highest 10 percent earned more than $84,270. Median annual wages for lodging managers in traveler accommodations were $45,380.

Salaries of lodging managers vary greatly according to their responsibilities, location, and the segment of the hotel industry in which they work. Managers may earn bonuses of up to 25 percent of their basic salary in some hotels and also may be furnished with 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 workers who supervise or manage a business focused on customer service include:

	Page
Food service managers	55
Gaming services occupations	520
Sales worker supervisors	551
Property, real estate, and community association managers	76

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Sources of Additional Information

For information on the hotel and lodging industry, contact:

➤ American Hotel and Lodging Association, 1201 New York Ave. NW., Suite 600, Washington, DC 20005. Internet: **http://www.ahla.com**

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

➤ Educational Institute of the American Hotel and Lodging Association, 800 N. Magnolia Ave., Suite 300, Orlando, FL 32803. Internet: **http://www.ei-ahla.org**

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

➤ International Council on Hotel, Restaurant, and Institutional Education, 2810 North Parham Rd., Suite 230, Richmond, VA 23294. Internet: **http://www.chrie.org**

Information on accreditation standards and a list of accredited educational programs in hospitality administration may be obtained from:

➤ Accreditation Commission for Programs in Hospitality Administration, PO Box 400, Oxford, MD 21654. Internet: **http://www.acpha-cahm.org/**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos015.htm**

Medical and Health Services Managers

Significant Points

- Job opportunities will be good, especially for applicants with work experience in healthcare and strong business and management skills.
- A master's degree is the standard credential, although a bachelor's degree is adequate for some entry-level positions.
- Medical and health services managers typically work long hours and may be called at all hours to deal with problems.

Nature of the Work

Healthcare is a business and, like every business, it needs good management to keep the business running smoothly. *Medical and health services managers*, also referred to as healthcare executives or healthcare administrators, plan, direct, coordinate, and supervise the delivery of healthcare. These workers are either specialists in charge of a specific clinical department or generalists who manage an entire facility or system.

The structure and financing of healthcare are changing rapidly. Future medical and health services managers must be prepared to deal with the integration of healthcare delivery systems, technological innovations, an increasingly complex regulatory environment, restructuring of work, and an increased focus on preventive care. They will be called on to improve efficiency in healthcare facilities and the quality of the care provided.

Large facilities usually have several *assistant administrators* who aid the top administrator and handle daily decisions. Assistant administrators direct activities in clinical areas, such as nursing, surgery, therapy, medical records, and health information.

In smaller facilities, top administrators handle more of the details of daily operations. For example, many *nursing home administrators* manage personnel, finances, facility operations, and admissions, while also providing resident care.

Clinical managers have training or experience in a specific clinical area and, accordingly, have more specific responsibilities than do generalists. 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 quality; develop reports and budgets; and coordinate activities with other managers.

Health information managers are responsible for the maintenance and security of all patient records. Recent regulations enacted by the Federal Government require that all healthcare providers maintain electronic patient records and that these records be secure. As a result, health information managers must keep up with current computer and software technology, as well as with legislative requirements. In addition, as patient data become more frequently used for quality management and in medical research, health information managers must ensure that databases are complete, accurate, and available only to authorized personnel.

In group medical practices, managers work closely with physicians. Whereas an office manager might 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 might have a chief administrator and several assistants, each responsible for a different area of expertise.

Medical and health services managers in managed care settings perform functions similar to those of their counterparts in large group practices, except that they could have larger staffs to manage. In addition, they might do more 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 might contain both inpatient and outpatient facilities and offer a wide range of patient services.

Work environment. Some managers work in comfortable, private offices; others share space with other staff. Many medical and health services managers work long hours. Nursing care facilities and hospitals operate around the clock; administrators

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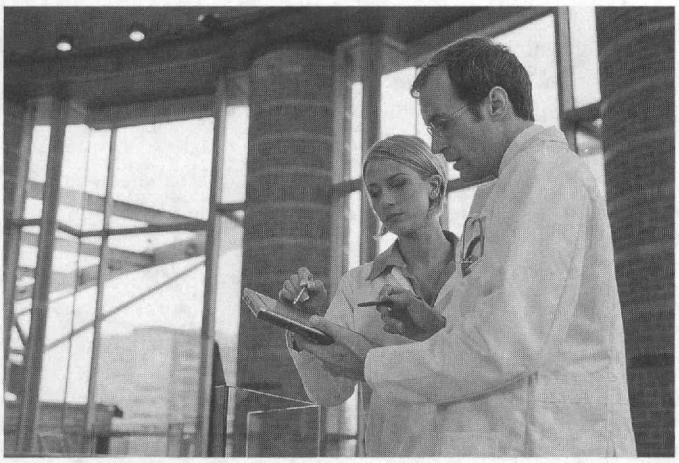

Large healthcare facilities usually have several assistant administrators who aid the top administrator and handle daily decisions.

and managers may be called at all hours to deal with problems. They also travel to attend meetings or to inspect satellite facilities.

Training, Other Qualifications, and Advancement

A master's degree in one of a number of fields is the standard credential for most generalist positions as a medical or healthcare manager. A bachelor's degree is sometimes adequate for entry-level positions in smaller facilities and departments. In physicians' offices and some other facilities, on-the-job experience may substitute for formal education.

Education and training. 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, at the departmental level within healthcare organizations, and in health information management. Physicians' offices and some other facilities hire those with on-the-job experience instead of formal education.

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 2008, according to the Commission on Accreditation of Healthcare Management Education, there were 72 schools that had accredited programs leading to the master's degree in health services administration.

For people seeking to become heads of clinical departments, a degree in the appropriate field and work experience may be sufficient early in their career. However, a master's degree in health services administration or a related field might be required to advance. For example, nursing service administrators usually are chosen from among supervisory registered nurses with administrative abilities and graduate degrees in nursing or health services administration.

Health information managers require a bachelor's degree from an accredited program. In 2008, there were 48 accredited bachelor's degree programs and 5 master's degree programs in health information management, according to the Commission on Accreditation for Health Informatics and Information Management Education.

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 into 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 coursework in areas such as hospital organization and management, marketing, accounting and budgeting, human resources administration, strategic planning, law and ethics, biostatistics or epidemiology, 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.

Licensure. 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. Some States also require licenses for administrators in assisted-living facilities. A license is not required in other areas of medical and health services management.

Certification and other qualifications. Medical and health services managers often are responsible for facilities and equipment worth millions of dollars, and for 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.

Health information managers who have a bachelor's degree or post baccalaureate degree from an approved program and who pass an exam can earn certification as a Registered Health Information Administrator from the American Health Information Management Association.

Advancement. Medical and health services managers advance by moving into more responsible and higher paying positions, such as assistant or associate administrator, department head, or chief executive officer, or by moving to larger facilities. Some experienced managers also may become consultants or professors of health care management.

New graduates with master's degrees in health services administration may start as department managers or as supervisory staff. The level of the starting position varies with the experience of the 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 medical group practices, clinics, mental health facilities, nursing care corporations, and consulting firms.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Medical and health services managers	11-9111	283,500	328,800	45,400	16

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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.

Employment

Medical and health services managers held about 283,500 jobs in 2008. About 38 percent worked in hospitals, and another 19 percent worked in offices of physicians or in nursing and residential care facilities. Many of the remainder worked in home healthcare services, Federal Government health care facilities, outpatient care centers, insurance carriers, and community care facilities for the elderly.

Job Outlook

Employment is projected to grow faster than the average. Job opportunities should be good, especially for applicants with work experience in healthcare and strong business management skills.

Employment change. Employment of medical and health services managers is expected to grow 16 percent from 2008 to 2018, faster than the average for all occupations. The healthcare industry will continue to expand and diversify, requiring managers to help ensure smooth business operations.

Managers in all settings will be needed to improve quality and efficiency of healthcare, while controlling costs, as insurance companies and Medicare demand higher levels of accountability. Managers also will be needed to oversee the computerization of patient records and to ensure their security as required by law. Additional demand for managers will stem from the need to recruit workers and increase employee retention, to comply with changing regulations, to implement new technology, and to help improve the health of their communities by emphasizing preventive care.

Hospitals will continue to employ the most medical and health services managers over the 2008–18 decade. However, the number of new jobs created is expected to increase at a slower rate in hospitals than in many other industries because of the growing use of clinics and other outpatient care sites. Despite relatively slow employment growth in hospitals, a large number of new jobs will be created because of the industry's large size.

Employment will grow fast in offices of health practitioners. Many services previously provided in hospitals will continue to shift to these settings, 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 also will be employed by healthcare management companies that provide management services to hospitals and other organizations and to specific departments such as emergency, information management systems, managed care contract negotiations, and physician recruiting.

Job prospects. Job opportunities will be good, especially for applicants with work experience in healthcare and strong business management skills. Medical and health services managers with experience in large hospital facilities will enjoy an advantage in the job market, as hospitals become larger and more complex. Competition for jobs at the highest management levels will be keen because of the high pay and prestige.

Earnings

Median annual wages of wage and salary medical and health services managers were $80,240 in May 2008. The middle 50 percent earned between $62,170 and $104,120. The lowest 10 percent earned less than $48,300, and the highest 10 percent earned more than $137,800. Median annual wages in the industries employing the largest numbers of medical and health services managers in May 2008 were:

General medical and surgical hospitals	$87,040
Outpatient care centers	74,130
Offices of physicians	74,060
Home health care services	71,450
Nursing care facilities	71,190

Earnings of medical and health services managers vary by type and size of the facility and by level of responsibility. For example, the Medical Group Management Association reported that, in 2007, median salaries for administrators were $82,423 in practices with 6 or fewer physicians; $105,710 in practices with 7 to 25 physicians; and $119,000 in practices with 26 or more physicians.

According to a survey by the Professional Association of Health Care Office Management, 2009 average total compensation for office managers in specialty physicians' practices was $54,314 in gastroenterology; $54,201 in dermatology; $58,899 in cardiology; $48,793 in ophthalmology; $44,910 in obstetrics and gynecology; $51,263 in orthopedics; $51,466 in pediatrics; $48,814 in internal medicine; and $47,152 in family practice.

Related Occupations

Medical and health services managers have training or experience in both health and management. Other occupations requiring knowledge of both fields include:

	Page
Insurance underwriters	106
Social and community service managers	824

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Sources of Additional Information

Information about undergraduate and graduate academic programs in this field is available from:

➤ Association of University Programs in Health Administration, 2000 North 14th St., Suite 780, Arlington, VA 22201. Internet: **http://www.aupha.org**

For a list of accredited graduate programs in medical and health services administration, contact:

➤ Commission on Accreditation of Healthcare Management Education, 2111 Wilson Blvd., Suite 700, Arlington, VA 22201. Internet: **http://www.cahme.org**

For information about career opportunities in healthcare management, contact:

➤ American College of Healthcare Executives, One N. Franklin St., Suite 1700, Chicago, IL 60606. Internet: **http://www.healthmanagementcareers.org**

For information about career opportunities in long-term care administration, contact:

➤ American College of Healthcare Administrators, 1321 Duke St., Suite 400, 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. Internet: **http://www.mgma.org**

For information about medical and healthcare office managers, contact:

➤ Professional Association of Health Care Office Management, 3755 Avocado Blvd., Suite 306, La Mesa, CA 91941. Internet: **http://www.pahcom.com**

For information about career opportunities in health information management, contact:

➤ American Health Information Management Association, 233 N. Michigan Ave., 21st Floor, Chicago, IL 60601. Internet: **http://www.ahima.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos014.htm**

Property, Real Estate, and Community Association Managers

Significant Points

- Opportunities should be best for those with college degrees in business administration, real estate, or related fields and for those with professional designations.
- Particularly good opportunities are expected for those with experience managing housing for older people or with experience running a healthcare facility.
- About 46 percent of property, real estate, and community association managers are self-employed.

Nature of the Work

To homeowners, a well-managed property looks nice, operates smoothly, and preserves the resale value of the property. To businesses and investors, properly managed real estate may result in greater income and profits. *Property, real estate, and community association managers* maintain and raise the value of real estate investments by handling the logistics of running a property. *Property and real estate managers* oversee the operation of income-producing commercial or residential properties and ensure that real estate investments achieve their expected revenues. *Community association managers* manage the communal property and services of condominiums, cooperatives, and planned communities through their homeowner or community associations.

When owners of residential homes, apartments, office buildings, or retail or industrial properties lack the time or expertise needed for the day-to-day management of their real estate investments or homeowner associations, they often hire a property or real estate manager or a community association manager. Managers are 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, making certain that rent is collected and that mortgages, taxes, insurance premiums, payroll, and maintenance bills are paid on time. Some oversee the preparation of financial statements and periodically report to the owners on the status of the property, occupancy rates, expiration dates of leases, and other matters. When vacancies occur, property managers may advertise the property or hire a leasing agent to find a tenant. They also may suggest to the owners what rent to charge. In community associations, homeowners pay no rent and pay their own real estate taxes and mortgages, but community association managers collect association fees that help pay for a variety of services such as playground, clubhouse, and swimming pool maintenance.

Often, property managers negotiate contracts for janitorial, security, landscaping, trash removal, and other services. 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 professionals for repairs that cannot be handled by regular property maintenance staff.

In addition to fulfilling these duties, property managers must understand and comply with pertinent legislation, such as the Americans with Disabilities Act, the Federal Fair Housing Amendment Act, and local fair housing laws. They must make certain that their renting and advertising practices are not discriminatory and that the property itself acts in accordance with all of the local, State, and Federal regulatory and building codes.

Onsite property managers are responsible for the day-to-day operations of a single property, such as an apartment complex, an office building, a shopping center, or a community association. To ensure that the property is safe and properly maintained, onsite managers routinely inspect the grounds, facilities, and equipment to determine whether repairs or maintenance is needed. In handling requests for repairs or trying to resolve

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When vacancies occur, property, real estate, and community association managers may advertise the property or hire a leasing agent to find a tenant.

complaints, they meet not only with current residents, 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 contracts, 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 senior-level property manager or the owner(s).

Some property and real estate managers, often called *real estate asset managers*, plan and direct the purchase, sale, and development of real estate properties on behalf of businesses and investors. These managers focus on long-term strategic financial planning, rather than on day-to-day operations of the property. In deciding to acquire property, real estate asset managers consider several factors, 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 favorable terms. Real estate asset managers review their company's real estate holdings periodically and identify properties that are no longer financially profitable. They then negotiate the sale of, or terminate the lease on, such properties.

Community association managers, by contrast, do work that more closely compares to that of onsite property managers. They collect monthly assessments, prepare financial statements and budgets, negotiate with contractors, and help to resolve complaints. Usually hired by a volunteer board of directors of the association, they manage the daily affairs, and supervise the maintenance, of property and facilities that the homeowners own and use jointly through the association. Community association managers also assist the board and owners in complying with association and government rules and regulations.

Some associations cover thousands of homes and employ their own onsite staff and managers. In addition to administering an association's 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 regularly meet with the elected boards of directors to discuss and resolve legal issues or disputes that may have an effect on 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. They may also meet to address association finances or discuss long-term planning.

Work environment. Nearly all property, real estate, and community association managers work out of an office. However, many managers spend a significant portion of their time away from their desks. Onsite managers, in particular, may spend a large part of their workday away from their offices, visiting the building engineer, showing apartments, checking on the janitorial and maintenance staff, or investigating problems reported by residents. Real estate asset managers may spend time away from home while traveling to company real estate holdings or searching for properties to purchase.

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 workdays, especially before financial and tax reports are due and before board and annual meetings. Some apartment managers are required to live in the apartment complexes where they work, so that they are available to handle emergencies, 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 may be available on weekends to show apartments to prospective residents.

Training, Other Qualifications, and Advancement

For the most part, onsite property managers who primarily oversee the rental and maintenance of properties learn on the job or have experience in the real estate or maintenance field. Managers of commercial properties and those dealing with a property's finances and contract management increasingly are needing a bachelor's or master's degree in business administration, accounting, finance, or real estate management, especially if they do not have much practical experience.

Education and training. Most employers prefer to hire college graduates for property management positions, particularly for offsite positions dealing with a property's finances and contract management and for most commercial properties. A bachelor's or master's degree in business administration, accounting, finance, real estate, or public administration is preferred for these positions. Those with degrees in the liberal arts also may qualify, especially if they have relevant coursework. In addition, most new managers participate in on-the-job training.

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Many people entering jobs such as assistant property manager have onsite management experience.

Licensure. Real estate managers who buy or sell property are required to be licensed by the State in which they practice. In a few States, property association managers must be licensed. Managers of public housing subsidized by the Federal Government are required to be certified.

Other qualifications. Previous employment as a real estate sales agent may be an asset to onsite managers, because it provides experience that is useful in showing apartments or office space. In the past, those with backgrounds in building maintenance have advanced to onsite management positions on the depth of their knowledge of mechanical systems in buildings, but this path is becoming less common as employers place greater emphasis on administrative, financial, and communication abilities for managerial jobs.

People 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 working with 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.

Good speaking, writing, computer, and financial skills, as well as an ability to deal tactfully with people, are essential in all areas of property management.

Certification and advancement. Many people begin property management careers as assistants, working closely with a property manager and learning how to prepare budgets, analyze insurance coverage and risk options, market property to prospective tenants, and collect overdue rent payments. In time, many assistants advance to property manager positions.

Some people start as onsite managers of apartment buildings, office complexes, or community associations. As they gain experience, often working under the supervision of a more experienced property manager, they may advance to positions of greater responsibility. Those who excel as onsite managers often transfer to assistant offsite property manager positions, in which they can gain experience handling a broad range of property management responsibilities.

The responsibilities and compensation of property, real estate, and community association managers increase as these workers manage more and larger properties. 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, homeowners' associations, or retail properties. Managers who do well at marketing properties to tenants might specialize in managing new properties, while those who are specifically 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.

Many employers encourage managers to attend short-term formal training programs conducted by various professional and trade associations that are active in the real estate field. Employers send managers to these programs to develop their management skills and expand their knowledge of specialized fields, such as the operation and maintenance of mechanical systems in buildings, the improvement of property values, insurance and risk management, personnel management, business and real estate law, community association risks and liabilities, tenant relations, communications, accounting and financial concepts, and reserve funding. Managers also participate in these programs to prepare themselves for positions of greater responsibility in property management. The completion of such programs, plus related job experience and a satisfactory score on a written examination, can lead to certification, or the formal award of a professional designation, by the sponsoring association. (Some organizations offering certifications are listed as sources of additional information at the end of this statement.) A number of associations also require their members to adhere to a specific code of ethics.

Employment

Property, real estate, and community association managers held about 304,100 jobs in 2008. About 46 percent of these managers are self-employed. Another 21 percent worked for lessors of real estate and in offices of real estate agents and brokers. Others worked for government agencies that manage public buildings.

Job Outlook

As fast as average employment growth is expected. Opportunities should be best for jobseekers with a college degree in business administration, real estate, or a related field and for those who attain a professional designation. Particularly good opportunities are expected for those with experience managing housing for older people or with experience running health care facilities.

Employment change. Employment of property, real estate, and community association managers is projected to increase by 8 percent during the 2008–18 decade, about as fast as average for all occupations. Job growth will be attributable to a growing population that will increasingly live in developments managed by third-party property management companies. These developments include apartment buildings, condomini-

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Property, real estate, and community association managers.....	11-9141	304,100	329,700	25,600	8

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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ums, homeowner associations, and the fast-growing amount of senior housing. Developments of new homes are increasingly being organized with community or homeowner associations that provide community services and oversee jointly owned common areas requiring professional management. There is also increasing awareness that property management firms help make properties more profitable and improve the resale value of homes and commercial property.

To cater to the increasing population, a small rise in the number of commercial and retail buildings that will need to be managed also will generate jobs for property managers.

Job prospects. In addition to openings from job growth, a number of openings are expected as managers transfer to other occupations or leave the labor force. Opportunities should be best for jobseekers with a college degree in business administration, real estate, or a related field and for those who attain a professional designation. Because of the projected increase in the elderly population, particularly good opportunities are expected for those with experience managing housing for older people and with experience managing healthcare facilities.

Earnings

Median annual wages of salaried property, real estate, and community association managers were $46,130 in May 2008. The middle 50 percent earned between $31,730 and $68,770 a year. The lowest 10 percent earned less than $21,860, and the highest 10 percent earned more than $102,250 a year. Median annual wages of salaried property, real estate, and community association managers in the largest industries that employed them in May 2008 were as follows:

Management of companies and enterprises	$74,010
Local government	59,480
Offices of real estate agents and brokers	44,160
Activities related to real estate	43,430
Lessors of real estate	40,180

Many resident apartment managers and onsite association managers receive the use of an apartment as part of their compensation package. In addition, managers often are reimbursed for the use of their personal vehicles.

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 the following:

	Page
Administrative services managers	29
Education administrators	41
Food service managers	55
Lodging managers	70
Medical and health services managers	73
Real estate brokers and sales agents	540
Urban and regional planners	220

Sources of Additional Information

For information about education and careers in property management, as well as information about professional designation and certification programs in both residential and commercial property management, contact:

➤ 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, asset management, facility management, and building systems maintenance, contact:

➤ Building Owners and Managers Institute, One Park Place, Suite 475, Annapolis, MD 21401. Internet: **http://www.bomi.org**

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, 225 Reinekers Ln., Suite 310, Alexandria, VA 22314. Internet: **http://www.nbccam.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos022.htm**

Purchasing Managers, Buyers, and Purchasing Agents

Significant Points

- About 42 percent of purchasing managers, buyers, and purchasing agents are employed in wholesale trade or manufacturing establishments.
- Employment is projected to grow 7 percent, which is as fast as the average.
- Opportunities should be best for those with a college degree in engineering, business, economics, or one of the applied sciences.
- Prospects often need continuing education or certification to advance.

Nature of the Work

Purchasing managers, buyers, and *purchasing agents* buy a vast array of farm products, durable and nondurable goods, and services for companies and institutions. They attempt to get the best deal for their company—the highest quality goods and services at the lowest possible cost. They accomplish this by studying sales records and inventory levels of current stock, identifying foreign and domestic suppliers, and keeping abreast of changes affecting both the supply of, and demand for, needed products and materials. Purchasing professionals consider price, quality, availability, reliability, and technical support when choosing suppliers and merchandise. To be effective,

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Purchasing professionals use many resources to gather information about potential suppliers.

purchasing professionals must have a working technical knowledge of the goods or services to be purchased.

There are several major types of purchasing managers, buyers, and purchasing agents. *Wholesale and retail buyers* purchase goods, such as clothing or electronics, for resale. Purchasing agents buy goods and services for use by their own company or organization. *Purchasing agents and buyers of farm products* purchase goods such as grain, Christmas trees, and tobacco for further processing or resale. Purchasing managers usually handle more complicated purchases and may supervise a group of purchasing agents. Purchasing professionals employed by government agencies or manufacturing firms usually are called purchasing directors, managers, or agents; sometimes they are known as contract specialists. Purchasing professionals in government place solicitations for services and accept bids and offers through the Internet. Some purchasing managers, called contract or supply managers, specialize in negotiating and supervising supply contracts.

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 manufacturers or from other wholesale firms for resale to retail firms, commercial establishments, 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. If they fail to purchase the right products for resale, buyers jeopardize the profits and reputation of their company. They keep track of inventories and sales levels, check competitors' sales activities, and 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.

Evaluating suppliers is one of the most critical functions of a purchasing manager, buyer, or purchasing agent. Many firms now run on a lean manufacturing schedule and use just-in-time inventories so any delays in the supply chain can shut down production and potentially cost the firm its customers. Purchasing professionals use many resources to find out all they can about potential suppliers. The Internet has become an effective tool for searching catalogs, trade journals, industry and company publications, and directories. Purchasing professionals attend meetings, trade shows, and conferences to learn of new industry trends and make contacts with suppliers. They often interview prospective suppliers and visit their plants and distribution centers to assess their capabilities. It is important to make certain that the supplier is capable of delivering the desired goods or services on time, in the correct quantities, and without sacrificing quality. 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. Most of the transaction process is now automated through use of the Internet.

Purchasing professionals often work closely with other employees in a process called "team buying." For example, before submitting an order, the team may discuss the design of custom-made products with company design engineers, the problems involving the quality of purchased goods with production supervisors, or the issues in shipping with managers in the receiving department. This additional interaction improves the quality of buying by adding different perspectives to the process.

Work environment. 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. Travel is sometimes necessary. Purchasers for worldwide companies may even travel outside the United States.

Training, Other Qualifications, and Advancement

Workers may begin as trainees, purchasing clerks, junior buyers, or assistant buyers. Most employers prefer to hire applicants who have a college degree and who are familiar with the merchandise they sell and with wholesaling and retailing practices. Prospects often need continuing education or certification to advance.

Education and training. Educational requirements tend to vary with the size of the organization. Large stores and distributors prefer applicants who have completed a bachelor's degree program with a business emphasis. Many manufacturing firms put an even 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 employer's business. Training periods vary in length, with most lasting 1 to 5 years. In manu-

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facturing, new employees 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.

In wholesale and retail establishments, most trainees begin by selling merchandise, checking invoices on material received, and keeping track of stock. As they progress, trainees are given increased buying-related responsibilities.

Other qualifications. Purchasing managers, buyers, and purchasing agents must know how to use various software packages and 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.

People who wish to become wholesale or retail buyers should be good at planning and decision making. They also should have an interest in merchandising. In addition, marketing skills and the ability to identify products that will sell 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.

Certification and advancement. An experienced purchasing agent or buyer may become an assistant purchasing manager 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 purchasing managers, buyers, and purchasing agents 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.

There are several recognized credentials for purchasing agents and purchasing managers. The Certified Purchasing Manager (C.P.M.) designation was conferred by the Institute for Supply Management. In 2008, this certification was replaced by the Certified Professional in Supply Management (CPSM) credential, covering the wider scope of duties now performed by purchasing professionals. The Certified Purchasing Professional (CPP) and Certified Professional Purchasing Manager (CPPM) designations are conferred by the American Purchasing Society. The Certified Supply Chain Professional (CSCP) credential is conferred by APICS, the Association for Operations Management. For workers in Federal, State, and local government, the National Institute of Governmental Purchasing offers the designations of Certified Professional Public Buyer (CPPB) and Certified Public Purchasing Officer (CPPO). These certifications are awarded only after work-related experience and education requirements are met and written or oral exams are successfully completed.

Employment

Purchasing managers, buyers, and purchasing agents held about 527,400 jobs in 2008. About 42 percent worked in the wholesale trade and manufacturing industries and another 10 percent worked in retail trade. The remainder worked mostly in service establishments, such as management of companies and enterprises or professional, scientific, and technical services. 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 295,200
Wholesale and retail buyers, except farm products 147,700
Purchasing managers 70,300
Purchasing agents and buyers, farm products 14,100

Job Outlook

Employment of purchasing managers, buyers, and purchasing agents is expected to increase 7 percent through the year 2018. Job growth and opportunities, however, will differ among different occupations in this category.

Employment change. Overall employment of purchasing managers, buyers, and purchasing agents is expected to increase 7 percent during the 2008-18 decade, which is as fast as the average for all occupations. Employment of purchasing agents, except wholesale, retail, and farm products—the largest employment group in the industry—will experience faster than average growth as more companies demand a greater number of purchased goods and services. Additionally, large companies are increasing the size of their purchasing departments to accommodate purchasing services contracts from smaller companies. Also, many purchasing agents are now charged with procuring services that traditionally had been done in-house,

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Purchasing managers, buyers, and purchasing agents	–	527,400	565,900	38,500	7
Purchasing managers	11-3061	70,300	71,400	1,100	2
Buyers and purchasing agents	13-1020	457,100	494,500	37,400	8
Purchasing agents and buyers, farm products	13-1021	14,100	14,000	-200	-1
Wholesale and retail buyers, except farm products	13-1022	147,700	144,400	-3,300	-2
Purchasing agents, except wholesale, retail, and farm products	13-1023	295,200	336,100	40,900	14

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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such as computer and IT (information technology) support in addition to traditionally contracted services such as advertising. Nonetheless, demand for workers may be somewhat limited by technological improvements such as software that has eliminated much of the paperwork involved in ordering and procuring supplies, and the growing number of purchases being made electronically through the Internet and electronic data interchange (EDI). Demand will also be limited by offshoring of routine purchasing actions to other countries.

Employment of purchasing managers is expected to have little or no change. 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. Still, purchasing managers will be needed to oversee large consolidated purchasing networks, thus spurring some employment growth.

Employment of purchasing agents and buyers of farm products is also projected to have little or no change, as overall growth in agricultural industries and retailers in the grocery-related industries consolidate. Furthermore, automation, offshoring, and the outsourcing of more services is expected to further impede employment growth.

Finally, little or no change in employment of wholesale and retail buyers, except farm products, is expected. In the retail industry, mergers and acquisitions have caused buying departments to consolidate. In addition, larger retail stores are eliminating local buying departments and creating a centralized buying department at their headquarters.

Job prospects. Persons who have a bachelor's degree in engineering, business, economics, or one of the applied sciences should have the best chance of obtaining a buyer position. 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. Most managers need experience in their respective field.

Earnings

Median annual wages of purchasing managers were $89,160 in May 2008. The middle 50 percent earned between $67,370 and $115,830. The lowest 10 percent earned less than $51,490, and the highest 10 percent earned more than $142,550.

Median annual wages of purchasing agents and buyers of farm products were $49,670 in May 2008. The middle 50 percent earned between $37,930 and $67,440. The lowest 10 percent earned less than $28,990, and the highest 10 percent earned more than $96,220.

Median annual wages of wholesale and retail buyers, except farm products, were $48,710 in May 2008. The middle 50 percent earned between $36,460 and $66,090. The lowest 10 percent earned less than $28,710, and the highest 10 percent earned more than $90,100. Median annual wages in the industries employing the largest numbers of wholesale and retail buyers, except farm products, were:

Management of companies and enterprises	$56,400
Wholesale electronic markets and agents and brokers	53,650
Grocery and related product merchant wholesalers	49,770
Machinery, equipment, and supplies merchant wholesalers	46,250
Grocery stores	35,700

Median annual wages of purchasing agents, except wholesale, retail, and farm products, were $53,940 in May 2008. The middle 50 percent earned between $41,670 and $70,910. The lowest 10 percent earned less than $33,650, and the highest 10 percent earned more than $88,790. Median annual wages in the industries employing the largest numbers of purchasing agents, except wholesale, retail, and farm products, were:

Federal Executive Branch	$73,520
Aerospace product and parts manufacturing	64,220
Navigational, measuring, electromedical, and control instruments manufacturing	59,040
Management of companies and enterprises	58,420
Local government	51,870

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

Another occupation that obtains materials and goods for businesses:

	Page
Procurement clerks	597

Other occupations that need knowledge of marketing and the ability to assess consumer demand include:

Advertising, marketing, promotions, public relations, and sales managers	32
Food service managers	55
Insurance sales agents	534
Lodging managers	70
Sales engineers	545
Sales representatives, wholesale and manufacturing	547

Sources of Additional Information

Further information about education, training, employment, and certification for purchasing careers is available from:

➤ American Purchasing Society, P.O. Box 256, Aurora, IL 60506.

➤ APICS the Association for Operations Management, 8430 West Bryn Mawr Avenue, Suite 1000, Chicago, IL 60631. Internet: **http://www.apics.org**

➤ Institute for Supply Management, P.O. Box 22160, Tempe, AZ 85285-2160. Internet: **http://www.ism.ws**

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➤ National Institute of Governmental Purchasing, Inc., 151 Spring St., Suite 300, Herndon, VA 20170-5223. Internet: **http://www.nigp.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos023.htm**

Top Executives

Significant Points

- Keen competition is expected because the prestige and high compensation of these jobs attract a substantial number of applicants.
- 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 vary as extensively as the nature of their responsibilities, but many of these workers have at least a bachelor's degree and considerable experience.

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 goals and objectives are met. Although they have a wide range of titles—such as *chief executive officer, chief operating officer, general manager, president, vice president,* school superintendent, county administrator, and mayor—all formulate policies and direct the overall operations of businesses and corporations, public-sector organizations, nonprofit institutions, and other organizations.

A corporation's goals and policies are established by the chief executive officer in collaboration with other top executives. All of these principals are closely monitored by a board of directors. In a large corporation, the chief executive officer meets frequently with the other top executives to ensure that the overall operation of the corporation is conducted in accordance with these goals and policies. In a governmental or nonprofit organization, top executives oversee budgets and ensure that resources are used properly and that programs are carried out as planned. Chief executive officers in government 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, top executives rely on a staff of highly skilled personnel.

Although the chief executive officer of a corporation retains overall accountability, a chief operating officer may be delegated several responsibilities, including the authority to oversee other executives who direct the activities of various departments and implement the organization's guidelines on a day-to-day basis. In publicly held and nonprofit corporations, the board of directors or a similar governing body ultimately is accountable for the success or failure of the enterprise and the chief executive officer reports to the board. In addition to being responsible for the operational success of a company, top executives, particularly *chief financial officers*, are accountable for the accuracy of their financial reporting, especially among publicly traded companies.

The nature of the responsibilities of other high-level executives depends on an organization's size. In small organizations, such as independent retail stores or small manufacturers, a partner, an owner, or a general manager often is responsible for purchasing, hiring, training, quality control, and day-to-day supervisory duties. In large organizations, top executives not only direct the overall organization, but also may be responsible for implementing strategies and setting the overall direction of a certain area of the company or organization. For example, 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. Today, these officers are playing a more important role in organizations and are increasingly becoming part of the executive team. To perform effectively, they need knowledge of the workings of the total organization. These managers propose budgets for projects and programs and make decisions about staff training and purchases of equipment. They hire and assign computer specialists, information technology workers, and support personnel to carry out information-technology-related projects. They manage 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.

General and operations managers plan, direct, or coordinate the operations of companies and other public- or private-sector organizations. Their duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources that are too diverse and general in nature to be classified into any one area of management or administration, such as personnel, purchasing, or administrative services. In some organizations, the tasks of general and operations managers may overlap those of chief executive officers.

Work environment. Top executives of large organizations typically have spacious offices and numerous support staff. Long hours, including evenings and weekends are standard for most top executives and general managers, although their schedules may be flexible.

To monitor operations and meet with customers, staff, and other executives, general managers and executives travel considerably among international, national, regional, and local offices. Many top executives also attend meetings and conferences sponsored by various associations. In large organizations, job transfers between local offices or subsidiaries are common for those on an executive career track.

Top executives are under intense pressure to succeed; depending on the organization, success may mean earning higher

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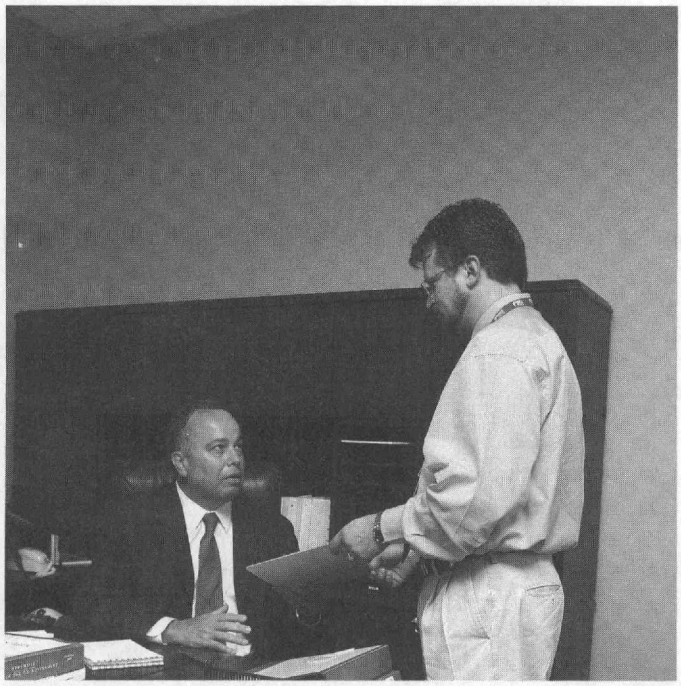

Top executives need highly developed management skills and the ability to communicate clearly and persuasively.

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.

Training, Other Qualifications, and Advancement

The formal education and experience required by top executives vary as extensively as their responsibilities do, but many of these workers have at least a bachelor's degree and considerable experience.

Education and training. Many top executives have a bachelor's or master's degree in business administration, liberal arts, or a more specialized discipline. The specific type and level of education required often depends on the type of organization for which top executives work. College presidents and school superintendents, for example, typically have a doctoral degree in the field in which they originally taught or in education administration. (For information on lower level managers in educational services, see the *Handbook* statement on education administrators.)

Some top executives in the public sector have a degree in public administration or liberal arts. Others might have a more specific educational background related to their jobs. (For information on lower level managers in health services, see the *Handbook* statement on medical and health services managers.)

Many top executive positions are filled from within the organization by promoting experienced lower level managers when an opening arises. In industries such as retail trade or transportation, for example, individuals without a college degree may work their way up within the company and become executives or general managers. When hiring top executives from outside the organization, those doing the hiring often prefer managers with extensive managerial experience.

Other qualifications. Top executives must have highly developed personal qualities and be able to communicate clearly and persuasively. An analytical mind, the ability to analyze large amounts of information and data quickly, and the ability to evaluate the relationships among numerous factors, also are important qualities. For managers to succeed, they need other important qualities as well, including leadership, self-confidence, motivation, decisiveness, flexibility, sound business judgment, and determination.

Certification and advancement. Advancement may be accelerated by participation in company training programs that impart a broader knowledge of company policy and operations. Participation in conferences and seminars can expand one's knowledge of national and international issues that influence the organization and can help the participants develop a network of useful contacts. To facilitate their promotion to an even higher level, managers who have experience in a particular field, such as accounting or engineering, may attend executive development programs geared toward their backgrounds.

Managers also can help their careers by becoming familiar with the latest trends in management and by attending national or local training programs sponsored by various executive training organizations. For example, the Institute of Certified Professional Managers offers the Certified Manager (CM) credential, which is earned by completing training and passing an exam. This certification is held by individuals at all experience levels, from those seeking to enter management careers to those who are already senior executives. Certification is not necessary for advancement, but may be helpful in developing and demonstrating valuable management skills.

General managers may advance to a top executive position, 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.

Employment

Top executives held about 2.1 million jobs in 2008. Employment by detailed occupation was distributed as follows:

General and operations managers	1,733,100
Chief executives	400,400

Job Outlook

Little to no change in employment of top executives is expected. Keen competition for jobs is expected because the prestige and high pay of these positions attract many applicants.

Employment change. Employment of top executives—including chief executives and general and operations managers—is expected to experience little to no change from 2008 to 2018. However, because these workers are essential to running companies and organizations, projected employment of top executives will vary by industry and will generally reflect the growth or decline of that industry. For example, job growth

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Top executives	–	2,133,500	2,125,700	-7,800	0
Chief executives	11-1011	400,400	394,900	-5,500	-1
General and operations managers	11-1021	1,733,100	1,730,800	-2,300	0

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

is expected in the fast-growing health services industry, while employment declines for top executives are projected for many manufacturing industries.

Employment of top executives also will be affected by the amount of consolidation occurring in a particular industry, because some management jobs typically are lost after a merger with another company. As a business grows, the number of top executives changes less than the number of employees. Therefore, top executives are not expected to experience as much employment growth as workers in the occupations they oversee.

Job prospects. Keen competition is expected for top executive positions because the prestige and high pay attract a substantial 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, a pattern that limits the number of job openings for new entrants to the occupation.

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, and information systems, as well as knowledge of several languages also may be beneficial.

Earnings

Top executives are among the highest paid workers in the United States. However, salary levels vary substantially, depending on level of executive responsibility; length of service; and type, size, and location of the firm, organization, or government agency. For example, a top manager in a very large corporation can earn significantly more than the mayor of a small town.

Median annual wages of general and operations managers in May 2008 were $91,570. The middle 50 percent earned between $62,900 and $137,020. Because the specific responsibilities of general and operations managers vary significantly within industries, earnings also tend to vary considerably. Median annual wages in the industries employing the largest numbers of general and operations managers were as follows:

Computer systems design and related services	$133,140
Management, scientific, and technical consulting services	130,390
Management of companies and enterprises	113,690
Building equipment contractors	91,370
Local government	82,150

Median annual wages of wage and salary chief executives in May 2008 were $158,560. Some top executives of large companies earn hundreds of thousands of dollars to more than $1 million annually, although salaries vary substantially by type and level of responsibilities and by industry. Government executives often earn considerably less.

In addition to salaries, total compensation for corporate executives often includes stock options and other performance bonuses. Among other benefits commonly enjoyed by top executives in private industry are the use of executive dining rooms and company-owned aircraft and cars, access to expense allowances, and company-paid insurance premiums and physical examinations. A number of chief executive officers also are provided with company-paid club memberships and other amenities. Nonprofit and government executives usually get fewer benefits.

Related Occupations

Top executives plan, organize, direct, control, and coordinate the operations of an organization and its major departments or programs. Many other management occupations have similar responsibilities, but are concentrated in specific industries or are responsible for a specific department within an organization that assigns them to another occupation. Other managerial occupations that are discussed elsewhere in the *Handbook* include the following:

	Page
Administrative services managers	29
Advertising, marketing, promotions, public relations, and sales managers	32
Computer and information systems managers	35
Education administrators	41
Financial managers	52
Food service managers	55
Industrial production managers	67
Lodging managers	70
Medical and health services managers	73

Sources of Additional Information

For more information on top executives, including educational programs, contact:

➤ American Management Association, 1601 Broadway, 6th Floor, New York, NY 10019. Internet: **http://www.amanet.org**

➤ National Management Association, 2210 Arbor Blvd., Dayton, OH 45439. Internet: **http://www.nma1.org**

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For more information on executive financial management careers, contact:

➤ Financial Executives International, 200 Campus Dr., Florham Park, NJ 07932. Internet: **http://www.financialexecutives.org**

➤ Financial Management Association International, College of Business Administration, University of South Florida, 4202 East Fowler Ave., BSN 3331, Tampa, FL 33620. Internet: **http://www.fma.org**

For information about management skills development, including the Certified Manager (CM) credential, contact:

➤ Institute for Certified Professional Managers, James Madison University, MSC 5504, Harrisonburg, VA 22807. Internet: **http://www.icpm.biz**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos012.htm**

Business and Financial Operations Occupations

Accountants and Auditors

Significant Points

- Most jobs require at least a bachelor's degree in accounting or a related field.
- Job opportunities should be favorable; those who have earned professional recognition through certification or licensure, especially a CPA, should enjoy the best prospects.
- Much faster than average employment growth will result from an increase in the number of businesses, changing financial laws and regulations, and greater scrutiny of company finances.

Nature of the Work

Accountants and auditors help to ensure that firms are run efficiently, public records kept accurately, and taxes paid properly and on time. They analyze and communicate financial information for various entities such as companies, individual clients, and Federal, State, and local governments. Beyond carrying out the fundamental tasks of the occupation—providing information to clients by preparing, analyzing, and verifying financial documents—many accountants also offer 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 and auditing: *public accounting*, *management accounting*, *government accounting*, and *internal auditing*.

Public accountants perform a broad range of accounting, auditing, tax, and consulting activities for their clients, which may be corporations, governments, nonprofit organizations, or individuals. For example, some public accountants concentrate on tax matters, such as advising companies about 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 inform investors and authorities that the statements have been correctly prepared and reported. These accountants are also referred to as *external auditors*. 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, including money laundering by organized criminals. *Forensic accountants* combine their knowledge of accounting and finance with law and investigative techniques to determine whether an activity is illegal. Many forensic accountants work closely with law enforcement personnel and lawyers during investigations and often appear as expert witnesses during trials.

Management accountants—also called *cost, managerial, industrial, corporate, or private accountants*—record and analyze the financial information of the companies for which they work. Among their other responsibilities are budgeting, performance evaluation, cost management, and asset management. Usually, management accountants are part of executive teams involved in strategic planning or the development of new products. They analyze and interpret the financial information that corporate executives need to make sound business decisions. They also prepare financial reports for other groups, including stockholders, creditors, regulatory agencies, and tax authorities. Within accounting departments, management accountants 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 ensure that revenues are received and expenditures are made in accordance with laws and regulations. Those 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 effectiveness of their organization's internal controls and check for mismanagement, waste, or fraud. They examine and evaluate their firms' financial and information systems, management procedures, and internal

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Accountants and auditors analyze and interpret financial information.

controls to ensure that records are accurate and controls are adequate. They also review company operations, evaluating their efficiency, effectiveness, and compliance with corporate policies and government regulations. Because computer systems commonly automate transactions and make information readily available, internal auditors may also help management evaluate the effectiveness of their controls based on real-time data, rather than personal observation. They may recommend and review controls for their organization's computer systems, to ensure their reliability and integrity of the data. Internal auditors may also have specialty titles, such as *information technology auditors, environmental auditors, and compliance auditors*.

Technology is rapidly changing the nature of the work of most accountants and auditors. With the aid of special software packages, accountants summarize transactions in the standard formats of financial records and organize data in special formats employed in financial analysis. These accounting packages greatly reduce the tedious 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 computer systems and networks and developing technology plans.

Work environment. Most accountants and auditors work in a typical office setting. Some may be able to do part of their work at home. Accountants and auditors employed by public accounting firms, government agencies, and organizations with multiple locations may travel frequently to perform audits at branches, clients' places of business, or government facilities.

Almost half of all accountants and auditors worked a standard 40-hour week in 2008, but many worked longer hours, particularly if they are self-employed and have numerous clients. Tax specialists often work long hours during the tax season.

Training, Other Qualifications, and Advancement

Most accountants and auditors need at least a bachelor's degree in accounting or a related field. Many accountants and auditors choose to obtain certification to help advance their careers, such as becoming a Certified Public Accountant (CPA).

Education and training. Most accountant and auditor positions require at least a bachelor's degree in accounting or a related field. 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. Some universities and colleges are now offering programs to prepare students to work in growing specialty professions such as internal auditing. Many professional associations offer continuing professional education courses, conferences, and seminars.

Some graduates of junior colleges or business or 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 accountant positions by demonstrating their accounting skills on the job.

Most beginning accountants and auditors may work under supervision or closely with an experienced accountant or auditor before gaining more independence and responsibility.

Licensure and certification. Any accountant filing a report with the Securities and Exchange Commission (SEC) is required by law to be a Certified Public Accountant (CPA). This may include senior level accountants working for or on behalf of public companies that are registered with the SEC. CPAs are licensed by their State Board of Accountancy. Any accountant who passes a national exam and meets the other requirements of the State where they practice can become a CPA. The vast majority of States require CPA candidates to be college graduates, but a few States will substitute a number of years of public accounting experience for a college degree.

As of 2009, 46 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. California, Colorado, New Hampshire, and Vermont are the only States that do not require 150 semester hours for certification. Many schools offer a 5-year combined bachelor's and master's degree to meet the 150 semester hour requirement, but a master's degree is not required. Prospective accounting majors should carefully research accounting curri-

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cula 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 American Institute of Certified Public Accountants (AICPA). The CPA examination is rigorous, and less than one-half of those who take it each year pass every part on the first try. Candidates are not required to pass all four parts at once, but most States require candidates to pass all four sections within 18 months of passing their first section. The CPA exam is now computerized and is offered 2 months out of every quarter at various testing centers throughout the United States. Most States also require applicants for a CPA license to have some accounting experience; however requirements vary by State or jurisdiction.

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.

Other qualifications. Previous experience in accounting or auditing can help an applicant get a job. Many colleges offer students the opportunity to gain experience through summer or part-time internship programs conducted by public accounting or business firms. In addition, as many business processes are now automated, practical knowledge of computers and their applications is a great asset for jobseekers in the accounting and auditing fields.

People planning a career in accounting and auditing 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 the results of their work to clients and managers both verbally and in writing. Accountants and auditors must be good at working with people, business systems, and computers. At a minimum, accountants and auditors should be familiar with basic accounting and computer software packages. Because financial decisions are made on the basis of their statements and services, accountants and auditors should have high standards of integrity.

Certification and advancement. Professional recognition through certification or other designation provides a distinct advantage in the job market. Certification can attest to professional competence in a specialized field of accounting and auditing. Accountants and auditors can seek credentials from a wide variety of professional societies.

The Institute of Management Accountants confers the Certified Management Accountant (CMA) designation upon applicants who complete a bachelor's degree or who attain a minimum score or higher on specified graduate school entrance exams. Applicants must have worked at least 2 years in management accounting, pass a four-part examination, agree to meet continuing education requirements, and comply with standards of professional conduct. The exam covers areas such as financial statement analysis, working-capital policy, capital structure, valuation issues, and risk management.

The Institute of Internal Auditors offers the Certified Internal Auditor (CIA) designation to graduates from accredited colleges and universities who have worked for 2 years as internal auditors and have passed a four-part examination. The IIA also offers the designations of Certified in Control Self-Assessment (CCSA), Certified Government Auditing Professional (CGAP), and Certified Financial Services Auditor (CFSA) to those who pass the exams and meet educational and experience requirements.

ISACA confers the Certified Information Systems Auditor (CISA) designation upon candidates who pass an examination and have 5 years of experience auditing information systems. Information systems experience, financial or operational auditing experience, or related college credit hours can be substituted for up to 2 years of information systems auditing, control or security experience.

For those accountants with their CPA, the AICPA offers the option to receive any or all of the Accredited in Business Valuation (ABV), Certified Information Technology Professional (CITP), or Personal Financial Specialist (PFS) designations. CPAs with these designations demonstrate a level of expertise in these areas in which accountants practice ever more frequently. The business valuation designation requires a written exam and the completion of a minimum of 10 business valuation projects that demonstrate a candidate's experience and competence. The technology designation requires the achievement of a set number of points awarded for business technology experience and education. Candidates for the personal financial specialist designation also must achieve a certain level of points based on experience and education, pass a written exam, and submit references.

Many senior corporation executives have a background in accounting, internal auditing, or finance. Beginning public accountants often 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.

Public accountants, management accountants, and internal auditors usually have much occupational mobility. Practitioners often shift into management accounting or internal auditing from public accounting, or between internal auditing and management accounting. It is less common for accountants and auditors to move from either management accounting or internal auditing into public accounting. Additionally, because they learn about and review the internal controls of various business units within a company, internal auditors often gain the experience needed to become upper-level managers.

Employment

Accountants and auditors held about 1.3 million jobs in 2008. They worked throughout private industry and government, but 24 percent of accountants and auditors worked for accounting,

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tax preparation, bookkeeping, and payroll services firms. Approximately 8 percent of accountants and auditors were self-employed.

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 as accountants for private industry or in government. (See teachers—postsecondary elsewhere in the *Handbook*.)

Job Outlook

Accountants and auditors are expected to experience much faster than average employment growth from 2008-18. Job opportunities should be favorable; accountants and auditors who have a professional certification, especially CPAs, should have the best prospects.

Employment change. Employment of accountants and auditors is expected to grow by 22 percent between 2008 and 2018, which is much faster than the average for all occupations. This occupation will have a very large number of new jobs arise, about 279,400 over the projections decade. An increase in the number of businesses, changing financial laws and corporate governance regulations, and increased accountability for protecting an organization's stakeholders will drive job growth.

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 reviewed by accountants and auditors regarding costs, expenditures, taxes, and internal controls will expand as well. The continued globalization of business also will lead to more demand for accounting expertise and services related to international trade and accounting rules and international mergers and acquisitions. Additionally, there is a growing movement towards International Financial Reporting Standards (IFRS), which uses a judgment-based system to determine the fair-market value of assets and liabilities, which should increase demand for accountants and auditors because of their specialized expertise.

An increased need for accountants and auditors also will arise from a greater emphasis on accountability, transparency, and controls in financial reporting. Increased scrutiny of company finances and accounting procedures will create opportunities for accountants and auditors, particularly CPAs, to audit financial records more thoroughly and completely. Management accountants and internal auditors increasingly will be needed to discover and eliminate fraud before audits, and ensure that important processes and procedures are documented accurately and thoroughly. Forensic accountants also will be needed to detect illegal financial activity by individuals, companies, and organized crime rings.

Job prospects. Job opportunities should be favorable. Accountants and auditors who have earned professional recognition through certification or other designation, especially a CPA, 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 may have an advantage.

Individuals who are proficient in accounting and auditing computer software and information systems or have expertise in specialized areas—such as international business, international financial reporting standards, or current legislation—may have an advantage in getting some accounting and auditing jobs. In addition, employers increasingly seek applicants with strong interpersonal and communication skills. Many accountants work on teams with others who have different backgrounds, so they must be able to communicate accounting and financial information clearly and concisely. Regardless of qualifications, however, competition will remain keen for the most prestigious jobs in major accounting and business firms.

In addition to openings from job growth, the need to replace accountants and auditors who retire or transfer to other occupations will produce numerous job openings in this large occupation.

Earnings

Median annual wages of wage and salary accountants and auditors were $59,430 in May 2008. The middle half of the occupation earned between $45,900 and $78,210. The bottom 10 percent earned less than $36,720, and the top 10 percent earned more than $102,380. Median annual wages in the industries employing the largest numbers of accountants and auditors were as follows:

Accounting, tax preparation, bookkeeping, and payroll services	$61,480
Management of companies and enterprises	59,820
Insurance carriers	59,550
Local government	53,660
State government	51,250

According to a salary survey conducted by the National Association of Colleges and Employers, bachelor's degree candidates in accounting received starting offers averaging $48,993 a year in July 2009; master's degree candidates in accounting were offered $49,786 initially.

Wage and salary accountants and auditors usually receive standard benefits, including health and medical insurance, life insurance, a 401(k) plan, and paid annual leave. High-level se-

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Accountants and auditors	13-2011	1,290,600	1,570,000	279,400	22

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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nior accountants may receive additional benefits, such as the use of a company car and an expense account.

Related Occupations

Accountants and auditors design internal control systems and analyze financial data. Others for whom training in accounting is valuable include

	Page
Bookkeeping, accounting, and auditing clerks	563
Budget analysts	93
Cost estimators	100
Financial analysts	103
Loan officers	109
Personal financial advisors	118
Tax examiners, collectors, and revenue agents.	121

Some 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 network, systems, and database administrators	128
Computer software engineers and computer programmers	134

Sources of Additional Information

Information on accredited accounting programs can be obtained from:

➤ AACSB International—Association to Advance Collegiate Schools of Business, 777 South Harbour Island Blvd., Suite 750, Tampa FL 33602. 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**

➤ AICPA Examinations Team, Parkway Corporate Center, 1230 Parkway Ave., Suite 311, Ewing, NJ 08628-3018. Internet: **http://www.cpa-exam.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 07645-1718. Internet: **http://www.imanet.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:

➤ ISACA, 3701 Algonquin Rd., Suite 1010, Rolling Meadows, IL 60008. Internet: **http://www.isaca.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos001.htm**

Appraisers and Assessors of Real Estate

Significant Points

- Workers generally must be licensed or certified, but State requirements vary.
- About 27 percent were self-employed.
- Employment is expected to grow more slowly than the average over the 2008-18 decade.
- During recessions, demand for appraisers declines; demand for assessors is less affected by economic and real estate market fluctuations.

Nature of the Work

Appraisers and assessors of real estate estimate the value of real property whenever it is sold, mortgaged, taxed, insured, or developed. They work in localities they are familiar with, so they have knowledge of any environmental or other concerns that may affect the value of a property. They note any unique characteristics of the property and of the surrounding area, such as a specific architectural style of a building or a major highway located next to the parcel. They also take into account additional aspects of a property such as the condition of the foundation and roof of a building or any renovations that may have been done. They might take pictures to document a certain room or feature, in addition to photographing the exterior of the building. After visiting the property, the appraiser or assessor will estimate the value of the property by taking into consideration such things as comparable home sales, lease records, location, view, previous appraisals, and income potential. During the entire process, appraisers and assessors keep a meticulous record of their research, observations, and methods used in calculating the property valuation.

Appraisers have independent clients and typically focus on valuing one property at a time. They often specialize in a certain type of real estate. For example, *commercial appraisers* specialize in property used for commercial purposes, such as stores or hotels. *Residential appraisers* focus on appraising homes or other residences and only provide appraisals for those that house 1 to 4 families. Other appraisers have a general practice and are willing to appraise the value of any type of real property.

Assessors predominately work for local governments and are responsible for valuing properties for property tax assessment purposes. Unlike appraisers, who generally focus on one property at a time, assessors often value entire neighborhoods using mass appraisal techniques and computer-assisted mass appraisal systems to value all the homes in a local neighborhood at once. Although they do not usually focus on a single property, they

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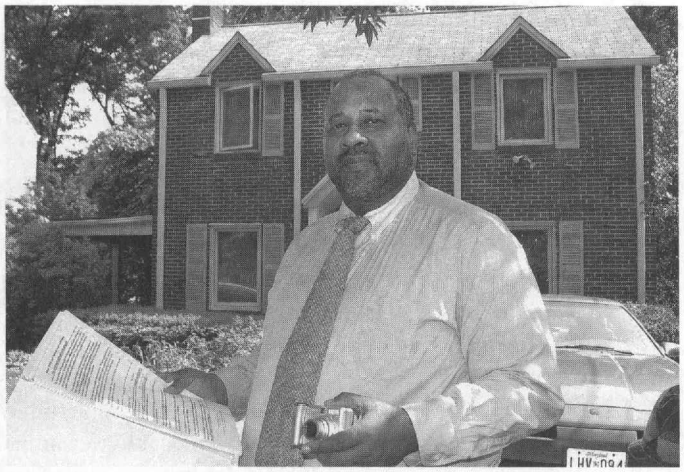

Appraisers play an important role in the purchasing and selling of real estate.

may use single property methods if the property owner challenges the assessment. Revaluations of assessed properties are performed cyclically on a schedule established by State statute or local practice Depending on the size of the jurisdiction and the number of staff in an assessor's office, a mass appraisal firm or a revaluation firm may do much of the work of valuing the properties in the jurisdiction. These results are then officially certified by the assessor.

When properties are reassessed, assessors issue notices to property owners indicating the new assessment. Assessors must be current on tax assessment procedures and must be able to defend the accuracy of their property assessments, either to the owner directly or at a public hearing, since assessors are responsible for dealing with taxpayers who want to contest their assigned property assessments. Assessors also keep a database of every parcel in their jurisdiction, labeling the property owner, assessment history, and size of the property, as well as property maps of the jurisdiction detailing the property distribution of the jurisdiction.

Work environment. Appraisers and assessors spend much of their time researching data and writing reports. However, with the advancement of computers and other technologies, such as wireless Internet, time spent in the office has decreased because research can now be done in less time and at site locations. Records that once required a visit to a courthouse or city hall often can be found online. On-site visits usually occur during daylight hours, and according to the client's schedule. Time spent on-site rather than in the office also depends on the specialty. For example, residential appraisers tend to spend less time on office work than commercial appraisers, who could spend up to several weeks on one property analyzing information and writing reports. Appraisers who work for private institutions generally spend most of their time inside the office, making on-site visits when necessary. Appraisers and assessors usually conduct on-site appraisal work alone.

Assessors and privately employed appraisers usually work a standard 40-hour work week. However, self-employed appraisers, often called "independent fee appraisers," tend to work more than a standard 40-hour work week, including spending their evenings and weekends writing reports. Approximately 13 percent of appraisers and assessors worked part time in 2008.

The offices of most independent-fee appraisers are relatively small, occupied by either the appraisers alone or by them and a small staff. However, private institutions such as banks and mortgage companies often employ several appraisers within one establishment. The size of offices of assessors depends mostly on the size of the local jurisdiction and the amount of work for which a particular office is responsible.

Training, Other Qualifications, and Advancement

The requirements to become a fully qualified appraiser or assessor are complex and vary by State and, sometimes, by the value or type of property. In general, both appraisers and assessors must be licensed or certified. Prospective appraisers and assessors should check with their State to determine the specific requirements.

Education and training. Many practicing appraisers and assessors have at least a bachelor's degree. Coursework in related subjects such as economics, finance, mathematics, computer science, English, and business or real estate law can be very useful for prospective appraisers and assessors.

Federal law mandates that most appraisers hold State certification. Requirements for these certifications vary by State, but there are certain minimum standards that appraisers must meet. Most appraisers of residential real property must have at least an associate degree, while appraisers of commercial real property are required to have at least a bachelor's degree.

Unlike appraisers, there are no federally mandated education and training requirements for assessors. In most States, the State assessor board sets education and experience requirements that must be met to obtain a certificate to practice as an assessor. A few States have no Statewide requirements, with standards instead set by each locality.

In States that mandate certification for assessors, the requirements are usually similar to those for appraisers. Some States also have more than one level of certification. All candidates must attend State-approved schools and facilities and take basic appraisal courses. Although appraisers generally value one property at a time while assessors value many at once, both occupations use similar methods and techniques. As a result, assessors and appraisers tend to take the same basic courses. In addition to passing a Statewide examination, candidates are usually required to have a set number of on-the-job hours that must be completed. For those States not requiring certificates for assessors, the hiring office usually will require the candidate to take basic appraisal courses, complete on-the-job training, and accrue a sufficient number of work hours to meet the requirements for obtaining appraisal licenses or certificates. Many assessors also possess a State appraisal license.

Assessors tend to start out in an assessor's office that is willing to provide on-the-job training; smaller municipalities are often unable to provide this experience. An alternate source of experience for aspiring assessors is through a revaluation firm.

Licensure. Being a Certified Residential Real Property Appraiser is the minimum qualification for valuing any residential property with a loan amount exceeding $250,000 and for valuing any other type of real property with a loan value of less than $250,000. Candidates for this certification must have at least an associate degree or in lieu of the degree, 21 units of

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specified college-level education. In addition, this certification requires 200 hours of appraiser-specific classroom training and 2,500 hours of work experience accrued over at least 2 years.

Certified General Real Property Appraisers have no restrictions on the types or values of real property for which they can give valuations. Candidates for this certification must have at least a bachelor's degree, or in lieu of the degree, 30 units of specified college-level education. In addition to a degree, this certification requires 300 hours of appraiser-specific classroom training and 3,000 hours of work experience accrued over at least 30 months. At least half of these hours must be in nonresidential appraisal work.

In addition to the Federally required Certified Residential and Certified General Real Property Appraiser classifications, most States also have the Licensed Residential Real Property Appraiser classification. Holders of this license are permitted to appraise noncomplex one-to-four residential units having a transaction value of less than $1,000,000, and complex one-to-four residential units having a transaction value of less than $250,000. For the Licensed Residential Appraiser classification, candidates must obtain 150 qualifying education hours and at least 2,000 hours of on-the-job training obtained over a period of no less than 1 year. In addition, all candidates must pass an examination.

In many States, those working on their appraiser requirements for licensure or certification are classified as a "trainee." Training programs vary by State but usually require at least 75 hours of specified appraisal education before one can apply for a trainee position. The number of additional courses trainees must take depends on the State requirements and the kind of license they wish to obtain.

Across all levels of certification and licensure, 15 hours of classroom education must be devoted to the Uniform Standards of Professional Appraisal Practice (USPAP), which are set forth by the Appraisal Standards Board (ASB) of the Appraisal Foundation. Additionally, the Licensed Residential, Certified Residential, and the General Real Property Appraiser designations each have an associated examination that must be passed before these credentials are awarded.

For both appraisers and assessors, continuing education is necessary to maintain a license or certification. The minimum continuing education requirement for appraisers is 14 hours per year. Appraisers must also complete a 7-hour National USPAP Update Course every 2 years. Some States have further requirements. Continuing education may be obtained in any State-approved school or facility, as well as in recognized seminars and conferences held by associations or related organizations. Assessors also must fulfill a continuing education requirement in most States, but the amount varies by State.

Other qualifications. Appraisers and assessors must possess good analytical skills, mathematical skills, and the ability to pay attention to detail. They also must be able to work alone as well as with other people. Because they work with the public, appraisers and assessors must be polite and have the ability to listen and thoroughly answer any questions from clients about their work.

Certification and advancement. Many appraisers and assessors choose to become a designated member of a regional or nationally recognized appraiser or assessor association. Designations are a way for appraisers or assessors to establish themselves in the profession, and are recognizable credentials to show employers and potential clients a higher level of education and experience. Obtaining a designation usually requires 5 to 10 years of training and experience, which is more than the minimum licensing requirements. Many appraisal associations have a membership category specifically for trainees, who then can receive full membership after licensure. Since States differ greatly on the requirements to become an assessor, licensure is not necessarily required for membership or designations; however, the imposed designation qualifications tend to be very stringent.

Advancement within the occupation comes with experience. The higher the level of appraiser licensure, for example, the higher the fees an independent fee appraiser may charge. Staying in one particular region or focusing on one type of appraising specialty also will help to establish one's business, reputation, and expertise. Assessors often have a career progression within their office, starting as a trainee and eventually ending up appointed or elected as a senior appraiser or supervisor.

Employment

In 2008, appraisers and assessors of real estate held about 92,400 jobs. About 27 percent were self-employed; virtually all were appraisers. Employment was concentrated in areas with high levels of real estate activity, such as major metropolitan areas. Assessors are more uniformly spread throughout the country than appraisers because every locality has at least one assessor.

About 29 percent of appraisers and assessors worked in local government; nearly all were assessors. Another 31 percent, mainly appraisers, worked for real estate firms.

Job Outlook

Employment is expected to grow more slowly than the average. Job opportunities should be best in areas with active real estate markets, and most job openings will result from the need to replace appraisers and assessors who retire or otherwise leave the occupation permanently.

Employment change. Employment of appraisers and assessors of real estate is expected to grow more slowly than the average over the 2008-18 decade, increasing by 5 percent. Demand for appraisal services is strongly tied to the real estate market,

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Appraisers and assessors of real estate	13-2021	92,400	96,600	4,200	5

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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which can fluctuate in the short term. Over the long term, employment growth will be driven by economic expansion and population increases—factors that generate demand for real property. However, employment will be held down to a certain extent by productivity increases brought about by the increased use of computers and other technologies, which allow appraisers and assessors to deal with more properties. The increased use of automated valuation models to conduct appraisals for mortgage purposes might also shift work away from appraisers.

Job prospects. Most job openings will result from the need to replace appraisers and assessors who retire or otherwise leave the occupation permanently. Employment opportunities should be best in areas with active real estate markets. Although opportunities for established certified appraisers are expected to be available in these areas, aspiring entrants to this occupation may have difficulty locating a trainee position because traditional sources of training positions, such as real estate offices and financial institutions, increasingly prefer not to take on new trainees.

The cyclical nature of the real estate market will have a direct effect on the job prospects of appraisers, especially those who appraise residential properties. In times of recession, fewer people buy or sell real estate, causing a decrease in the demand for appraisers. As a result, opportunities will be best for appraisers who are able to switch specialties and appraise different types of properties.

Because assessors are needed in every local or State jurisdiction to make assessments for property tax purposes regardless of the state of the local economy, assessors generally are less affected by economic and real estate market fluctuations than are appraisers.

Earnings

Median annual wages of appraisers and assessors of real estate were $47,370 in May 2008. The middle 50 percent earned between $34,330 and $66,640. The lowest 10 percent earned less than $25,900, and the highest 10 percent earned more than $88,680. Median annual wages of those working for local governments were $43,550. Median annual wages of those working in activities related to real estate were $47,890. Earnings for independent-fee appraisers can vary significantly because they are paid fees on a per appraisal basis.

Related Occupations

Other occupations that involve the inspection of real estate include the following:

	Page
Construction and building inspectors	628
Real estate brokers and sales agents	540

Another occupation involved in determining the value of items is:

Claims adjusters, appraisers, examiners, and investigators	96

Sources of Additional Information

For more information on licensure requirements, contact

➤ The Appraisal Foundation, 1155 15th St. NW., Suite 1111, Washington, DC 20005. Internet: **http://www.appraisalfoundation.org**

For more information on individual State licensure requirements, contact

➤ Appraisal Subcommittee (ASC), 1401 St. NW., Suite 760, Washington, D.C. 20005. Internet: **http://www.asc.gov**

For more information on appraisers of real estate, contact

➤ American Society of Appraisers, 555 Herndon Pkwy., Suite 125, Herndon, VA 20170. Internet: **http://www.appraisers.org**

➤ Appraisal Institute, 550 W. Van Buren St., Suite 1000, Chicago, IL 60607. Internet: **http://www.appraisalinstitute.org**

➤ National Association of Independent Fee Appraisers, 401 N. Michigan Ave., Suite 2200, Chicago, IL 60611. Internet: **http://www.naifa.com**

For more information on assessors of real estate, contact

➤ International Association of Assessing Officers, 314 W. 10th St., Kansas City, MO 64105. Internet: **http://www.iaao.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos300.htm**

Budget Analysts

Significant Points

- The need for sound financial analysis will spur job growth for budget analysts.
- A bachelor's degree generally is the minimum educational requirement, but some employers prefer or require a master's degree.
- Candidates with a master's degree are expected to have the best opportunities.
- About 41 percent of all budget analysts work in government.

Nature of the Work

Budget analysts help organizations allocate their financial resources. They develop, analyze, and execute budgets, as well as estimate future financial needs for private businesses, nonprofit organizations, and government agencies. In private sector firms, a budget analyst's main responsibility is to examine the budget and seek new ways to improve efficiency and increase profits. In nonprofit and governmental organizations, which usually are not concerned with profits, analysts try to find the most efficient way to distribute funds and other resources among various departments and programs.

In addition to managing an organization's budget, analysts are often involved in program performance evaluation, policy analysis, and the drafting of budget-related legislation. At times, they also conduct training sessions for company or government personnel regarding new budget procedures.

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At the beginning of each budget cycle, managers and department heads submit operational and financial proposals to budget analysts for review. These plans outline the organization's programs, estimate the financial needs of these programs, and propose funding initiatives to meet those needs. Analysts then examine these budget estimates and proposals for completeness, accuracy, and conformance with established procedures, regulations, and organizational objectives. Sometimes they employ cost-benefit analyses to review financial requests, assess program tradeoffs, and explore alternative funding methods. They also examine past budgets and research economic and financial developments that affect the organization's income and expenditures.

After the initial review process, budget analysts consolidate individual departmental budgets into operating and capital budget summaries. These summaries contain statements that argue for or against funding requests. Budget summaries are then submitted to senior management, or as is often the case in government organizations, 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 usually is made by the organization head in a private firm, or by elected officials, such as State legislators, in government.

Throughout 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 spending, budget analysts may write a report explaining the variations and recommending revised procedures. To avoid or alleviate deficits, budget analysts may recommend program cuts or a reallocation of excess funds. They also inform program managers and others within the organization of the status and availability of funds in different accounts.



Budget analysts help organizations determine the best use of financial resources.

Data and statistical analysis software has greatly increased the amount of data and information that budget analysts can compile, review, and produce. Analysts use spreadsheet, database, and financial analysis software to improve their understanding of different budgeting options and to provide accurate, up-to-date information to agency leaders. In addition, many organizations are beginning to incorporate Enterprise Resource Planning (ERP) programs into their budget-making process. ERP programs can consolidate all of an organization's operating information into a single computer system, which helps analysts estimate the effects that a budget alteration will have on each part of an organization.

Work environment. Budget analysts usually work in a comfortable office setting. They spend the majority of their time working independently, compiling and analyzing data and preparing budget proposals. Some budget analysts travel to obtain budget details first-hand or to personally verify funding allocation.

The schedules of budget analysts vary throughout the budget cycle, and many are required to work additional hours during the initial development, mid-year reviews, and final reviews of budgets. The pressures of deadlines and tight work schedules can be stressful. In 2008, about 48 percent of budget analysts worked 40 hours per week, while about 11 percent worked more than 50 hours per week.

Training, Other Qualifications, and Advancement

A bachelor's degree usually is the minimum educational requirement for budget analyst jobs, but some organizations prefer or require a master's degree. Entry-level budget analysts usually begin with limited responsibilities but can be promoted to intermediate-level positions within 1 to 2 years, and to senior positions with additional experience.

Education and training. Employers generally require budget analysts to have at least a bachelor's degree, but some 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. State and local governments have varying requirements, but usually require a bachelor's degree in one of many areas, including accounting, finance, business, public administration, economics, statistics, political science, or sociology. Because developing a budget requires strong numerical and analytical skills, courses in statistics or accounting are helpful, regardless of the prospective budget analyst's major field of study. Some States may require a master's degree. Occasionally, budget-related or finance-related work experience can be substituted for formal education.

In most organizations, budget analysts usually learn the job by working through one complete budget cycle. During the cycle, which typically lasts 1 year, analysts become familiar with the various steps involved in the budgeting process. Many budget analysts also take professional development classes throughout their careers.

Other qualifications. Budget analysts must abide by strict ethical standards. Integrity, objectivity, and confidentiality are all essential when dealing with financial information, and budget analysts must avoid any personal conflicts of interest. Most

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Budget analysts	13-2031	67,200	77,400	10,100	15

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

budget analysts also need mathematical skills and should be able to use software packages, including spreadsheet, database, data-mining, and financial analysis programs. Strong oral and written communication skills also are essential, because budget analysts must prepare, present, and defend budget proposals to decision makers. In addition, budget analysts must be able to work under strict time constraints.

Certification and advancement. Entry-level budget analysts usually begin with limited responsibilities, working under close supervision. Capable analysts can be promoted to intermediate-level positions within 1 to 2 years, and to senior positions with additional experience. Because of the importance and high visibility of their jobs, senior budget analysts may be promoted to management positions in various parts of their organizations, or with other organizations with which they have worked.

Government budget analysts employed at the Federal, State, or local level may earn the Certified Government Financial Manager designation granted by Advancing Government Accountability, an organization that represents government accountability officers. To earn this designation, candidates must have a minimum of a bachelor's degree, 24 credit hours of study in financial management, and 2 years of professional-level experience in governmental financial management. They also must pass a series of three exams that cover topics on the governmental environment; governmental accounting, financial reporting, and budgeting; and governmental financial management and control. To maintain the designation, individuals must complete 80 hours of continuing professional education every 2 years.

Employment

Budget analysts held 67,200 jobs in 2008. Government is a major employer, accounting for 41 percent of budget analyst jobs. Budget analysts were also employed in manufacturing; management services; professional, scientific, and technical services; and schools.

Job Outlook

Budget analyst jobs are expected to increase faster than average. Candidates with a master's degree are expected to have the best opportunities.

Employment change. Employment of budget analysts is expected to increase by 15 percent between 2008 and 2018, faster than the average for all occupations. Employment growth will be driven by the continuing demand for sound financial analysis in both the public and the private sectors.

As businesses and other organizations become more complex and specialized, budget planning and financial control will demand greater attention. In recent years, computer applications used in budget analysis have become increasingly sophisticated, allowing more data to be analyzed and processed in a shorter amount of time. As a result, agency leaders have begun to demand more data, analyses, and other types of information relevant to the budgeting process. This has increased the workload of budget analysts, and created the need for more workers. As this process continues, demand for budget analysts will grow.

Job prospects. Job openings will result from employment growth and from the need to replace workers who retire or leave the occupation for other reasons. Candidates with a master's degree are expected to have the best opportunities. Familiarity with spreadsheet, database, data-mining, financial-analysis, and Enterprise Resource Planning software packages also should enhance a jobseeker's prospects.

Earnings

Wages of budget analysts vary by experience, education, and employer. Median annual wages of budget analysts in May 2008 were $65,320. The middle 50 percent earned between $52,290 and $82,150. The lowest 10 percent earned less than $42,470, and the highest 10 percent earned more than $100,360. Median annual wages in the industries employing the largest numbers of budget analysts were:

Aerospace product and parts manufacturing	$70,830
Federal Executive Branch	70,650
Management of companies and enterprises	70,460
Colleges, universities, and professional schools	58,190
Elementary and secondary schools	57,700

The average annual salary in March 2009 for budget analysts employed by the Federal Government was $80,456.

Related Occupations

Other workers involved in financial analysis include:

	Page
Accountants and auditors	86
Cost estimators	100
Financial analysts	103
Financial managers	52
Insurance underwriters	106
Loan officers	109
Management analysts	111
Tax examiners, collectors, and revenue agents	121

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 and certification in government financial management may be obtained from:

➤ Advancing of Government Accountability, 2208 Mount Vernon Ave., Alexandria, VA 22301. Internet: **http://www.agacgfm.org**

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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 budget analyst positions with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.gov/** or through an interactive voice response telephone system at (703) 724-1850. This number is not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos003.htm**

Claims Adjusters, Appraisers, Examiners, and Investigators

Significant Points

- Employment is concentrated in insurance-related industries.
- Training and entry requirements vary widely.
- College graduates and those with related experience should have the best opportunities for most types of jobs; competition will be keen for jobs as investigators.
- Job opportunities should be best in health insurance companies, and in regions susceptible to natural disasters.

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, seeking compensation for their loss. Adjusters, appraisers, examiners, and investigators deal with those claims. They work primarily for property and casualty insurance companies, for whom they handle a wide variety of claims alleging property damage, liability, or bodily injury. Their main role is to investigate claims, negotiate settlements, and authorize payments to claimants, who are the policyholders who make a claim. They must be mindful not to violate their 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. Although many adjusters, appraisers, examiners, and investigators have overlapping functions and may even perform the same tasks, the insurance industry generally assigns specific roles to each of these claims workers.

Adjusters plan and schedule the work required to process a claim. They might, for example, handle the claim filed after an automobile accident or after a storm damages a customer's home. Adjusters investigate claims by interviewing the claimant and witnesses, consulting police and hospital records, and inspecting property damage to determine how much the company should pay for the loss. Adjusters may 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 statements, either written, or recorded audio or video—is set down in a report that is then used to evaluate the claim. When the policyholder's claim is approved, 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.

Some large insurance companies centralize claims adjustment in a claims center, where the payout amount is estimated and a check is issued immediately. However, cases handled by independent adjusters, or those involving business losses or homeowner claims, such as hurricane or fire damage, all require a senior adjuster to physically inspect the damage and determine proper compensation.

When it comes to business or residential loss caused by, for example, vandalism or flooding, claimants can opt not to rely on the insurance company's adjuster and may instead choose to hire a public adjuster. Public adjusters are self employed and work in the best interest of the client, rather than the insurance company. In doing so, the adjuster prepares and presents claims to insurance companies, looking to negotiate the best possible settlement for the claimant. Insurance carriers also use the service of independent adjusters on a freelance basis, often in lieu of hiring them as regular employees. In this case the independent adjusters work in the interest of 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 claims after they are submitted in order to ensure that proper guidelines have been followed. They may assist adjusters with complicated claims or when, for instance, a natural 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 given the diagnosis. They use guides that have information on the average period of disability, expected treatments, and average hospital stays for various ailments. Examiners check claim applications for completeness and accuracy, interview medical specialists, and consult policy files to verify the information reported in a claim. They then authorize appropriate payment, deny the claim, 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, since most life

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insurance policies pay additional benefits if a death is accidental. Claims examiners also may review new applications for life insurance to make sure that the applicants have no serious illnesses that would make them a high risk to insure.

Another occupation that plays an important role in the accurate settlement of claims is that of the *appraiser*, whose role is to estimate 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.

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. Specialized software then generates estimates on standard forms. Adjusters also utilize digital cameras, which allow photographs of the damage to be sent to the company, allowing for faster and more efficient processing of claims.

When adjusters or examiners suspect fraud, they refer the claim to an investigator. *Insurance investigators* handle claims in which the company suspects fraudulent or criminal activity, such as arson, falsified workers' disability claims, staged accidents, or unnecessary medical treatments. The severity of insurance fraud cases can vary greatly, from claimants simply overstating damage to a vehicle to complicated fraud rings 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 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 an oral statement, take photographs, and inspect facilities, such as doctors' offices, to determine, for example, whether the doctors have a proper license. Investigators often consult with legal counsel and can be expert witnesses in court cases.

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 will take photos to document the activity and report it to the insurance company.

Work environment. Working environments of claims adjusters, appraisers, examiners, and investigators vary greatly. Many claims adjusters and auto damage appraisers 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.

Some adjusters 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. 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.

Most claims examiners employed by life and health insurance companies work a standard 5-day, 40-hour week in a typical office environment. In contrast, adjusters often must arrange their work schedules to accommodate evening and weekend appointments with clients. This sometimes results in adjusters working irregular schedules, especially when they have a lot of claims to scrutinize. Adjusters are often called to work in the event of emergencies and may have to work 50 or 60 hours a week until all claims are resolved.

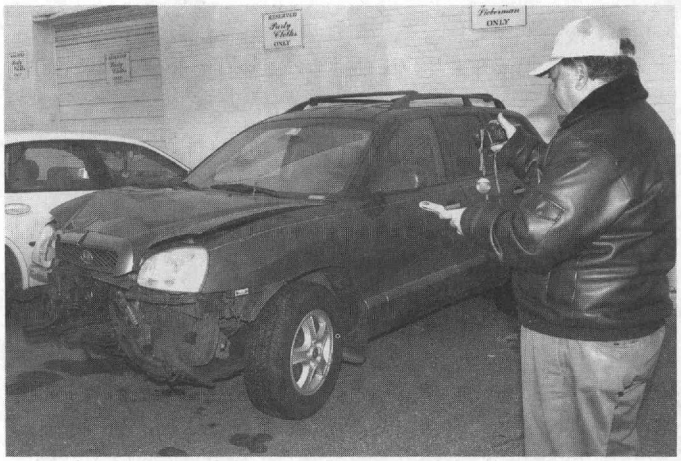
Appraisers spend much of their time offsite at automotive body shops estimating vehicle damage costs. The remaining time may be spent working in the office. Many independent appraisers work from home, as continually improving valuation software has made estimating damage easier and more routine. Auto damage appraisers typically work regular hours, and rarely work on the weekends. Self employed appraisers also have the flexibility to make their own hours, as many appraisals are done by appointment.

Some days, investigators will spend all day in the office, searching databases, making telephone calls, and writing reports. Other times, they may be away, performing surveillance activities or interviewing witnesses. Some of the work can involve disagreements with claimants, so the job can be stressful and potentially confrontational. 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.

Training, Other Qualifications, and Advancement

Training and entry requirements vary widely. Although many in these occupations do not have a college degree, most companies prefer to hire college graduates, or those with some insurance-related work experience or vocational training.

Education and training. There are no formal education requirements for any of these occupations, and a high school degree is typically the minimal requirement needed to obtain employment. However, most employers prefer to hire college



Claims adjusters evaluate insurance claims, report their findings, and make recommendations.

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graduates or people who have some insurance-related work experience or vocational training.

While a variety of degrees can be an asset, no specific college major is recommended. For example, a claims adjuster who has a business or an accounting background might be suited to specialize in claims of financial loss due to strikes, breakdowns of equipment, 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. 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.

While auto damage appraisers are not required to have a college education, most companies prefer to hire persons with formal training, previous experience, or those with knowledge and technical skills who can identify and estimate the cost of repair. Many vocational colleges offer 2-year programs in auto body repair and teach students how to estimate the costs to repair damaged vehicles.

For investigator jobs, most insurance companies prefer to hire people trained as law enforcement officers, private investigators, claims adjusters, or examiners because these workers have good interviewing and interrogation skills.

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 take on more responsibility as they demonstrate competence in handling assignments and progress in their coursework. Auto damage appraisers typically receive on-the-job training, which may last several months. This training usually involves of working under close supervision while estimating damage costs until the employer decides the trainee is ready to perform estimates on their own.

Continuing education is very important for claims adjusters, appraisers, examiners, and investigators because Federal and State laws and court decisions affect how claims are handled and the scope of insurance policies. Also, examiners working on life and health claims must be familiar with new medical procedures and prescription drugs. Examiners working on auto claims must be familiar with new car models and repair techniques.

Many companies offer training sessions to inform their employees of industry changes, and a number of schools and associations give courses and seminars on various topics having to do with claims. Online courses are also making distance learning possible.

Licensure. Licensing requirements for claims adjusters, appraisers, examiners, and investigators vary by State. Some States have few requirements, while others require either the completion of pre-licensing education, a satisfactory score on a licensing exam, or both. Earning a voluntary professional designation can sometimes substitute for completing an exam. In some States, claims adjusters employed by insurance companies can work under the company license and need not become licensed themselves. Public adjusters may need to meet separate or additional requirements. For example, some States require public adjusters to file a surety bond—a unique contract between at least three parties.

Some States that require licensing also require a certain number of continuing education credits per year in order to renew the license. Workers can fulfill their continuing education requirements by attending classes or workshops, by writing articles for claims publications, or by giving lectures and presentations.

Other qualifications. Claims adjusters, appraisers, and examiners often work closely with claimants, witnesses, and other insurance professionals, so they must be able to communicate effectively with others. Knowledge of computer applications also is very helpful. In addition, a valid driver's license and a good driving record are required for workers who must travel on the job. Some companies require applicants to pass a series of written tests designed to measure their communication, analytical, and general mathematical skills.

When hiring investigators, employers look for individuals who have ingenuity and 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.

Certification and advancement. 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 become supervisor or manager of the investigations department. Once they achieve expertise, many choose to start their own independent adjusting or auto damage appraising firms.

Numerous examiners and adjusters choose to earn professional certifications and designations to demonstrate their expertise. Although requirements for these designations vary, some entail a minimum number of years of experience and the successful completion of an examination; in addition, a certain number of continuing education credits must be earned each year to retain the designation.

Employment

Adjusters, appraisers, examiners, and investigators held about 306,300 jobs in 2008. Insurance carriers employed 49 percent of claims adjusters, appraisers, examiners, and investigators; agencies, brokerages, and other insurance related activities, such as private claims adjusting companies, employed another 24 percent. Less than 4 percent of these jobs were held by auto damage insurance appraisers. About 2 percent of adjusters, appraisers, examiners, and investigators were self-employed.

Job Outlook

Overall employment is expected to increase as fast as average. For claims adjusters and examiners, opportunities will be best with health insurance companies. For appraiser jobs, opportunities will be best for those who have some vocational training and previous auto body repair experience. Keen competition is expected for investigator jobs as the number of applicants typically outnumbers the number of positions available.

Employment change. Employment of claims adjusters, appraisers, examiners, and investigators is expected to grow by 7 percent over the 2008–18 decade, as fast as average for all occupations. Employment growth of adjusters and claims ex-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Claims adjusters, appraisers, examiners, and investigators	13-1030	306,300	327,200	20,900	7
Claims adjusters, examiners, and investigators	13-1031	294,600	315,500	20,900	7
Insurance appraisers, auto damage	13-1032	11,700	11,700	100	1

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

aminers will primarily stem from the growth of the health insurance industry. Rising health care premiums and attempts by large insurance carriers to minimize costs will result in a greater need for claims examiners to more scrupulously review a growing number of medical claims. More claims being made by a growing elderly population also should spur demand for adjusters and claims examiners. Although technology 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, demand for these jobs will increase anyway because many tasks cannot be easily automated.

Employment of insurance investigators is not expected to grow significantly, despite the expected increase in the number of claims in litigation and complexity of insurance fraud cases. Efficiencies gained through the Internet will continue to reduce the amount of time it takes investigators to perform background checks, allowing them to handle more cases.

Little to no change in employment of auto damage appraisers is expected. Despite a growing number of drivers and auto insurance policies being sold by insurance companies, the number of claims being filed is not expected to increase as much as the number of policies as efforts to make vehicles, roads, and highways safer will yield a decrease in the number of claims per policy.

Job prospects. Job opportunities for claims adjusters and examiners will be best in the health insurance industry as the industry seeks to minimize the number of paid claims, and in areas susceptible to natural disasters, such as the Gulf coast or West coast. Hurricanes in Florida or wild fires in California, for example, will continue to spur demand, and opportunities with smaller independent firms will be particularly good. And while technology has made the work more efficient, workers will still be needed to contact policyholders, inspect damaged property, and consult with experts. Numerous job openings also will result from the need to replace workers who transfer to other occupations or leave the labor force. College graduates and those with previous related experience should have the best opportunities for jobs as claims adjusters, examiners, and investigators. Auto damage appraisers with related vocational training and auto body shop experience should have the best prospects. People entering these occupations with no formal training may find more opportunities with large insurance companies rather than small independent firms who prefer to hire experienced workers.

Competition for investigator jobs will remain keen because the occupation attracts many qualified people, including retirees from law enforcement, the military, and experienced claims adjusters and examiners who choose to get an investigator license. Heightened media and public awareness of insurance fraud also may attract qualified candidates to this occupation.

Earnings

Median annual wages of wage and salary claims adjusters, examiners, and investigators were $55,760 in May 2008. The middle 50 percent earned between $42,400 and $70,860. The lowest 10 percent earned less than $34,140, and the highest 10 percent earned more than $84,260.

Median annual wages of wage and salary auto damage insurance appraisers were $53,440 in May 2008. The middle 50 percent earned between $43,990 and $63,180. The lowest 10 percent earned less than $36,500, and the highest 10 percent earned more than $73,210.

Many claims adjusters, especially those who work for insurance companies, receive additional bonuses or benefits as part of their job. Adjusters are often furnished with a laptop computer, a smart phone, and a company car, or are reimbursed for the use of their own vehicle for business purposes.

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 whose duties are related include:

	Page
Bill and account collectors	561
Billing and posting clerks and machine operators	587
Bookkeeping, accounting, and auditing clerks	563
Cost estimators	100
Credit authorizers, checkers, and clerks	589
Medical records and health information technicians	423

In determining the validity of a claim, insurance adjusters must inspect the damage to assess the magnitude of the loss. Workers who perform similar duties include:

	Page
Construction and building inspectors	628
Fire inspectors and investigators	525

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. Other workers who review documents for accuracy and compliance with a given set of rules and regulations are:

Accountants and auditors	86
Tax examiners, collectors, and revenue agents	121

Auto damage appraisers must be familiar with the structure and functions of various automobiles and their parts. They must

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also be familiar with techniques to estimate value. The following workers have similar duties:

Appraisers and assessors of real estate 90
Automotive body and related repairers 687
Automotive service technicians and mechanics 690

Insurance investigators detect and investigate fraudulent claims and criminal activity. Their work is similar to that of:

Private detectives and investigators 477

Sources of Additional Information

General information about a career as a claims adjuster, appraiser, examiner, or investigator is available from the home offices of many insurance companies. Information about licensing requirements for claims adjusters may be obtained from the department of insurance in each State.

Information about the property-casualty insurance field can be obtained by contacting:

➤ Insurance Information Institute, 110 William St., New York, NY 10038. Internet: **http://www.iii.org**

For information about professional designation and training programs, contact any of the following organizations:

➤ American Institute for Chartered Property Casualty Underwriters and the Insurance Institute of America, 720 Providence Rd., Suite 100, Malvern, PA 19355–3433. Internet: **http://www.aicpcu.org**

➤ International Claim Association, 1155 15th St. NW., Suite 500, Washington, DC 20005. Internet: **http://www.claim.org**

➤ National Association of Public Insurance Adjusters, 21165 Whitfield Place, Suite 105, Potomac Falls, VA 20165. Internet: **http://www.napia.com**

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**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos125.htm**

Cost Estimators

Significant Points

- About 59 percent of cost estimators work in the construction industry, and another 15 percent are employed by manufacturers.
- Good job opportunities are expected; those with industry work experience and a bachelor's degree in a related field will have the best prospects.
- Voluntary certification can be beneficial to cost estimators; some employers may require professional certification for employment.

Nature of the Work

Accurately forecasting the cost, size, and duration of future projects is vital to the survival of any business. *Cost estimators* develop the cost information that business owners and managers need to make a bid for a contract or to decide on the profitability of a proposed new project or product. They also determine which endeavors are making a profit.

Regardless of the industry in which they work, estimators collect and analyze data on all of the factors that can affect costs, such as materials, labor, location, duration of the project, and special machinery requirements, including computer hardware and software. Job duties vary widely depending on the type and size of the project.

The methods for estimating costs can also differ greatly by industry. On a large 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 gathers information on access to the site; surface topography and drainage, and the availability of electricity, water, and other services. The estimator records this information, which may go in the final project estimate.

After the site visit, the estimator determines the quantity of materials and the labor required to complete the firm's part of the project. This process, called the quantity survey or "takeoff," involves completing standard estimating forms, filling in dimensions, numbers of units, and other information. A cost estimator working for a general contractor, for example, estimates the costs of all of the items that the contractor must provide. Although subcontractors estimate their costs as part of their own bidding process, the general contractor's cost estimator often analyzes bids made by subcontractors. Also during the takeoff process, the estimator must make decisions concerning equipment needs, the sequence of operations, the size of the crew required, and physical constraints at the site. Allowances for wasted materials, inclement weather, shipping delays, and other factors that may increase costs also must be incorporated in the estimate.

After completing the quantity surveys, the estimator prepares a cost summary for the entire project, which includes the costs of labor, equipment, materials, subcontractors, overhead, taxes, insurance, markup, and any additional costs that may affect the project. The chief estimator then prepares the bid proposal for submission to the owner. On large construction projects, there may be several estimators, each specializing in one area, such as electrical work or excavation, concrete, and forms.

Construction cost estimators also may be employed by the project's architect, engineering firm, or owner to help establish a budget, manage and control project costs, and to track actual costs relative to bid specifications as the project develops. During construction, estimators may be employed to manage the cost of change orders and negotiate and settle and extra costs or mitigate potential claims. Estimators may also be called upon as expert witness on cost in a construction dispute case.

In manufacturing, cost estimators usually are assigned to the engineering, cost, or pricing department. The estimator's goal is to accurately estimate the costs associated with developing and producing products. The job may begin when management

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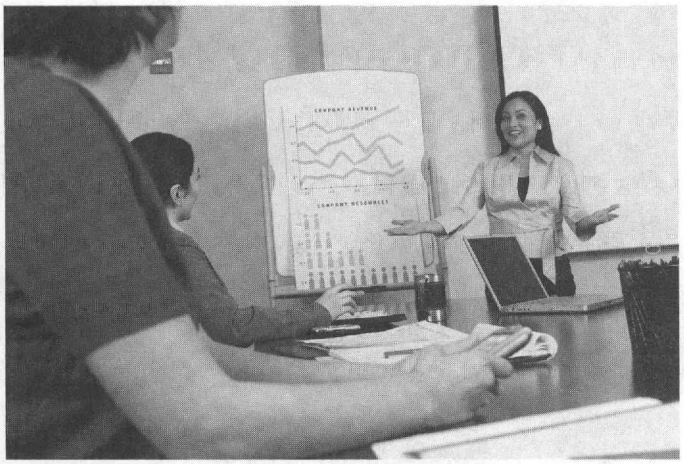

Cost estimators develop information that business owners and managers need to determine the potential profitability of a new project or product.

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. For example, when estimating the cost of manufacturing a new product, the estimator works with engineers, first reviewing blueprints or conceptual drawings to determine the machining operations, tools, gauges, and materials that will be required. The estimator then prepares a parts list and determines whether it would be more efficient to produce or to purchase the parts. To do this, the estimator asks 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 considerable 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. As a result, some cost estimators now specialize in estimating only computer software development and related costs.

Thereafter, the cost estimator 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 the performance of workers producing parts for the new product improves with practice. These curves are commonly called "cost reduction" curves, because many problems—such as engineering changes, rework, shortages of parts, and lack of operator skills—diminish as the number of units produced increases, resulting in lower unit costs.

Using all of this information, the estimator then calculates the standard labor hours necessary to produce a specified 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 compares the cost of purchasing parts with the firm's estimated cost of manufacturing them to determine which is less expensive.

Computers play a vital role in cost estimation because the process often involves complex mathematical calculations and requires advanced mathematical techniques. For example, to undertake a parametric analysis (a process used to estimate costs per unit based on square footage or other specific requirements of a project), cost estimators use a computer database containing information on the 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. New and improved cost estimating software has lead to more efficient computations, leaving estimators more time to visit 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 usual duties. In addition, the duties of construction managers may include estimating costs. (For more information, see the statements on operations research analysts and construction managers elsewhere in the *Handbook*.)

Work environment. Estimators spend most of their time in offices, but visits to construction worksites and factory floors are often needed for their work. In some industries, there may be frequent travel between a firm's headquarters, its subsidiaries, and subcontractors.

Estimators usually work a 40-hour week, but overtime is common. Cost estimators often work under pressure and stress, especially when facing bid deadlines. Inaccurate estimating can cause a firm to lose a bid or to lose money on a job that was not accurately estimated.

Training, Other Qualifications, and Advancement

Job entry requirements for cost estimators will vary by industry. In the construction and manufacturing industries, employers increasingly prefer to hire cost estimators with a bachelor's degree in a related field, although it is also possible for experienced construction workers to become cost estimators. Voluntary certification can be beneficial to cost estimators; some employers, including the Federal Government, may require professional certification for employment.

Education and training. In the construction industry, employers increasingly prefer individuals with a degree in construction management, building science, or construction science, all of which usually include several courses in cost estimating. Most construction estimators also have considerable construction experience, gained through work in the industry, internships, or cooperative education programs; and for some estimators, years of experience can substitute for a degree in addition to taking classes in the field or getting an associate degree. 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, experience in quantitative techniques is important.

Many colleges and universities include cost estimating as part of bachelor's and associate degree curriculums in civil engineering, industrial engineering, information systems development, and construction management or construction engineering technology. In addition, cost estimating is often part of master's degree programs in construction science or construction man-

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agement. Organizations representing cost estimators, such as the American Society of Professional Estimators (ASPE), 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 learn about 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.

Estimators also receive long-term training on the job because every company has its own way of handling estimates. Working with an experienced estimator, newcomers become familiar with each step in the process. Those with no experience reading construction specifications or blueprints first learn that aspect of the work. Subsequently, they 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 prices for materials.

Other qualifications. Cost estimators need to have an aptitude for mathematics, be able to analyze, compare, and interpret detailed but sometimes poorly defined information, and be able to make sound and accurate judgments based on this information. The ability to focus on details, while analyzing and managing larger obstacles, is vital. Assertiveness and self-assurance in presenting and supporting conclusions are also important, as are strong communications and interpersonal skills, because estimators may work as part of a team alongside managers, owners, engineers, and design professionals. Cost estimators also need to be proficient with computers and have skills in programming. Familiarity with cost estimation software, including commercial, and Building Information Modeling (BIM) software is beneficial. BIM software technology takes standard blueprints and creates three-dimensional models on the computer, allowing for better estimates of the building process. Proficiency in project management and the ability to incorporate work breakdown structure (WBS) techniques are increasingly important in cost estimating complex development projects.

Certification and advancement. Voluntary certification can be beneficial 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. The ASPE, 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 a written examination. In addition, certification requirements may include the publication of at least one article or paper in the field.

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, program manager for a government contractor, 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.

Employment

Cost estimators held about 217,800 jobs in 2008. About 59 percent of estimators were in the construction industry and another 15 percent were employed in manufacturing. 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 experiencing rapid change or development.

Job Outlook

Employment is projected to grow much faster than average. Overall, good job opportunities are expected; those with industry work experience and a bachelor's degree in a related field will have the best prospects.

Employment change. Employment of cost estimators is expected to grow by 25 percent between 2008 and 2018, much faster than average for all occupations. Growth in the construction industry will account for most new jobs in this occupation. In particular, construction and repair of highways, streets, bridges, subway systems, airports, water and sewage systems, and electric power plants and transmission lines will stimulate the need for more cost estimators. Similarly, an increasing population will result in more construction of residential homes, hospitals, schools, restaurants, and other structures that require cost estimators. As the population ages, the demand for nursing and extended-care facilities will also increase. The growing complexity of construction projects will also boost demand for cost estimators as more workers specialize in a particular area of construction.

Job prospects. Because there are no formal bachelor's degree programs in cost estimating, some employers have difficulty recruiting qualified cost estimators, resulting in good employment opportunities. Job prospects in construction should be best for those who have a degree in construction science, construction management, or building science or have years of practical experience in the various phases of construction or in a specialty craft area. Knowledge of Building Information Modeling software would also be helpful. For cost estimating jobs in manufacturing, those who have degrees in mathematics, statistics, engineering, accounting, business administration, or

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Cost estimators	13-1051	217,800	272,900	55,200	25

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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economics, and who are familiar with cost estimation software should have the best job prospects.

In addition to job openings arising from employment growth, many additional openings should result annually from the need to replace workers who transfer to other occupations due to the sometimes stressful nature of the work, or who retire or leave the occupation for other reasons.

Employment of cost estimators, like that of many other construction workers, is sensitive to the fluctuations of the economy. Workers in these trades may experience periods of unemployment when the overall level of construction falls. On the other hand, shortages of these workers may occur in some areas during peak periods of building activity.

Earnings

Salaries of cost estimators vary widely by experience, education, size of firm, and industry. Median annual wages of wage and salary cost estimators in May 2008 were $56,510. The middle 50 percent earned between $42,720 and $74,320. The lowest 10 percent earned less than $33,150, and the highest 10 percent earned more than $94,470. Median annual wages in the industries employing the largest numbers of cost estimators were:

Nonresidential building construction	$65,410
Building equipment contractors	60,510
Building finishing contractors	55,430
Residential building construction	55,390
Foundation, structure, and building exterior contractors	54,670

Related Occupations

Other workers who quantitatively analyze cost information include:

	Page
Accountants and auditors	86
Budget analysts	93
Claims adjusters, appraisers, examiners, and investigators	96
Construction managers	38
Economists	209
Financial analysts	103
Financial managers	52
Industrial production managers	67
Insurance underwriters	106
Loan officers	109
Market and survey researchers	212
Operations research analysts	145
Personal financial advisors	118

Sources of Additional Information

Information about career opportunities, certification, educational programs, and cost-estimating techniques may be obtained from:

➤ AACE International, 209 Prairie Ave., Suite 100, Morgantown, WV 26501. Internet: **http://www.aacei.org**

➤ American Society of Professional Estimators (ASPE), 2525 Perimeter Place Drive, Suite 103, Nashville, TN 37214. Internet: **http://www.aspenational.org**

➤ Society of Cost Estimating and Analysis, 527 Maple Ave. East, Suite 301, Vienna, VA 22180. Internet: **http://www.sceaonline.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos006.htm**

Financial Analysts

Significant Points

- Financial analyst positions require a bachelor's or master's degree.
- Positions may also require professional licenses and certifications.
- Keen competition is anticipated for these highly paid positions.
- Financial analysts earn high wages.

Nature of the Work

Financial analysts provide guidance to businesses and individuals making investment decisions. Financial analysts assess the performance of stocks, bonds, commodities, and other types of investments. Also called *securities analysts* and *investment analysts*, they work for banks, insurance companies, mutual and pension funds, securities firms, the business media, and other businesses, making investment decisions or recommendations. Financial analysts study company financial statements and analyze commodity prices, sales, costs, expenses, and tax rates to determine a company's value by projecting its future earnings. They often meet with company officials to gain a better insight into the firms' prospects and management.

Financial analysts can be divided into two categories: *buy side analysts* and *sell side analysts*. Analysts on the buy side work for companies that have a great deal of money to invest. These companies, called institutional investors, include mutual funds, hedge funds, insurance companies, independent money managers, and nonprofit organizations with large endowments. Buy side financial analysts devise investment strategies. Conversely, sell side analysts help securities dealers, such as banks and other firms, sell stocks, bonds, and other investments. The business media hire financial advisors that are supposed to be impartial, and occupy a role somewhere in the middle.

Financial analysts generally focus on trends impacting a specific industry, region, or type of product. For example, an analyst will focus on a subject area such as the utilities industry, an area such as Latin America, or the options market. Firms with larger research departments assign analysts even narrower subject areas. They must understand how new regulations, policies, and political and economic trends may impact the investments they are watching. *Risk analysts* evaluate the risk in portfolio decisions, project potential losses, and determine how to limit potential losses and volatility using diversification, currency futures, derivatives, short selling, and other investment decisions.

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Financial analysts research and analyze financial data, helping managers make sound decisions.

Some experienced analysts called *portfolio managers* supervise a team of analysts and select the mix of products, industries, and regions for their company's investment portfolio. Hedge fund and mutual *fund managers* are called fund managers. Fund and portfolio managers frequently make split-second buy or sell decisions in reaction to quickly changing market conditions. These managers are not only responsible for the overall portfolio, but are also expected to explain investment decisions and strategies in meetings with investors.

Ratings analysts evaluate the ability of companies or governments to pay their debts, including bonds. On the basis of their evaluation, a management team rates the risk of a company or government defaulting on its bonds. Other financial analysts perform budget, cost, and credit analysis as part of their responsibilities.

Financial analysts use spreadsheet and statistical software packages to analyze financial data, spot trends, create portfolios, and develop forecasts. Analysts also use the data they find to measure the financial risks associated with making a particular investment decision. On the basis of their results, they recommend whether to buy, hold, or sell particular investments.

Work environment. Financial analysts usually work in offices. They may work long hours, travel frequently to visit companies or potential investors, and face the pressure of deadlines. Much of their research must be done after office hours because their days are filled with telephone calls and meetings.

Training, Other Qualifications, and Advancement

Financial analysts must have a bachelor's degree. Many positions require a master's degree in finance or a Master of Business Administration (MBA). Positions may also require professional licenses and certifications. However, licenses and certifications are generally only earned after someone is hired.

Education and training. A bachelor's or graduate degree is required for financial analysts. Most companies require a bachelor's degree in a related field, such as finance, business, accounting, statistics, or economics. An understanding of statistics, economics, and business is essential, and knowledge of accounting policies and procedures, corporate budgeting, and financial analysis methods is recommended. An MBA or a master's degree in finance is often required. Advanced courses or knowledge of options pricing, bond valuation, and risk management are important.

Licensure. The Financial Industry Regulatory Authority (FINRA) is the main licensing organization for the securities industry. Depending on an individual's work, different licenses may be required, although buy side analysts are less likely to need licenses. The majority of these licenses require sponsorship by an employer, so companies do not expect individuals to have these licenses before starting a job. Experienced workers who change jobs will need to have their licenses renewed with the new company.

Other qualifications. Strong math, analytical, and problem-solving skills are essential qualifications for financial analysts. Good communication skills are necessary because these workers must present complex financial concepts and strategies. Self-confidence, maturity, and the ability to work independently are important. 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. Although much of the software they use is proprietary, financial analysts must be comfortable working with spreadsheets and statistical packages.

With the increasing global diversification of investments, companies are assigning more financial analysts to cover foreign markets. These analysts normally specialize in one country, such as Brazil, or one region, such as Latin America. Companies prefer financial analysts to have the international experience necessary to understand the language, culture, business environment, and political conditions in the country or region that they cover.

Certification and advancement. Although not always required, certifications enhance professional standing and are recommended by employers. Certifications are becoming increasingly common. Financial analysts can earn the Chartered Financial Analyst (CFA) designation, sponsored by the CFA Institute. To qualify for this designation, applicants need a bachelor's degree, four years of related work experience, and must pass three exams. Applicants can take the exams while they are obtaining the required work experience. Passing the exams requires several hundred hours of self-study. These ex-

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ams cover subjects such as accounting, economics, securities analysis, financial markets and instruments, corporate finance, asset valuation, and portfolio management. Additional certifications are helpful for financial analysts who specialize in specific areas, such as risk management.

Financial analysts advance by moving into positions where they are responsible for larger or more important products. They may supervise teams of financial analysts. They may become portfolio managers or fund managers, directing the investment portfolios of their companies or funds.

Employment

Financial analysts held 250,600 jobs in 2008. Many financial analysts work at large financial institutions based in New York City or other major financial centers. About 47 percent of financial analysts worked in the finance and insurance industries, including securities and commodity brokers, banks and credit institutions, and insurance carriers. Others worked throughout private industry and government.

Job Outlook

Employment of financial analysts is expected to grow much faster than the average for all occupations. However, keen competition will continue for these well-paid jobs, especially for new entrants.

Employment change. As the level of investment increases, overall employment of financial analysts is expected to increase by 20 percent during the 2008–18 decade, which is much faster than the average for all occupations. Primary factors for this growth are increasing complexity and global diversification of investments and growth in the overall amount of assets under management. As the number and type of mutual and hedge funds and the amount of assets invested in these funds increase, companies will need more financial analysts to research and recommend investments. As the international investment increases, companies will need more analysts to cover the global range of investment options.

Job prospects. Despite employment growth, keen competition is expected for these high-paying jobs. Growth in financial services will create new positions, but there are still far more people who would like to enter the occupation. For those aspiring to financial analyst jobs, a strong academic background, including courses such as finance, accounting, and economics, is essential. Certifications and graduate degrees, such as a CFA certification or a master's degree in business or finance, significantly improve an applicant's prospects.

Earnings

Median annual wages, excluding bonuses, of wage and salary financial analysts were $73,150 in May 2008, which is more than double the national median wage. The middle 50 percent earned between $54,930 and $99,100. The lowest 10 percent earned less than $43,440, and the highest 10 percent earned more than $141,070. Annual performance bonuses are quite common and can be a significant part of their total earnings.

Related Occupations

Other jobs requiring expertise in finance and investment include:

	Page
Accountants and auditors	86
Actuaries	125
Budget analysts	93
Financial managers	52
Insurance sales agents	534
Insurance underwriters	106
Personal financial advisors	118
Securities, commodities, and financial services sales agents	553

Sources of Additional Information

For general information on securities industry employment, contact:

➤ Financial Industry Regulatory Authority (FINRA), 1735 K St. NW. Washington, DC 20006. Internet: **http://www.finra.org**

➤ Securities Industry and Financial Markets Association, 120 Broadway, 35th Floor, New York, NY 10271. Internet: **http://www.sifma.org**

For information on financial analyst careers and training, contact:

➤ American Academy of Financial Management, 200 L&A Rd., Suite B, Metairie, LA 70001. Internet: **http://www.aafm.us**

For information on financial analyst careers and CFA certification, contact:

➤ CFA Institute, 560 Ray C. Hunt Dr., Charlottesville, VA 22903. Internet: **http://www.cfainstitute.org**

For additional career information, see the *Occupational Outlook Quarterly* article "Financial analysts and personal financial advisors" online at **http://www.bls.gov/opub/ooq/2000/summer/art03.pdf** and in print at many libraries and career centers.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos301.htm**

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Financial analysts	13-2051	250,600	300,300	49,600	20

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Insurance Underwriters

Significant Points

- Most large insurance companies prefer to hire candidates who have a bachelor's degree or some insurance-related experience.
- Continuing education is necessary for advancement.
- Employment is expected to decline slowly as the spread of automated underwriting software increases worker productivity
- Job opportunities should be best for those with strong computer skills and a background in finance.

Nature of the Work

Insurance companies protect individuals and organizations from financial loss by assuming billions of dollars in risk each year—risks of car accident, property damage, illness, and other occurrences. *Underwriters* decide whether insurance is provided and, if so, under what terms. They identify and calculate the risk of loss from policyholders, establish who receives a policy, determine the appropriate premium, and write policies that cover this risk. An insurance company may lose business to competitors if risk underwriting is too conservative, or it may have to pay excessive claims if the underwriting actions are too liberal.

Using sophisticated computer software, underwriters analyze information in insurance applications to determine whether a risk is acceptable and will not result in a loss. Insurance applications often are supplemented with reports from loss-control representatives, medical reports, reports from data vendors, and actuarial studies. Underwriters then must decide whether to issue the policy and, if so, determine the appropriate premium. In making this determination, underwriters consider a wide variety of factors about the applicant. For example, an underwriter working in health insurance will consider age, family history, lifestyle, and current health, whereas an underwriter working for a property-casualty insurance company is concerned with the causes of loss to which property is exposed, such as hurricanes or earthquakes, and the safeguards taken by the applicant. Therefore, underwriters serve as the main link between the insurance carrier and the insurance agent.

Technology plays an important role in an underwriter's job. Underwriters use computer applications called "smart" systems to calculate risks more efficiently and accurately. Such systems—also known as "automated underwriting systems"—analyze and rate insurance applications, recommend acceptance or denial of the risk, and adjust the premium rate according to the risk. To start the process, underwriters create software rules to screen applicants based on certain criteria, such as income and credit score for mortgage applicants or age and family medical history for life insurance applicants. After the software completes its assessment, underwriters can either approve or refute the decision, or, if it is questionable, request additional information from the applicant. These automated systems allow underwriters to quickly make decisions and, in most cases, effectively make sound judgments and minimize losses.

The Internet also has aided underwriters in their work. Many insurance carriers' computer systems are linked to various databases on the Internet that allow immediate access to information—such as driving records and credit scores—necessary in determining a potential client's risk. This kind of access reduces the time and paperwork needed for an underwriter to complete a risk assessment.

Although there are many lines of insurance work, most underwriters specialize in one of four broad categories: life, health, mortgage, and property and casualty. Life and health insurance underwriters may further specialize in individual or group policies.

An increasing proportion of insurance sales, particularly in life and health insurance, are being made through group contracts. A standard group policy insures everyone in a specified group through a single contract at a standard premium. The group underwriter analyzes the overall composition of the group to ensure that the total risk is not excessive. Another type of group policy provides members of a group—senior citizens, for example—with individual policies that reflect their particular 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.

Property and casualty underwriters specialize in either commercial or personal insurance and then by type of risk insured, such as fire, homeowners', automobile, or marine. In cases where property-casualty companies provide insurance through a single "package" policy covering various types of risks, the underwriter must be familiar with different types of insurance. For business insurance, the underwriter should be able to evaluate the firm's entire operation in appraising its application for insurance.

Work environment. Underwriters mainly have sedentary desk jobs that do not require strenuous physical activity. Most underwriters are based in a company headquarters or regional branch office, but they occasionally attend meetings away from home. Construction and marine underwriters frequently travel to inspect worksites and assess risks.

Although some overtime may be required, underwriters typically work a standard 40-hour week. Those in managerial positions often work more than 40 hours per week.

Training, Other Qualifications, and Advancement

Although there are no formal education requirements for becoming an underwriter, employers prefer candidates who have either a bachelor's degree or insurance-related experience and strong computer skills. Much of what an underwriter does may be learned through on-the-job training, so the majority of underwriters start their careers as trainees.

Education and training. For entry-level underwriting jobs, most large insurance companies prefer college graduates who have a degree in business administration or finance. However, a bachelor's degree in almost any field—plus courses in busi-

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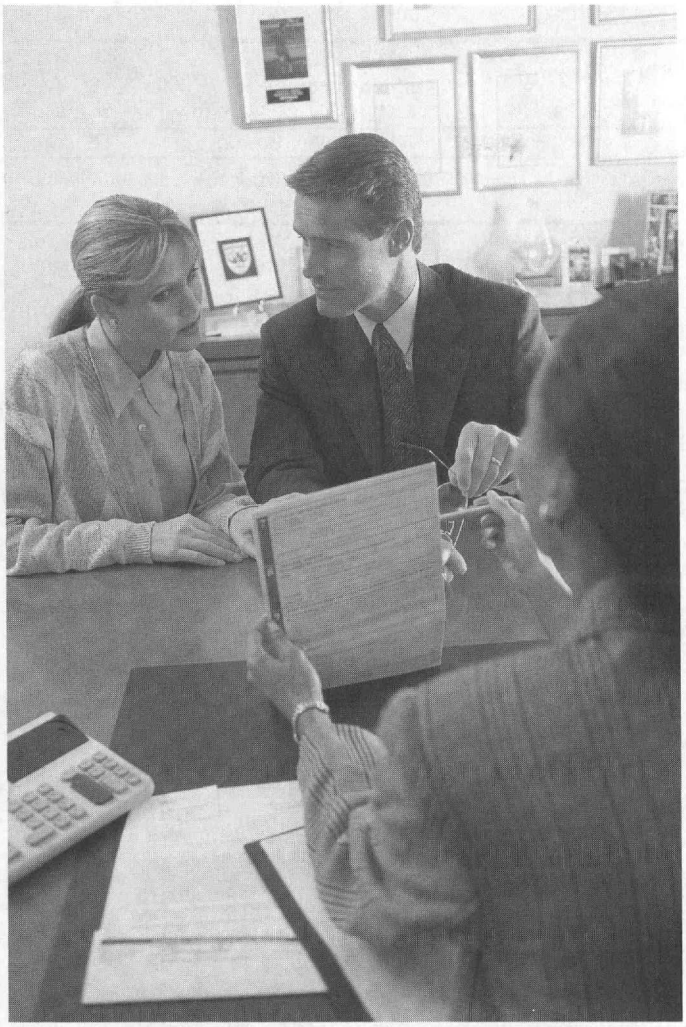

Insurance underwriters review insurance applications and determine the appropriate premium to charge a customer.

ness law and accounting—provides a good general background and may be sufficient to qualify entry-level jobseekers. Because computers are an integral part of most underwriters' jobs, some coursework with computers is also beneficial. Still, many employers prefer to hire candidates who have several years of related experience in underwriting or insurance.

New employees usually start as underwriter trainees or assistant underwriters. Under the supervision of an experienced risk analyst, beginning underwriters may help collect information on applicants and evaluate routine applications. 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, which generally last from a few months to a year. As trainees gain experience, they are assigned policy applications that are more complex and cover greater risks.

The computer programs many underwriters use to assess risk are continually being updated, so on-the-job computer training may continue throughout an underwriter's career.

Other qualifications. Underwriters must pay attention to detail and possess good judgment to make sound decisions. Additionally, good communication and interpersonal skills are beneficial because much of the underwriter's work involves dealing with agents and other professionals.

Certification and advancement. Continuing education is necessary for advancement, because changes in tax laws, government benefits programs, and other State and Federal regulations can affect the insurance needs of clients and businesses. Independent-study programs for experienced underwriters are also available. The Insurance Institute of America offers a training program for beginning underwriters. The Institute also offers the designation of Associate in Commercial Underwriting (ACU) for those starting a career in underwriting business insurance policies, or an Associate in Personal Insurance (API) for those interested in underwriting personal insurance policies. To earn either the ACU or API designation, underwriters complete a series of courses and examinations that generally last 1 to 2 years.

The American Institute for Chartered Property Casualty Underwriters awards the Chartered Property and Casualty Underwriter (CPCU) designation to experienced underwriters. Earning the CPCU designation requires passing eight exams, having at least 3 years of insurance experience, and abiding by the Institute's and CPCU Society's code of professional ethics.

The American College offers the equivalent Chartered Life Underwriter (CLU) designation and the Registered Health Underwriter (RHU) designation for life and health insurance professionals. For those new to the industry, the American College also offers the Life Underwriter Training Council Fellow (FUTCF), an introductory course that teaches basic insurance concepts.

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, but these managers often need a master's degree. 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.

Employment

Insurance underwriters held about 102,900 jobs in 2008. Insurance carriers employed 67 percent of all underwriters. Most of the remaining underwriters work in insurance agencies and brokerages.

Most underwriters are based in the insurance company's home office. But some, mainly 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.

Job Outlook

Although employment is expected to decline slowly, job prospects will remain good because of high turnover.

Employment change. Employment of underwriters is expected to decline 4 percent during the 2008-18 decade. Demand for underwriters will continue to be offset by automation and technological advancement—factors that have resulted, in large part, to stagnant employment levels over the past two decades. For example, upgrades to underwriting software have helped

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Insurance underwriters	13-2053	102,900	98,700	-4,300	-4

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

increase underwriter productivity. Automated underwriting quickly rates and analyzes insurance applications, reducing the need for underwriters. In addition, adoption of this technology into other segments of insurance, such as life and health and long-term care, will continue to impede employment growth through the projection period, although at a slower rate than in the past. Nonetheless, even as automated underwriting continues to be adopted and upgrades to underwriting software makes workers more productive, the need for humans to verify information will continue.

Additionally, some demand for underwriters may arise as insurance carriers try to restore profitability. As the carriers' returns on their investments have declined, insurers may place more emphasis on underwriting to generate revenues. An expected increase in sales of health insurance and long-term care insurance, designed specifically for the elderly, also may result in some new jobs. As members of the baby-boom generation grow older and a growing share of the Nation's population moves into the older age groups, more people are expected to purchase these kinds of insurance products.

Job prospects. Job opportunities should be best for those with experience in related insurance jobs, a background in finance, and strong computer and communication skills. The need to replace workers who retire or transfer to another occupation will create many job openings. In fact, high turnover will account for most job openings. High turnover among underwriters results, in part, from the limited upward mobility of workers in the occupation—a scenario that is likely to continue through the projections decade (2008-18).

New and emerging fields of insurance may also be a source of job opportunities for underwriters. Insurance carriers are always assessing new risks and offering new types of policies to meet changing circumstances. Underwriters are needed particularly in product development, where they assess risks and set the premiums for new lines of insurance. Growing demand for long-term care insurance—a relatively new product offered by insurance carriers—may also provide some job opportunities for underwriters.

Earnings

Median annual wages of wage and salary insurance underwriters were $56,790 in May 2008. The middle 50 percent earned between $43,490 and $76,700 a year. The lowest 10 percent earned less than $35,010, and the highest 10 percent earned more than $99,940. Median annual wages of underwriters working with insurance carriers were $57,480, while underwriters' median annual wages in agencies, brokerages, and other insurance-related activities were $54,410.

Insurance companies usually provide better-than-average benefits, including retirement plans and employer-financed group life and health insurance. Insurance companies usually pay tuition for underwriting courses that their trainees complete, and some also offer salary incentives.

Related Occupations

Underwriters make decisions based on financial and statistical data. Other occupations with similar responsibilities include the following:

	Page
Accountants and auditors	86
Actuaries	125
Budget analysts	93
Cost estimators	100
Credit analysts	823
Financial managers	52
Loan officers	109

Other related jobs in the insurance industry include

Claims adjusters, appraisers, examiners, and investigators	96
Insurance sales agents	534

Sources of Additional Information

Information about a career as an insurance underwriter is available from the home offices of many insurance companies.

Information about the property-casualty insurance field can be obtained by contacting

➤ Insurance Information Institute, 110 William St., New York, NY 10038. Internet: **http://www.iii.org**

Information on the underwriting function and the CPCU and AU designations can be obtained from

➤ American Institute for Chartered Property and Casualty Underwriters and Insurance Institute of America, 720 Providence Rd., Suite 100, Malvern, PA 19355. Internet: **http://www.aicpcu.org**

➤ CPCU Society, 720 Providence Rd., Malvern, PA 19355. Internet: **http://www.cpcusociety.org**

Information on the CLU and RHU designations can be obtained from

➤ The American College, 270 S. Bryn Mawr Ave., Bryn Mawr, PA 19010. Internet: **http://www.theamericancollege.edu**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos026.htm**

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Loan Officers

Significant Points

- Nearly 9 out of 10 loan officers work for commercial banks, savings institutions, credit unions, and related financial institutions.
- Educational requirements range from a high school diploma for many loan officers to a bachelor's degree for commercial loan officers; previous banking, lending, or sales experience is highly valued.
- Good job opportunities are expected for mortgage and consumer loan officers and excellent opportunities are expected for commercial loan officers.
- Earnings often fluctuate with the number of loans generated, rising substantially when the economy is strong and interest rates are low.



Loan officers guide clients through the loan application process.

Nature of the Work

Many individuals take out loans to buy a house, car, or pay for a college education. Businesses use loans to start companies, purchase inventory, or invest in capital equipment. *Loan officers* facilitate this lending by finding potential clients and helping them to apply for loans. Loan officers gather information to determine the likelihood that individuals and businesses will repay the loan. Loan officers may also provide guidance to prospective borrowers who have problems qualifying for traditional loans. For example, loan officers might determine the most appropriate type of loan for a particular customer and explain specific requirements and restrictions associated with the loan.

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 loans made to purchase real estate or to refinance an existing mortgage.

Loan officers guide clients through the process of applying for a loan. The process begins with the client contacting the bank through a phone call, visiting a branch, or filling out a Web-based loan application. The loan officer obtains basic information from the client about the purpose of the loan and the applicant's ability to pay the loan. The loan officer may need to explain the different types of loans and credit terms available to the applicant. Loan officers answer questions about the process and sometimes assist clients in filling out the application.

After a client completes an 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 using underwriting software that determines if a client is eligible for the loan. When a credit history is not available or when 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. Commercial loans are often too complex for a loan officer to rely solely on underwriting software. The variety in companies' financial statements and varying types of collateral require human judgment. Collateral is any asset, such as a factory, house, or car, owned by the borrower that becomes the property of the bank if the loan is not repaid. Loan officers comment on, and verify, the information of a loan application 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.

Commercial loans are sometimes so large—for example, the loan needed to build a new shopping mall—that a single bank will not lend all of the money. In this case, a commercial loan officer may work with other banks or investment bankers to put together a package of loans from multiple sources to finance the project.

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.

Some loan officers, called *loan underwriters*, specialize in evaluating a client's creditworthiness and may conduct a financial analysis or other risk assessment.

Other loan officers, referred to as *loan collection officers*, contact borrowers with delinquent loan accounts to help them find a method of repayment 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.

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Work environment. Working as a loan officer usually involves considerable work outside the office. For example, commercial and mortgage loan officers frequently work away from their offices and rely on laptop computers and cellular telephones to keep in contact with their employers and clients. Mortgage loan officers often work out of their home or car, visiting offices or homes of clients to complete loan applications. Commercial loan officers sometimes travel to other cities to prepare complex loan agreements. Consumer loan officers, however, are likely to spend most of their time in an office.

Most loan officers 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 are especially busy when interest rates are low, causing a surge in loan applications.

Training, Other Qualifications, and Advancement

Loan officers need a high school diploma and receive on-the-job training. Commercial loan officer positions often require a bachelor's degree in finance, economics, or a related field. Previous banking, lending, or sales experience is also highly valued by employers.

Education and training. Loan officer positions generally require a high school degree. Loan officers receive on-the-job training consisting of some formal company-sponsored training and informal training on the job over their first few months of employment. Commercial loan officer positions often require a bachelor's degree in finance, economics, or a related field. Because commercial loan officers analyze the finances of businesses applying for credit, they need to understand business accounting, financial statements, and cash flow analysis. Loan officers often advance to their positions after gaining experience in various other related occupations, such as teller or customer service representative.

Licensure. Recent federal legislation requires that all mortgage loan officers be licensed. Licensing requirements include at least 20 hours of coursework, passing a written exam, passing a background check, and having no felony convictions. There are also continuing education requirements for mortgage loan officers to maintain their licenses. There are currently no specific licensing requirements for other loan officers.

Other qualifications. People planning a career as a loan officer should be good at working with others, confident, and highly motivated. Loan officers must be willing to attend community events as representatives of their employer. Sales ability, good interpersonal and communication skills, and a strong desire to succeed also are important qualities for loan officers. Banks generally require their employees to pass a background check. Most employers also prefer applicants who are familiar with computers and banking and financial software.

Certification and advancement. Capable loan officers may advance to larger branches of their firms or to managerial positions. Some loan officers advance to supervise other loan officers and clerical staff.

Various banking associations and private schools offer courses and programs for students interested in lending and for experienced loan officers who want to keep their skills current. For example, the Bank Administration Institute, an affiliate of the American Banker's Association, offers the Loan Review Certificate Program for people who review and approve loans.

The Mortgage Bankers Association offers the Certified Mortgage Banker (CMB) designation to loan officers in real estate finance. The association offers three CMB designations: residential, commerce, and master to candidates who have 3 years of experience, earn educational credits, and pass an exam. Completion of these courses and programs generally enhances employment and advancement opportunities.

Employment

Loan officers held about 327,800 jobs in 2008. Nearly 9 out of 10 loan officers were employed by commercial banks, savings institutions, credit unions, and related financial institutions. 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.

Job Outlook

Loan officers can expect average employment growth. Good job opportunities should exist for loan officers.

Employment change. Employment of loan officers is projected to grow 10 percent between 2008 and 2018, which is about as fast as the average for all occupations. Employment growth will be driven by economic expansion and population increases—factors that generate demand for loans. Growth will be partially offset by increased automation that speeds the lending process and by the growing use of the Internet to apply for and obtain loans. However, these changes have also reduced the cost and complexity associated with refinancing loans, which could increase the number of loans originated.

The use of automated underwriting software has made the loan evaluation process much simpler than in the past. Underwriting software allows loan officers—particularly loan underwriters—to evaluate many more loans in less time. In addition, the mortgage application process has become highly automated and standardized, a simplification that has enabled mortgage loan vendors to offer their services over the Internet. Online vendors accept loan applications from customers over the Internet and determine which lenders have the best interest rates

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Loan officers	13-2072	327,800	360,900	33,000	10

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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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 is expected to become more common in the future and to slow job growth for loan officers.

Job prospects. Most job openings will result from the need to replace workers who retire or otherwise leave the occupation permanently. Good job opportunities should exist for mortgage and consumer loan officers. College graduates and those with banking, lending, or sales experience should have the best job prospects. Excellent opportunities should exist for commercial loan officers as banks report having a hard time finding qualified candidates.

Job opportunities for loan officers are influenced by the volume of applications, which is determined largely by interest rates and by the overall level of economic activity. 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. An upswing in the economy or a decline in interest rates often results in a surge in real estate buying and mortgage refinancing, requiring loan officers to work long hours processing applications and inducing lenders to hire additional loan officers. Loan officers often are paid by commission on the value of the loans they place, and when the real estate market slows they 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, an increase in the number of delinquent loans results in more demand for loan collection officers.

Earnings

Median annual wages of wage and salary loan officers were $54,700 in May 2008. The middle 50 percent earned between $39,710 and $76,860. The lowest 10 percent earned less than $30,850, while the top 10 percent earned more than $106,360. Median annual wages in the industries employing the largest numbers of loan officers were as follows:

Federal Executive Branch	$69,070
Management of companies and enterprises	58,100
Nondepository credit intermediation	54,240
Activities related to credit intermediation	54,140
Depository credit intermediation	53,490

The form of compensation for loan officers varies. Most are paid a commission based on the number of loans they originate. Some institutions pay only salaries, while others pay their loan officers a salary plus a commission or bonus based on the number of loans or the performance of the loans that they originated. Loan officers who are paid on commission usually earn more than those who earn only a salary, and those who work for smaller banks generally earn less than those employed by larger institutions.

Earnings often fluctuate with the number of loans generated, rising substantially when the economy is strong and interest rates are low.

Related Occupations

Loan officers help people manage financial assets and secure loans. Occupations that involve similar functions include:

	Page
Financial analysts	103
Insurance sales agents	534
Insurance underwriters	106
Loan counselors	823
Personal financial advisors	118
Real estate brokers and sales agents	540
Securities, commodities, and financial services sales agents	553

Sources of Additional Information

Information about a career as a mortgage loan officer can be obtained from:

➤ Mortgage Bankers Association, 1331 L St. NW., Washington, DC 20005. Internet: **http://www.mortgagebankers.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.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos018.htm**

Management Analysts

Significant Points

- Despite 24 percent employment growth, keen competition is expected for jobs; opportunities should be best for those with a graduate degree, specialized expertise, and a talent for salesmanship and public relations.
- About 26 percent, three times the average for all occupations, are self-employed.
- A bachelor's degree is sufficient for many entry-level government jobs; many positions in private industry require a master's degree, specialized expertise, or both.

Nature of the Work

As business becomes more complex, firms are continually faced with new challenges. They increasingly rely on *management analysts* to help them remain competitive amidst these changes. Management analysts, often referred to as *management 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 might employ a consultant who is an expert in just-in-time invento-

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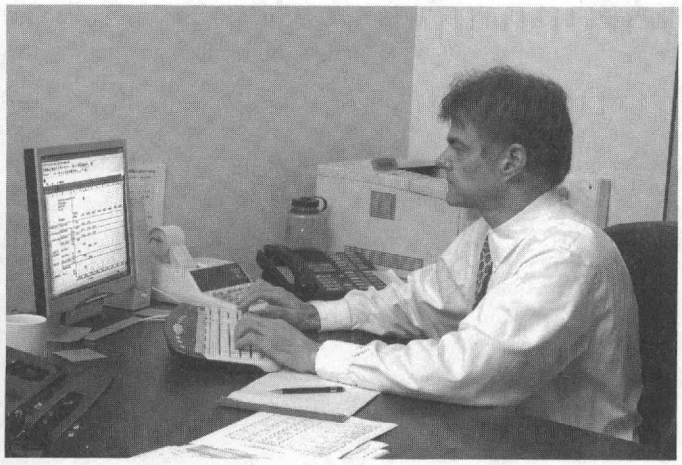

Management analysts collect and analyze information in order to make recommendations to managers.

ry management to help improve its inventory-control system. 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; computer systems analysts; computer scientists; and computer programmers.)

Management analysts might be single practitioners or part of large international organizations employing thousands of other 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 previous clients, and a completion deadline. The company then selects the proposal that best suits its needs. Some firms, however, employ internal management consulting groups rather than hiring outside consultants.

After obtaining an assignment or contract, management analysts first define the nature and extent of the problem that they have been asked to solve. 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 analysts or consultants then develop solutions to the problem. While 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, such as one that shows how inventory levels affect costs and product delivery times.

Once they have decided on a course of action, consultants report their findings and recommendations to the client. Their suggestions usually are submitted in writing, but oral presentations regarding findings are also common. For some projects, management analysts are retained to help implement their suggestions.

Like their private-sector colleagues, management analysts in government agencies try to increase efficiency and worker productivity and to control costs. 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 ones best meet the agency's needs. Analysts may manage contracts for a wide range of goods and services to ensure quality performance and to prevent cost overruns.

Work environment. 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 when 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.

Training, Other Qualifications, and Advancement

Entry requirements for management analysts vary. For some entry-level positions, a bachelor's degree is sufficient. For others, a master's degree or specialized expertise is required.

Education and training. Educational requirements for entry-level jobs in this field vary between private industry and government. Many 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 or industry in which the worker plans to consult. Other firms hire workers with a bachelor's degree as research analysts or associates and promote them to consultants after several years. Some government agencies require experience, graduate education, or both, but many also

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hire people with a bachelor's degree and little work experience for entry-level management analyst positions.

Few universities or colleges offer formal programs 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. Common fields of study include business, management, accounting, marketing, economics, statistics, computer and information science, or engineering. Most analysts also 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.

Other qualifications. 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.

Certification and advancement. As consultants gain experience, they often become solely responsible for specific projects, taking on more responsibility and managing their own hours. At the senior level, consultants may supervise teams working on more complex projects and become more involved in seeking out new business. Those with exceptional skills may eventually become partners in the firm and focus on attracting new clients and bringing in revenue. Senior consultants who leave their consulting firms often move to senior management positions at non-consulting firms. Others with entrepreneurial ambition may open their own firms.

A high percentage of management consultants are self-employed, in part because business startup and overhead costs are low. Since many small consulting firms fail each year because of lack of managerial expertise and clients, persons interested in opening their own firm must have good organizational and marketing skills. Several years of consulting experience are also helpful.

The Institute of Management Consultants USA, Inc. 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.

Employment

Management analysts held about 746,900 jobs in 2008. About 26 percent of these workers, three times the average for all occupations, were self-employed. Management analysts are found throughout the country, but employment is concentrated in large metropolitan areas. Management analysts work in a range of industries, including management, scientific, and technical consulting firms; computer systems design and related services firms; and Federal, State, and local governments.

Job Outlook

Employment of management analysts is expected to grow 24 percent, much faster than the average for all occupations. Despite projected rapid employment growth, keen competition is expected for jobs as management analysts because the independent and challenging nature of the work and the high earnings potential make this occupation attractive to many.

Employment change. Employment of management analysts is expected to grow by 24 percent, much faster than the average, over the 2008–18 decade, 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 by increasing use of consulting teams that are often more versatile.

Job growth for management analysts will be 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 regulatory changes, developments in information technology, and the growth of electronic commerce. In addition, as firms try to solve regulatory changes due to the current economic credit and housing crisis, consultants will be hired to render advice on the recovery process. Firms will also hire information technology consultants who specialize in "green" or environmentally safe use of technology management consulting to help lower energy consumption and implement "green" initiatives. Traditional companies hire analysts to help design intranets, company Web sites, or to establish online businesses. New Internet startup companies hire analysts not only to design Web sites but also to advise them in traditional business practices, such as pricing strategies, marketing, and inventory and human resource management.

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 to take advantage of this expanding market. Although information technology consulting should remain one of the fastest growing consulting areas, employment in the computer services industry can be volatile, and so the most successful management analysts may also consult in other business areas.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Management analysts	13-1111	746,900	925,200	178,300	24

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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The growth of international business will also contribute 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; to advise them on legal matters pertaining to specific countries; or to help them 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. Just as globalization creates new opportunities for management analysts, it also allows U.S. firms to hire management analysts in other countries; however, because international work is expected to increase the total amount of work, this development is not expected to adversely affect employment in this occupation.

Furthermore, as international and domestic markets become more competitive, firms will need to use resources more efficiently. Management analysts will be increasingly sought to help reduce costs, streamline operations, and develop marketing strategies. As this process expands and as businesses downsize, even more opportunities will be created for analysts to perform duties that were previously handled internally. Finally, more management analysts will also be needed in the public sector, as Federal, State, and local government agencies seek to improve efficiency.

Job prospects. Despite rapid employment growth, keen competition is expected. The pool of applicants from which employers can draw is quite large, since analysts can have very diverse educational backgrounds and work experience. 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, specialized expertise, and a talent for salesmanship and public relations.

Economic downturns can also have adverse effects on employment for some management consultants. In these times, businesses look to cut costs, and consultants may be considered an 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, specific expertise, and size of employer. Generally, management analysts employed in large firms or in metropolitan areas have the highest salaries. Median annual wages of wage and salary management analysts in May 2008 were $73,570. The middle 50 percent earned between $54,890 and $99,700. The lowest 10 percent earned less than $41,910 and the highest 10 percent earned more than $133,850. Median annual wages in the industries employing the largest numbers of management analysts were:

Computer systems and design related services	$82,090
Management, scientific, and technical consulting services	81,670
Federal Executive Branch	79,830
Management of companies and enterprises	73,760
State government	55,590

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:

	Page
Accountants and auditors	86
Budget analysts	93
Cost estimators	100
Economists	209
Financial analysts	103
Market and survey researchers	212
Operations research analysts	145
Personal financial advisors	118

Some management analysts specialize in information technology and work with computers, similar to:

Computer scientists	132
Computer systems analysts	140

Most management analysts also have managerial experience similar to that of:

Administrative services managers	29
Advertising, marketing, promotions, public relations, and sales managers	32
Financial managers	52
Human resources, training, and labor relations managers and specialists	61
Industrial production managers	67
Top executives	83

Sources of Additional Information

Information about career opportunities in management consulting is available from:

➤ Association of Management Consulting Firms, 370 Lexington Ave., Suite 2209, New York, NY 10017. 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 USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly*

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article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos019.htm**

Meeting and Convention Planners

Significant Points

- People with a variety of educational or work backgrounds can become meeting and convention planners.
- Planners often work long hours in the period prior to and during a meeting or convention, and extensive travel may be required.
- Employment is expected to grow faster than the average for all occupations.
- Opportunities will be best for individuals with a bachelor's degree and some experience as a meeting planner.

Nature of the Work

Meetings and conventions bring people together for a common purpose, and *meeting* and *convention planners* work to ensure that this purpose is achieved seamlessly. *Planners* coordinate every detail of meetings and conventions, from the speakers and meeting location to arranging for printed materials and audio-visual equipment.

The first step in planning a meeting or convention is determining the purpose, message, or impression that the sponsoring organization wants to communicate. Planners increasingly focus on how meetings affect the goals of their organizations; for example, they may survey prospective attendees to find out what motivates them and how they learn best. A more recent option for planners is to decide whether the meeting or convention can achieve goals in a virtual format versus the traditional meeting format. Virtual conferences are offered over the Internet where attendees view speakers and exhibits online. After this decision is made, planners then choose speakers, entertainment, and content, and arrange the program to present the organization's information in the most effective way.

Meeting and convention planners search for prospective meeting sites, primarily hotels and convention or conference centers. When choosing a site, the planner considers who the prospective attendees are and how they will get to the meeting. Being close to a major airport is important for organizations that have attendees traveling long distances who are pressed for time. The planner may also select a site based on its attractiveness to increase the number of attendees.

Once they have narrowed down possible locations for the meeting, planners issue requests for proposals to all possible meeting sites in which they are interested. These requests state the meeting dates and outline the planner's needs for the meeting or convention, including meeting and exhibit space, lodging, food and beverages, telecommunications, audio-visual requirements, transportation, and any other necessities. The establishments respond with proposals describing what space and services they can supply, and at what price. Meeting and convention planners review these proposals and either make recommendations to the clients or management or choose the site themselves.

Once the location is selected, meeting and convention planners arrange support services, coordinate with the facility, prepare the site staff for the meeting, and set up all forms of electronic communication needed for the meeting or convention, such as e-mail, voice mail, video, and online communication.

Meeting logistics, the management of the details of meetings and conventions, such as labor and materials, is another major component of the job. Planners register attendees and issue name badges, coordinate lodging reservations, and arrange transportation. They make sure that all necessary supplies are ordered and transported to the meeting site on time, that meeting rooms are equipped with sufficient seating and audio-visual equipment, that all exhibits and booths are set up properly, and that all materials are printed. They also make sure that the meeting adheres to fire and labor regulations and oversee food and beverage distribution.

There also is a financial management component of the work. Planners negotiate contracts with facilities and suppliers. These contracts, which have become increasingly complex, are often drawn up more than a year in advance of the meeting or convention. Contracts often include clauses requiring the planner to book a certain number of rooms for meetings in order to qualify for space discounts and imposing penalties if the rooms are not filled. Therefore, it is important that the planner closely estimates how many people will attend the meeting based on previous meeting attendance and current circumstances. Planners must also oversee the finances of meetings and conventions. They are given overall budgets by their organizations and must create a detailed budget, forecasting what each aspect of the event will cost. Additionally, some planners oversee meetings that contribute significantly to their organization's operating budget and must ensure that the event meets income goals.

An important part of the work is measuring how well the meeting's purpose was achieved. After determining what the objectives are, planners try to measure if objectives were met and if the meeting or conference was a success. The most common way to gauge their success is to have attendees fill out surveys about their experiences at the event. Planners can ask specific questions about what sessions were attended, how well organized the event appeared, how they felt about the overall experience, and ask for suggestions on how to improve the next event. If the purpose of a meeting or convention is publicity, a good measure of success would be how much press coverage the event received. A more precise measurement of meeting success, and one that is gaining importance, is return on investment. Planners compare the costs and benefits of an event and show whether it was worthwhile to the organization. For example, if a company holds a meeting to motivate its employees and

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improve company morale, the planner might track employee turnover before and after the meeting.

Some aspects of the work vary by the type of organization for which planners work. Those who work for associations must market their meetings to association members, convincing members that attending the meeting is worth their time and expense. Marketing is usually less important for corporate meeting planners because employees are generally required to attend company meetings. *Corporate planners* usually have shorter time frames in which to prepare their meetings. Planners who work in Federal, State, and local governments must learn how to operate within established government procedures, such as procedures and rules for procuring materials and booking lodging for government employees. *Government meeting planners* also need to be aware of any potential ethics violations.

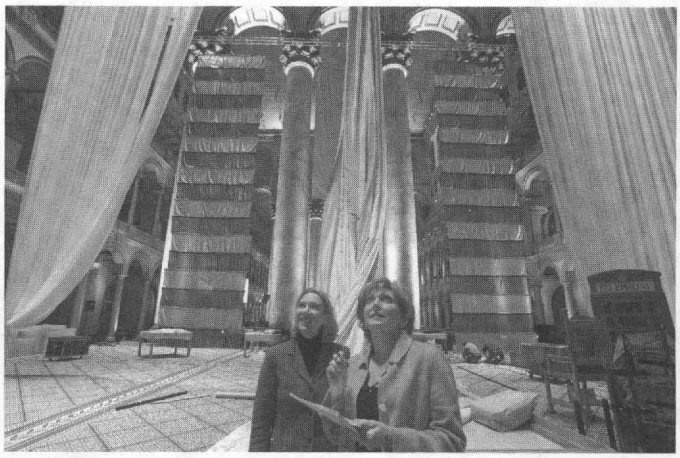
Convention service managers, meeting professionals who work in hotels, convention centers, and similar establishments, act as liaisons between the meeting facility and planners who work for associations, businesses, or governments. They present food service options to outside planners, coordinate special requests, suggest hotel services based on the planner's budget, and otherwise help outside planners present effective meetings and conventions in their facilities.

In large organizations or those that sponsor large meetings or conventions, meeting professionals are more likely to specialize in a particular aspect of meeting planning. Some specialties are *conference coordinators*, who handle most of the meeting logistics; *registrars*, who handle advance registration and payment, name badges, and the set-up of on-site registration; and *education planners*, who coordinate the meeting content, including speakers and topics. In organizations that hold very large or complex meetings, there may be several senior positions, such as *manager of registration, education seminar coordinator*, or *conference services director*, with the entire meeting planning department headed by a department director.

Work environment. The work of meeting and convention planners may be considered either stressful or energizing, but there is no question that it is fast-paced and demanding. Planners oversee multiple operations at one time, face numerous deadlines, and orchestrate the activities of several different groups of people. Meeting and convention planners spend the majority of their time in offices, but during meetings, they work on-site at the hotel, convention center, or other meeting location. They travel regularly to attend meetings and to visit prospective meeting sites. The extent of travel depends upon the type of organization for which the planner works. Local and regional organizations require mostly regional travel, while national and international organizations require travel to more distant locales, including travel abroad.

Work hours can be long and irregular, with planners working more than 40 hours per week in the time leading up to a meeting and fewer hours after finishing a meeting. During meetings or conventions, planners may work very long days, starting as early as 5:00 a.m. and working until midnight. They are sometimes required to work on weekends.

Some physical activity is required, including long hours of standing and walking and some lifting and carrying of boxes of materials, exhibits, or supplies. Planners work with the public



Meeting and convention planners search for prospective meeting sites, primarily hotels and convention or conference centers.

and with workers from diverse backgrounds. They may get to travel to luxurious hotels and interesting places and meet speakers and meeting attendees from around the world, while enjoying a high level of autonomy.

Training, Other Qualifications, and Advancement

People with a variety of educational or work backgrounds become meeting and convention planners. Many migrate into the occupation after gaining planning experience. For example, an administrative assistant may begin planning small meetings and gradually move into a full-time position as a meeting and convention planner. Although there are some certification programs and college courses in meeting and convention planning available, most needed skills are learned through experience.

Education and training. Many employers prefer applicants who have a bachelor's degree, but this is not always required. The proportion of planners with a bachelor's degree is increasing because the work and responsibilities are becoming more complex.

Other planners enter the profession by gaining planning experience while working in another position, such as administrative assistant. Others enter the occupation after working in hotel sales or as marketing or catering coordinators. These are effective ways to learn about meeting and convention planning because these hotel personnel work with numerous meeting planners, participate in negotiations for hotel services, and witness many different meetings. Workers who enter the occupation in these ways often start at a higher level than those with bachelor's degrees and no experience.

Planners with college degrees have backgrounds in a variety of disciplines, but some useful undergraduate majors are marketing, public relations, communications, business, and hotel or hospitality management. Individuals who have studied hospitality management may start out with greater responsibilities than those with other academic backgrounds. College students may also gain experience by planning meetings for a university organization or club.

Several universities offer bachelor's or master's degrees with majors in meetings management. Additionally, meeting and convention planning continuing education programs are offered

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by a few universities and colleges. These programs are designed for career development of meeting professionals as well as for people wishing to enter the occupation. Some programs may require 40 to more than 100 classroom hours and may last anywhere from 1 semester to 2 years.

Once hired, most of the training is done informally on the job. Entry-level planners generally begin by performing small tasks under the supervision of senior meeting professionals. For example, they may issue requests for proposals and discuss the resulting proposals with higher level planners. They also may assist in registration, review of contracts, or the creation of meeting timelines, schedules, or objectives. They may start by planning small meetings, such as committee meetings. Those who start at small organizations have the opportunity to learn more quickly since they will be required to take on a larger number of tasks.

Other qualifications. Because meeting and convention planners communicate with a wide range of people, they must have excellent written and verbal communications skills and interpersonal skills in order to convey the needs of the organization effectively. In addition, they must be good at establishing and maintaining relationships with clients and suppliers.

Meeting and convention planners must be detail-oriented with excellent organizational skills, and they must be able to multi-task, meet tight deadlines, and maintain composure under pressure in a fast-paced environment. Quantitative and analytic skills are needed to formulate and follow budgets and to understand and negotiate contracts. The ability to speak multiple languages is a plus, since some planners must communicate with meeting attendees and speakers from around the world. Planners also need computer skills, such as the ability to use financial and registration software and the Internet.

Certification and advancement. To advance in this occupation, planners must volunteer to take on more responsibility and find new and better ways of doing things in their organizations. The most important factors are demonstrated skill on the job, determination, and gaining the respect of others within the organization. Because formal education is increasingly important, those who enter the occupation may enhance their professional standing by enrolling in meeting planning courses offered by professional meeting and convention planning organizations, colleges, or universities.

As meeting and convention planners prove themselves, they are given greater responsibilities. This may mean taking on a wider range of duties or moving to another planning specialty to gain experience in that area before moving to a higher level. For example, a planner may be promoted from conference coordinator, with responsibility for meeting logistics, to program coordinator, with responsibility for booking speakers and formatting the meeting's program. The next step up may be meeting manager, who supervises all parts of the meeting, and then director of meetings, and then possibly department director of meetings and education. Another path for promotion is to move from a small organization to a larger one, taking on responsibility for larger meetings and conventions.

The Convention Industry Council offers the Certified Meeting Professional (CMP) credential, a voluntary certification for meeting and convention planners. Although the CMP is not required, it is widely recognized in the industry and may help in career advancement. To qualify, candidates must have a minimum of 3 years of meeting management experience, full-time employment in a meeting management capacity, and proof of accountability for successfully completed meetings. Those who qualify must then pass an examination that covers topics such as adult learning, financial management, facilities and services, logistics, and meeting programs.

The Society of Government Meeting Professionals (SGMP) offers the Certified Government Meeting Professional credential. This certification is not required to work as a government meeting planner. It may, however, be helpful to those who want to demonstrate knowledge of issues specific to planning government meetings, such as regulations and policies governing procurement and travel. To qualify for certification, candidates must have at least 1 year of membership in SGMP. Membership requires employment as a meeting planner within Federal, State, or local government or for a firm that works on government contracts. To become certified, members must take a 3-day course and pass an exam.

With significant experience, meeting planners may become independent meeting consultants, advance to vice president or executive director of an association, or start their own meeting planning firms.

Employment

Meeting and convention planners held about 56,600 jobs in 2008. About 27 percent worked for religious, grantmaking, civic, professional, and similar organizations and 14 percent worked for accommodation, including hotels and motels. The remaining worked for educational services, public and private, and in other industries that host meetings. About 6 percent of meeting planners were self-employed.

Job Outlook

Employment of meeting and convention planners is expected to grow faster than the average for all occupations. Opportunities will be best for individuals with a bachelor's degree and some meeting planning experience.

Employment change. Employment of meeting and convention planners is expected to grow 16 percent over the 2008-18 decade, which is faster than the average for all occupations. As businesses and organizations become increasingly international, meetings and conventions become even more important. In

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Meeting and convention planners	13-1121	56,600	65,400	8,800	16

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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organizations that span the country or the globe, the periodic meeting is increasingly the only time the organization can bring all of its members together. Despite the proliferation of alternative forms of communication, such as e-mail, videoconferencing, and the Internet, face-to-face interaction is still irreplaceable. In fact, these new forms of communication which foster interaction and connect individuals and groups that previously would not have collaborated actually increase the demand for meetings by these new groups and individuals. Industries that are experiencing high growth tend to experience corresponding growth in meetings and conferences.

Job prospects. In addition to openings from employment growth, there will be some job openings that arise due to the need to replace workers who leave this occupation. Opportunities will be best for individuals with a bachelor's degree and some meeting planning experience. A CMP is also viewed favorably by potential employers.

The skills that meeting planners develop are useful in whichever industry they work. They often do not need industry-specific knowledge, which allows them to change industries relatively easily. There will also be opportunities for freelance meeting planners to contract with organizations that do not maintain meeting planners on staff.

Demand for corporate meeting planners is susceptible to business cycle fluctuations because meetings are usually among the first expenses cut when budgets are tight. For associations, fluctuations are less pronounced because meetings are generally a source of revenue rather than an expense. However, since fewer people are able to attend association meetings during recessions, associations often reduce their meeting staff as well. Associations for industries such as healthcare, in which meeting attendance is required for professionals to maintain their licensure, are the least likely to experience cutbacks during downturns in the economy.

Earnings

Median annual wages of meeting and convention planners in May 2008 were $44,260. The middle 50 percent earned between $34,480 and $57,820. The lowest 10 percent earned less than $27,450, and the highest 10 percent earned more than $74,610. In May 2008, median annual wages in the industries employing the largest numbers of meeting and convention planners were as follows:

Management, scientific, and technical consulting services	$49,600
Business, professional, labor, political, and similar organizations	47,670
Other support services	44,290
Colleges, universities, and professional schools	41,860
Traveler accommodation	41,470

Related Occupations

Other occupations that have similar planning and organizing responsibilities include:

	Page
Food service managers	55
Lodging managers	70
Public relations specialists	350
Travel agents	557

Sources of Additional Information

For information about meeting planner certification, contact:

➤ Convention Industry Council, 700 N. Fairfax St., Suite 510, Alexandria, VA 22314. Internet: **http://www.conventionindustry.org**

For information about the Certified Government Meeting Professional designation, contact:

➤ Society of Government Meeting Professionals, 908 King St., Lower Level, Alexandria, VA 22314. Internet: **http://www.sgmp.org**

For information about internships and on-campus student meeting planning organizations, contact:

➤ Professional Convention Management Association, 2301 S. Lake Shore Dr., Suite 1001, Chicago, IL 60616-1419. Internet: **http://www.pcma.org**

For information about meeting planning education, entering the profession, and career paths, contact:

➤ Meeting Professionals International, 3030 Lyndon B Johnson Fwy., Suite 1700, Dallas, TX 75234-2759. Internet: **http://www.mpiweb.org**

For additional career information about meeting and convention planners, see the *Occupational Outlook Quarterly* article "Meeting and convention planners," online at **http://www.bls.gov/opub/ooq/2005/fall/art03.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos298.htm**

Personal Financial Advisors

Significant Points

- Most personal financial advisors have a bachelor's degree.
- Math, analytical, and interpersonal skills are important.
- Keen competition is anticipated for these highly paid positions, despite much faster than average job growth.
- About 29 percent of personal financial advisors are self-employed.

Nature of the Work

Personal financial advisors assess the financial needs of individuals and assist them with investments, tax laws, and insurance decisions. Advisors help their clients identify and plan for short-term and long-term goals. Advisors help clients plan for retirement, education expenses, and general investment choices. Many also provide tax advice or sell insurance. Although most planners offer advice on a wide range of topics, some specialize in areas such as retirement and estate planning or risk management.

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Personal financial advisors usually work with many clients and often must find their own customers.

Personal financial advisors usually work with many clients and often must find their own customers. Many personal financial advisors spend a great deal of their time marketing their services. Many advisors meet potential clients by giving seminars or through business and social networking. Finding clients and building a customer base is one of the most important aspects of becoming a successful financial advisor.

Financial advisors begin work with a client by setting up a consultation. This is usually an in-person meeting where the advisor obtains as much information as possible about the client's finances and goals. The advisor creates 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 investment returns. Advisors sometimes seek advice from financial analysts, accountants, or lawyers.

Financial advisors usually meet with established clients at least once a year to update them on potential investments and adjust their financial plan to any life changes—such as marriage, disability, or retirement. Financial advisors also answer clients' questions regarding changes in benefit plans or the consequences of changing their job. Financial planners must educate their clients about risks and possible scenarios so that the clients don't harbor unrealistic expectations.

Many personal financial advisors are licensed to directly buy and sell financial products, such as stocks, bonds, derivatives, annuities, and insurance products. Depending upon the agreement they have with their clients, personal financial advisors may have their clients' permission to make decisions regarding the buying and selling of stocks and bonds.

Private bankers or *wealth managers* are personal financial advisors who work for people who have a lot of money to invest. Because they have so much capital, these clients resemble institutional investors and approach investing differently from the general public. Private bankers manage portfolios for these individuals using the resources of the bank, including teams of financial analysts, accountants, lawyers, and other professionals. Private bankers sell these services to wealthy individuals, generally spending most of their time working with a small number of clients. Private bankers normally directly manage their customers' finances.

Work environment. Personal financial advisors usually work in offices or their own homes. Personal financial advisors usually work standard business hours, but they also schedule meetings with clients in the evenings or on weekends. Many also teach evening classes or hold seminars to bring in more clients. Some personal financial advisors spend a fair amount of their time traveling, to attend conferences or training sessions or to visit clients.

Private bankers also generally work during standard business hours, but because they work so closely with their clients, they may have to be available outside normal hours upon request.

Training, Other Qualifications, and Advancement

Personal financial advisors must have a bachelor's degree. Many also earn a master's degree in finance or business administration or get professional designations. Math, analytical, and interpersonal skills are important.

Education and training. A bachelor's or graduate degree is strongly preferred for personal financial advisors. 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 are also helpful. Programs in financial planning are becoming more available in colleges and universities.

Licensure. Personal financial advisors who directly buy or sell stocks, bonds, insurance policies, or specific investment advice need a combination of licenses that varies based upon the products they sell. In addition to those licenses, smaller firms that manage clients' investments must be registered with state regulators, and larger firms must be registered with the Securities and Exchange Commission. Personal financial advisors who choose to sell insurance need licenses issued by State boards. State licensing board information and requirements for registered investment advisors are available from the North American Securities Administrator Association.

Other qualifications. Personal financial advisors need strong math, analytical, and interpersonal skills. They need strong sales ability, including the ability to make a wide-range of customers feel comfortable. Personal financial advisor training emphasizes the different types of investors, and how to tailor advice to the investor's personality. They need the ability to present financial concepts to clients in easy-to-understand language. Some advisors have experience in a related occupation, such as accountant, auditor, insurance sales agent, or broker.

Private bankers may have previously worked as a financial analyst and need to understand and explain highly technical investment strategies and products.

Certification and advancement. Although not always required, certifications enhance professional standing and are

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Personal financial advisors	13-2052	208,400	271,200	62,800	30

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

recommended by employers. Personal financial advisors may obtain the Certified Financial Planner (CFP) credential. This certification, issued by the Certified Financial Planner Board of Standards, requires 3 years of relevant experience; the completion of education requirements, including a bachelor's degree; passing a comprehensive examination, and adherence to a code of ethics. The exam tests the candidate's knowledge of the financial planning process, insurance and risk management, employee benefits planning, taxes and retirement planning, and investment and estate planning. Candidates are also required to have a working knowledge of debt management, planning liability, emergency fund reserves, and statistical modeling.

Personal financial advisors have several different paths to advancement. Those who work in firms may move into managerial positions. Others may choose to open their own branch offices for securities firms and serve as independent registered representatives of those firms.

Employment

Personal financial advisors held 208,400 jobs in May 2008. Jobs were spread throughout the country, although a significant number are located in New York, California, and Florida. About 63 percent worked in finance and insurance industries, including securities and commodity brokers, banks, insurance carriers, and financial investment firms. About 29 percent of personal financial advisors were self-employed, operating small investment advisory firms.

Job Outlook

Employment of personal financial advisors is expected to grow much faster than the average for all occupations. Despite strong job growth, keen competition will continue for these well paid jobs, especially for new entrants.

Employment change. Personal financial advisors are projected to grow by 30 percent over the 2008–18 period, which is much faster than the average for all occupations. Growing numbers of advisors will be needed to assist the millions of workers expected to retire in the next 10 years. As more members of the large baby boom generation reach their peak years of retirement savings, personal investments are expected to increase and more people will seek the help of experts. Many companies also have replaced traditional pension plans with retirement savings programs, so more individuals are managing their own retirements than in the past, creating jobs for advisors. In addition, as people are living longer, they should plan to finance longer retirements.

The growing number and assets of very wealthy individuals will help drive growth of private bankers and wealth managers. The need for private bankers to explain and manage increasing complexity of financial and investment products will continue to drive growth.

Job prospects. Personal financial advisors will face keen competition, as relatively low barriers to entry and high wages attract many new entrants. Many individuals enter the field by working for a bank or full-service brokerage. Because the occupation requires sales, people who have strong selling skills will ultimately be most successful. A college degree and certification can lend credibility.

Earnings

Median annual wages of wage and salary personal financial advisors were $69,050 in May 2008. The middle 50 percent earned between $46,390 and $119,290. Personal financial advisors who work for financial services firms are often paid a salary plus bonus. Bonuses are not included in the wage data listed here. Advisors who work for financial investment or planning firms or who are self-employed typically earn their money by charging a percentage of the clients' assets under management. They may also earn money by charging hourly fees for their services or through fees on stock and insurance purchases. Advisors generally receive commissions for financial products they sell, in addition to charging a fee. Wages of self-employed workers are not included in the earnings given here.

Related Occupations

Other jobs requiring expertise in finance and investment or in the sale of financial products include:

	Page
Accountants and auditors	86
Actuaries	125
Budget analysts	93
Financial analysts	103
Financial managers	52
Insurance sales agents	534
Insurance underwriters	106
Real estate brokers and sales agents	540
Securities, commodities, and financial services sales agents	553

Sources of Additional Information

For general information on securities industry employment, contact:

➤ Financial Industry Regulatory Authority (FINRA), 1735 K St. NW., Washington, DC 20006. Internet: **http://www.finra.org**

➤ Securities Industry and Financial Markets Association, 120 Broadway, 35th Floor, New York, NY 10271. Internet: **http://www.sifma.org**

For information on state and federal investment advisor registration, contact:

➤ North American Securities Administrator Association, 750 First St. NE., Suite 1140, Washington, DC 20002. Internet: **http://www.nasaa.org**

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➤ Securities and Exchange Commission (SEC), 100 F St. NE., Washington, DC 20549. Internet: **http://www.sec.gov**

For information on personal financial advisor careers, contact:

➤ Certified Financial Planner Board of Standards, Inc., 1425 K St. NW., Suite 500, Washington, DC 20005. Internet: **http://www.cfp.net**

➤ Financial Planning Association, 4100 E. Mississippi Ave., Suite 400, Denver, CO 80246-3053. Internet: **http://www.fpanet.org**

For additional career information, see the *Occupational Outlook Quarterly* article "Financial analysts and personal financial advisors" online at **http://www.bls.gov/opub/ooq/2000/summer/art03.pdf** and in print at many libraries and career centers.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos302.htm**

Tax Examiners, Collectors, and Revenue Agents

Significant Points

- Tax examiners, collectors, and revenue agents work for Federal, State, and local governments.
- Many workers have a bachelor's degree, but relevant experience is important for many jobs.
- Employment is expected to grow as fast as the average, while retirements should create additional job openings.
- Competition will be greatest for positions with the Internal Revenue Service.

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. By reviewing tax returns, conducting audits, identifying taxes payable, and collecting overdue tax dollars, these workers ensure that governments obtain revenues from businesses and citizens.

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 any adjustments or corrections they make to the States. 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, examiners verify that Social Security numbers match names and that taxpayers have correctly interpreted the instructions on 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 taxpayers by mail or telephone to address discrepancies and request supporting documentation. They may notify taxpayers 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 with more complex tax issues, 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 in State and local governments. 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 Federal revenue agents 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 large 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. Revenue agents also use computers to analyze data and identify trends that help pinpoint tax offenders.

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

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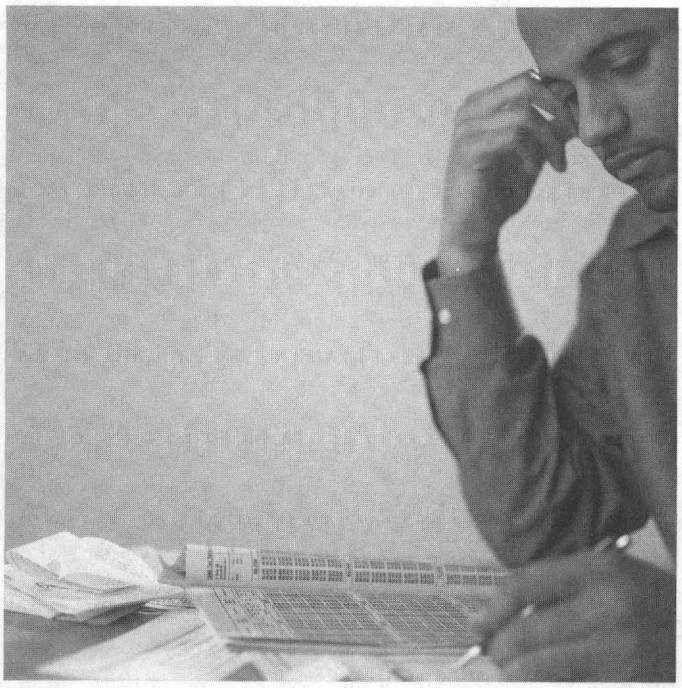

Many tax examiners, collectors, and revenue agents have a bachelor's degree, but relevant experience is important for many jobs.

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 on 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—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 taxes owed.

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 must maintain records, including contacts, telephone numbers, and actions taken.

Like tax examiners and revenue agents, collectors use computers to maintain files. Computer technology also gives collectors access to data 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 the seizure of a property will involve complex legal steps.

At the State level, collectors decide whether to take action by reviewing tax returns filed in the State where they work. Collection work may be handled over the telephone or turned over to a collector who specializes in obtaining settlements. These collectors contact people directly and have the authority to issue subpoenas and request seizures of property. At the local levels, collectors have less power than their State and Federal counterparts. Although they can start the processes leading to the seizure of property and garnishment of wages, they must go through the local court system.

Work environment. Tax examiners, collectors, and revenue agents work in clean, pleasant, and comfortable office settings. Depending upon work assignment, travel may be 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.

Stress can result from the need to work under a deadline. Collectors also must face the unpleasant task of confronting delinquent taxpayers.

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 may review sales, gasoline, and cigarette taxes instead of handling tax returns, may have a steadier workload year-round.

Training, Other Qualifications, and Advancement

Many tax examiners, collectors, and revenue agents have a bachelor's degree. But relevant experience, or a combination of postsecondary education and experience, is sufficient qualification for many jobs. Specialized experience is sufficient to qualify for many jobs in State and local government.

Education and training. In the Federal Government, workers must have a bachelor's degree or a combination of some college education and related experience. After being hired by the IRS, employees can expect to attend several multiweek training seminars. In State and local governments, workers often have an associate degree, some college-level business classes and specialized experience, or a high school diploma and specialized experience.

For more advanced entry-level positions, applicants often must have a bachelor's degree. Candidates may sometimes qualify without a bachelor's degree, however, if they can demonstrate experience working with tax records, tax laws and regulations, documents, financial accounts, or similar records.

Specific education and training requirements vary by occupational specialty.

Tax examiners usually must have a bachelor's degree in accounting or a related discipline or a combination of education and full-time accounting, auditing, or tax compliance work. Tax examiner candidates at the IRS must have a bachelor's degree

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or one year of full-time specialized experience, which could include full-time work in accounting, bookkeeping, or tax analysis. After they are hired, tax examiners receive some formal training. In addition, annual employer-provided updates keep tax examiners current with changes in procedures and regulations.

Collectors usually must have some combination of college education and experience in collections, management, customer service, or tax compliance, or as a loan officer or credit manager. A bachelor's degree is required for employment as a collector with the IRS. No additional experience is required, and experience may not be substituted for the degree. Degrees in business, finance, accounting, and criminal justice are good backgrounds.

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.

Revenue agents usually must have a bachelor's degree in accounting, business administration, economics, or a related discipline or a combination of education and full-time business administration, accounting, or auditing work. Revenue agents with the IRS must have either a bachelor's degree or 30 semester hours of accounting coursework along with specialized experience. Specialized experience includes full-time work in accounting, bookkeeping, or tax analysis.

Other qualifications. 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.

Collectors need good interpersonal and communication skills because they deal directly with the public and because their reports are scrutinized when the tax agency must legally justify attempts to seize assets. They must be able to negotiate well and deal effectively with others in potentially confrontational situations.

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 they must keep current with changes in the tax code and laws. Revenue agents that travel need a valid driver's license to perform their duties.

Advancement. 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.

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 level 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.

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. Employers also continually offer training in new auditing techniques and tax-related issues and court decisions. As revenue agents gain knowledge and experience, they may specialize in an industry, work with large corporations, and cover increasingly complex tax returns. Some revenue agent advancement specialties involve assisting in criminal investigations, auditing the books of suspected criminals, working with grand juries to help secure indictments, or becoming an international agent.

Employment

In 2008, tax examiners, revenue agents, and collectors held about 72,700 jobs. About 98 percent worked for government. About 2 percent were self employed. In the IRS, tax examiners and revenue agents predominate because of the role of the agency. Collectors make up a smaller proportion, because most disputed tax liabilities do not require enforced collection.

Job Outlook

Employment is expected to grow as fast as the average, while retirements over the next 10 years should create additional job openings at all levels of government.

Employment change. Employment of tax examiners, collectors, and revenue agents is projected to grow 13 percent during the 2008-18 decade, which is considered as fast as the average. Demand for tax examiners, revenue agents, and tax collectors will stem from changes in government policy toward tax enforcement and from growth in the number of businesses.

Two factors should increase the demand for revenue agents and tax collectors—the Federal Government is expected to increase its tax enforcement efforts, and new technology and information sharing among tax agencies make it easier for agencies to pinpoint potential offenders, increasing the number of cases for audit and collection.

The work of tax examiners is especially well suited to automation, adversely affecting demand for these workers in particular. In addition, more than 40 States and many local tax agencies contract out part of their tax collection functions to

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Tax examiners, collectors, and revenue agents	13-2081	72,700	82,200	9,500	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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private-sector collection agencies in order to reduce costs, and this trend is likely to continue. The IRS outsourced some tax collection activities, but the agency is ending this practice.

Job prospects. The large number of retirements expected over the next 10 years is expected to create many job openings at all levels of government. Both State and Federal tax agencies are continuing to focus enforcement on higher income taxpayers and businesses, which file more complicated tax returns. Because of this, workers with knowledge of accounting, tax laws, and experience working with complex tax issues will have the best opportunities.

Competition will be greatest for positions with the IRS. Opportunities at the Federal level will reflect the tightening or relaxation of budget constraints imposed on the IRS, the primary employer of these workers.

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.

Earnings

In May 2008, median annual wages for all tax examiners, collectors, and revenue agents were $48,100. The middle 50 percent earned between $36,590 and $66,730. The bottom 10 percent earned less than $28,390, and the top 10 percent earned more than $89,630. However, wages vary considerably, depending on the level of government and occupational specialty. For example, in March 2009, the Federal Government's average annual salary was $42,035 for tax examiners, $91,507 for internal revenue agents, and $63,547 for tax specialists.

IRS employees receive family, vacation, and sick leave. Full-time permanent IRS employees are offered tax-deferred retirement savings and investment plans with employer matching contributions, health insurance, and life insurance.

Related Occupations

Other occupations that analyze and interpret financial data include:

	Page
Accountants and auditors	86
Budget analysts	93
Cost estimators	100
Financial analysts	103
Financial managers	52
Loan officers	109
Personal financial advisors	118

Sources of Additional Information

Information on obtaining positions as tax examiners, collectors, or revenue agents with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

State or local government personnel offices can provide information about tax examiner, collector, or revenue agent jobs at those levels of government.

For information about careers at the Internal Revenue Service, contact:

➤ Internal Revenue Service, 1111 Constitution Ave. NW., Washington, D.C. 20224. Internet: **http://www.jobs.irs.gov**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos260.htm**

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Professional and Related Occupations

Computer and Mathematical Occupations

Actuaries

Significant Points

- A strong background in mathematics is essential.
- Actuaries generally have a bachelor's degree and must pass a series of examinations—often taking 4 to 8 years—to gain full professional status.
- Competition for jobs will be keen as the number of qualified candidates is expected to exceed the number of positions available.
- About 55 percent of actuaries are employed by insurance carriers.

Nature of the Work

Through their knowledge of statistics, finance, and business, *actuaries* assess the risk of events occurring and help create policies for businesses and clients that minimize the cost of that risk. For this reason, actuaries are essential to the insurance industry.

Actuaries analyze data to estimate the probability and likely cost to the company of an event such as death, sickness, injury, disability, or loss of property. Actuaries also address financial matters, such as how a company should invest resources to maximize return on investments, or how an individual should invest in order to attain a certain retirement income level. Using their expertise in evaluating various types of risk, 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 either property and casualty insurance or life and health insurance. They use sophisticated modeling techniques to forecast the likelihood of certain events occurring, and the impact these events will have on claims and potential losses for the company. For example, property and casualty actuaries calculate the expected number 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 premium charged for such insurance will enable the company to cover potential claims and other expenses. This premium must be profitable, yet competitive with other insurance companies.

Within the life and health insurance fields, actuaries help companies develop health and long-term-care insurance policies by predicting the likelihood of occurrence of heart disease, diabetes, stroke, cancer, and other chronic ailments among a particular group of people who have something in common, such as living in a certain area or having a family history of illness. Such work of actuaries can be beneficial to both the consumer and the company because the ability to accurately predict the likelihood of a particular health event among a certain group ensures that premiums are assessed fairly based on the risk to the company. Additionally, life insurance actuaries help companies develop annuity and life insurance policies for individuals by estimating how long someone is expected to live.

Actuaries in other financial service industries manage credit and help set a price for corporate security offerings. They also devise new investment tools to help their firms compete with other companies. Pension actuaries work under the provisions of the Employee Retirement Income Security Act (ERISA) of 1974 which sets minimum standards for pension and health plans in private industry. Actuaries working for the government help manage social programs such as Social Security and Medicare.

Actuaries help determine corporate policy on risk, for example, and also help explain complex technical matters to company executives, government officials, shareholders, policyholders, or the general public. They may testify before public agencies on proposed legislation that affects 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 by forecasting demand in competitive settings.

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 offering them advice on how to lessen the risk of injury on the job. Consulting actuaries sometimes testify in court regarding the value of 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. Some 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.

Work environment. Actuaries have desk jobs, and their offices usually are comfortable and pleasant. While most actuaries work at least 40 hours a week, those in consulting type jobs may be required to travel and thus work more than 40 hours per week.

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Training, Other Qualifications, and Advancement

Actuaries need a strong background in mathematics, statistics, and general business. They generally have a bachelor's degree and are required to pass a series of exams in order to become certified professionals.

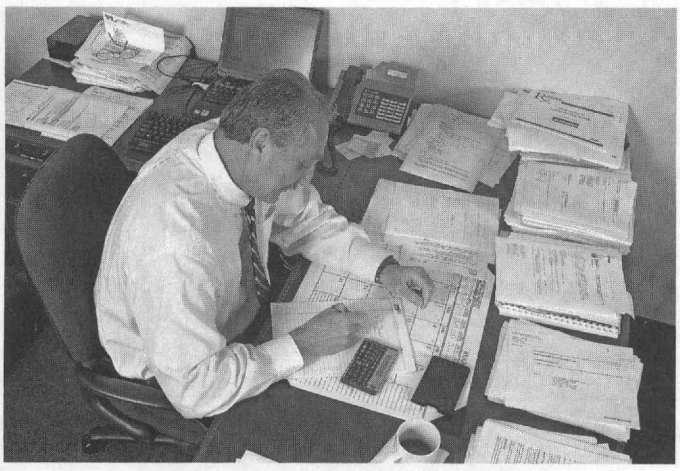
Education and training. Actuaries need a strong foundation in mathematics and general business. Usually, actuaries earn an undergraduate degree in mathematics, statistics, or actuarial science, or a business-related field such as finance, economics, or business. While in college, students should complete coursework in economics, applied statistics, and corporate finance, which is a requirement for professional certification. Furthermore, many students obtain internships to gain experience in the profession prior to graduation. More than 100 colleges and universities offer an actuarial science program, and most offer a degree in mathematics, statistics, economics, or finance.

Increasingly, companies are requiring potential employees to have passed the initial actuarial exam described in the next section, which tests an individual's proficiency in mathematics—including calculus, probability, and statistics before being hired.

Beginning actuaries often rotate among different jobs in an organization, such as marketing, underwriting, financial reporting and product development, to learn various actuarial operations and phases of insurance work. 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.

Licensure. Two professional societies sponsor programs leading to full professional status in their specialty: the Society of Actuaries (SOA) and the Casualty Actuarial Society (CAS). The SOA certifies actuaries in the fields of life insurance, health benefits systems, retirement systems, and finance and investment. The CAS gives a series of examinations in the property and casualty field, which includes automobile, homeowners, medical malpractice, workers compensation, and personal injury liability.

Four of the first seven 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 examination, which tests an individual's competence in mathematics and helps evaluate their potential as actuaries. If candidates pass the initial exam, prospects can begin taking the next series of exams with the help of self-study guides and courses. Those who pass two or more examinations have better opportunities for employment at higher starting salaries than those who do not. These initial exams can be taken while the candidate is still in college.



Actuaries need a strong background in mathematics.

Many candidates find work as an actuary immediately after graduation and work through the certification process while gaining some experience in the field. In fact, many employers pay the examination fees and provide their employees time to study. As actuaries pass exams, they are often rewarded with a pay increase. Despite the fact that employers are supportive during the exam process, home study is necessary and many actuaries study for months to prepare for each exam.

The process for gaining certification in the Casualty Actuarial Society is predominantly exam-based. To reach the first level of certification, the Associate or ACAS level, a candidate must complete seven exams, attend one course on professionalism and complete the coursework in applied statistics, corporate finance, and economics required by both the SOA and CAS. This process generally takes from 4 to 8 years. The next level, the Fellowship, or FCAS level, requires passing two additional exams in advanced topics, including investment and assets and dynamic financial analysis and the valuation of insurance. Most actuaries reach the fellowship level 2 to 3 years after attaining Associate status.

The certification process of the Society of Actuaries blends exams with computer learning modules and coursework. After taking the initial exams, candidates must choose a specialty—group and health benefits, individual life and annuities, retirement benefits, investments or finance/enterprise risk management. To reach the Associate or ASA level, a candidate must complete the initial five exams, the coursework in applied statistics, corporate finance, and economics required by the SOA and CAS, eight computer modules with two subsequent essays, and a seminar in professionalism. This process generally takes from 4 to 8 years. To attain the Fellowship or FSA level, a candidate must pass two additional exams within a chosen specialty and must complete three computer modules, a seminar in professionalism, and a course in fellowship admissions. Attaining Fellowship status usually takes an additional 2 to 3 years after becoming an Associate.

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 of the U.S. Treasury Department and the U.S. Department of Labor for the Enrollment of Actuaries. To qualify for enrollment, applicants must meet certain experience requirements and pass two exams administered by the SOA, as stipulated by the Board.

Other qualifications. Actuaries should have strong computer skills and be able to develop and use spreadsheets and databases, as well as standard statistical analysis software. Knowledge of programming languages, such as Visual Basic

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for Applications, SAS, or SQL, is also useful. Companies also increasingly prefer well-rounded individuals who, in addition to having acquired a strong technical background, have some training in business and possess strong communication skills. Good interpersonal skills also are important, particularly for consulting actuaries.

To perform their duties effectively, actuaries must keep up with current economic and social trends and legislation, as well as developments in health, business, and finance that could affect insurance or investment practices.

Advancement. 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 executive positions in their companies, such as Chief Risk Officer or Chief Financial Officer. These generally require that actuaries use their abilities for assessing risk and apply it to the entire company as a whole. Actuaries with supervisory ability may advance to management positions in other areas, such as underwriting, accounting, data processing, marketing, and advertising. Some experienced actuaries move into consulting, often by opening their own consulting firm. A few actuaries transfer to college and university faculty positions. (See the section on teachers—postsecondary elsewhere in the *Handbook*.)

Employment

Actuaries held about 19,700 jobs in 2008. About 55 percent of all actuaries were employed by insurance carriers. Approximately 16 percent work for management, scientific and technical consulting services. Others worked for insurance agents and brokers and in the management of companies and enterprises industry. A relatively small number of actuaries are employed by government agencies.

Job Outlook

Employment is expected to grow much faster than the average for all occupations. Competition for jobs will be keen as the number of qualified candidates is expected to exceed the number of positions available.

Employment change. Employment of actuaries is expected to increase by 21 percent over the 2008–18 period, which is much faster than the average for all occupations. While employment in the insurance industry—the largest employer of actuaries—will experience some growth, greater job growth will occur in other industries, such as financial services and consulting.

Despite slower than average growth of the insurance industry, employment in this key sector is expected to increase during the projection period as actuaries will be needed to develop, price, and evaluate a variety of insurance products and calculate the costs of new risks. Natural disasters should continue to require the work of actuaries in property and casualty insurance while the growing popularity of annuities, a financial product offered primarily by life insurance companies, will also spur demand. Penetration among actuaries into non-traditional areas, such as the financial services sector, to help price corporate security offerings, for example, will also contribute to some employment growth.

Consulting firms should experience strong employment demand as an increasing number of industries utilize actuaries to assess risk. Increased regulation of managed healthcare companies and drafting healthcare legislation will also spur employment growth.

Nonetheless, growth may be, to a degree, offset by corporate downsizing and consolidation of the insurance industry—the largest employer of actuaries. Life insurance companies, for example, are expected to increasingly shed high level actuarial positions as companies merge and streamline operations. Pension actuaries will also experience declining demand. This is largely due to the decline of defined benefit plans, which required review by an actuary, in favor of investment-based retirement funds, such as 401ks.

Job prospects. Job seekers are likely to face competition because the number of job openings is expected to be less than the number of qualified applicants. College graduates who have passed two of the initial exams and completed an internship should enjoy the best prospects. A solid foundation in mathematics, including the ability to compute complex probability and statistics, is essential. Experience or skills in computer programming can also be important. In addition to job growth, a small number of jobs will open up each year to replace actuaries who retire or transfer to new jobs.

The best employment opportunities should be in consulting firms. Companies that may not find it cost-effective to employ their own actuaries are increasingly hiring consulting actuaries to analyze various risks. Openings should also be available in the healthcare field if changes take place in managed healthcare. The desire to contain healthcare costs will provide job opportunities for actuaries who will be needed to evaluate the risks associated with new medical issues, such as the impact of new diseases.

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.

Earnings

Median annual wages of actuaries were $84,810 in May 2008. The middle 50 percent earned between $62,020 and $119,110.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Actuaries	15-2011	19,700	23,900	4,200	21

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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The lowest 10 percent had wages less than $49,150, while the top 10 percent earned more than $160,780.

According to the National Association of Colleges and Employers, annual starting salaries for graduates with a bachelor's degree in actuarial science averaged $56,320 in July 2009.

Related Occupations

Other workers whose jobs require mathematical and statistical skills include:

	Page
Accountants and auditors	86
Budget analysts	93
Economists	209
Financial analysts	103
Insurance underwriters	106
Market and survey researchers	212
Mathematicians	143
Personal financial advisors	118
Statisticians	148

Sources of Additional Information

Career information on actuaries specializing in pensions is available from:

➤ American Society of Pension Professionals & 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 600, Schaumburg, IL 60173-2226. Internet: **http://www.soa.org**

For information about actuarial careers in property and casualty insurance, contact:

➤ Casualty Actuarial Society (CAS), 4350 N. Fairfax Dr., Suite 250 Arlington, VA 22203. 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 information on a career as an actuary, contact:

➤ American Academy of Actuaries, 1850 M St. NW., Suite 300, Washington, DC 20036. Internet: **http://www.actuary.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos041.htm**

Computer Network, Systems, and Database Administrators

Significant Points

- Employment is projected to grow much faster than the average for all occupations and add 286,600 new jobs over the 2008–18 decade.
- Excellent job prospects are expected.
- Workers can enter this field with many different levels of formal education, but relevant computer skills are always needed.

Nature of the Work

Information Technology (IT) has become an integral part of modern life. Among its most important functions are the efficient transmission of information and the storage and analysis of information. The workers described below all help individuals and organizations share and store information through computer networks and systems, the Internet, and computer databases.

Network architects or *network engineers* are the designers of computer networks. They set up, test, and evaluate systems such as local area networks (LANs), wide area networks (WANs), the Internet, intranets, and other data communications systems. Systems are configured in many ways and 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 architects and engineers perform network modeling, analysis, and planning, which often require both hardware and software solutions. For example, setting up a network may involve the installation of several pieces of hardware, such as routers and hubs, wireless adaptors, and cables, as well as the installation and configuration of software, such as network drivers. These workers may also research related products and make necessary hardware and software recommendations, as well as address information security issues.

Network and computer systems administrators design, install, and support an organization's computer systems. They are responsible for LANs, WANs, network segments, and Internet and intranet systems. They work in a variety of environments, including large corporations, small businesses, and government organizations. They install and maintain network hardware and software, analyze problems, and monitor networks to ensure their availability to users. These workers gather data to evaluate a system's performance, identify user needs, and determine system and network requirements.

Systems administrators are responsible for maintaining system efficiency. They ensure that the design of an organization's computer system allows all of the components, including computers, the network, and software, to work properly together. Administrators also troubleshoot problems reported by users and by automated network monitoring systems and make recommendations for future system upgrades. Many of these workers are also responsible for maintaining network and system security.

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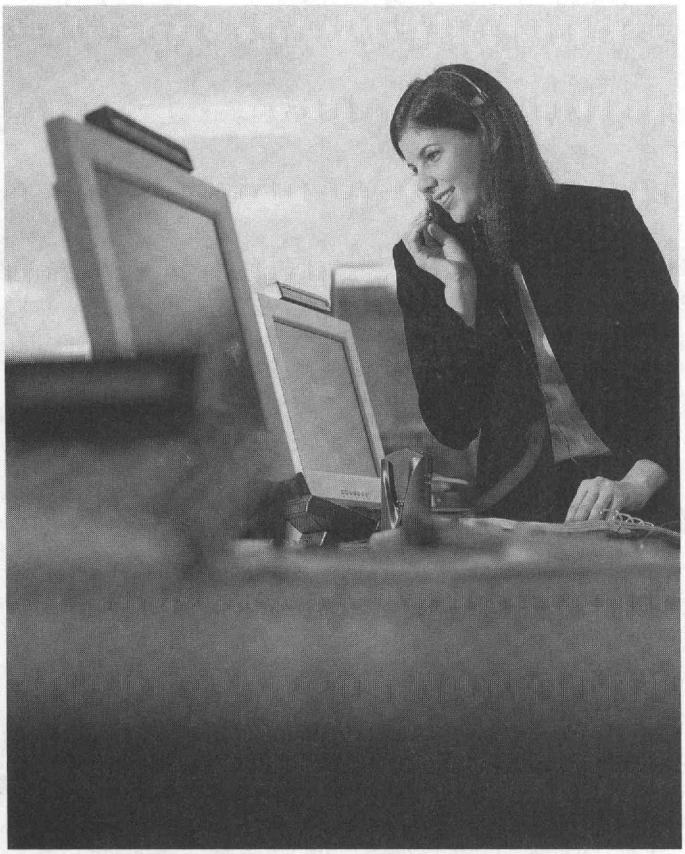

Computer network, systems, and database administrators help organizations share and store information.

Database administrators work with database management software and determine ways to store, organize, analyze, use, and present data. They identify user needs and set up new computer databases. In many cases, database administrators must integrate data from old systems into a new system. They also test and coordinate modifications to the system when needed, and troubleshoot problems when they occur. 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 many databases are connected to the Internet, database administrators also must plan and coordinate security measures with network administrators. Some database administrators may also be responsible for database design, but this task is usually performed by *database designers* or *database analysts*. (Database designers are covered in the *Handbook* section on computer software engineers and computer programmers.)

Computer security specialists plan, coordinate, and maintain an organization's information security. These workers educate users about computer security, install security software, monitor networks for security breaches, respond to cyber attacks, and, in some cases, gather data and evidence to be used in prosecuting cyber crime. The responsibilities of computer security specialists have increased in recent years as cyber attacks have become more sophisticated.

Telecommunications specialists focus on the interaction between computer and communications equipment. These workers design voice, video, and data-communication systems, supervise the installation of the systems, and provide maintenance and other services to clients after the systems are installed. They also test lines, oversee equipment repair, and may compile and maintain system records.

Web developers are responsible for the technical aspects of Web site creation. Using software languages and tools, they create applications for the Web. They identify a site's users and oversee its production and implementation. They determine the information that the site will contain and how it will be organized, and may use Web development software to integrate databases and other information systems. Some of these workers may be responsible for the visual appearance of Web sites. Using design software, they create pages that appeal to the tastes of the site's users.

Webmasters or *Web administrators* are responsible for maintaining Web sites. They oversee issues such as availability to users and speed of access, and are responsible for approving the content of the site. Webmasters also collect and analyze data on Web activity, traffic patterns, and other metrics, as well as monitor and respond to user feedback.

Work environment. Network and computer systems administrators, network architects, database administrators, computer security specialists, Web administrators, and Web developers normally work in well-lighted, comfortable offices or computer laboratories. Most work about 40 hours a week. However, about 15 percent of network and systems administrators; 14 percent of database administrators; and about 16 percent of network systems and data communications analysts (which includes network architects, telecommunications specialists, Web administrators, and Web developers) worked more than 50 hours per week in 2008. In addition, some of these workers may be required to be "on call" outside of normal business hours in order to resolve system failures or other problems.

As computer networks expand, more of these workers may be able to perform their duties from remote locations, reducing or eliminating the need to travel to the customer's workplace.

Injuries in these occupations are uncommon, but like other workers who spend long periods in front of a computer terminal typing on a keyboard, these workers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Training, Other Qualifications, and Advancement

Training requirements vary by occupation. Workers can enter this field with many different levels of formal education, but relevant computer skills are always needed. Certification may improve an applicant's chances for employment and can help workers maintain adequate skill levels throughout their careers.

Education and training. Network and computer systems administrators often are required to have a bachelor's degree, although an associate degree or professional certification, along with related work experience, may be adequate for some positions. Most of these workers begin as computer support specialists before advancing into network or systems administration positions. (Computer support specialists are covered elsewhere in the *Handbook*.) Common majors for network and systems administrators are computer science, information science, and management information systems (MIS), but a degree in any field, supplemented with computer courses and experience, may be adequate. A bachelor's degree in a computer-related

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field generally takes 4 years to complete and includes courses in computer science, computer programming, computer engineering, mathematics, and statistics. Most programs also include general education courses such as English and communications. MIS programs usually are part of the business school or college and contain courses such as finance, marketing, accounting, and management, as well as systems design, networking, database management, and systems security.

For network architect and database administrator positions, a bachelor's degree in a computer-related field generally is required, although some employers prefer applicants with a master's degree in business administration (MBA) with a concentration in information systems. MBA programs usually require 2 years of study beyond the undergraduate degree, and, like undergraduate business programs, include courses on finance, marketing, accounting, and management, as well as database management, electronic business, and systems management and design. In addition to formal education, network architects may be required to have several years of relevant work experience.

For Webmasters, an associate degree or certification is sufficient although more advanced positions might require a computer-related bachelor's degree. For telecommunications specialists, employers prefer applicants with an associate degree in electronics or a related field, but for some positions, experience may substitute for formal education. Applicants for security specialist and Web developer positions generally need a bachelor's degree in a computer-related field, but for some positions, related experience and certification may be adequate.

Certification and other qualifications. Workers in these occupations must have strong problem-solving, analytical, and communication skills. Because they often deal with a number of tasks simultaneously, the ability to concentrate and pay close attention to detail also is important. Although these workers sometimes work independently, they frequently work in teams on large projects. As a result, they must be able to communicate effectively with other computer workers, such as programmers and managers, as well as with users or other staff who may have no computer background.

Jobseekers can enhance their employment opportunities by earning certifications, which are offered through product vendors, computer associations, and other training institutions. Many employers regard these certifications as the industry standard, and some require their employees to be certified. In some cases, applicants without formal education may use certification and experience to qualify for some positions.

Because technology changes rapidly, computer specialists must continue to acquire the latest skills. Many organizations offer intermediate and advanced certification programs that pertain to the most recent technological advancements.

Advancement. Entry-level network and computer systems administrators are involved in routine maintenance and monitoring of computer systems. After gaining experience and expertise, they are often able to advance to more senior-level positions. They may also advance to supervisory positions.

Database administrators and network architects may advance into managerial positions, such as chief technology officer, on the basis of their experience. Computer specialists with work experience and considerable expertise in a particular area may find opportunities as independent consultants.

Computer security specialists can advance into supervisory positions, or may move into other occupations, such as computer systems analysts.

Employment

Computer network, systems, and database administrators held about 961,200 jobs in 2008. Of these, 339,500 were network and computer systems administrators, 120,400 were database administrators, and 292,000 were network and data communications analysts. In addition, about 209,300 were classified as "computer specialists, all other," a residual category.

These workers were employed in a wide range of industries. About 14 percent of all computer network, systems, and database administrators were in computer systems design and related services. Substantial numbers of these workers were also employed in telecommunications companies, financial firms and insurance providers, business management organizations, schools, and government agencies. About 7 percent were self-employed.

Job Outlook

Employment is expected to grow much faster than the average, and job prospects should be excellent.

Employment change. Overall employment of computer network, systems, and database administrators is projected to increase by 30 percent from 2008 to 2018, much faster than the average for all occupations. In addition, this occupation will add 286,600 new jobs over that period. Growth, however, will vary by specialty.

Employment of network and computer systems administrators is expected to increase by 23 percent from 2008 to 2018. Computer networks are an integral part of business, and demand for these workers will increase as firms continue to invest in new technologies. The increasing adoption of mobile technologies means that more establishments will use the Internet to conduct business online. This growth translates into a need for systems administrators who can help organizations use technology to communicate with employees, clients, and consumers. Growth will also be driven by the increasing need for information security. As cyber attacks become more sophisticated, demand will increase for workers with security skills.

Employment of database administrators is expected to grow by 20 percent from 2008 to 2018. Demand for these workers is expected to increase as organizations need to store, organize, and analyze increasing amounts of data. In addition, as more databases are connected to the Internet, and as data security becomes increasingly important, a growing number of these workers will be needed to protect databases from attack.

Employment of network systems and data communications analysts is projected to increase by 53 percent from 2008 to 2018, placing it among the fastest growing of all occupations. This occupational category includes network architects and engineers, as well as Web administrators and developers. Demand for network architects and engineers will increase as organizations continue to upgrade their IT capacity and incorporate the newest technologies. The growing reliance on wireless networks will result in a need for many more of these workers.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Computer network, systems, and database administrators	–	961,200	1,247,800	286,600	30
Database administrators	15-1061	120,400	144,700	24,400	20
Network and computer systems administrators	15-1071	339,500	418,400	78,900	23
Network systems and data communications analysts	15-1081	292,000	447,800	155,800	53
All other computer specialists	15-1099	209,300	236,800	27,500	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

Workers with knowledge of information security also will be in demand, as computer networks transmit an increasing amount of sensitive data.

Demand for Web administrators and Web developers will also be strong. More of these workers will be needed to accommodate the increasing amount of data sent over the Internet, as well as the growing number of Internet users. In addition, as the number of services provided over the Internet expands, Web administrators and developers will continue to see employment increases.

Growth in computer network, systems, and database administrators will be rapid in the computer systems design, data processing and hosting, software publishing, and technical consulting industries, as these types of establishments utilize or provide an increasing array of IT services. Growth will also be rapid in healthcare, as these organizations look to increase their efficiency and improve patient care through the use of information systems and other technology.

Growth in this occupation may be tempered somewhat by offshore outsourcing, as firms transfer work to countries with lower-prevailing wages and highly skilled work forces. In addition, the consolidation of IT services may increase efficiency, reducing the demand for workers.

Job prospects. Computer network, systems, and database administrators should continue to enjoy excellent job prospects. In general, applicants with a college degree and certification will have the best opportunities. However, for some of these occupations, opportunities will be available for applicants with related work experience. Job openings in these occupations will be the result of strong employment growth, as well as the need to replace workers who transfer to other occupations or leave the labor force.

Earnings

Median annual wages of network and computer systems administrators were $66,310 in May 2008. The middle 50 percent earned between $51,690 and $84,110. The lowest 10 percent earned less than $41,000, and the highest 10 percent earned more than $104,070. Median annual wages in the industries employing the largest numbers of network and computer systems administrators in May 2008 were as follows:

Management of companies and enterprises	$70,680
Computer systems design and related services	70,490
Wired telecommunications carriers	66,950
Colleges, universities, and professional schools	57,380
Elementary and secondary schools	56,320

Median annual wages of database administrators were $69,740 in May 2008. The middle 50 percent earned between $52,340 and $91,850. The lowest 10 percent earned less than $39,900, and the highest 10 percent earned more than $111,950. In May 2008, median annual wages of database administrators employed in computer systems design and related services were $78,510, and for those in management of companies and enterprises, wages were $74,730.

Median annual wages of network systems and data communication analysts were $71,100 in May 2008. The middle 50 percent earned between $54,330 and $90,740. The lowest 10 percent earned less than $41,660, and the highest 10 percent earned more than $110,920. These wages encompass network architects, telecommunications specialists, Webmasters, and Web developers. Median annual wages in the industries employing the largest numbers of network systems and data communications analysts in May 2008 were as follows:

Wired telecommunications carriers	$75,930
Insurance carriers	74,910
Management of companies and enterprises	73,720
Computer systems design and related services	72,410
Local government	64,230

Related Occupations

Other occupations that work with information technology include:

	Page
Computer and information systems managers	35
Computer scientists	132
Computer software engineers and computer programmers	134
Computer support specialists	138
Computer systems analysts	140

Sources of Additional Information

For additional information about a career as a computer network, systems, or database administrator, contact:

➤ The League of Professional System Administrators, 15000 Commerce Pkwy., Suite C, Mount Laurel, NJ 08054. Internet: **http://www.lopsa.org**

➤ Data Management International, 19239 N. Dale Mabry Hwy. #132, Lutz, FL 33548. Internet: **http://www.dama.org**

Additional information on a career in information technology is available from the following organizations:

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➤ Association for Computing Machinery (ACM), 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: **http://computingcareers.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW., Suite 700 Washington, DC 20036-4910. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: **http://www.cs.washington.edu/WhyCSE**

➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: **http://www.ncwit.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos305.htm**

Computer Scientists

Significant Points

- Most computer scientists are required to possess a Ph.D.
- Employment is projected to increase much faster than the average for all occupations.
- Job prospects are expected to be excellent.

Nature of the Work

The widespread and increasing use of computers and information technology has generated a need for highly trained, innovative workers with extensive theoretical expertise. These workers, called *computer scientists*, are the designers, creators, and inventors of new technology. By creating new technology, or finding alternative uses for existing resources, they solve complex business, scientific, and general computing problems. Some computer scientists work on multidisciplinary projects, collaborating with electrical engineers, mechanical engineers, and other specialists.

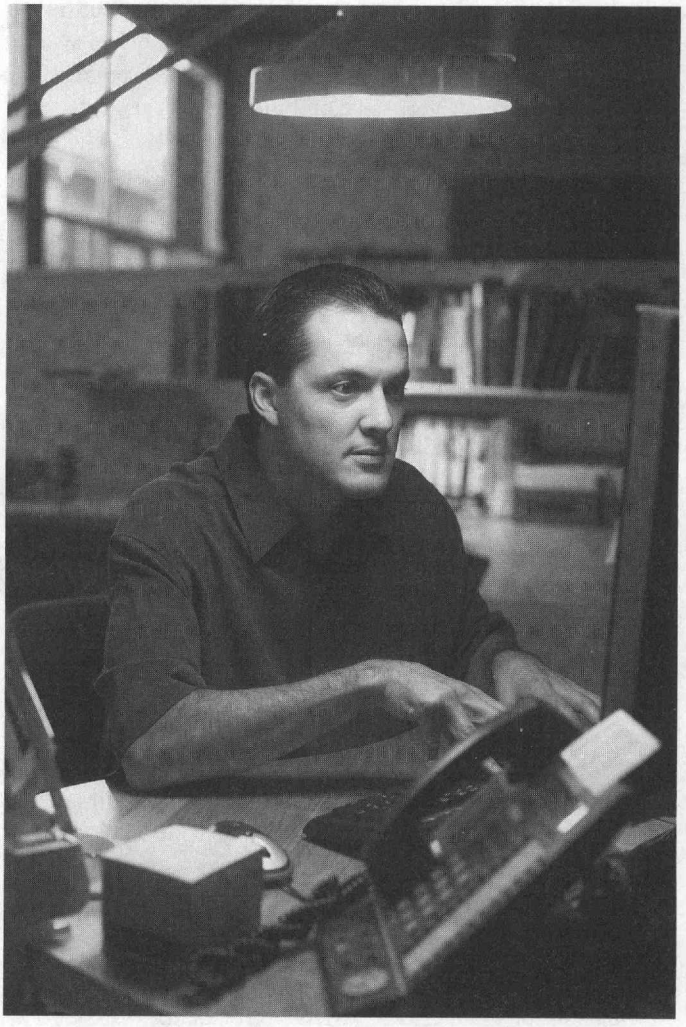
Computer scientists conduct research on a wide array of topics. Examples include computer hardware architecture, virtual reality, and robotics. Scientists who research hardware architecture discover new ways for computers to process and transmit information. They design computer chips and processors, using new materials and techniques to make them work faster and give them more computing power. When working with virtual reality, scientists use technology to create life-like situations. For example, scientists may invent video games that make users feel like they are actually in the game. Computer scientists working with robotics try to create machines that can perform tasks on their own—without people controlling them. Robots perform many tasks, such as sweeping floors in peoples' homes, assembling cars on factory production lines, and "auto-piloting" airplanes.

Computer science researchers employed by academic institutions (covered in the section on teachers—postsecondary, elsewhere in the *Handbook*) have job functions that are similar in many ways to those employed by other organizations. In general, researchers in academic settings have more flexibility to focus on pure theory, while those working in business or scientific organizations, covered here, usually focus on projects that have the possibility of producing patents and profits. Some researchers in non-academic settings, however, have considerable latitude in determining the direction of their research.

Work environment. Computer scientists normally work in offices or laboratories in comfortable surroundings. Like other workers who spend long periods in front of a computer terminal typing on a keyboard, computer scientists are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Training, Other Qualifications, and Advancement

A Ph.D. is required for most jobs, and an aptitude for math is important.



Computer scientists develop theories that lead to technological innovation.

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Education and training. Most computer scientists are required to possess a Ph.D. in computer science, computer engineering, or a closely related discipline. For some positions in the Federal Government, a bachelor's degree in a computer-related field may be adequate.

In order to be admitted to a Ph.D. program, applicants generally are required to obtain a bachelor's degree with a strong computer science or computer engineering component. Popular undergraduate majors for Ph.D. program applicants include computer science, computer engineering, software engineering, information systems, and information technology. A bachelor's degree generally takes 4 years to complete. A Ph.D. generally requires at least 5 years of study beyond the bachelor's degree. Ph.D. students usually spend the first two years taking classes on advanced topics, including computer and software systems, artificial intelligence, digital communication, and microprocessors. Students spend the remaining years conducting research on topics in computer science or computer engineering.

Other qualifications. Computer scientists must be able to think logically and creatively. They must possess a strong aptitude for math and other technical topics, as these are critical to the computing field. Because they often deal with a number of tasks simultaneously, the ability to concentrate and pay close attention to detail also is important. Although computer scientists sometimes work independently, they frequently work in teams on large projects. As a result, 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.

Advancement. After they gain experience with an organization, computer scientists may advance into managerial or project leadership positions. Some choose to leave private industry for academic positions.

Employment

Computer scientists held about 28,900 jobs in 2008. Although they are increasingly employed in every sector of the economy, the greatest concentration of these workers, about 23 percent, was in the computer systems design and related services industry. Many computer scientists were also employed by software publishing firms, scientific research and development organizations, and in education.

Job Outlook

Employment growth is expected to be much faster than the average, and job prospects should be excellent.

Employment change. Employment of computer scientists is expected to grow by 24 percent from 2008 to 2018, which is much faster than the average for all occupations. Employment of these computer specialists is expected to grow as individuals and organizations continue to demand increasingly sophisticated technologies. Job increases will be driven, in part, by very rapid growth in computer systems design and related services industry, as well as the software publishing industry, which are projected to be among the fastest growing industries in the U.S. economy.

Computer scientists develop the theories that allow many new technologies to be developed. The demand for increasing efficiency in areas such as networking technology, computing speeds, software performance, and embedded systems will lead to employment growth. In addition, the growing emphasis on information security will lead to new jobs.

Job prospects. Computer scientists should enjoy excellent job prospects. Graduates from Ph.D. programs in computer science and engineering are in high demand, and many companies report difficulties finding sufficient numbers of these highly skilled workers. In addition to openings resulting from rapid growth in the occupation, some additional job openings will arise from the need to replace workers who move into other occupations or who leave the labor force.

Earnings

Median annual wages of computer and information scientists were $97,970 in May 2008. The middle 50 percent earned between $75,340 and $124,370. The lowest 10 percent earned less than $57,480, and the highest 10 percent earned more than $151,250. Median annual wages of computer and information scientists employed in computer systems design and related services in May 2008 were $99,900.

Related Occupations

Others who work with information technology, or who engage in research and development include:

	Page
Computer and information systems managers	35
Computer network, systems, and database administrators	128
Computer software engineers	161
and computer programmers	134
Computer support specialists	138
Engineers	
Teachers—postsecondary	282

Sources of Additional Information

Further information about computer careers is available from:

➤ Association for Computing Machinery (ACM), 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: **http://computingcareers.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW., Suite 700 Washington, DC 20036-4910. Internet: **http://www.computer.org**

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Computer and information scientists, research	15-1011	28,900	35,900	7,000	24

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: **http://www.ncwit.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: **http://www.cs.washington.edu/WhyCSE**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos304.htm**

Computer Software Engineers and Computer Programmers

Significant Points

- Computer software engineers are among the occupations projected to grow the fastest and add the most new jobs over the 2008–18 decade, resulting in excellent job prospects.
- Employment of computer programmers is expected to decline by 3 percent through 2018.
- Job prospects will be best for applicants with a bachelor's or higher degree and relevant experience.

Nature of the Work

Computer software engineers design and develop software. They apply the theories and principles of computer science and mathematical analysis to create, test, and evaluate the software applications and systems that make computers work. The tasks performed by these workers evolve quickly, reflecting changes in technology and new areas of specialization, as well as the changing practices of employers. (A separate section on computer hardware engineers appears in the engineers section of the *Handbook*.)

Software engineers design and develop many types of software, including computer games, business applications, operating systems, network control systems, and middleware. They must be experts in the theory of computing systems, the structure of software, and the nature and limitations of hardware to ensure that the underlying systems will work properly.

Computer software engineers begin by analyzing users' needs, and then design, test, and develop software to meet those needs. During this process they create flowcharts, diagrams, and other documentation, and may also create the detailed sets of instructions, called algorithms, that actually tell the computer what to do. They also may be responsible for converting these instructions into a computer language, a process called programming or coding, but this usually is the responsibility of *computer programmers*.

Computer software engineers can generally be divided into two categories: applications engineers and systems engineers. *Computer applications software engineers* analyze end users' needs and design, construct, deploy, and maintain general computer applications software or specialized utility programs. These workers use different programming languages, depending on the purpose of the program and the environment in which the program runs. The programming languages most often used are C, C++, Java, and Python. Some software engineers develop packaged computer applications, but most create or adapt customized applications for business and other organizations. Some of these workers also develop databases.

Computer systems software engineers coordinate the construction, maintenance, and expansion of an organization's computer systems. Working with the organization, 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 organization's intranets—networks that link computers within the organization and ease communication among various departments. Often, they are also responsible for the design and implementation of system security and data assurance.

Systems software engineers also work for companies that configure, implement, and install the computer systems of other organizations. These workers may be members of the marketing or sales staff, serving as the primary technical resource for sales workers, or providing logistical and technical support. Since the selling of complex computer systems often requires substantial customization to meet the needs of the purchaser, software engineers help to identify and explain needed changes. In addition, systems software engineers are responsible for ensuring security across the systems they are configuring.

Computer programmers write programs. After computer software engineers and systems analysts design software programs, the programmer converts that design into a logical series of instructions that the computer can follow (A section on computer systems analysts appears elsewhere in the *Handbook*.). The programmer codes these instructions in any of a number of programming languages, depending on the need. The most common languages are C++ and Python.

Computer programmers also update, repair, modify, and expand existing programs. Some, especially those working on large projects that involve 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 a program. Programmers working on smaller projects often use "programmer environments," applications that increase productivity by combining compiling, code walk-through, code generation, test data generation, and debugging functions. Programmers also use libraries of basic code that can be modified or customized for a specific application. This approach yields more reliable and consistent programs and increases programmers' productivity by eliminating some routine steps.

As software design has continued to advance, and some programming functions have become automated, programmers have begun to assume some of the responsibilities that were once performed only by software engineers. As a result, some

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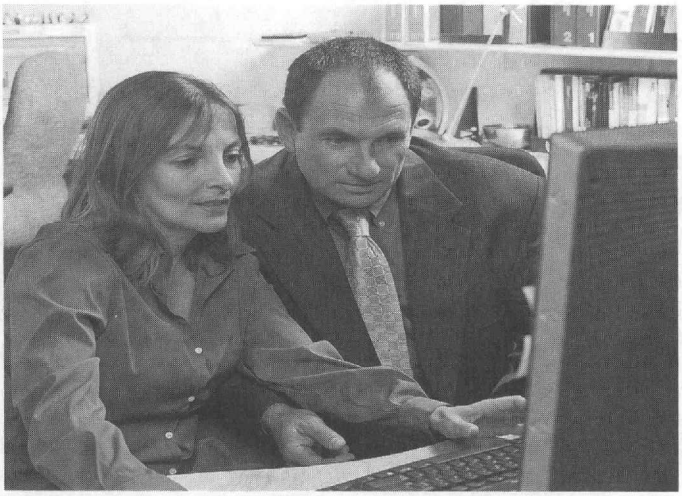

Employment of computer software engineers and computer programmers is expected to grow much faster than the average.

computer programmers now assist software engineers in identifying user needs and designing certain parts of computer programs, as well as other functions.

Work environment. Computer software engineers and programmers normally work in clean, comfortable offices or in laboratories in which computer equipment is located. Software engineers who work for software vendors and consulting firms frequently travel to meet with customers. Telecommuting is becoming more common as technological advances allow more work to be done from remote locations.

Most software engineers and programmers work 40 hours a week, but about 15 percent of software engineers and 11 percent of programmers worked more than 50 hours a week in 2008. Injuries in these occupations are rare. However, like other workers who spend long periods in front of a computer terminal typing at a keyboard, engineers and programmers are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Training, Other Qualifications, and Advancement

A bachelor's degree commonly is required for software engineering jobs, although a master's degree is preferred for some positions. A bachelor's degree also is required for many computer programming jobs, although a 2-year degree or certificate may be adequate in some cases. Employers favor applicants who already have relevant skills and experience. Workers who keep up to date with the latest technology usually have good opportunities for advancement.

Education and training. For software engineering positions, most employers prefer applicants who have at least a bachelor's degree and broad knowledge of, and experience with, a variety of computer systems and technologies. The usual college majors for applications software engineers are computer science, software engineering, or mathematics. Systems software engineers often study computer science or computer information systems. Graduate degrees are preferred for some of the more complex jobs.

Many programmers require a bachelor's degree, but a 2-year degree or certificate may be adequate for some positions. 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, finance, or another area of business.

Employers who use computers for scientific or engineering applications usually prefer college graduates who have a degree in computer or information science, mathematics, engineering, or the physical sciences. Employers who use computers for business applications prefer to hire people who have had college courses in management information systems and business, and who possess strong programming skills. A graduate degree in a related field is required for some jobs.

In addition to educational attainment, employers highly value relevant programming skills and experience. Students seeking software engineering or programming jobs can enhance their employment opportunities by participating in internships. Some employers, such as large computer and consulting firms, train new employees in intensive, company-based programs.

As technology advances, employers will need workers with the latest skills. To help keep up with changing technology, workers may take continuing education and professional development seminars offered by employers, software vendors, colleges and universities, private training institutions, and professional computing societies. Computer software engineers also need skills related to the industry in which they work. Engineers working for a bank, for example, should have some expertise in finance so that they understand banks' computing needs.

Certification and other qualifications. Certification is a way to demonstrate a level of competence and may provide a jobseeker with a competitive advantage. Certification programs are generally offered by product vendors or software firms, which may require professionals who work with their products to be certified. Voluntary certification also is available through various other organizations, such as professional computing societies.

Computer software engineers and programmers must have strong problem-solving and analytical skills. Ingenuity and creativity are particularly important in order to design new, functional software programs. The ability to work with abstract concepts and to do technical analysis is especially important for systems engineers because they work with the software that controls the computer's operation. Engineers and programmers also must be able to communicate effectively with team members, other staff, and end users. Because they often deal with a number of tasks simultaneously, they must be able to concentrate and pay close attention to detail. Business skills are also important, especially for those wishing to advance to managerial positions.

Advancement. For skilled workers who keep up to date with the latest technology, prospects for advancement are good. Advancement opportunities for computer software engineers increase with experience. Eventually, they may become a project manager, manager of information systems, or chief information officer, especially if they have business skills and training. Some computer software engineers with several years of experience or expertise can find lucrative opportunities working as systems designers or independent consultants, particularly in

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Computer software engineers and computer programmers	–	1,336,300	1,619,300	283,000	21
Computer programmers	15-1021	426,700	414,400	-12,300	-3
Computer software engineers	15-1030	909,600	1,204,800	295,200	32
Computer software engineers, applications	15-1031	514,800	689,900	175,100	34
Computer software engineers, systems software	15-1032	394,800	515,000	120,200	30

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

specialized fields such as business-to-business transactions or security and data assurance.

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 may be promoted to managerial positions. Programmers with specialized knowledge and experience with a language or operating system may become computer software engineers. As employers increasingly contract with outside firms to do programming jobs, more opportunities should arise for experienced programmers with expertise in a specific area to work as consultants.

Employment

Computer software engineers and computer programmers held about 1.3 million jobs in 2008. Approximately 514,800 were computer applications software engineers, about 394,800 were computer systems software engineers, and about 426,700 were computer programmers. Although computer software engineers and computer programmers can be found in a wide range of industries about 32 percent were employed in computer systems design and related services. Many also worked for software publishers, manufacturers of computers and related electronic equipment, financial institutions, and insurance providers. About 48,200 computer software engineers and computer programmers were self-employed in 2008.

Job Outlook

Overall, employment of computer software engineers and computer programmers is projected to increase much faster than the average for all occupations. Job prospects should be best for those with a bachelor's degree and relevant experience.

Employment change. Overall, employment of computer software engineers and computer programmers is projected to increase by 21 percent from 2008 to 2018, much faster than the average for all occupations. This will be the result of rapid growth among computer software engineers, as employment of computer programmers is expected to decline.

Employment of computer software engineers is expected to increase by 32 percent from 2008–2018, which is much faster than the average for all occupations. In addition, this occupation will see a large number of new jobs, with more than 295,000 created between 2008 and 2018. Demand for computer software engineers will increase as computer networking continues to grow. For example, expanding Internet technologies have spurred demand for computer software engineers who can develop Internet, intranet, and World Wide Web applications. Likewise, electronic data-processing systems in business, telecommunications, healthcare, government, and other settings continue to become more sophisticated and complex. Implementing, safeguarding, and updating computer systems and resolving problems will fuel the demand for growing numbers of systems software engineers.

New growth areas will also continue to arise from rapidly evolving technologies. The increasing uses of the Internet, the proliferation of Web sites, and mobile technology such the as wireless Internet have created a demand for a wide variety of new products. As more software is offered over the Internet, and as businesses demand customized software to meet their specific needs, applications and systems software engineers will be needed in greater numbers. In addition, the growing use of handheld computers will create demand for new mobile applications and software systems. As these devices become a larger part of the business environment, it will be necessary to integrate current computer systems with this new, more mobile technology.

In addition, information security concerns have given rise to new software needs. Concerns over "cyber security" should result in the continued investment in software that protects computer networks and electronic infrastructure. The expansion of this technology over the next 10 years will lead to an increased need for software engineers to design and develop secure applications and systems, and to integrate them into older systems.

As with other information technology jobs, offshore outsourcing may temper employment growth of computer software engineers. Firms may look to cut costs by shifting operations to foreign countries with lower prevailing wages and highly educated workers. Jobs in software engineering are less prone to being offshored than are jobs in computer programming, however, because software engineering requires innovation and intense research and development.

Employment of computer programmers is expected to decline slowly, decreasing by 3 percent from 2008 to 2018. Advances in programming languages and tools, the growing ability of users to write and implement their own programs, and the offshore outsourcing of programming jobs will contribute to this decline.

Because they can transmit their programs digitally, computer programmers can perform their job function from anywhere in the world, allowing companies to employ workers in countries that have lower prevailing wages. Computer programmers are at a much higher risk of having their jobs offshored than are workers involved in more complex and sophisticated information technology functions, such as software engineering. Much

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of the work of computer programmers requires little localized or specialized knowledge and can be made routine once knowledge of a particular programming language is mastered.

Nevertheless, employers will continue to need some local programmers, especially those 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. Furthermore, a recent trend of domestic sourcing may help to keep a number of programming jobs onshore. Instead of hiring workers in foreign locations, some organizations have begun to contract with programmers in low-cost areas of the United States. This allows them to reduce payroll expenses, while eliminating some of the logistical issues that arise with offshore outsourcing.

Job prospects. As a result of rapid employment growth over the 2008 to 2018 decade, job prospects for computer software engineers should be excellent. Those with practical experience and at least a bachelor's degree in a computer-related field should have the best opportunities. Employers will continue to seek computer professionals with strong programming, systems analysis, interpersonal, and business skills. In addition to jobs created through employment growth, many job openings will result from the need to replace workers who move into managerial positions, transfer to other occupations, or leave the labor force. Consulting opportunities for computer software engineers also should continue to grow as businesses seek help to manage, upgrade, and customize their increasingly complicated computer systems.

Although employment of computer programmers is projected to decline, numerous job openings will result from the need to replace workers who leave the labor force or transfer to other occupations. Prospects for these openings should be best for applicants with a bachelor's degree and experience with a variety of programming languages and tools. As technology evolves, however, and newer, more sophisticated tools emerge, programmers will need to update their skills in order to remain competitive. Obtaining vendor-specific or language-specific certification also can provide a competitive edge.

Earnings

In May 2008, median annual wages of wage-and-salary computer applications software engineers were $85,430. The middle 50 percent earned between $67,790 and $104,870. The lowest 10 percent earned less than $53,720, and the highest 10 percent earned more than $128,870. Median annual wages in the industries employing the largest numbers of computer applications software engineers in May 2008 were as follows:

Professional and commercial equipment and supplies merchant wholesalers	$93,740
Software publishers	87,710
Management of companies and enterprises	85,990
Computer systems design and related services	84,610
Insurance carriers	80,370

In May 2008, median annual wages of wage-and-salary computer systems software engineers were $92,430. The middle 50 percent earned between $73,200 and $113,960. The lowest 10 percent earned less than $57,810, and the highest 10 percent earned more than $135,780. Median annual wages in the industries employing the largest numbers of computer systems software engineers in May 2008 were as follows:

Scientific research and development services	$102,090
Computer and peripheral equipment manufacturing	101,270
Software publishers	93,590
Navigational measuring electromedical and control instruments manufacturing	91,720
Computer systems design and related services	91,610

Median annual wages of wage-and-salary computer programmers were $69,620 in May 2008. The middle 50 percent earned between $52,640 and $89,720 a year. The lowest 10 percent earned less than $40,080, and the highest 10 percent earned more than $111,450. Median annual wages in the industries employing the largest numbers of computer programmers in May 2008 are shown below:

Software publishers	$81,780
Management of companies and enterprises	71,040
Computer systems design and related services	70,270
Employment services	70,070
Insurance carriers	69,790

According to the National Association of Colleges and Employers, starting salary offers for graduates with a bachelor's degree in computer science averaged $61,407 in July 2009.

Related Occupations

Other professional workers who deal extensively with computer technology or data include:

	Page
Actuaries	125
Computer network, systems, and database administrators	128
Computer scientists	132
Computer support specialists	138
Computer systems analysts	140
Engineers	161
Mathematicians	143
Operations research analysts	145
Statisticians	148

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, 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: **http://computingcareers.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW., Suite 700 Washington, DC 20036-4910. Internet: **http://www.computer.org**

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➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: **http://www.cs.washington.edu/WhyCSE**

➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: **http://www.ncwit.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos303.htm**

Computer Support Specialists

Significant Points

- Job growth is projected to be faster than the average for all occupations.
- A bachelor's degree is required for some jobs, while an associate degree or certification is adequate for others.
- Job prospects should be good, especially for college graduates with relevant skills and experience.

Nature of the Work

Computer support specialists provide technical assistance, support, and advice to individuals and organizations that depend on information technology. They work within organizations that use computer systems, for computer hardware or software vendors, or for third-party organizations that provide support services on a contract basis, such as help-desk service firms. Support specialists are usually differentiated between technical support specialists and help-desk technicians.

Technical support specialists respond to inquiries from their organizations' computer users and may run automatic diagnostics programs to resolve problems. In addition, they may write training manuals and train computer users in the use of new computer hardware and software. These workers also oversee the daily performance of their company's computer systems, resolving technical problems with Local Area Networks (LAN), Wide Area Networks (WAN), and other systems.

Help-desk technicians respond to telephone calls and e-mail messages from customers looking for help with computer problems. In responding to these inquiries, 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. They also install, modify, clean, and repair computer hardware and software. Many computer support specialists start out at the help desk.

Help-desk technicians deal directly with customer issues, and their employers value them as a source of feedback on their products and services. They are consulted for information about what gives customers the most trouble, as well as other customer concerns.

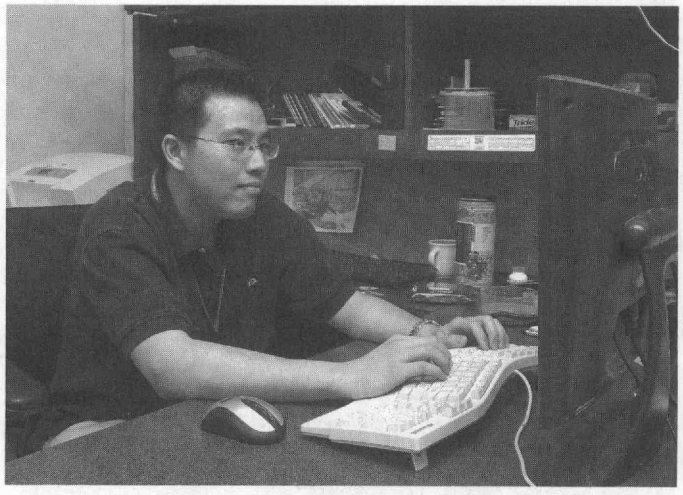
Work environment. Computer support specialists normally work in well-lighted, comfortable offices or computer laboratories. Most work about 40 hours a week. Those who work for third-party support firms often are away from their offices, spending considerable time working at a client's location. As computer networks expand, more computer support specialists may be able to provide technical support from remote locations. This capability would reduce or eliminate travel to the customer's workplace, and may allow some support specialists to work from home.

Injuries in this occupation are uncommon, but like other workers who type on a keyboard for long periods, computer support specialists are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Training, Other Qualifications, and Advancement

A college degree is required for some computer support specialist positions, but an associate degree or certification may be sufficient for others. Strong problem-solving and communication skills are essential.

Education and training. Due to the wide range of skills required, there are many paths of entry to a job as a computer support specialist. Training requirements for computer support specialist positions vary, but many employers prefer to hire applicants with some formal college education. A bachelor's degree in computer science, computer engineering, or information systems is a prerequisite for some jobs; other jobs, however, may require only a computer-related associate degree. Some employers will hire applicants with a college degree in any field, as long as the applicant has the necessary technical skills. For some jobs, relevant computer experience and certifications may substitute for formal education.



Employment of computer support specialists is expected to increase faster than the average.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Computer support specialists	15-1041	565,700	643,700	78,000	14

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

Most support specialists receive on-the-job training after being hired. This training can last anywhere from 1 week to 1 year, but a common length is about 3 months. Many computer support specialists, in order to keep up with changes in technology, continue to receive training throughout their careers by attending professional training programs offered by employers, hardware and software vendors, colleges and universities, and private training institutions.

Certification and other qualifications. For some jobs, professional certification may qualify an applicant for employment. Certification can demonstrate proficiency in a product or process, and help applicants obtain some entry-level positions. Some hardware and software vendors require their computer support specialists to be certified, and many of these will fund this training after an applicant is hired. Voluntary certification programs are offered by a wide variety of organizations, including product vendors and training institutions, and are available across the Nation.

People interested in becoming a computer support specialist 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 to communicate effectively via e-mail, over the phone, or in person. Strong writing skills are useful in writing e-mail responses and preparing manuals for employees and customers.

Advancement. Entry-level computer support specialists generally work directly with customers or in-house users. They may advance into positions that handle products or problems with higher levels of technical complexity. Some may advance into management roles. Some computer support specialists may find opportunities in other occupations, such as computer programmers or software engineers, designing products rather than assisting users. Promotions depend heavily on job performance, but formal education and professional certification can improve advancement opportunities. Advancement opportunities in hardware and software companies can occur quickly, sometimes within months.

Employment

Computer support specialists held about 565,700 jobs in 2008. Although they worked in a wide range of industries, about 18 percent were employed in the computer systems design and related services industry. Substantial numbers of these workers were also employed in administrative and support services companies, financial institutions, insurance companies, government agencies, educational institutions, software publishers, telecommunications organizations, and healthcare organizations.

Job Outlook

Employment is expected to increase faster than the average. Job prospects should be good, especially for those with a college degree and relevant skills.

Employment change. Employment of computer support specialists is expected to increase by 14 percent from 2008 to 2018, which is faster than the average for all occupations. Demand for these workers will result as organizations and individuals continue to adopt the newest forms of technology. As technology becomes more complex and widespread, support specialists will be needed in greater numbers to resolve the technical problems that arise. Businesses, especially, will demand greater levels of support, as information technology has become essential in the business environment.

Job growth will be fastest in several industries that rely heavily on technology. These include the computer systems design and related services industry; the data processing, hosting and related services industry; the software publishing industry; and the management, scientific, and technical consulting industry. These industries will employ a growing number of support specialists as they utilize and provide an increasing array of IT services. Healthcare and related establishments, in addition, may see substantial growth as these organizations look to improve their efficiency and patient care through the use of information systems and other technology.

Overall growth may be dampened, to a certain extent, as some jobs are outsourced to offshore locations. Advances in technology increasingly allow computer support specialists to provide assistance remotely. Some employers may seek to reduce expenses by hiring workers in areas that have lower prevailing wages.

Job prospects. Job prospects are expected to be good; those who possess a bachelor's degree, relevant technical and communication skills, and previous work experience should have even better opportunities than applicants with an associate degree or professional certification.

Earnings

Median annual wages of wage-and-salary computer support specialists were $43,450 in May 2008. The middle 50 percent earned between $33,680 and $55,990. The lowest 10 percent earned less than $26,580, and the highest 10 percent earned more than $70,750. Median annual wages in the industries employing the largest numbers of computer support specialists in May 2008 were as follows:

Professional and commercial equipment and supplies merchant wholesalers	$48,580
Management of companies and enterprises	45,200
Colleges, universities, and professional schools	43,130
Computer systems design and related services	43,080
Elementary and secondary schools	40,550

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Related Occupations

Other occupations that deal with technology or respond to customer inquiries include:

	Page
Broadcast and sound engineering technicians and radio operators	337
Computer and information systems managers	35
Computer network, systems, and database administrators	128
Computer software engineers and computer programmers	134
Customer service representatives	567

Sources of Additional Information

For additional information about a career as a computer support specialist, contact:

➤ Association of Support Professionals, 122 Barnard Ave., Watertown, MA 02472. Internet: **http://asponline.com**

➤ HDI, 102 South Tejon, Suite 1200, Colorado Springs, CO, 80903. Internet: **http://www.thinkhdi.com**

For additional information about computer careers, contact:

➤ Association for Computing Machinery, 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: **http://computingcareers.acm.org**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW., Suite 700 Washington, DC 20036-4910. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE., Bellevue, WA 98007. Internet: **http://www.nwcet.org**

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: **http://www.cs.washington.edu/WhyCSE**

➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: **http://www.ncwit.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos306.htm**

Computer Systems Analysts

Significant Points

- Employment is expected to increase much faster than average.
- Excellent job prospects are expected as organizations continue to adopt increasingly sophisticated technologies.
- Employers generally prefer applicants who have at least a bachelor's degree; relevant work experience also is very important.

Nature of the Work

Nearly all organizations rely on computer and information technology (IT) to conduct business and operate efficiently. *Computer systems analysts* use IT tools to help enterprises of all sizes achieve their goals. They may design and develop new computer systems by choosing and configuring hardware and software, or they may devise ways to apply existing systems' resources to additional tasks.

Most systems analysts work with specific types of computer systems—for example, business, accounting, and financial systems or scientific and engineering systems—that vary with the kind of organization. Analysts who specialize in helping an organization select the proper system hardware and software are often called *system architects* or *system designers*. Analysts who specialize in developing and fine-tuning systems often have the more general title of *systems analysts*.

To begin an assignment, systems analysts consult with an organization's managers and users to define the goals of the system and then design a system to meet those goals. They specify the inputs that the system will access, decide how the inputs will be processed, and format the output to meet users' needs. Analysts use techniques such as structured analysis, data modeling, information engineering, mathematical model building, sampling, and a variety of accounting principles to ensure their plans are efficient and complete. They also may prepare cost-benefit and return-on-investment analyses to help management decide whether implementing the proposed technology would be financially feasible.

When a system is approved, systems analysts oversee the implementation of the required hardware and software components. 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 in-depth testing may be called *software quality assurance analysts*. In addition to running tests, these workers diagnose problems, recommend solutions, and determine whether program requirements have been met. After the system has been implemented, tested, and debugged, computer systems analysts may train its users and write instruction manuals.

In some organizations, *programmer-analysts* design and update the software that runs a computer. They also create custom applications tailored to their organization's tasks. Because they are responsible for both programming and systems analysis, these workers must be proficient in both areas. (A separate section on computer software engineers and computer programmers appears elsewhere in the *Handbook*.) As this dual proficiency becomes more common, analysts are increasingly working with databases, object-oriented programming languages, client–server applications, and multimedia and Internet technology.

One challenge created by expanding computer use is the need for different computer systems to communicate with each other. Many systems analysts are involved with "networking," connecting all the computers within an organization or across organizations, as when setting up e-commerce networks to facilitate business between companies.

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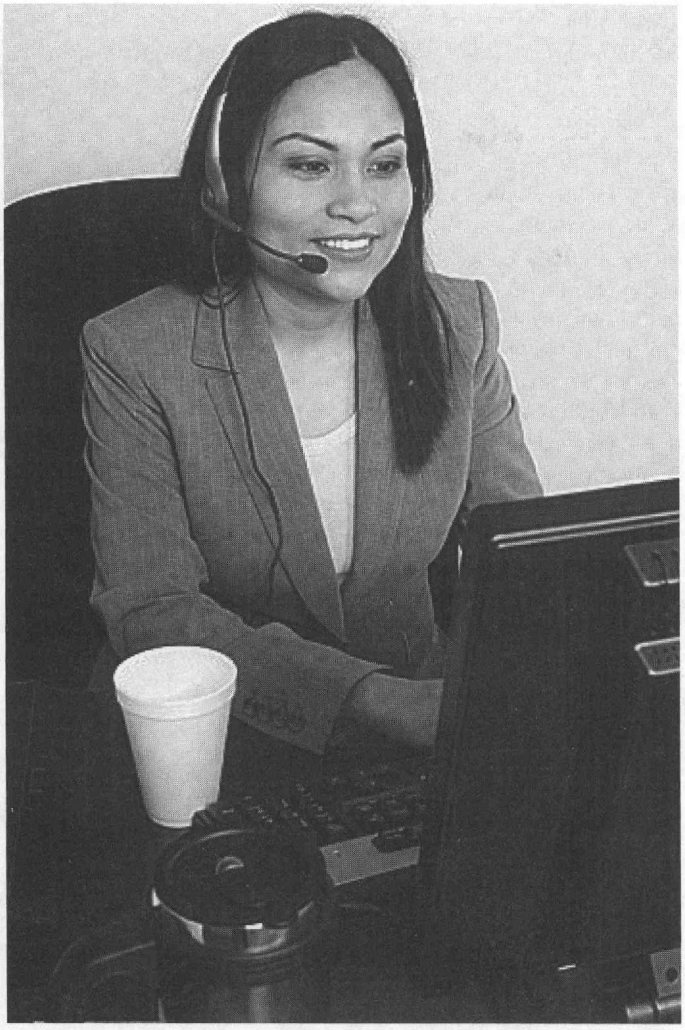

Computer systems analysts use information technology to help organizations operate more effectively.

Work environment. Computer systems analysts work in offices or laboratories in comfortable surroundings. Many work about 40 hours a week, but some work more than 50 hours a week. Some analysts telecommute, using computers to work from remote locations.

Injuries in this occupation are uncommon, but computer systems analysts, like other workers who spend long periods typing on a computer, are susceptible to eyestrain, back discomfort, and hand and wrist problems such as carpal tunnel syndrome.

Training, Other Qualifications, and Advancement

Training requirements for computer systems analysts vary depending on the job, but many employers prefer applicants who have a bachelor's degree. Relevant work experience also is very important. Advancement opportunities are good for those with the necessary skills and experience.

Education and training. When hiring computer systems analysts, employers usually prefer applicants who have at least a bachelor's degree. For more technically complex jobs, people with graduate degrees are preferred. For jobs in a technical or scientific environment, employers often seek applicants who have at least a bachelor's degree in a technical field, such as computer science, information science, applied mathematics, engineering, or the physical sciences. For jobs in a business environment, employers often seek applicants with at least a bachelor's degree in a business-related field such as management information systems (MIS). Increasingly, employers are seeking individuals who have a master's degree in business administration (MBA) with a concentration in information systems.

Despite the preference for technical degrees, however, people who have degrees in other areas may find employment as systems analysts if they also have technical skills. Courses in computer science or related subjects combined with practical experience can qualify people for some jobs in the occupation.

Employers generally look for people with expertise relevant to the job. For example, systems analysts who wish to work for a bank may need some expertise in finance, and systems analysts who wish to work for a hospital may need some knowledge of health management. Furthermore, business enterprises generally prefer individuals with information technology, business, and accounting skills and frequently assist employees in obtaining these skills.

Technological advances come so rapidly in the computer field that continuous study is necessary to remain competitive. Employers, hardware and software vendors, colleges and universities, and private training institutions offer continuing education to help workers attain the latest skills. Additional training may come from professional development seminars offered by professional computing societies.

Other qualifications. Employers usually look for people who have broad knowledge and experience related to computer systems and technologies, strong problem-solving and analytical skills, and the ability to think logically. In addition, the ability to concentrate and pay close attention to detail is important because computer systems analysts often deal with many tasks simultaneously. Although these workers sometimes work independently, they frequently work in teams on large projects. Therefore, they must have good interpersonal skills and be able to communicate effectively with computer personnel, users, and other staff who may have no technical background.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Computer systems analysts	15-1051	532,200	640,300	108,100	20

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Advancement. With experience, systems analysts may be promoted to senior or lead analyst. Those who possess leadership ability and good business skills also can become computer and information systems managers or can advance into executive positions such as chief information officer. Those with work experience and considerable expertise in a particular subject or application may find lucrative opportunities as independent consultants, or they may choose to start their own computer consulting firms.

Employment

Computer systems analysts held about 532,200 jobs in 2008. Although they are employed in many industries, 24 percent of these workers were in the computer systems design and related services industry. Computer systems analysts also were employed by governments; insurance companies; financial institutions; and business management firms. About 30,300 computer systems analysts were self-employed in 2008.

Job Outlook

Employment is expected to grow much faster than the average for all occupations, and job prospects should be excellent.

Employment change. Employment of computer systems analysts is expected to grow by 20 percent from 2008 to 2018, which is much faster than the average for all occupations. Demand for these workers will increase as organizations continue to adopt and integrate increasingly sophisticated technologies and as the need for information security grows.

As information technology becomes an increasingly important aspect of the business environment, the demand for computer networking, Internet, and intranet functions will drive demand for computer systems analysts. The increasing adoption of the wireless Internet, known as WiFi, and of personal mobile computers has created a need for new systems that can integrate these technologies into existing networks. Explosive growth in these areas is expected to fuel demand for analysts who are knowledgeable about systems development and integration. In addition, as sensitive data continues to be transmitted and stored electronically, the need for information security specialists is expected to grow rapidly. Furthermore, the healthcare industry is expected to increase its use of information technology and will demand the services of this occupation. The adoption of e-prescribing, electronic health records, and other IT platforms will drive this trend, creating a large number of new jobs.

As with other information technology jobs, employment growth may be tempered somewhat by offshoring. Firms may look to cut costs by shifting operations to foreign countries with lower prevailing wages and highly skilled workers. However, due to the high level of expertise that is required, as well as the frequent need to be near the job site, systems analysts are less likely to be offshored than other IT occupations.

Job prospects. Job prospects should be excellent. Job openings will occur as a result of strong job growth and from the need to replace workers who move into other occupations or who leave the labor force.

Earnings

Median annual wages of wage and salary computer systems analysts were $75,500 in May 2008. The middle 50 percent earned between $58,460 and $95,810 a year. The lowest 10 percent earned less than $45,390, and the highest 10 percent earned more than $118,440. Median annual wages in the industries employing the largest numbers of computer systems analysts in May 2008 were:

Professional and commercial equipment and supplies merchant wholesalers	$89,670
Computer systems design and related services	78,680
Data processing, hosting, and related services	78,010
Management of companies and enterprises	76,070
Insurance carriers	74,610

Related Occupations

Other workers who use computers extensively and who use logic and creativity to solve business and technical problems include:

	Page
Actuaries	125
Computer and information systems managers	35
Computer network, systems, and database administrators	128
Computer software engineers and computer programmers	134
Engineers	161
Management analysts	111
Mathematicians	143
Operations research analysts	145
Statisticians	148

Sources of Additional Information

Further information about computer careers is available from:

➤ Association for Computing Machinery (ACM), 2 Penn Plaza, Suite 701, New York, NY 10121-0701. Internet: **http://computingcareers.acm.org/**

➤ Institute of Electrical and Electronics Engineers Computer Society, Headquarters Office, 2001 L St. NW, Suite 700 Washington, DC 20036-4910. Internet: **http://www.computer.org**

➤ National Workforce Center for Emerging Technologies, 3000 Landerholm Circle SE, Bellevue, WA 98007. Internet: **http://www.nwcet.org**

➤ University of Washington Computer Science and Engineering Department, AC101 Paul G. Allen Center, Box 352350, 185 Stevens Way, Seattle, WA 98195-2350. Internet: **http://www.cs.washington.edu/WhyCSE**

➤ National Center for Women and Information Technology, University of Colorado, Campus Box 322 UCB, Boulder, CO 80309-0322. Internet: **http://www.ncwit.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos287.htm**

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Mathematicians

Significant Points

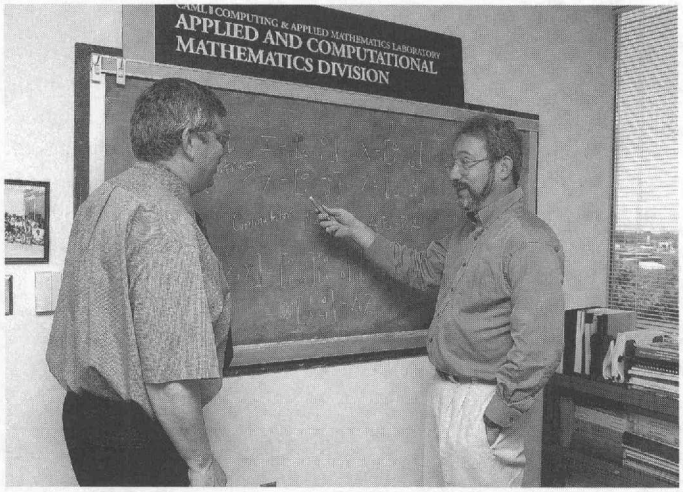
- A Ph.D. in mathematics usually is the minimum educational requirement, except in the Federal Government.
- Much faster than average employment growth is expected for mathematicians.
- Keen competition for jobs is expected.
- Ph.D. holders with a strong background in mathematics and a related field, 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, 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, dividing their time between teaching and conducting research. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Applied mathematicians use theories and techniques, such as mathematical modeling and computational methods, to formulate and solve practical problems in business, government, engineering, and the physical, life, and social sciences. For example, they may analyze the most efficient way to schedule airline routes between cities, the effects and safety of new drugs, the aerodynamic characteristics of an experimental automobile, or the cost-effectiveness of alternative manufacturing processes.



Applied mathematicians use math to solve practical problems.

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—codes—designed to transmit military, political, financial, or law-enforcement-related information.

Applied mathematicians start with a practical problem, envision its separate elements, and then reduce the elements to mathematical variables. They often use computers to analyze relationships among the variables, and they solve complex problems by developing models with alternative solutions.

Individuals with titles other than mathematician also do work in applied mathematics. In fact, because mathematics is the foundation on which so many other academic disciplines are built, the number of workers using mathematical techniques is much greater than the number formally called 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, are actually specialists in a particular branch of mathematics. (For more information, see the statements on actuaries, operations research analysts, and statisticians elsewhere in the *Handbook*.) Applied mathematicians frequently are required to collaborate with other workers in their organizations to find common solutions to problems.

Work environment. Mathematicians usually work in comfortable offices. They often are part of interdisciplinary teams 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 may conduct research by themselves or in close collaboration with other mathematicians. Collaborators may work together at the same institution or from different locations, using technology such as e-mail to communicate. Mathematicians in academia also may be aided by graduate students.

Training, Other Qualifications, and Advancement

A Ph.D. degree in mathematics usually is the minimum educational requirement for prospective mathematicians, except in the Federal Government.

Education and training. In private industry, candidates for mathematician jobs typically need a Ph.D., although there may be opportunities for those with a master's degree. Most of the positions designated for mathematicians are in research-and-development laboratories, as part of technical teams.

In the Federal Government, entry-level job candidates usually must have at least a bachelor's degree with a major in mathematics or 24 semester hours of mathematics courses. Outside the Federal Government, 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

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requirements may become primary or secondary school mathematics teachers. (For additional information, see the statement on teachers- kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

Most colleges and universities offer a bachelor's degree in mathematics, and many universities offer master's and doctoral degrees in pure or applied mathematics. Courses usually required for these programs 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. In graduate programs, students also conduct research and take advanced courses, usually specializing in a subfield of mathematics.

Many colleges and universities advise or require students majoring in mathematics to take courses in a closely related field, 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.

Other qualifications. For jobs in applied mathematics, training in the field in which 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 to have good reasoning to identify, analyze, and apply basic principles to technical problems. Communication skills also are important because mathematicians must be able to interact and discuss proposed solutions with people who may not have extensive knowledge of mathematics.

Advancement. The majority of those with a 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. In these occupations, workers can advance to management positions.

Employment

Mathematicians held about 2,900 jobs in 2008. Many people with mathematical backgrounds also worked in other occupations. For example, there were about 54,800 jobs for postsecondary mathematical science teachers in 2008.

Many mathematicians work for the Federal Government, primarily in the U.S. Department of Defense which accounts for about 81 percent of the mathematicians employed by the Federal Government. Many of the other mathematicians employed by the Federal Government work for the National Institute of Standards and Technology (NIST) or the National Aeronautics and Space Administration (NASA).

In the private sector, major employers include scientific research and development services and management, scientific, and technical consulting services. Some mathematicians also work for insurance carriers.

Job Outlook

Employment of mathematicians is expected to grow much faster than average. However, keen competition for jobs is expected.

Employment change. Employment of mathematicians is expected to increase by 22 percent during the 2008–18 decade, which is much faster than average for all occupations. 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. Many mathematicians also are involved in financial analysis and in life sciences research.

Job prospects. Job competition will remain keen because employment in this occupation is relatively small and few new jobs are expected. Ph.D. holders with a strong background in mathematics and a related discipline, such as engineering or computer science, and who apply mathematical theory to real-world problems will have the best job prospects in related occupations. In addition, mathematicians with experience in computer programming will better their job prospects in many occupations.

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 available university positions—especially tenure-track positions—many graduates will need to find employment in industry and government.

Employment in theoretical mathematical research is sensitive to general economic fluctuations and to changes in government spending. Job prospects will be greatly influenced by changes in public and private funding for research and development.

Earnings

Median annual wages of mathematicians were $95,150 in May 2008. The middle 50 percent earned between $71,430

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Mathematicians	15-2021	2,900	3,600	700	22

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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and $119,480. The lowest 10 percent had earnings of less than $53,570, while the highest 10 percent earned more than $140,500.

In March 2009, the average annual salary in the Federal Government was $107,051 for mathematicians; $107,015 for mathematical statisticians; and $101,645 for cryptanalysts.

Related Occupations

Other occupations that require extensive knowledge of mathematics or, in some cases, a degree in mathematics include the following:

	Page
Actuaries	125
Computer network, systems, and database administrators	128
Computer scientists	132
Computer software engineers and computer programmers	134
Computer systems analysts	140
Operations research analysts	145
Statisticians	148

A strong background in mathematics also facilitates employment for the following workers:

Economists	209
Engineers	161
Financial analysts	103
Market and survey researchers	212
Personal financial advisors	118
Physicists and astronomers	206
Teachers—postsecondary	282
Teachers—preschool, kindergarten, elementary, middle, and secondary	288

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 02904-2294. Internet: **http://www.ams.org**

For specific information on careers in applied mathematics, contact

➤ Society for Industrial and Applied Mathematics, 3600 Market St. 6th Floor, Philadelphia, PA 19104-2688. Internet: **http://www.siam.org**

Information on obtaining positions as mathematicians with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos043.htm**

Operations Research Analysts

Significant Points

- Candidates should have strong quantitative and computer skills; employers prefer workers who have completed advanced math courses.
- Employment is projected to grow much faster than average.
- Individuals with a master's or Ph.D. degree in operations research or management science should have excellent employment prospects; some entry-level positions are available to those with a bachelor's degree.

Nature of the Work

Operations research analysts formulate and apply mathematical modeling methods to develop and interpret information that assists management with policy formulation and other managerial functions. Using analytical techniques, operations research analysts help managers to make better decisions and solve problems. The procedures of operations research were first formalized by the military. They have been used in wartime to effectively deploy radar, search for enemy submarines, and get supplies to where they are most needed. In peacetime and in private enterprises, operations research is used in planning business ventures and analyzing options by using statistical analysis, data mining, simulation, computer modeling, linear programming, and other mathematical techniques.

In addition to the military, operations research analysts today are employed in almost every industry, as companies and organizations must effectively manage money, materials, equipment, people, and time. Operations research analysts reduce the complexity of these elements by applying analytical methods from mathematics, science, and engineering, to help companies make better decisions and improve efficiency. Using sophisticated software tools, operations research analysts are largely responsible for solving complex problems, such as setting up schedules for sports leagues or determining how to organize products in supermarkets. Presenting the pros and cons of each possible scenario, analysts present solutions to managers, who use the information to make decisions.

Analysts are often involved in top-level strategizing, planning, and forecasting. They help to allocate resources, measure performance, schedule, design production facilities and systems, manage the supply chain, set prices, coordinate transportation and distribution, or analyze large databases.

The duties of operations research analysts vary according to the structure and management of the organizations they are assisting. Some firms centralize operations research in one department; others use operations research in each division. Many analysts work with management consulting companies

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that perform contract work for other firms. Analysts working in these positions often have areas of specialization, such as transportation or finance. Because problems are very complex and often require expertise from many disciplines, most analysts work in teams.

Teams of analysts usually start projects by listening to managers describe problems. Analysts ask questions and search for data that may help to formally define a problem. For example, an operations research team 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 determine the optimal number of windshields to be kept in stock. Too many windshields would be wasteful and expensive, whereas too few could halt production.

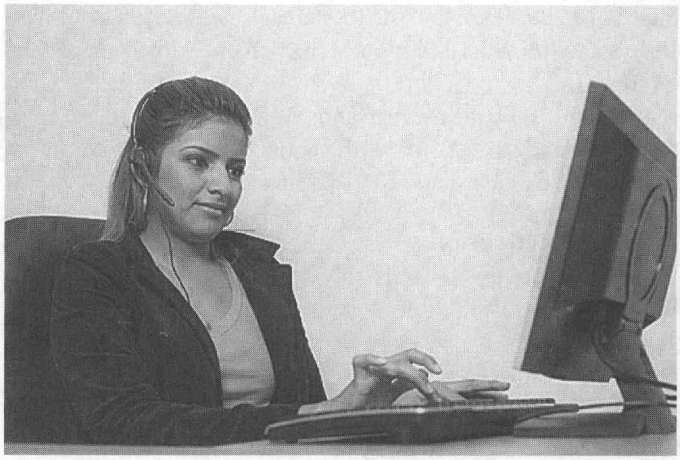
Analysts study the problem, breaking it into its components. Then they gather information from a variety of sources. To determine the optimal inventory, operations research analysts might talk with engineers about production levels, discuss purchasing arrangements with buyers, and examine storage-cost data provided by the accounting department. They might also find data on past inventory levels or other statistics that may help them to project their needs.

Relevant information in hand, the team determines the most appropriate analytical technique. Techniques used may include Monte Carlo simulations, 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 involve the construction of mathematical models that attempt to describe the system. The problem of the windshields, for example, would be described as a set of equations that represent real-world conditions.

Using these models, the team can explicitly describe the different components and clarify the relationships among them. The model's inputs can then be altered to examine what might happen to the system under different circumstances. In most cases, a computer program is used to numerically evaluate the model.

A team will often run the model with a variety of different inputs to determine the results of each change. A model for airline flight scheduling, for example, might stipulate such things as connecting cities, the amount of fuel required to fly the routes, projected levels of passenger demand, varying ticket and fuel prices, pilot scheduling, and maintenance costs. Analysts may also use optimization techniques to determine the most cost effective or profit-maximizing solution for the airline.

Based on the results of the analysis, the operations research team presents recommendations to managers. Managers may ask analysts to modify and rerun the model with different inputs or change some aspect of the model before making their decisions. Once a manager reaches a final decision, the team usually works with others in the organization to ensure the plan's successful implementation.



Operations research analysts can advance by becoming technical specialists or supervisors on more complicated projects.

Work environment. Operations research analysts generally work 40 hours a week; some, however, work longer. While most of their work is done in an office environment, they may spend time in the field, analyzing processes through direct observation. Because they work on projects that are of immediate interest to top managers, operations research analysts often are under pressure to meet deadlines.

Training, Other Qualifications, and Advancement

Some entry-level positions are available to those with a bachelor's degree in operations research, management science, or a related field, but higher degrees are required for many positions. Strong quantitative and computer skills are essential. Employers prefer workers who have completed advanced math courses.

Education and training. A bachelor's degree coupled with extensive coursework in mathematics and other quantitative subjects usually is the minimum education requirement. Many employers, however, prefer applicants with a master's degree in operations research, management science, or a closely related field—such as computer science, engineering, business, applied mathematics, or information systems. Dual graduate degrees in operations research and computer science are especially attractive to employers. There are numerous degree programs in operations research and closely related fields in colleges and universities across the United States.

Continuing education is important for operations research analysts. Keeping up to date with technological advances, software tools, and improvements in analytical methods is vital for maintaining their problem-solving skills.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Operations research analysts	15-2031	63,000	76,900	13,900	22

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Other qualifications. Those considering careers as operations research analysts should be able to pay attention to detail because much time is spent on data analysis. Candidates should also have strong computer and quantitative skills and be able to perform complex research. Employers prefer analysts who understand how to use advanced operations research software and statistical packages. Although not always required, having programming skills can be very helpful.

Since operations research is a multi-disciplinary field, a background in political science, economics, statistics, engineering, accounting, and management can also be useful. Operations research analysts must be able to think logically, work well with people, and write and speak well.

Advancement. Beginning analysts usually perform routine computational work under the supervision of more experienced analysts. As novices gain knowledge and experience, they are assigned more complex tasks and are given greater autonomy to design models and solve problems.

Operations research analysts can advance by becoming technical specialists or project team leaders. Analysts also gain valuable insights into the industry where they work and may assume higher level managerial or administrative positions. Operations research analysts with significant experience or expertise may become independent consultants. Others may move into corporate management, where they eventually may become chief operating officers.

Employment

Operations research analysts held about 63,000 jobs in 2008. Major employers include computer systems design firms; insurance carriers and other financial institutions; management; telecommunications companies; and scientific, and technical consulting services firms. Most operations research analysts in the Federal Government work for the Department of Defense.

Job Outlook

Employment is projected to grow much faster than average. Individuals with a master's or Ph.D. degree in operations research or management science should have excellent job opportunities; some entry-level positions are available to those with a bachelor's degree.

Employment change. Employment of operations research analysts is expected to grow 22 percent over the 2008–18 period, much faster than the average for all occupations. As technology advances and companies further emphasize efficiency, demand for operations research analysis should continue to grow. Technological advancements have extended the availability of data access and storage, making information more readily available. Advancements in computing capabilities and analytical software have made it cheaper and faster for analysts to solve problems. As problem solving becomes cheaper and faster with technological advances, more firms will have the ability to employ or consult with analysts.

Additionally, organizations increasingly will be faced with the pressure of growing domestic and international competition and must work to maximize organizational efficiency. As a result, businesses increasingly will rely on operations research analysts to optimize profits by improving productivity and reducing costs. As new technologies are introduced into the marketplace, operations research analysts will be needed to determine how to best use those new technologies.

Job prospects. Jobs for operations research analysts exist in almost every industry because of the diversity of applications for their work. As businesses and government agencies continue to contract out jobs to cut costs, opportunities for operations research analysts will be best in management, scientific, and technical consulting firms. The relatively small pool of qualified candidates will result in excellent opportunities for those with a master's or Ph.D. degree in operations research or management science. Operations research is not a particularly well-known field, which means there are fewer applicants competing for each job.

In addition to job growth, some openings will result from the need to replace analysts retiring or leaving the occupation for other reasons.

Earnings

Median annual wages of operations research analysts were $69,000 in May 2008. The middle 50 percent earned between $51,780 and $92,920. The lowest 10 percent had wages of less than $40,000, while the highest 10 percent earned more than $118,130. Median annual wages of operations research analysts working in management, scientific, and technical consulting services were $80,290 in May 2008. The average annual salary for operations research analysts in the Federal Government was $107,198 in March 2009.

Operations research analysts generally are paid fixed annual salaries with the possibility of bonuses. They also receive benefits typical of professional employees, such as medical and life insurance and 401(k) programs. Many employers offer training programs, including tuition reimbursement programs that allow analysts to attend advanced university classes.

Related Occupations

Operations research analysts apply advanced analytical methods to large, complicated problems, similar to:

	Page
Computer software engineers and computer programmers	134
Computer systems analysts	140
Economists	209
Engineers	161
Management analysts	111
Market and survey researchers	212
Mathematicians	143
Statisticians	148

Sources of Additional Information

For information on career opportunities and a list of degree programs for operations research analysts, contact:

➤ Institute for Operations Research and the Management Sciences, 7240 Parkway Dr., Suite 300, Hanover, MD 21076. Internet: **http://www.informs.org**

For information on operations research careers and degree programs in the Armed Forces, contact:

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➤ Military Operations Research Society, 1703 N. Beauregard St., Suite 450, Alexandria, VA 22311. Internet: **http://www.mors.org**

Information on obtaining positions as operations research analysts with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos044.htm**

Statisticians

Significant Points

- About 30 percent of statisticians work for Federal, State, and local governments; private-industry employers include scientific research and development services, insurance carriers, and pharmaceutical and medicine manufacturing.
- A master's degree in statistics or mathematics is the minimum educational requirement for most jobs. Individuals with a degree in statistics are likely to have opportunities in a variety of fields.

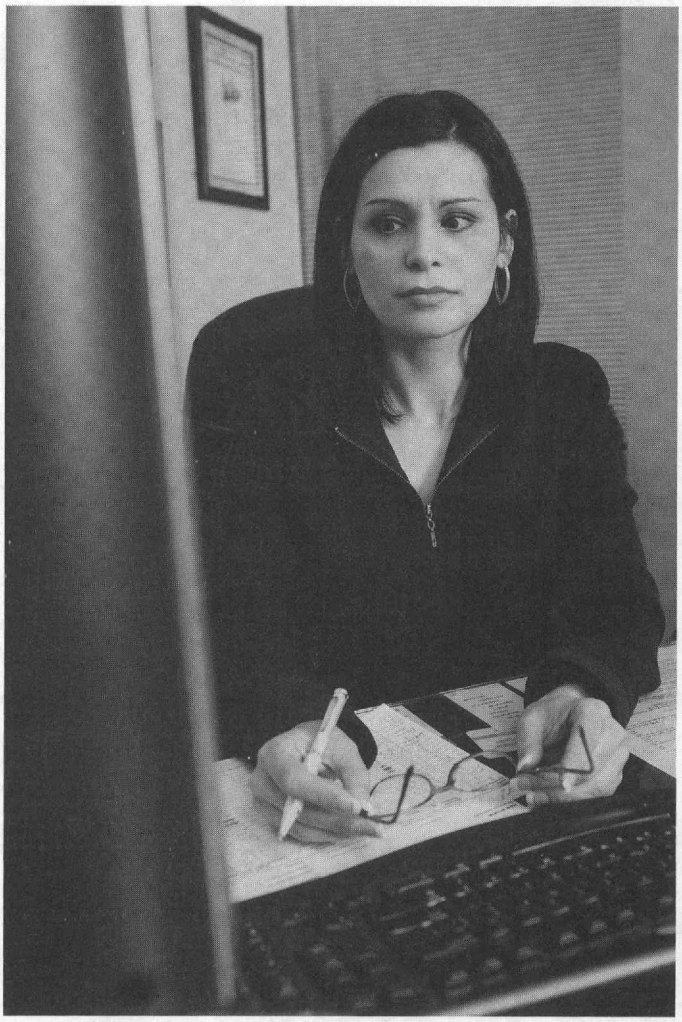
Nature of the Work

Statistics is the scientific application of mathematical principles to the collection, analysis, and presentation of numerical data. *Statisticians* apply their mathematical and statistical knowledge to the design of surveys and experiments; the collection, processing, and analysis of data; and the interpretation of experiments and survey results. Opinion polls, statements about the accuracy of scales and other measuring devices, and information about average earnings in an occupation are all usually the work of statisticians.

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 statistical techniques, such as the design of experiments to gain Federal approval of a newly manufactured drug. Statistics might be needed to show whether the seemingly good results of a drug were likely because of the drug rather than just the effect of random variation in patient outcomes.

One technique that is especially useful to statisticians is sampling—obtaining information about a population of people or of a 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 with the use of 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 in which engines are run until failure and breakdown in order to determine the failure time of engines exposed to extreme weather conditions. Working for a pharmaceutical company, statisticians might develop and evaluate the results of clinical trials to determine the safety and effectiveness of new medications. At a computer software firm, statisticians might help construct new statistical software packages to analyze data more accurately and efficiently. In addition to designing experiments for product development and testing, some statisticians are involved in deciding what products to manufacture, how much to charge for them, and to whom the products should be



Advanced computer programs have led to jobs for statisticians in many industries.

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marketed. Statisticians also may manage assets and liabilities, determining the risks and returns of certain investments.

Nearly every government agency employs statisticians. 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 figure out the average level of pesticides in drinking water, the number of endangered species living in a particular area, or the number of people afflicted with a certain disease. Statisticians also are employed in national defense agencies, determining the accuracy of new weapons and the likely effectiveness of defense strategies.

Because statistical specialists are employed in so many different kinds of work, specialists who use statistics often have different professional designations. For example, a person using statistical methods to analyze economic data may be called an *econometrician*, while statisticians in public health and medicine may hold titles such as *biostatistician* or *biometrician*.

Work environment. Statisticians generally work regular hours in an office environment. Sometimes, they may work more hours to meet deadlines.

Some statisticians travel to provide advice on research projects, supervise and set up surveys, or gather statistical data. Although e-mail and teleconferencing make it easier for statisticians to work with clients in different areas, there still are situations that require the statistician to be present, such as during meetings or while gathering data.

Training, Other Qualifications, and Advancement

A master's degree in statistics or mathematics is the minimum educational requirement, but research and academic jobs generally require a Ph.D., while Federal Government jobs require at least a bachelor's degree.

Education and training. A master's degree in statistics or mathematics usually is the minimum educational requirement for most statistician jobs. Research and academic positions usually require a Ph.D. in statistics. Beginning positions in industrial research often require a master's degree combined with several years of experience.

Jobs with the Federal Government require at least a bachelor's degree. The training required for employment as an entry-level statistician in the Federal Government is a bachelor's degree, including at least 15 semester hours of statistics or a combination of 15 hours of mathematics and statistics with at least 6 semester hours 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 colleges and universities offer degree programs in statistics, biostatistics, or mathematics, while other schools also offer 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. Many schools also offer degrees in fields that include a sufficient number of courses in statistics to qualify graduates for some entry-level positions with the Federal Government. Required subjects for statistics majors include differential and integral calculus, statistical methods, mathematical modeling, and probability theory. Additional recommended courses for undergraduates include linear algebra, design and analysis of experiments, applied multivariate analysis, and mathematical statistics.

Because computers are used extensively for statistical applications, a strong background in computer science is highly recommended. For positions involving quality and improvement in productivity, 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 valuable for many jobs in market research, business analysis, and forecasting.

Advancements in technology have made a great impact on statistics. Statistical modeling continues to become quicker and easier because of increased computational power and new analytical methods or software. Continuing education is important for statisticians, who need to stay abreast of emerging technologies to perform well.

Other qualifications. Good communication skills are important for statisticians who seek a job in private industry, because these statisticians 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.

Advancement. 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. Opportunities for promotion are greater for people with advanced degrees. Master's and Ph.D. degree holders usually enjoy independence in their work and may engage in research, develop statistical methods, or, after a number of years of experience in a particular area, become statistical consultants.

Employment

Statisticians held about 22,600 jobs in 2008. About 20 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 10 percent were found in State and local governments. Most of the remaining jobs were in private industry, especially in scientific research and development services, insurance carriers, and pharmaceutical and medicine manufacturing.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Statisticians	15-2041	22,600	25,500	2,900	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Job Outlook

Average employment growth is projected. Individuals with a degree in statistics should have opportunities in a variety of fields.

Employment change. Employment of statisticians is projected to grow 13 percent from 2008 to 2018, about as fast as the average for all occupations. The demand for individuals with a background is statistics is projected to grow, although some jobs will be in occupations with titles other than statistician.

The use of statistics is widespread and growing. Statistical models aid in decision making in both private industry and government. There will always be a demand for the skills statisticians provide. Technological advances are expected to spur demand for statisticians. Ever-faster computer processing allows statisticians to analyze greater amounts of data much more quickly and to gather and sort through large amounts of data that would not have been analyzed in the past. As data processing continues to become more efficient and less expensive, an increasing number of employers will want to employ statisticians to take advantage of the new information available.

Biostatisticians should experience employment growth, primarily because of the growing pharmaceuticals business. As pharmaceutical companies develop new treatments and medical technologies, biostatisticians will be needed to do research and clinical trials.

Job prospects. Individuals with a degree in statistics have opportunities in a variety of fields. For example, many jobs involve the analysis and interpretation of data from economics, biological science, psychology, computer software engineering, education, and other disciplines. Additional job openings will become available as currently employed statisticians transfer to other occupations, retire, or leave the workforce 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.

Earnings

Median annual wage-and-salary wages of statisticians were $72,610 in May 2008. The middle 50 percent earned between $52,730 and $95,170. The lowest 10 percent earned less than $39,740, while the highest 10 percent earned more than $117,190.

The average annual salary for statisticians in the Federal Government was $92,322 in March 2009, while mathematical statisticians averaged $107,015.

Related Occupations

Among the people who work with statistics are those in such diverse occupations as the following:

	Page
Actuaries	125
Computer scientists	132
Computer software engineers and computer programmers	134
Computer systems analysts	140
Economists	209
Engineers	161
Financial analysts	103
Market and survey researchers	212
Mathematicians	143
Operations research analysts	145
Personal financial advisors	118
Social scientists, other	226

Some statisticians also work as:

Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—postsecondary	282

Sources of Additional Information

For information about career opportunities in statistics, contact

➤ American Statistical Association, 732 North Washington 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 02904. Internet: **http://www.ams.org**

Information on obtaining positions as statisticians with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos045.htm**

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Architects, Surveyors, and Cartographers

Architects, Except Landscape and Naval

Significant Points

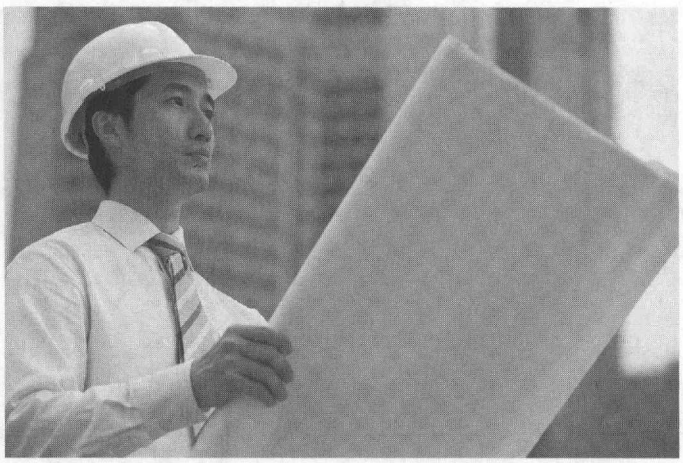
- About 21 percent of architects are self-employed—almost 3 times the proportion for all occupations.
- Licensing requirements include a professional degree in architecture, at least 3 years of practical work, training, and passing all divisions of the Architect Registration Examination.
- Architecture graduates may face competition, especially for jobs in the most prestigious firms.

Nature of the Work

People need places in which to live, work, play, learn, worship, meet, govern, shop, and eat. *Architects* are responsible for designing these places, whether they are private or public; indoors or out; rooms, buildings, or complexes. Architects are licensed professionals trained in the art and science of building design who develop the concepts for structures and turn those concepts into images and plans.

Architects create the overall 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 may be involved in all phases of a construction project, from the initial discussion with the client through the final delivery of the completed structure. 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.



It takes many years of education and experience to become a licensed architect.

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, preparing cost analysis and land-use studies, or specifying the requirements the design must meet. For example, they may determine space requirements by researching the numbers and types of 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 people who are disabled. Computer-aided design and drafting (CADD) and building information modeling (BIM) technology has replaced traditional paper and pencil as the most common method for creating design and construction drawings. 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.

Often working with engineers, urban planners, interior designers, landscape architects, and other professionals, architects in fact spend a great deal of their time coordinating information from, and the work of, other professionals engaged in the same project.

They 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.

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.

Work environment. Usually working in a comfortable environment, architects spend most of their time in offices consulting with clients, developing reports and drawings, and working

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with other architects and engineers. However, they often visit construction sites to review the progress of projects. In 2008, approximately 1 in 5 architects worked more than 50 hours per week, as long hours and work during nights and weekends is often necessary to meet deadlines.

Training, Other Qualifications, and Advancement

There are three main steps in becoming an architect: completing a professional degree in architecture; gaining work experience through an internship; and attaining licensure by passing the Architect Registration Exam.

Education and training. In most States, architects must hold a professional degree in architecture from one of the 117 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-accredited program may meet the educational requirement for licensing in a few States.

Most architects earn their professional degree through a 5-year Bachelor of Architecture degree program, which is intended for students with no previous architectural training. Others earn a master's degree after completing a bachelor's degree in another field or after completing a preprofessional architecture program. A master's degree in architecture can take 1 to 5 years to complete depending on the extent of previous training in architecture.

The choice of degree depends on preference and educational background. Prospective architecture students should consider the options before committing to a program. For example, although the 5-year bachelor of architecture offers the most direct route to the professional degree, courses are specialized, and if the student does not complete the program, transferring to a program in another discipline may be difficult. A typical program includes courses in architectural history and theory, building design with an emphasis on CADD, structures, technology, construction methods, professional practice, math, physical sciences, and liberal arts. Central to most architectural programs is the design studio, where students apply the skills and concepts learned in the classroom and create drawings and three-dimensional models of their designs.

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 useful for research, teaching, and certain specialties.

All State architectural registration boards require architecture graduates to complete a training period—usually at least 3 years—before they may sit for the licensing exam. Every State follows the training standards established by the Intern Development Program, a program of the American Institute of Architects and the National Council of Architectural Registration Boards (NCARB). These standards stipulate broad training under the supervision of a licensed architect. Most new graduates complete their training period by working as interns at architectural firms. Some States allow a portion of the training to occur in the offices of related professionals, such as engineers or general contractors. Architecture students who complete internships while still in school can count some of that time toward the 3-year training period.

Interns in architectural firms may assist in the design of one part of a project, help prepare architectural documents or drawings, build models, or prepare construction drawings on CADD. Interns also may research building codes and materials or write specifications for building materials, installation criteria, the quality of finishes, and other related details.

Licensure. All States and the District of Columbia require individuals to be licensed (registered) before they may call themselves architects and contract to provide architectural services. During the time between graduation and becoming licensed, architecture school graduates generally work in the field under the supervision of a licensed architect who takes legal responsibility for all work. Licensing requirements include a professional degree in architecture, a period of practical training or internship, and a passing score on all divisions of the Architect Registration Examination. The examination is broken into nine divisions consisting of either multiple choice or graphical questions. The eligibility period for completion of all divisions of the exam varies by State.

Most States also require some form of continuing education to maintain a license, and many others are expected to adopt mandatory continuing education. Requirements vary by State but usually involve the completion of a certain number of credits annually or biennially through workshops, formal university classes, conferences, self-study courses, or other sources.

Other qualifications. 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 understand spatial relationships. Other important qualities for anyone interested in becoming an architect are creativity and the ability to work independently and as part of a team. Computer skills are also required for writing specifications, for 2-dimensional and 3- dimensional drafting using CADD programs, and for financial management.

Certification and advancement. A growing number of architects voluntarily seek certification by the National Council of Architectural Registration Boards. Certification is awarded after independent verification of the candidate's educational transcripts, employment record, and professional references. Certification can make it easier to become licensed across States. In fact, it is the primary requirement for reciprocity of licensing among State Boards that are NCARB members. In 2009, approximately one-third of all licensed architects had this certification.

After becoming licensed and gaining experience, architects take on increasingly complex assignments, eventually managing entire projects. In large firms, architects may advance to supervisory or managerial positions. Some architects become partners in established firms, while others set up their own practices. Some 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.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Architects, except landscape and naval	17-1011	141,200	164,200	22,900	16

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

Employment

Architects held about 141,200 jobs in 2008. Approximately 68 percent of jobs were in the architectural, engineering, and related services industry. A small number worked for residential and nonresidential building construction firms and for government agencies responsible for housing, community planning, or construction of government buildings, such as the U.S. Departments of Defense and Interior and the General Services Administration. About 21 percent of architects are self-employed.

Job Outlook

Employment is expected to grow faster than the average for all occupations. Competition is expected, especially for positions at the most prestigious firms, and opportunities will be best for those architects who are able to distinguish themselves with their creativity.

Employment change. Employment of architects is expected to increase by 16 percent between 2008 and 2018, which is faster than the average for all occupations. Current demographic trends will lead to an increase in demand for architects. As the population of Sunbelt States continues to grow, the people living there will need new places to live and work. As the population continues to live longer and baby boomers retire, there will be a need for more healthcare facilities, nursing homes, and retirement communities. In education, buildings at all levels are getting older and enrollments continue to increase, which will require many school districts and universities to build new facilities and renovate existing ones.

In recent years, some architecture firms have outsourced the drafting of construction documents and basic design for large-scale commercial and residential projects to architecture firms overseas. This trend is expected to continue and may have a negative impact on employment growth for lower-level architects and interns who would normally gain experience by producing these drawings.

Job prospects. Besides employment growth, additional job openings will arise from the need to replace architects who transfer to other occupations or stop working for other reasons. A growing number of students are graduating with architectural degrees and some competition for entry-level jobs can be anticipated. Competition will be especially keen for jobs at the most prestigious architectural firms as prospective architects try to build their reputation. Prospective architects who have had internships while in school will have an advantage in obtaining positions after graduation. Opportunities will be best for those architects who are able to distinguish themselves from others with their creativity.

There should be demand for architects with knowledge of "green" design. Green design, also known as sustainable design, emphasizes the efficient use of resources such as energy and water, waste and pollution reduction, conservation, and environmentally friendly design, specifications, and materials. Rising energy costs and increased concern about the environment has led to many new buildings being built green.

Employment of architects is strongly tied to the activity of the construction industry and some types of construction are sensitive to cyclical changes in the economy. For example, during recessions nonresidential construction of office and retail space tends to fall as funding for these projects becomes harder to obtain and the demand for these spaces falls. Firms 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. Residential construction makes up a small portion of work for architects, so major changes in the housing market would not be as significant as fluctuations in the nonresidential market.

Opportunities are also geographically sensitive, and some parts of the Nation may have fewer new building projects. Also, many firms specialize in specific buildings, such as hospitals or office towers, and demand for these buildings may vary by region. Architects may find it increasingly necessary to gain reciprocity in order to compete for the best jobs and projects in other States.

Earnings

Median annual wages of wage-and-salary architects were $70,320 in May 2008. The middle 50 percent earned between $53,480 and $91,870. The lowest 10 percent earned less than $41,320, and the highest 10 percent earned more than $119,220. Those just starting their internships can expect to earn considerably less.

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.

Many firms pay tuition and fees toward continuing education requirements for their employees.

Related Occupations

Others workers involved in the construction and maintenance of buildings include:

	Page
Construction managers	38
Engineers	161
Landscape architects	154
Urban and regional planners	220

Architects design buildings and related structures. Other occupations with design responsibilities include:

	Page
Commercial and industrial designers	304
Graphic designers	312
Interior designers	314

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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**

➤ The National Architectural Accrediting Board, 1735 New York Ave. NW, Washington, DC 20006. Internet: **http://www.naab.org**

➤ The National Council of Architectural Registration Boards, Suite 700K, 1801 K St. NW, Washington, D.C. 20006. Internet: **http://www.ncarb.org**

➤ The American Institute of Architects and the American Institute of Architecture Students jointly sponsor a Web site: **http://www.archcareers.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos038.htm**

Landscape Architects

Significant Points

- About 21 percent of landscape architects are self-employed—almost 3 times the proportion for all occupations.
- Almost all States require landscape architects to be licensed, which generally requires a degree in landscape architecture from an accredited school, work experience, and a passing score on the Landscape Architect Registration Exam.
- Good job opportunities are expected, but new graduates may face competition for jobs in the largest and most prestigious firms.

Nature of the Work

People enjoy attractively designed gardens, public parks and playgrounds, residential areas, college campuses, shopping centers, golf courses, and parkways. *Landscape architects* design these areas so they are not only functional but also beautiful and harmonious with the natural environment. They plan the location of buildings, roads, and walkways, and the arrangement of flowers, shrubs, and trees. They also design and plan the restoration of natural places disturbed by humans, such as wetlands, stream corridors, mined areas, and forested land.

Working with building 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 purpose of the project and the funds available. They then analyze the natural elements of the site, such as the climate, soil, slope of the land, drainage, and vegetation. They also assess existing buildings, roads, walkways, and utilities to determine what improvements are necessary. At all stages, they evaluate the project's impact on the local ecosystem.

After studying and analyzing the site, landscape architects prepare a preliminary design. To address 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 (GIS) technology, a computer mapping system.

Throughout all phases of planning and design, landscape architects consult with other professionals, such as civil engineers, hydrologists, or building architects, 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. Landscape architects then monitor the implementation of their design, while general contractors or landscape contractors usually direct the actual construction of the site and installation of plantings.



Landscape architects are involved in a wide variety of construction projects.

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Some landscape architects work on a variety of types of projects. Others specialize in a particular area, such as 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 work in environmental remediation, such as preservation and restoration of wetlands or abatement of stormwater run-off in new developments. Historic landscape preservation and restoration is another area where landscape architects increasingly play a role.

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 may prepare environmental impact statements and studies on environmental issues such as public land-use planning.

Work environment. 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 can spend considerably more time out of the office traveling to sites.

Although many landscape architects work approximately 40 hours per week, about 1 in 5 worked more than 50 hours per week in 2008, as long hours and work during nights and weekends is often necessary to meet deadlines.

Training, Other Qualifications, and Advancement

Almost every State requires landscape architects to be licensed. While requirements vary among the States, they usually include a degree in landscape architecture from an accredited school; work experience; and a passing score on the Landscape Architect Registration Exam.

Education and training. A bachelor's or master's degree in landscape architecture usually is necessary for entry into the profession. Sixty-seven colleges and universities offered undergraduate or graduate programs in landscape architecture that were accredited by the Landscape Architecture Accreditation Board of the American Society of Landscape Architects in 2009. There are two undergraduate professional degrees: a Bachelor of Landscape Architecture (BLA) and a Bachelor of Science in Landscape Architecture (BSLA). These programs usually require 4 or 5 years of study for completion. Those who hold an undergraduate degree in a field other than landscape architecture can enroll in a Master of Landscape Architecture (MLA) graduate degree program, which typically takes 3 years of full-time study to complete. Those who hold undergraduate degrees in landscape architecture can earn their MLA in 2 years.

Courses required in these programs usually include 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. The design studio is a key component of any curriculum. Whenever possible, students are assigned real projects, providing them with valuable hands-on experience. While working on these projects, students become proficient in the use of computer-aided design, model building, geographic information systems, and video simulation.

Many employers recommend that prospective landscape architects complete a summer internship with a landscape architecture firm during their formal educational studies. Interns are able to hone their technical skills and gain an understanding of the day-to-day operations of the business, including how to win clients, generate fees, and work within a budget.

Licensure and certification. As of 2009, there were 49 States that required landscape architects to be licensed. Licensing is based on the Landscape Architect Registration Examination (L.A.R.E.), sponsored by the Council of Landscape Architectural Registration Boards, and administered in two portions, a graphic portion and a multiple-choice portion. Applicants wishing to take the exam usually need a degree from an accredited school plus 1 to 4 years of work experience under the supervision of a licensed landscape architect, although standards vary by State. For those without an accredited landscape architecture degree, most states provide alternative paths to qualify to take the L.A.R.E., usually requiring more work experience. Currently, 13 States require that a State examination be passed in addition to the L.A.R.E. to satisfy registration requirements. State examinations focus on laws, environmental regulations, plants, soils, climate, and any other characteristics unique to the State.

Because requirements for licensure are not uniform, landscape architects may find it difficult to transfer their registration from one State to another. National standards include 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. By meeting national requirements, a landscape architect can also obtain certification from the Council of Landscape Architectural Registration Boards which can be useful in obtaining reciprocal licensure in other States.

In States where licensure is required, new hires may be called "apprentices" or "intern landscape architects" until they be-

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Landscape architects	17-1012	26,700	32,000	5,300	20

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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come 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 designed. 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.

A majority of States require some form of continuing education to maintain a license. Requirements usually involve the completion of workshops, seminars, formal university classes, conferences, self-study courses, or other classes.

The Federal Government does not require its landscape architects to be licensed. Candidates for entry positions with the Federal Government should have a bachelor's or master's degree in landscape architecture.

Other qualifications. People 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 and written 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. Landscape architects must also be able to draft and design using CAD software. Knowledge of computer applications of all kinds, including word processing, desktop publishing, and spreadsheets is also important. Landscape architects use these tools to develop presentations, proposals, reports, and land impact studies for clients, colleagues, and superiors.

Many landscape architects are self-employed. 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.

Advancement. After several years, landscape architects 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.

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.

Employment

Landscape architects held about 26,700 jobs in 2008. About 51 percent of landscape architects were employed in architectural, engineering, and related services. State and local governments employed approximately 6 percent. About 21 percent of landscape architects were 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.

Job Outlook

Employment is expected to grow much faster than the average for all occupations. There should be good job prospects overall, but new graduates may face competition for jobs in the largest and most prestigious landscape architecture firms.

Employment change. Employment of landscape architects is expected to increase by 20 percent during the 2008–18 decade, which is much faster than the average for all occupations. Employment will grow as the planning and development of new construction, together with the continued redevelopment of existing buildings, creates more opportunities for landscape architects. With land costs rising and the public desiring more beautiful spaces, the importance of good site planning and landscape design is growing.

Additionally, environmental concerns and increased demand for sustainably designed construction projects will spur demand for the services of landscape architects. For example, landscape architects are involved in designing green roofs that are covered with some form of vegetation, and that can significantly reduce costs associated with heating and cooling a building, as well as reduce air and water pollution. Landscape architects will also be needed to design plans to manage storm water run-off in a way that avoids pollution of waterways and conserves water resources.

Job prospects. There should be good job opportunities overall as demand for landscape architecture services increases, but new graduates can expect to face competition for jobs in the largest and most prestigious landscape architecture firms. Many employers prefer to hire entry-level landscape architects who have internship experience, which significantly reduces the amount of on-the-job training required. Opportunities will be best for landscape architects who develop strong technical skills—such as computer design—communication skills, and 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.

Opportunities will vary by year and geographic region, depending on local economic conditions. During a recession, when real estate sales and construction slow down, landscape architects may face greater competition for jobs and sometimes layoffs. But because landscape architects can work on many different types of projects, they may have steadier work than other design professionals when traditional construction slows.

In addition to growth, the need to replace landscape architects who retire or leave the labor force will produce some job openings.

Earnings

In May 2008, median annual wages for landscape architects were $58,960. The middle 50 percent earned between $45,840 and $77,610. The lowest 10 percent earned less than $36,520 and the highest 10 percent earned over $97,370. Architectural, engineering, and related services employed more landscape architects than any other group of industries, and there the median annual wages were $59,610 in May 2008.

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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:

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Architects, except landscape and naval	151
Construction managers	38
Engineers	161
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	157
Urban and regional planners	220

Others workers concerned with the environment include:

Environmental scientists and specialists	199
Geoscientists and hydrologists	202

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, 3949 Pender Dr., Suite 120, Vienna, VA 22030. Internet: **http://www.clarb.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos039.htm**

Surveyors, Cartographers, Photogrammetrists, and Surveying and Mapping Technicians

Significant Points

- About 7 out of 10 jobs were in architectural, engineering, and related services.
- Employment is expected to grow faster than the average for all occupations.
- Surveyors, cartographers, and photogrammetrists who have a bachelor's degree and strong technical skills should have favorable job prospects.

Nature of the Work

Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians are responsible for measuring and mapping the Earth's surface. *Surveyors* establish official land, airspace, and water boundaries. They write descriptions of land for deeds, leases, and other legal documents; define airspace for airports; and take measurements of construction and mineral sites. Other surveyors provide data about the shape, contour, location, elevation, or dimension of land or land features. *Cartographers and photogrammetrists* collect, analyze, interpret, and map geographic information using data from surveys and photographs. *Surveying and mapping technicians* assist these professionals by collecting data in the field, making calculations, and helping with computer-aided drafting. Collectively, these occupations play key roles in the field of geospatial information.

Surveyors measure distances, directions, and angles between points on, above, and below the Earth's surface. In the field, they select known survey reference points and determine the precise location of important features in the survey area using specialized equipment. Surveyors also research legal records, look for evidence of previous boundaries, and analyze data to determine the location of boundary lines. They are sometimes called to provide expert testimony in court regarding their work or the work of other surveyors. Surveyors also record their results, verify the accuracy of data, and prepare plots, maps, and reports.

Some surveyors perform specialized functions that support the work of other surveyors, cartographers, and photogrammetrists. For example, *geodetic surveyors* use high-accuracy techniques, including satellite observations, to measure large areas of the earth's surface. *Geophysical prospecting surveyors* mark sites for subsurface exploration, usually to look for 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 use the Global Positioning System (GPS) to locate reference points with a high degree of precision. To use this system, a surveyor places a satellite signal receiver—a small instrument mounted on a tripod—on a desired point, and another receiver on a point for which the geographic position is known. The receiver simultaneously collects information from several satellites and the known reference point 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 interpret and check the results produced by GPS.

Field measurements are often taken by a survey party that gathers the information needed by the 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 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 total station, which measures and records angles and distances simultaneously. Surveying technicians compile notes, make sketches, and enter the data obtained from surveying instruments into computers either in the field or at the office.

Photogrammetrists and cartographers measure, map, and chart the Earth's surface. Their work involves everything

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from performing geographical research and compiling data to producing maps. They collect, analyze, and interpret both spatial data—such as latitude, longitude, elevation, and distance—and nonspatial data—such as population density, land-use patterns, annual precipitation levels, and demographic characteristics. Their maps may give both physical and social characteristics of the land. They prepare maps in either digital or graphic form, using information provided by geodetic surveys and remote sensing systems including aerial cameras, satellites, light-imaging detection and ranging (LIDAR), or other technologies.

LIDAR uses lasers attached to planes and other equipment to digitally map the topography of the Earth. It is often more accurate than traditional surveying methods and also can be used to collect other forms of data, such as the location and density of forests. Data developed by LIDAR can be used by surveyors, cartographers, and photogrammetrists to provide spatial information to specialists in geology, seismology, forestry, construction, and other fields.

Geographic Information Systems (GIS) have become an integral tool for surveyors, cartographers, photogrammetrists, and surveying and mapping technicians. Workers use GIS to assemble, integrate, analyze, and display data about location in a digital format. They also use GIS to compile information from a variety of sources. GIS typically are used to make maps which combine information useful for environmental studies, geology, engineering, planning, business marketing, and other disciplines. As more of these systems are developed, many mapping specialists are being called *geographic information specialists*.



Land surveyors frequently take measurements in the field.

Work environment. Surveyors and surveying technicians 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. Construction-related work may be limited during times of inclement weather.

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 is sometimes part of the job, and surveyors and technicians may commute long distances, stay away from home overnight, or temporarily relocate near a survey site. Surveyors also work indoors while planning surveys, searching court records for deed information, analyzing data, and preparing reports and maps.

Cartographers and photogrammetrists spend most of their time in offices using computers. However, certain jobs may require extensive field work to verify results and acquire data.

Training, Other Qualifications, and Advancement

Most surveyors, cartographers, and photogrammetrists have a bachelor's degree in surveying or a related field. Every State requires that surveyors be licensed.

Education and training. In the past, many people with little formal training started as members of survey crews and worked their way up to become licensed surveyors, but this has become increasingly difficult. Now, most surveyors need a bachelor's degree. A number of universities offer bachelor's degree programs in surveying, and many community colleges, technical institutes, and vocational schools offer 1-year, 2-year, and 3-year programs in surveying or surveying technology.

Cartographers and photogrammetrists usually have a bachelor's degree in cartography, geography, surveying, engineering, forestry, computer science, or a physical science, although a few enter these positions after working as technicians. With the development of GIS, cartographers and photogrammetrists need more education and stronger technical skills—including more experience with computers—than in the past.

Most cartographic and photogrammetric technicians also have specialized postsecondary education. High school students interested in surveying and cartography should take courses in algebra, geometry, trigonometry, drafting, mechanical drawing, and computer science.

Licensure. All 50 States and all U.S. territories license surveyors. For licensure, most State licensing boards require that individuals pass a series of written examinations given by the National Council of Examiners for Engineering and Surveying (NCEES). After passing a first exam, the Fundamentals of Surveying, most candidates work under the supervision of an experienced surveyor for 4 years before taking a second exam,

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	–	147,000	174,500	27,600	19
Surveyors, cartographers, and photogrammetrists	17-1020	70,000	81,800	11,900	17
Cartographers and photogrammetrists	17-1021	12,300	15,600	3,300	27
Surveyors	17-1022	57,600	66,200	8,600	15
Surveying and mapping technicians	17-3031	77,000	92,700	15,700	20

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

the Principles and Practice of Surveying. Additionally, most States also require surveyors to pass a written examination prepared by the State licensing board.

Specific requirements for training and education vary among the States. An increasing number of States require a bachelor's degree in surveying or in a closely related field, such as civil engineering or forestry, regardless of the number of years of experience. Some States require the degree to be from a school accredited by the Accreditation Board for Engineering and Technology (ABET). Most States also have a continuing education requirement.

Additionally, a number of States require cartographers and photogrammetrists to be licensed as surveyors, and some States have specific licenses for photogrammetrists.

Other qualifications. Surveyors, cartographers, and photogrammetrists should be able to visualize objects, distances, sizes, and abstract forms. They must work with precision and accuracy because mistakes can be costly. Surveying and mapping is a cooperative operation, so good interpersonal skills and the ability to work as part of a team is important.

Certification and advancement. 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. Depending on State licensing requirements, they may advance to licensed surveyor in some cases.

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 and the passing of written examinations. Although not required for State licensure, many employers require certification for promotion to positions with greater responsibilities.

The American Society for Photogrammetry and Remote Sensing (ASPRS) has voluntary certification programs for technicians and professionals in photogrammetry, remote sensing, and GIS. To qualify for these professional distinctions, individuals must meet work experience and training standards and pass a written examination. The professional recognition these certifications bestow can help workers gain promotions.

Employment

Surveyors, cartographers, photogrammetrists, and surveying technicians held about 147,000 jobs in 2008. Employment was distributed by occupational specialty as follows:

Surveying and mapping technicians.....77,000
Surveyors.....57,600
Cartographers and photogrammetrists.....12,300

The architectural, engineering, and related services industry—including firms that provided surveying and mapping services to other industries on a contract basis—provided 7 out of 10 jobs for these workers. Federal, State, and local governmental agencies provided about 15 percent of these jobs. Major Federal Government employers are the U.S. Geological Survey (USGS), the Bureau of Land Management (BLM), the National Oceanic and Atmospheric Administration, the U.S. Forest Service, and the Army Corps of Engineers. Most surveyors in State and local government work for highway departments or urban planning and redevelopment agencies. Utility companies also employ surveyors, cartographers, photogrammetrists, and surveying technicians.

Job Outlook

These occupations should experience faster than average employment growth. Surveyors, cartographers, and photogrammetrists who have a bachelor's degree and strong technical skills should have favorable job prospects.

Employment change. Employment of surveyors, cartographers, photogrammetrists, and surveying and mapping technicians is expected to grow 19 percent from 2008 to 2018, which is faster than the average for all occupations. Increasing demand for fast, accurate, and complete geographic information will be the main source of job growth.

An increasing number of firms are interested in geographic information and its applications. For example, GIS can be used to create maps and information used in emergency planning, security, marketing, urban planning, natural resource exploration, construction, and other applications. Also, the increased popularity of online interactive mapping systems and GPS devices have created a higher demand for and awareness of current and accurate digital geographic information among consumers.

Growth in construction stemming from increases in the population and the related need to upgrade the Nation's infrastructure will cause growth for surveyors and surveying technicians who ensure that projects are completed with precision and in

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line with original plans. These workers are usually the first on the job for any major construction project, and they provide information and recommendations to engineers, architects, contractors, and other professionals during all phases of a construction project.

Job prospects. In addition to openings from growth, job openings will continue to arise from the need to replace workers who transfer to other occupations or who leave the labor force altogether. Many cartographers and surveyors are approaching retirement age. Surveyors, cartographers, and photogrammetrists who have a bachelor's degree and strong technical skills should have favorable job prospects.

Opportunities for surveyors, cartographers, photogrammetrists, and technicians should remain concentrated in engineering, surveying, mapping, building inspection, and drafting services firms. Increasing demand for geographic data, as opposed to traditional surveying services, will mean better opportunities for mapping technicians and professionals who are involved in the development and use of GIS and digital mapmaking.

The demand for traditional surveying services is strongly tied to construction activity and opportunities will vary by year and geographic region, depending on local economic conditions. During a recession, when real estate sales and construction slow down, surveyors and surveying technicians may face greater competition for jobs and sometimes layoffs. However, because these workers can work on many different types of projects, they may have steadier work than other workers when construction slows.

Earnings

Median annual wages of cartographers and photogrammetrists were $51,180 in May 2008. The middle 50 percent earned between $39,510 and $69,220. The lowest 10 percent earned less than $31,440 and the highest 10 percent earned more than $87,620.

Median annual wages of surveyors were $52,980 in May 2008. The middle 50 percent earned between $38,800 and $70,010. The lowest 10 percent earned less than $29,600 and the highest 10 percent earned more than $85,620. Median annual wages of surveyors employed in architectural, engineering, and related services were $51,870 in May 2008.

Median annual wages of surveying and mapping technicians were $35,120 in May 2008. The middle 50 percent earned between $27,370 and $45,860. The lowest 10 percent earned less than $21,680, and the highest 10 percent earned more than $58,030. Median annual wages of surveying and mapping technicians employed in architectural, engineering, and related services were $33,220 in May 2008, while those employed by local governments had median annual wages of $40,510.

Related Occupations

Workers who use surveying data in land development and construction include:

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Architects, except landscape and naval	151
Engineers	161
Landscape architects	154

Cartography is related to the work of:

Environmental scientists and specialists	199
Social scientists, other	226
Urban and regional planners	220

Sources of Additional Information

For career information on surveyors, cartographers, photogrammetrists, and surveying technicians, contact:

➤ American Congress on Surveying and Mapping, 6 Montgomery Village Ave., Suite 403, 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, 6 Montgomery Village Ave., Suite 403, Gaithersburg, MD 20879. Internet: **http://www.nspsmo.org**

For information on a career as a geodetic surveyor, contact:

➤ American Association of Geodetic Surveying (AAGS), 6 Montgomery Village Ave., Suite 403, Gaithersburg, MD 20879. Internet: **http://www.aagsmo.org**

For career information on photogrammetrists, photogrammetric technicians, remote sensing scientists, and image-based cartographers or geographic information system specialists, contact:

➤ ASPRS: Imaging and Geospatial Information Society, 5410 Grosvenor Lane, Suite 210, Bethesda, MD 20814-2160. Internet: **http://www.asprs.org**

Information on careers in remote sensing, photogrammetry, surveying, GIS, and other geography-related disciplines also is available from the Spring 2005 *Occupational Outlook Quarterly* article, "Geography Jobs", available online at **http://www.bls.gov/opub/ooq/2005/spring/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos040.htm**

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Engineers

Significant Points

- Employment is projected to grow about as fast as the average for all occupations, although growth will vary by specialty; overall job opportunities for engineers are expected to be good.
- A bachelor's degree in engineering is required for most entry-level jobs, but some research positions may require a graduate degree.
- Starting salaries are among the highest of all college graduates.
- Continuing education is critical for engineers in order to keep up with improvements in technology.

Nature of the Work

Engineers apply the principles of science and mathematics to develop economical solutions to technical problems. Their work is the link between scientific discoveries and the commercial applications that meet societal and consumer needs.

Many engineers develop new products. During the process, they consider several factors. For example, in developing an industrial robot, engineers specify the functional requirements precisely; design and test the robot's components; integrate the components to produce the final design; and evaluate the design's overall effectiveness, cost, reliability, and safety. This process applies to the development of many different products, such as chemicals, computers, powerplants, helicopters, and toys.

In addition to their involvement in design and development, many engineers work in testing, production, or maintenance. These engineers supervise production in factories, determine the causes of a component's failure, and test manufactured products to maintain quality. They also estimate the time and cost required to complete projects. Supervisory engineers are responsible for major components or entire projects. (See the statement on engineering and natural sciences managers elsewhere in the *Handbook*.)

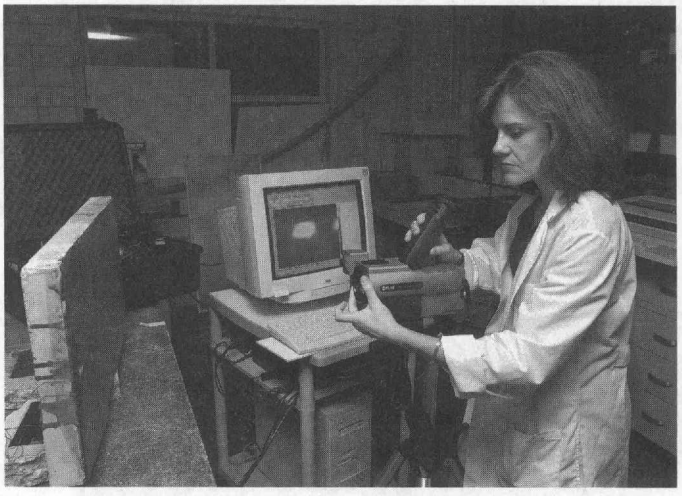
Engineers use computers extensively to produce and analyze designs; to simulate and test how a machine, structure, or system operates; to generate specifications for parts; to monitor the quality of products; and to control the efficiency of processes. Nanotechnology, which involves the creation of high-performance materials and components by integrating atoms and molecules, also is introducing entirely new principles to the design process.

Most engineers specialize. Following are details on the 17 engineering specialties covered in the Federal Government's Standard Occupational Classification (SOC) system. Numerous other specialties are recognized by professional societies, and each of the major branches of engineering has numerous subdivisions. Civil engineering, for example, includes structural and transportation engineering, and materials engineering includes ceramic, metallurgical, and polymer engineering. Engineers also may specialize in one industry, such as motor vehicles, or in one type of technology, such as turbines or semiconductor materials.

Aerospace engineers design, test, and supervise the manufacture of aircraft, spacecraft, and missiles. Those 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, and production methods. They also may specialize in a particular type of aerospace product, such as commercial aircraft, military fighter jets, helicopters, spacecraft, or missiles and rockets, and may become experts in aerodynamics, thermodynamics, celestial mechanics, propulsion, acoustics, or guidance and control systems.

Agricultural engineers apply their knowledge of engineering technology and science to agriculture and the efficient use of biological resources. Accordingly, they also are referred to as *biological and agricultural engineers*. They design agricultural machinery, equipment, sensors, processes, and structures, such as those used for crop storage. Some engineers specialize in areas such as power systems and machinery design, structural and environmental engineering, and food and bioprocess engineering. They develop ways to conserve soil and water and to improve the processing of agricultural products. Agricultural engineers often work in research and development, production, sales, or management.

Biomedical engineers develop devices and procedures that solve medical and health-related problems by combining their knowledge of biology and medicine with engineering principles and practices. Many do research, along with medical scientists, to develop and evaluate systems and products such as artificial organs, prostheses (artificial devices that replace missing body parts), instrumentation, medical information systems, and health management and care delivery systems. Biomedical engineers also may design devices used in various medical procedures, imaging systems such as magnetic resonance



Engineers design tests for new products.

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imaging (MRI), and devices for automating insulin injections or controlling body functions. Most engineers in this specialty need a sound background in another engineering specialty, such as mechanical or electronics engineering, in addition to specialized biomedical training. Some specialties within biomedical engineering are biomaterials, biomechanics, medical imaging, rehabilitation engineering, and orthopedic engineering.

Chemical engineers apply the principles of chemistry to solve problems involving the production or use of chemicals and other products. They design equipment and 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 energy, electronics, food, clothing, and paper. In addition, they work in healthcare, biotechnology, and business services. Chemical engineers apply principles of physics, mathematics, and mechanical and electrical engineering, as well as chemistry. Some may specialize in a particular chemical process, such as oxidation or polymerization. Others specialize in a particular field, such as nanomaterials, or in the development of specific products. They must be aware of all aspects of chemical manufacturing and how the manufacturing process affects the environment and the safety of workers and consumers.

Civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems. They must consider many factors in the design process from the construction costs and expected lifetime of a project to government regulations and potential environmental hazards such as earthquakes and hurricanes. Civil engineering, considered one of the oldest engineering disciplines, encompasses many specialties. The major ones are structural, water resources, 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.

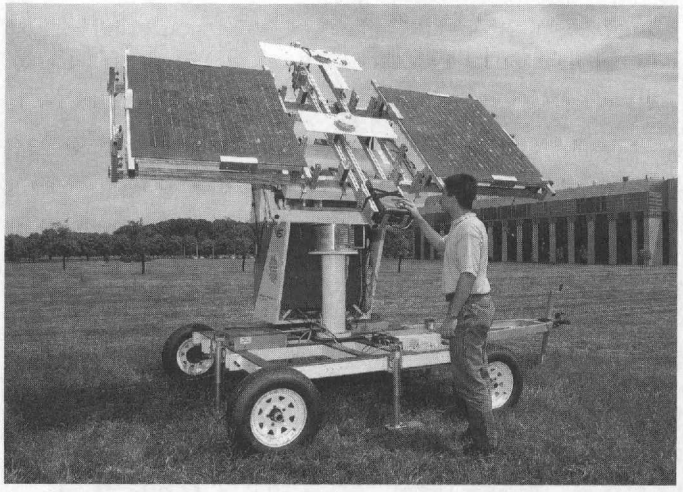
Computer hardware engineers research, design, develop, test, and oversee the manufacture and installation of computer hardware, including computer chips, circuit boards, computer systems, and related equipment such as keyboards, routers, and printers. (Computer software engineers—often simply called 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 similar to that of electronics engineers in that they may design and test circuits and other electronic components; however, computer hardware engineers do that work only as it relates to computers and computer-related equipment. The rapid advances in computer technology are largely a result of the research, development, and design efforts of these engineers.

Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment. Some of this equipment includes electric motors; machinery controls, lighting, and wiring in buildings; radar and navigation systems; communications systems; and power generation, control, and transmission devices used by electric utilities. Electrical engineers also design the electrical systems of automobiles and aircraft. Although the terms *electrical* and *electronics engineering* often are used interchangeably in academia and industry, electrical engineers traditionally have focused on the generation and supply of power, whereas electronics engineers have worked on applications of electricity to control systems or signal processing. Electrical engineers specialize in areas such as power systems engineering or electrical equipment manufacturing.

Electronics engineers, except computer, are responsible for a wide range of technologies, from portable music players to global positioning systems (GPS), which can continuously provide the location of, for example, a vehicle. Electronics engineers design, develop, test, and supervise the manufacture of electronic equipment such as broadcast and communications systems. Many 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. Electronics engineers specialize in areas such as communications, signal processing, and control systems or have a specialty within one of these areas—control systems or aviation electronics, for example.

Environmental engineers use the principles of biology and chemistry to 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, advise on its treatment and containment, and develop regulations to prevent mishaps. They design municipal water supply and industrial wastewater treatment systems, conduct research on the environmental impact of proposed construction projects, analyze scientific data, and perform quality-control checks. Environmental engineers are concerned with local and worldwide environmental issues. Some may study and attempt to minimize the effects of acid rain, global warming, automobile emissions, and ozone depletion. They also may be involved in the protection of wildlife. Many environmental engineers work as consultants, helping their clients to comply with regulations, prevent environmental damage, and clean up hazardous sites.

Health and safety engineers, except mining safety engineers and inspectors, prevent harm to people and property by applying their knowledge of systems engineering and me-



Some engineers, like mining and civil engineers, work outside.

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chanical, chemical, and human performance principles. Using this specialized knowledge, they identify and measure potential hazards, such as the risk of fires or the dangers involved in handling toxic chemicals. They recommend appropriate loss prevention measures according to their probability of harm and potential damage. Health and safety engineers develop procedures and designs to reduce the risk of illness, injury, or damage. Some work in manufacturing industries to ensure that the designs of new products do not create unnecessary hazards. They must be able to anticipate, recognize, and evaluate hazardous conditions, as well as develop hazard control methods.

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 provide a service. They are concerned primarily with increasing productivity through the management of people, methods of business organization, and technology. To maximize efficiency, industrial engineers study product requirements carefully and then design manufacturing and information systems to meet those requirements with the help of mathematical methods and models. They develop management control systems to aid in financial planning and cost analysis, and they 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 and determine the most efficient plant locations. Industrial engineers develop wage and salary administration systems and job evaluation programs. Many industrial engineers move into management positions because the work is closely related to the work of managers.

Marine engineers and naval architects are involved in the design, construction, and maintenance of ships, boats, and related equipment. They design and supervise the construction of everything from aircraft carriers to submarines and from sailboats to tankers. Naval architects work on the basic design of ships, including the form and stability of hulls. Marine engineers work on the propulsion, steering, and other systems of ships. Marine engineers and naval architects apply knowledge from a range of fields to the entire process by which water vehicles are designed and produced. Other workers who operate or supervise the operation of marine machinery on ships and other vessels sometimes may be called marine engineers or, more frequently, ship engineers, but they do different work and are covered under water transportation occupations elsewhere in the *Handbook*.

Materials engineers are involved in the development, processing, and testing of the materials used to create a range of products, from computer chips and aircraft wings to golf clubs and snow skis. They work with metals, ceramics, plastics, semiconductors, and composites to create new materials that meet certain mechanical, electrical, and chemical requirements. They also are involved in selecting materials for new applications. Materials engineers have developed the ability to create and then study materials at an atomic level, using advanced processes to replicate the characteristics of those materials and their components with computers. Most materials engineers specialize in a particular material. For example, metallurgical engineers specialize in metals such as steel, and ceramic engineers develop ceramic materials and the processes for making them into useful products such as glassware or fiber-optic communication lines.

Mechanical engineers research, design, develop, manufacture, and test tools, engines, machines, and other mechanical devices. Mechanical engineering is one of the broadest engineering disciplines. Engineers in this discipline work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines. They also work on 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. Some mechanical engineers design tools that other engineers need for their work. In addition, mechanical engineers work in manufacturing or agriculture production, maintenance, or technical sales; many become administrators or managers.

Mining and geological engineers, including mining safety engineers, find, extract, and prepare coal, metals, and minerals for use by manufacturing industries and utilities. They design open-pit and underground mines, 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 that 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 are working to solve problems related to land reclamation and to water and air pollution. 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 the surfaces of walls and roofs, monitor air quality, and examine mining equipment for compliance with safety practices.



Engineers typically need a bachelor's degree.

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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 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 development of fusion energy. Some specialize in the development of nuclear power sources for naval vessels or spacecraft; others find industrial and medical uses for radioactive materials—for example, in equipment used to diagnose and treat medical problems.

Petroleum engineers design methods for extracting oil and gas from deposits below the earth. Once these resources have been discovered, petroleum engineers work with geologists and other specialists to understand the geologic formation and properties of the rock containing the reservoir, to determine the drilling methods to be used, and to monitor drilling and production operations. They design equipment and processes to achieve the maximum profitable recovery of oil and gas. Because only a small proportion of oil and gas in a reservoir flows out under natural forces, petroleum engineers develop and use various enhanced recovery methods, including injecting water, chemicals, gases, or steam into an oil reservoir to force out more of the oil and doing 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 for increasing the recovery of these resources and lowering the cost of drilling and production operations.

Work environment. 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 here and abroad.

Many engineers work a standard 40-hour week. At times, deadlines or design standards may bring extra pressure to a job, requiring engineers to work longer hours.

Training, Other Qualifications, and Advancement

Engineers typically enter the occupation with a bachelor's degree in an engineering specialty, but some basic research positions may require a graduate degree. Engineers offering their services directly to the public must be licensed. Continuing education to keep current with rapidly changing technology is important for engineers.

Education and training. A bachelor's degree in engineering is required for almost all entry-level engineering jobs. College graduates with a degree in a natural science or mathematics occasionally may qualify for some engineering jobs, especially in specialties that are in high demand. Most engineering degrees are granted in electrical and electronics engineering, mechanical engineering, and 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 which more closely match their interests.

Most engineering programs involve a concentration of study in an engineering specialty, along with courses in both mathematics and the physical and life sciences. Many programs also include courses in general engineering. A design course, sometimes accompanied by a computer or laboratory class or both, is part of the curriculum of most programs. Often, general courses not directly related to engineering, such as those in the social sciences or humanities, also are required.

In addition to the standard engineering degree, many colleges offer 2-year or 4-year degree programs in engineering technology. These programs, which usually include various hands-on laboratory classes that focus on current issues in the application of engineering principles, 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 some research and development programs, but is not required for the majority of entry-level engineering jobs. Many experienced engineers obtain graduate degrees in engineering or business administration to learn new technology and broaden their education. Numerous high-level executives in government and industry began their careers as engineers.

The Accreditation Board for Engineering and Technology (ABET) accredits college and university programs in engineering and engineering technology. ABET accreditation is based on a program's faculty, curriculum, and facilities; the achievement of a program's students; program improvements; and institutional commitment to specific principles of quality and ethics. Graduation from an ABET-accredited program may be required for engineers who need to be licensed.

Although most institutions offer programs in the major branches of engineering, only a few offer programs in the smaller specialties. Also, programs with 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), in addition to courses in English, social studies, and humanities. 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,

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most courses are in engineering, usually with a concentration in one specialty. Some programs offer a general engineering curriculum; students then specialize on the job or in graduate school.

Some engineering schools have agreements with 2-year colleges whereby the 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 that allow students who spend 3 years in a liberal arts college studying preengineering subjects and 2 years in an engineering school studying core subjects to receive 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 with practical work, permitting students to gain valuable experience and to finance part of their education.

Licensure. 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 (PEs). This licensure generally requires a degree from an ABET-accredited engineering program, 4 years of relevant work experience, and 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 (EITs) or engineer interns (EIs). After acquiring suitable work experience, EITs can take the second examination, called 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 own licensure requirements. Many civil, mechanical, and chemical engineers are licensed PEs. Independently of licensure, various certification programs are offered by professional organizations to demonstrate competency in specific fields of engineering.

Other qualifications. 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 becoming increasingly important as engineers interact more frequently with specialists in a wide range of fields outside engineering.

Engineers who work for the Federal Government usually must be U.S. citizens. Some engineers, particularly nuclear engineers and aerospace and other engineers working for defense contractors, may need to hold a security clearance.

Certification and advancement. 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 eventually may become engineering managers or enter other managerial or sales jobs. In sales, an engineering background enables them to discuss a product's technical aspects and assist in product planning, installation, and use. (See the statements under management and business and financial operations occupations, and the statement on sales engineers elsewhere in the *Handbook*.)

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Engineers	17-2000	1,571,900	1,750,300	178,300	11
Aerospace engineers	17-2011	71,600	79,100	7,400	10
Agricultural engineers	17-2021	2,700	3,000	300	12
Biomedical engineers	17-2031	16,000	27,600	11,600	72
Chemical engineers	17-2041	31,700	31,000	-600	-2
Civil engineers	17-2051	278,400	345,900	67,600	24
Computer hardware engineers	17-2061	74,700	77,500	2,800	4
Electrical and electronics engineers	17-2070	301,500	304,600	3,100	1
Electrical engineers	17-2071	157,800	160,500	2,700	2
Electronics engineers, except computer	17-2072	143,700	144,100	400	0
Environmental engineers	17-2081	54,300	70,900	16,600	31
Industrial engineers, including health and safety	17-2110	240,400	273,700	33,200	14
Health and safety engineers, except mining safety engineers and inspectors	17-2111	25,700	28,300	2,600	10
Industrial engineers	17-2112	214,800	245,300	30,600	14
Marine engineers and naval architects	17-2121	8,500	9,000	500	6
Materials engineers	17-2131	24,400	26,600	2,300	9
Mechanical engineers	17-2141	238,700	253,100	14,400	6
Mining and geological engineers, including mining safety engineers	17-2151	7,100	8,200	1,100	15
Nuclear engineers	17-2161	16,900	18,800	1,900	11
Petroleum engineers	17-2171	21,900	25,900	4,000	18
All other engineers	17-2199	183,200	195,400	12,200	7

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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Numerous professional certifications for engineers exist and may be beneficial for advancement to senior technical or managerial positions. Many certification programs are offered by the professional societies listed as sources of additional information for engineering specialties at the end of this statement.

Employment

In 2008, engineers held about 1.6 million jobs. Following is the distribution of employment by engineering specialty:

Civil engineers	278,400
Mechanical engineers	238,700
Industrial engineers	214,800
Electrical engineers	157,800
Electronics engineers, except computer	143,700
Computer hardware engineers	74,700
Aerospace engineers	71,600
Environmental engineers	54,300
Chemical engineers	31,700
Health and safety engineers, except mining safety engineers and inspectors	25,700
Materials engineers	24,400
Petroleum engineers	21,900
Nuclear engineers	16,900
Biomedical engineers	16,000
Marine engineers and naval architects	8,500
Mining and geological engineers, including mining safety engineers	7,100
Agricultural engineers	2,700
All other engineers	183,200

About 36 percent of engineering jobs were found in manufacturing industries, and another 30 percent were in the professional, scientific, and technical services industries, primarily in architectural, engineering, and related services. Many engineers also worked in the construction, telecommunications, and wholesale trade industries.

Federal, State, and local governments employed about 12 percent of engineers in 2008. About 6 percent 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. Many engineers in State and local government agencies worked in highway and public works departments. In 2008, about 3 percent of 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; for example, petroleum engineering jobs tend to be located in States with sizable petroleum deposits, such as Texas, Louisiana, Oklahoma, Alaska, and California. Other branches, such as civil engineering, are widely dispersed, and engineers in these fields often move from place to place to work on different projects.

Job Outlook

Employment of engineers is expected to grow about as fast as the average for all occupations over the next decade, but growth will vary by specialty. Biomedical engineers should experience the fastest growth, while civil engineers should see the largest employment increase. Overall job opportunities in engineering are expected to be good.

Overall employment change. Overall engineering employment is expected to grow by 11 percent over the 2008–18 decade, about as fast as the average for all occupations. Engineers traditionally have been concentrated in slower growing or declining manufacturing industries, in which they will continue to be needed to design, build, test, and improve manufactured products. However, increasing employment of engineers in engineering, research and development, and consulting services industries should generate most of the employment growth. The job outlook varies by engineering specialty, as discussed later.

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 increase productivity and expand output of goods and services. New technologies continue to improve the design process, enabling engineers to produce and analyze various product designs much more rapidly than in the past. Unlike the situation in some other occupations, however, technological advances are not expected to substantially limit employment opportunities in engineering, because engineers are needed to provide the ideas that lead to improved products and more productive processes.

The continued globalization of engineering work will likely dampen domestic employment growth to some degree. There are many well-trained, often English-speaking engineers available around the world who are willing to work at much lower salaries than U.S. engineers. The rise of the Internet has made it relatively easy for part 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. Even so, there will always be a need for onsite engineers to interact with other employees and clients.

Overall job prospects. Overall job opportunities in engineering are expected to be good, and, indeed, prospects will be excellent in certain specialties. In addition to openings from job growth, many openings will be created by the need to replace current engineers who retire; transfer to management, sales, or other occupations; or leave engineering 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 in government funding for research and development have resulted in significant layoffs of engineers in the past. The trend toward contracting for engineering work with engineering services firms, both domestic and foreign, also has made engineers more vulnerable to layoffs during periods of lower demand.

It is important for engineers, as it is for workers in other technical and scientific occupations, to continue their education throughout their careers, because much of their value to their employer depends on their knowledge of the latest technology. Engineers in high-technology areas, such as biotechnology or information technology, may find that their technical knowledge will become outdated rapidly. By keeping current in their field, engineers will be able to deliver the best solutions and greatest value to their employers. Engineers who have not

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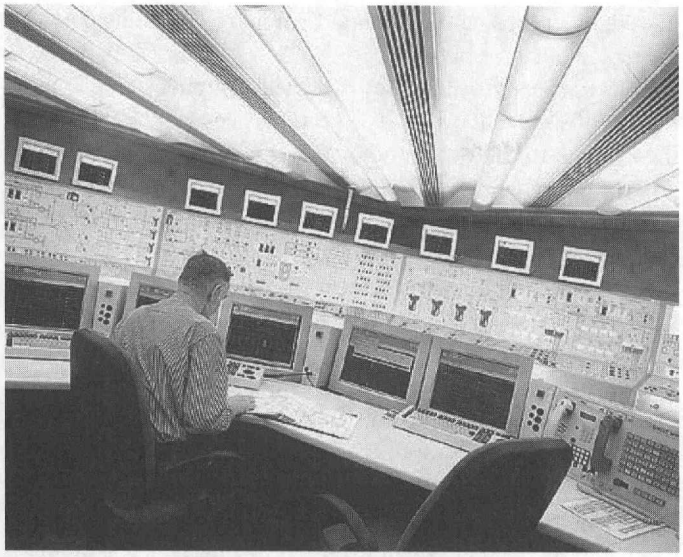

Job opportunities should be favorable for graduates of engineering programs.

kept current in their field may find themselves at a disadvantage when seeking promotions or during layoffs.

Employment change and job outlook by engineering specialty.

Aerospace engineers are expected to have 10 percent growth in employment over the projections decade, about as fast as the average for all occupations. New technologies and new designs for commercial and military aircraft and spacecraft produced during the next decade should spur demand for aerospace engineers. The employment outlook for aerospace engineers appears favorable. Although the number of degrees granted in aerospace engineering has begun to increase after many years of declines, new graduates continue to be needed to replace aerospace engineers who retire or leave the occupation for other reasons.

Agricultural engineers are expected to have employment growth of 12 percent over the projections decade, about as fast as the average for all occupations. Employment growth should result from the need to increase crop yields to feed an expanding population and to produce crops used as renewable energy sources. Moreover, engineers will be needed to develop more efficient agricultural production and to conserve resources. In addition, engineers will be needed to meet the increasing demand for biosensors, used to determine the optimal treatment of crops.

Biomedical engineers are expected to have employment growth of 72 percent over the projections decade, much faster than the average for all occupations. The aging of the population and a growing focus on health issues will drive demand for better medical devices and equipment designed by biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for biomedical engineers, particularly in pharmaceutical manufacturing and related industries. Because of the growing interest in this field, the number of degrees granted in biomedical engineering has increased greatly. Many biomedical engineers, particularly those employed in research laboratories, need a graduate degree.

Chemical engineers are expected to have an employment decline of 2 percent over the projections decade. Overall employment in the chemical manufacturing industry is expected to continue to decline, although chemical companies will continue to employ chemical engineers to research and develop new chemicals and more efficient processes to increase output of existing chemicals. However, there will be employment growth for chemical engineers in service-providing industries, such as professional, scientific, and technical services, particularly for research in energy and the developing fields of biotechnology and nanotechnology.

Civil engineers are expected to have employment growth of 24 percent over the projections decade, much faster than the average for all occupations. Spurred by general population growth and the related need to improve the Nation's infrastructure, more civil engineers will be needed to design and construct or expand transportation, water supply, and pollution control systems, and buildings and building complexes. They also will be needed to repair or replace existing roads, bridges, and other public structures. Because construction industries and architectural, engineering, and related services employ many civil engineers, employment opportunities will vary by geographic area and may decrease during economic slowdowns, when construction is often curtailed.

Computer hardware engineers are expected to have employment growth of 4 percent over the projections decade, slower than the average for all occupations. 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. As computer and semiconductor manufacturers contract out more of their engineering needs to both domestic and foreign design firms, much of the growth in employment of hardware engineers is expected to take place in the computer systems design and related services industry.

Electrical engineers are expected to have employment growth of 2 percent over the projections decade. Although strong demand for electrical devices—including electric power generators, wireless phone transmitters, high-density batteries, and navigation systems—should spur job growth, international competition and the use of engineering services performed in other countries will limit employment growth. Electrical engineers working in firms providing engineering expertise and design services to manufacturers should have better job prospects.

Electronics engineers, except computer, are expected to experience little to no employment change over the projections decade. Although rising demand for electronic goods—including communications equipment, defense-related equipment, medical electronics, and consumer products—should continue to increase demand for electronics engineers, foreign competition in electronic products development and the use of engineering services performed in other countries will limit employment growth. Growth is expected to be fastest in service-providing industries—particularly in firms that provide engineering and design services.

Environmental engineers are expected to have employment growth of 31 percent over the projections decade, much faster than the average for all occupations. More environmental engineers will be needed to help companies comply with envi-

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ronmental regulations and to develop methods of cleaning up environmental hazards. A shift in emphasis toward preventing problems rather than controlling those which already exist, as well as increasing public health concerns resulting from population growth, also are expected to spur demand for environmental engineers. Because of this employment growth, job opportunities should be favorable.

Health and safety engineers, except mining safety engineers and inspectors, are expected to have employment growth of 10 percent over the projections decade, about as fast as the average for all occupations. Because health and safety engineers make production processes and products as safe as possible, their services should be in demand as concern increases for health and safety within work environments. As new technologies for production or processing are developed, health and safety engineers will be needed to ensure that they are safe.

Industrial engineers are expected to have employment growth of 14 percent over the projections decade, faster than the average for all occupations. As firms look for new ways to reduce costs and raise productivity, they increasingly will turn to industrial engineers to develop more efficient processes and reduce costs, delays, and waste. This focus should lead to job growth for these engineers, even in some manufacturing industries with declining employment overall. Because their work is similar to that done in management occupations, many industrial engineers leave the occupation to become managers. Numerous openings will be created by the need to replace industrial engineers who transfer to other occupations or leave the labor force.

Marine engineers and naval architects are expected to have employment growth of 6 percent over the projections decade, slower than the average for all occupations. Continued demand for naval vessels and recreational small craft should more than offset the long-term decline in the domestic design and construction of large oceangoing vessels. Good prospects are expected for marine engineers and naval architects because of growth in employment, the need to replace workers who retire or take other jobs, and the limited number of students pursuing careers in this occupation.

Materials engineers are expected to have employment growth of 9 percent over the projections decade, about as fast as the average for all occupations. Growth should result from increased use of composite and other nontraditional materials developed through biotechnology and nanotechnology research. As manufacturing firms contract for their materials engineering needs, most employment growth is expected in professional, scientific, and technical services industries.

Mechanical engineers are expected to have employment growth of 6 percent over the projections decade, slower than the average for all occupations. Mechanical engineers are involved in the production of a wide range of products, and continued efforts to improve those products will create continued demand for their services. In addition, some new job opportunities will be created through the effects of emerging technologies in biotechnology, materials science, and nanotechnology. Additional opportunities outside of mechanical engineering will exist because the skills acquired through earning a degree in mechanical engineering often can be applied in other engineering specialties.

Mining and geological engineers, including mining safety engineers, are expected to have employment growth of 15 percent over the projections decade, faster than the average for all occupations. Following a lengthy period of decline, strong growth in demand for minerals is expected to create some employment growth over the 2008–18 period. Moreover, many currently employed mining engineers are approaching retirement age, a factor that should create additional job openings. Furthermore, relatively few schools offer mining engineering programs, resulting in good job opportunities for graduates. The best opportunities may require frequent travel or even living overseas for extended periods as mining operations around the world recruit graduates of U.S. mining engineering programs.

Nuclear engineers are expected to have employment growth of 11 percent over the projections decade, about as fast as the

Table 1. Earnings distribution by engineering specialty, May 2008.

Specialty	Lowest 10%	Lowest 25%	Median	Highest 25%	Highest 10%
Aerospace engineers	$58,130	$72,390	$92,520	$114,530	$134,570
Agricultural engineers	43,150	55,430	68,730	86,400	108,470
Biomedical engineers	47,640	59,420	77,400	98,830	121,970
Chemical engineers	53,730	67,420	84,680	105,000	130,240
Civil engineers	48,140	58,960	74,600	94,470	115,630
Computer hardware engineers	59,170	76,250	97,400	122,750	148,590
Electrical engineers	52,990	64,910	82,160	102,520	125,810
Electronics engineers, except computer	55,330	68,400	86,370	106,870	129,920
Environmental engineers	45,310	56,980	74,020	94,280	115,430
Health and safety engineers, except mining safety engineers and inspectors	43,540	56,190	72,490	90,740	106,220
Industrial engineers	47,720	59,120	73,820	91,020	107,270
Marine engineers and naval architects	43,070	57,060	74,140	94,840	118,630
Materials engineers	51,420	63,830	81,820	102,040	124,470
Mechanical engineers	47,900	59,230	74,920	94,400	114,740
Mining and geological engineers, including mining safety engineers	45,020	57,970	75,960	96,030	122,750
Nuclear engineers	68,300	82,540	97,080	115,170	136,880
Petroleum engineers	57,820	80,040	108,020	148,700	>166,400
Engineers, all other	49,270	67,360	88,570	110,310	132,070

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average for all occupations. Most job growth will be in research and development and engineering services. Although no commercial nuclear power plants have been built in the United States for many years, increased interest in nuclear power as an energy source will spur demand for nuclear engineers to research and develop new designs for reactors. 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. Nuclear engineers are expected to have good employment opportunities because the small number of nuclear engineering graduates is likely to be in rough balance with the number of job openings.

Petroleum engineers are expected to have employment growth of 18 percent over the projections decade, faster than the average for all occupations. Petroleum engineers increasingly will be needed to develop new resources, as well as new methods of extracting more from existing sources. Excellent opportunities are expected for petroleum engineers because the number of job openings is likely to exceed the relatively small number of graduates. Petroleum engineers work around the world, and in fact, the best employment opportunities may include some work in other countries.

Earnings

Earnings for engineers vary significantly by specialty, industry, and education. Variation in median earnings and in the earnings distributions for engineers in a number of specialties is especially significant. Table 1 shows wage distributions in May 2008 for engineers in specialties covered in this statement.

In the Federal Government, mean annual salaries for engineers ranged from $81,085 in agricultural engineering to $126,788 in ceramic engineering in March 2009.

As a group, engineers earn some of the highest average starting salaries among those holding bachelor's degrees. Average starting salary offers for graduates of bachelor's degree programs in engineering, according to a July 2009 survey by the National Association of Colleges and Employers, were as follows:

Petroleum	$83,121
Chemical	64,902
Mining and Mineral	64,404
Computer	61,738
Nuclear	61,610
Electrical/electronics and communications	60,125
Mechanical	58,766
Industrial/manufacturing	58,358
Materials	57,349
Aerospace/aeronautical/astronautical	56,311
Agricultural	54,352
Bioengineering and biomedical	54,158
Civil	52,048

Related Occupations

Engineers apply the principles of natural science and mathematics in their work. Other workers who use scientific and mathematical principles include the following:

	Page
Agricultural and food scientists	177
Architects, except landscape and naval	151
Atmospheric scientists	192
Biological scientists	181
Chemists and materials scientists	195
Computer and information systems managers	35
Computer scientists	132
Computer software engineers and computer programmers	134
Drafters	170
Engineering and natural sciences managers	46
Engineering technicians	173
Environmental scientists and specialists	199
Geoscientists and hydrologists	202
Mathematicians	143
Physicists and astronomers	206
Sales engineers	545
Science technicians	230

Sources of Additional Information

Information about careers in engineering is available from:

➤ JETS, 1420 King St., Suite 405, Alexandria, VA 22314. Internet: **http://www.jets.org**

Information on ABET-accredited engineering programs is available from:

➤ ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202. Internet: **http://www.abet.org**

Those interested in information on the Professional Engineer licensure should contact:

➤ National Council of Examiners for Engineering and Surveying, P.O. Box 1686, Clemson, SC 29633. Internet: **http://www.ncees.org**

➤ National Society of Professional Engineers, 1420 **King** St., **Alexandria,** VA **22314.** Internet: **http://www.nspe.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. Internet: **http://www.asee.org**

Information on obtaining engineering positions with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724–1850 or TDD (978) 461–8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

For more detailed information on an engineering specialty, contact societies representing the individual branches of en-

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gineering. Each can provide information about careers in the particular branch.

Aerospace engineers

➤ American Institute of Aeronautics and Astronautics, Inc., 1801 Alexander Bell Dr., Suite 500, Reston, VA 20191. Internet: **http://www.aiaa.org**

Agricultural engineers

➤ American Society of Agricultural and Biological Engineers, 2950 Niles Rd., St. Joseph, MI 49085. Internet: **http://www.asabe.org**

Biomedical engineers

➤ Biomedical Engineering Society, 8401 Corporate Dr., Suite 140, Landover, MD 20785. Internet: **http://www.bmes.org**

Chemical engineers

➤ American Chemical Society, Department of Career Services, 1155 16th St. NW., Washington, DC 20036. Internet: **http://www.chemistry.org**

➤ American Institute of Chemical Engineers, 3 Park Ave., New York, NY 10016. Internet: **http://www.aiche.org**

Civil engineers

➤ American Society of Civil Engineers, 1801 Alexander Bell Dr., Reston, VA 20191. Internet: **http://www.asce.org**

Computer hardware engineers

➤ IEEE Computer Society, 2001 L St. NW., Suite 700., Washington, DC 20036. Internet: **http://www.computer.org**

Electrical and electronics engineers

➤ IEEE–USA, 2001 L St. NW., Suite 700, Washington, DC 20036. Internet: **http://www.ieeeusa.org**

Environmental engineers

➤ American Academy of Environmental Engineers, 130 Holiday Court, Suite 100, Annapolis, MD 21401. Internet: **http://www.aaee.net**

Health and safety engineers

➤ American Society of Safety Engineers, 1800 E Oakton St., Des Plaines, IL 60018. Internet: **http://www.asse.org**

Industrial engineers

➤ Institute of Industrial Engineers, 3577 Parkway Lane, Suite 200, Norcross, GA 30092. Internet: **http://www.iienet.org**

Marine engineers and naval architects

➤ Society of Naval Architects and Marine Engineers, 601 Pavonia Ave., Jersey City, NJ 07306. Internet: **http://www.sname.org**

Materials engineers

➤ ASM International, 9639 Kinsman Rd., Materials Park, OH 44073. Internet: **http://www.asminternational.org**

➤ Minerals, Metals, and Materials Society, 184 Thorn Hill Rd., Warrendale, PA 15086. Internet: **http://www.tms.org**

Mechanical engineers

➤ American Society of Mechanical Engineers, 3 Park Ave., New York, NY 10016. Internet: **http://www.asme.org**

➤ SAE International, 400 Commonwealth Dr., Warrendale, PA 15096. Internet: **http://www.sae.org**

Mining and geological engineers, including mining safety engineers

➤ Society for Mining, Metallurgy, and Exploration, Inc., 8307 Shaffer Parkway, Littleton, CO 80127. Internet: **http://www.smenet.org**

Nuclear engineers

➤ American Nuclear Society, 555 North Kensington Ave., La Grange Park, IL 60526. Internet: **http://www.ans.org**

Petroleum engineers

➤ Society of Petroleum Engineers, 222 Palisades Creek Dr., Richardson, TX 75080. Internet: **http://www.spe.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos027.htm**

Drafters and Engineering Technicians

Drafters

Significant Points

- Opportunities should be best for individuals with at least 2 years of postsecondary training in drafting.
- Overall employment is projected to grow more slowly than average, but growth will vary by specialty.
- Demand for various types of drafters depends on the needs of local industry.

Nature of the Work

Drafters prepare technical drawings and plans, which are used by production and construction workers to build everything from microchips to skyscrapers.

Drafters' drawings provide visual guidelines and show how to construct a product or structure. Drawings include technical details and specify dimensions, materials, and procedures. Drafters fill in technical details using drawings, rough sketches, specifications, and calculations made by engineers, surveyors, architects, or scientists. For example, many drafters use their knowledge of standardized building techniques to draw in the details of structures. Some use their understanding of engineering and manufacturing theory and standards to draw the parts

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of a machine; they 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.

Most drafters use Computer Aided Design and Drafting (CADD) systems to prepare drawings. Consequently, some drafters may be referred to as CADD operators. With CADD systems, drafters can create and store drawings electronically so that they can be viewed, printed, or programmed directly into automated manufacturing systems. CADD systems also permit drafters to quickly prepare variations of a design. Although drafters use CADD extensively, they still need knowledge of traditional drafting techniques in order to fully understand and explain concepts.

Drafting work has many specialties; the most common types of drafters are the following:

Aeronautical drafters prepare engineering drawings that detail plans and specifications used in the manufacture of aircraft, missiles, and related parts.

Architectural drafters draw architectural and structural features of buildings for new construction projects. These workers may specialize in a type of building, 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 and wiring in communication centers, power plants, 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.

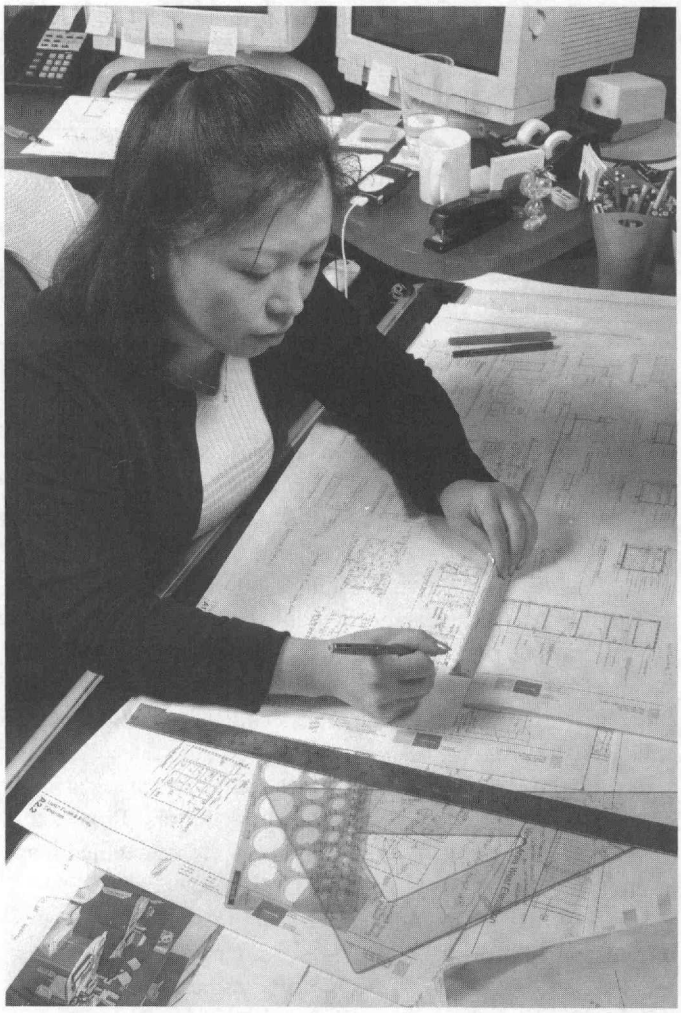
Mechanical drafters prepare drawings showing the detail and method of assembly of a wide variety of machinery and mechanical devices, indicating dimensions, fastening methods, and other requirements.

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.

Work environment. Drafters usually work in comfortable offices. Because they spend long periods in front of computers doing detailed work, drafters may be susceptible to eyestrain, back discomfort, and hand and wrist problems. Most drafters work a standard 40-hour week; only a small number work part time.

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 CADD techniques.



Most drafters use computer-aided design and drafting software.

Education and training. High school courses in mathematics, science, computer technology, design, computer graphics, and, where available, drafting are useful for people considering a drafting career. Employers prefer applicants who have also completed training after high school at a technical institute, community college, or 4-year college or university. Prospective students should contact prospective employers to ask which schools they prefer and contact schools to ask for information about the kinds of jobs their graduates have, the type and condition of instructional facilities and equipment, and teacher qualifications.

Technical institutes offer intensive technical training, but they provide a less general education than do community colleges. Either certificates or diplomas may be awarded, and programs can vary considerably in length and in the types of courses offered. Many technical institutes offer 2-year associate degree programs.

Community colleges offer programs similar to those in technical institutes but include more classes in drafting theory and also often require general education classes. Courses taken at community colleges are more likely 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 a 4-year college. Most 4-year colleges do not offer training in drafting, but they do offer classes

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Drafters	17-3010	251,900	262,500	10,700	4
Architectural and civil drafters	17-3011	118,400	129,100	10,800	9
Electrical and electronics drafters	17-3012	33,600	33,900	300	1
Mechanical drafters	17-3013	78,700	77,800	-900	-1
Drafters, all other	17-3019	21,200	21,700	500	2

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

in engineering, architecture, and mathematics that 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.

Training differs somewhat within the drafting specialties, although the basics, such as mathematics, are similar. In an electronics drafting program, for example, students learn how to depict electronic components and circuits in drawings. In architectural drafting, they learn the technical specifications of buildings.

Certification and other qualifications. Mechanical ability and visual aptitude are important for drafters. Prospective drafters should be able to draw well and perform detailed work accurately. 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, and other professionals and, sometimes, with customers.

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 knowledge and an understanding of nationally recognized practices. Individuals who wish to become certified must pass the Drafter Certification Test, which is administered periodically at ADDA-authorized sites. Applicants are tested on basic drafting concepts, such as geometric construction, working drawings, and architectural terms and standards.

Advancement. Entry-level or junior drafters usually do routine work under close supervision. After gaining experience, they may become intermediate 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 to senior drafter, designer, or supervisor. Many employers pay for continuing education; with appropriate college degrees, drafters may go on to become engineering technicians, engineers, or architects.

Employment

Drafters held about 251,900 jobs in 2008. Architectural and civil drafters held 47 percent of these jobs, mechanical drafters held about 31 percent, and electrical and electronics drafters held about 13 percent.

About 52 percent 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. Another 24 percent of jobs were in manufacturing industries such as machinery, fabricated metal products, computer and electronic products, and transportation-equipment manufacturing. Approximately 3 percent of drafters were self-employed in 2008.

Job Outlook

Drafters can expect slower than average employment growth, with the best opportunities expected for those with at least 2 years of postsecondary training.

Employment change. Employment of drafters is expected to grow by 4 percent between 2008 and 2018, which is slower than the average for all occupations. However, growth will vary by specialty.

Architectural and civil drafting is expected to be the fastest growing specialty, increasing by 9 percent, which is about as fast as the average. Increases in overall construction activity stemming from U.S. population growth and the related need to improve the Nation's infrastructure should spur demand for drafters trained in architectural and civil design.

In contrast to employment of architectural and civil drafters, little or no change in employment is expected of mechanical drafters and of electronic and electrical drafters. Many of these workers are concentrated in slow-growing or declining manufacturing industries that offer few opportunities for growth related to expansion. However, increasingly complex design problems associated with new products and manufacturing processes will increase the demand for mechanical drafters and electronic and electrical drafters employed in engineering and drafting services firms that will be charged with finding solutions to these problems.

Across all specialties, CADD systems that are more powerful and easier to use will allow many tasks to be done by other technical professionals, thus curbing demand for drafters. Job growth also should be slowed as some drafting work, which can be done by sending CADD files over the Internet, is outsourced offshore to countries that pay lower wages.

Job prospects. Opportunities should be best for individuals with at least 2 years of postsecondary training in a drafting program that provides strong technical skills and 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 tech-

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nology continues to advance, employers will look for drafters with a strong background in fundamental drafting principles, a high level of technical sophistication, and the ability to apply their knowledge to a broader range of responsibilities. Most job openings are expected to arise from the need to replace drafters who transfer to other occupations or leave the labor force completely.

Employment of drafters remains tied to industries that are sensitive to cyclical changes in the economy, primarily construction and manufacturing. 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.

Demand for particular drafting specialties varies throughout the country because employment usually is contingent on the needs of local industry.

Earnings

Drafters' earnings vary by specialty, location, and level of responsibility. Median annual wages of architectural and civil drafters were $44,490 in May 2008. The middle 50 percent earned between $35,290 and $55,740. The lowest 10 percent earned less than $28,220, and the highest 10 percent earned more than $67,110. Median annual wages for architectural and civil drafters in architectural, engineering, and related services were $44,390.

Median annual wages of mechanical drafters were $46,640 in May 2008. The middle 50 percent earned between $36,490 and $59,010. The lowest 10 percent earned less than $29,390, and the highest 10 percent earned more than $71,340. Median annual wages for mechanical drafters in architectural, engineering, and related services were $47,630.

Median annual wages of electrical and electronics drafters were $51,320 in May 2008. The middle 50 percent earned between $40,210 and $65,400. The lowest 10 percent earned less than $32,050, and the highest 10 percent earned more than $79,790. In architectural, engineering, and related services, median annual wages for electrical and electronics drafters were $47,910.

Related Occupations

Other workers who prepare or analyze detailed drawings and make precise calculations and measurements include:

	Page
Architects, except landscape and naval	151
Commercial and industrial designers	304
Engineers	161
Engineering technicians	173
Landscape architects	154
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	157

Sources of Additional Information

Information on schools offering programs in drafting and related fields is available from:

➤ Accrediting Commission of Career Schools and Colleges, 2101 Wilson Blvd., Suite 302, Arlington, VA 22201. Internet: **http://www.accsc.org**

Information about certification is available from:

➤ American Design Drafting Association, 105 E. Main St., Newbern, TN 38059. Internet: **http://www.adda.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos111.htm**

Engineering Technicians

Significant Points

- Electrical and electronic engineering technicians make up 33 percent of all engineering technicians.
- Employment of engineering technicians is influenced by economic conditions similar to those which affect engineers; as a result, job outlook varies by specialty.
- Opportunities will be best for individuals with an associate degree or other postsecondary 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 narrowly focused and application-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, those 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 and drafting (CADD) equipment.

Most engineering technicians specialize, learning skills and working in the same disciplines as engineers. Occupational titles, therefore, tend to reflect this similarity. The Handbook does not cover in detail some branches of engineering technology, such as chemical engineering technology (the development of new chemical products and processes) and bioengineering technology (the development and implementation of biomedical equipment), for which there are accredited programs of study.

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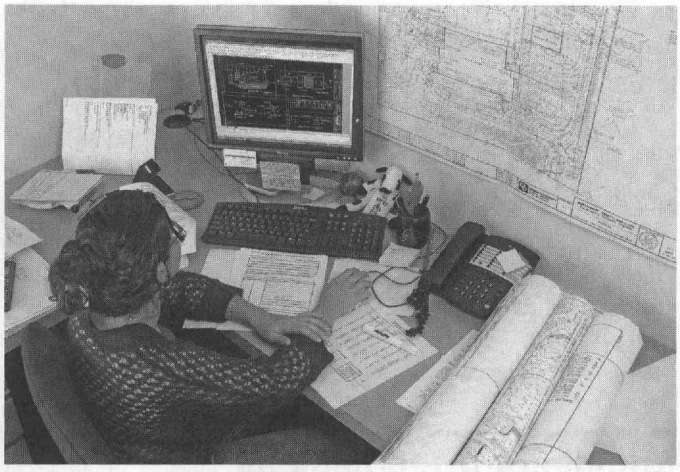

Engineering technicians assist engineers in designing and testing new products.

Aerospace engineering and operations technicians operate and maintain equipment used to test aircraft and spacecraft. New aircraft designs are subjected to years of testing before they are put into service, since failure of key components during flight can be fatal. Technicians may calibrate test equipment, such as wind tunnels, and determine causes of equipment malfunctions. They may also program and run computer simulations that test new designs virtually. Using computer and communications systems, aerospace engineering and operations technicians often record and interpret test data.

Civil engineering technicians help civil engineers plan and oversee the construction of highways, buildings, bridges, dams, wastewater treatment systems, and other structures. 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; construction and building inspectors; drafters; and surveyors, cartographers, photogrammetrists, and surveying and mapping technicians are covered elsewhere in the Handbook.)

Electrical and electronic engineering technicians help design, develop, test, and manufacture electrical and electronic equipment such as communication equipment, medical monitoring 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 primarily involve repairing electrical and electronic equipment are often are referred to as electronics technicians, but they are included with electrical and electronics installers and repairers elsewhere in the Handbook.)

Electro-mechanical engineering technicians combine knowledge of mechanical engineering technology with knowledge of electrical and electronic circuits to design, develop, test, and manufacture electronic and computer-controlled mechanical systems, such as robotic assembly machines. They also operate these machines in factories and other worksites. Their work often overlaps that of both electrical and electronic engineering technicians and mechanical engineering technicians.

Environmental engineering technicians work closely with environmental engineers and scientists in developing methods and devices used in the prevention, control, or remediation of environmental hazards. They inspect and maintain equipment related to air pollution and recycling. Some inspect water and wastewater treatment systems to ensure that pollution control requirements are met.

Industrial engineering technicians study the efficient use of personnel, materials, and machines in factories, stores, repair shops, and offices. Working under the direction of industrial engineers, they prepare layouts of machinery and equipment, plan the flow of work, conduct statistical studies of production time or quality, and analyze production costs.

Mechanical engineering technicians help engineers design, develop, test, and manufacture industrial machinery, consumer products, and other equipment. They may assist in product tests by, for example, setting up instrumentation for auto crash tests. They may make sketches and rough layouts, record and analyze data, make calculations and estimates, and report on their findings. 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.

Work environment. Most engineering technicians work 40 hours a week in laboratories, in offices, in manufacturing or industrial plants, or on construction sites. Some may be exposed to hazards from equipment, chemicals, or toxic materials, but incidents are rare as long as proper procedures are followed.

Training, Other Qualifications, and Advancement

Most employers prefer to hire engineering technicians with an associate degree or other postsecondary training in engineering technology. Training is available at technical institutes, at community colleges, at extension divisions of colleges and universities, at public and private vocational-technical schools, and in the Armed Forces.

Education and training. Although it may be possible to qualify for certain engineering technician jobs without formal training, most employers prefer to hire someone with a 2-year associate degree or other postsecondary training in engineering technology. Workers with less formal engineering technology training need more time to learn skills while on the job. Prospective engineering technicians should take as many high school science and math courses as possible to prepare for programs in engineering technology after high school.

Most 2-year associate degree programs accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) include at least college algebra and trigonometry and one or two basic science courses. Depending on the specialty, more math or science may be required. About 700 ABET-accredited programs are offered in engineering technology specialties.

The type of technical courses required depends on the specialty. For example, prospective mechanical engineering technicians may take courses in fluid mechanics, thermodynamics, and mechanical design; prospective electrical engineering technicians may need classes in electrical circuits, microprocessors, and digital electronics; and those preparing to work in environmental engineering technology need courses

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Engineering technicians, except drafters	17-3020	497,300	523,100	25,800	5
Aerospace engineering and operations technicians	17-3021	8,700	8,900	200	2
Civil engineering technicians	17-3022	91,700	107,200	15,500	17
Electrical and electronic engineering technicians	17-3023	164,000	160,400	-3,600	-2
Electro-mechanical technicians	17-3024	16,400	15,600	-800	-5
Environmental engineering technicians	17-3025	21,200	27,500	6,400	30
Industrial engineering technicians	17-3026	72,600	77,400	4,800	7
Mechanical engineering technicians	17-3027	46,100	45,500	-700	-1
Engineering technicians, except drafters, all other	17-3029	76,600	80,600	4,000	5

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

in environmental regulations and safe handling of hazardous materials.

Technical institutes offer intensive technical training through application and practice, but they provide less theory and general education than do community colleges. Many technical institutes 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 organizations, with programs that vary considerably in length and types of courses offered.

Community colleges offer curriculums that are similar to those in technical institutes but 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, whereas others continue their education at 4-year colleges. However, an associate degree in pre-engineering is different from one in engineering technology. Students who enroll in a 2-year pre-engineering program may find it difficult to find work as an engineering technician if 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 having 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.

Vocational-technical schools, another source of technical training, include postsecondary public institutions that serve local students and emphasize training needed by local employers. Most schools that offer training to become an engineering technician 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 and may be less applicable 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.

Other qualifications. Because many engineering technicians assist in design work, creativity is desirable. Good communication skills and the ability to work well with others also are important because engineering technicians are typically part of a team of engineers and other technicians.

Certification and advancement. 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.

Employment

Engineering technicians held 497,300 jobs in 2008. Approximately 33 percent were electrical and electronic engineering technicians, as indicated by the following tabulation.

Electrical and electronic engineering technicians.....164,000
Civil engineering technicians.....91,700
Industrial engineering technicians.....72,600
Mechanical engineering technicians.....46,100
Environmental engineering technicians.....21,200
Electro-mechanical technicians.....16,400
Aerospace engineering and operations technicians.....8,700
Engineering technicians, except drafters, all other.....76,600

About 34 percent of all engineering technicians worked in manufacturing. Another 25 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 2008, the Federal Government employed 35,300 engineering technicians. State governments employed 31,300, and local governments employed 25,100.

Job Outlook

Overall employment of engineering technicians is expected to grow slower than the average for all occupations, but projected growth and job prospects vary by specialty. Opportunities will be best for individuals with an associate degree or other postsecondary training in engineering technology.

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Employment change. Overall employment of engineering technicians is expected to grow by 5 percent between 2008 and 2018, slower than the average for all occupations. Competitive pressures will force companies to improve and update manufacturing facilities and product designs, although increased efficiencies and automation of many support activities will curtail job growth for engineering technicians.

Employment of engineering technicians in some design functions may also be affected by increasing globalization of the development process. To reduce costs and speed project completion, some companies may relocate part of their development operations to facilities overseas, affecting both engineers and engineering technicians—particularly in electronics and computer-related specialties. However, some aspects of the work of engineering technicians require on-site presence, particularly in the environmental, civil, and industrial specialties, so demand for these engineering technicians within the United States should continue to grow.

Because engineering technicians work closely with engineers, employment of engineering technicians is often influenced by the same local and national economic conditions that affect engineers. As a result, the employment outlook varies with industry and specialization.

Aerospace engineering and operations technicians are expected to have 2 percent employment growth between 2008 and 2018, signifying little or no change. Although demand for aerospace products will continue to grow, increased use of computer simulations for designing and testing new products will diminish the need for new aerospace engineering technicians.

Civil engineering technicians are expected to have 17 percent employment growth between 2008 and 2018, faster than the average for all occupations. Spurred by population growth and the related need to improve the Nation's infrastructure, more civil engineering technicians will be needed to expand transportation, water supply, and pollution control systems, as well as large buildings and building complexes. They also will be needed to repair or replace existing roads, bridges, and other public structures.

The number of electrical and electronic engineering technician jobs is expected to decline by 2 percent between 2008 and 2018, signifying little or no change. Despite rising demand for electronic goods—including communications equipment, defense-related equipment, medical electronics, and consumer products—foreign competition in design and manufacturing, together with increased efficiencies in the design process, will reduce demand for these workers.

The number of electro-mechanical technician jobs is expected to decline moderately by 5 percent between 2008 and 2018. As with the closely related electrical and electronic engineering technicians and mechanical engineering technicians, job losses will be caused by increased productivity in the design and manufacture of electro-mechanical products such as unmanned aircraft and robotic equipment.

Environmental engineering technicians are expected to have 30 percent employment growth between 2008 and 2018, much faster than the average for all occupations. More environmental engineering technicians 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 which already exist, as well as increasing public health concerns resulting from population growth, also will spur demand.

Industrial engineering technicians are expected to have 7 percent employment growth between 2008 and 2018, about as fast as average. As firms continue to seek new means of reducing costs and increasing productivity, demand for industrial engineering technicians to analyze and improve production processes should increase. This should lead to some job growth even in manufacturing industries with slowly growing or declining employment.

Mechanical engineering technicians are expected to decline by 1 percent between 2008 and 2018, which represents little or no change. Increased foreign competition in both design services and manufacturing, together with improved efficiencies in design and testing, will reduce the need for mechanical engineering technicians.

Job prospects. Job prospects will vary by specialty and location, as employment is influenced by economic conditions similar to those which affect engineers. In general, opportunities will be best for individuals with an associate degree or other postsecondary training in engineering technology. As technology becomes more sophisticated, employers will continue to look for technicians who are skilled in new technology and who require little additional training. Even in specialties that are expected to experience job declines, there will still be job openings resulting from the need to replace technicians who retire or leave the labor force for any other reason.

Earnings

Median annual wages in May 2008 of engineering technicians by specialty are shown in the following tabulation.

Aerospace engineering and operations technicians	$55,040
Electrical and electronic engineering technicians	53,240
Mechanical engineering technicians	48,130
Industrial engineering technicians	47,180
Electro-mechanical technicians	46,310
Civil engineering technicians	44,290
Environmental engineering technicians	41,100

Median annual wages of wage and salary electrical and electronic engineering technicians were $53,240 in May 2008. The middle 50 percent earned between $41,550 and $64,120. The lowest 10 percent earned less than $32,490, and the highest 10 percent earned more than $78,560. Median annual earnings in the industries employing the largest numbers of electrical and electronic engineering technicians were:

Wired telecommunications carriers	$56,080
Architectural, engineering, and related services	51,650
Semiconductor and other electronic component manufacturing	48,960
Navigational, measuring, electromedical, and control instruments manufacturing	48,200
Employment services	42,960

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In May 2008, median annual wages for aerospace engineering and operations technicians in the aerospace products and parts manufacturing industry were $52,150, and the median annual salary for environmental engineering technicians in the architectural, engineering, and related services industry was $39,510. Median annual wages for civil engineering technicians in the architectural, engineering, and related services industry were $43,880. The median annual wage for industrial engineering technicians in the semiconductor and other electronic component manufacturing industry was $43,760. In the architectural, engineering, and related services industry, the median annual wage for mechanical engineering technicians was $47,130. Electro-mechanical technicians earned a median annual wage of $44,580 in the semiconductor and other electronic component manufacturing industry.

Related Occupations

Engineering technicians apply scientific and engineering skills that are usually gained in postsecondary programs below the bachelor's degree level. Similar occupations include:

	Page
Broadcast and sound engineering technicians and radio operators	337
Drafters	170
Science technicians	230

Sources of Additional Information

Information about careers in engineering technology is available from:

➤ JETS (Junior Engineering Technical Society), 1420 King St., Suite 405, Alexandria, VA 22314. Internet: **http://www.jets.org**

➤ Pathways to Technology. Internet: **http://www.pathwaystotechnology.org**

Information on engineering technology programs accredited by the Accreditation Board for Engineering and Technology is available from:

➤ ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202. Internet: **http://www.abet.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos112.htm**

Life Scientists

Agricultural and Food Scientists

Significant Points

- Faster than average growth is expected as agricultural and food scientists develop new products using biotechnology and work to limit the negative environmental impact of agriculture.
- A bachelor's degree in agricultural science is sufficient for most jobs in product development; a master's or Ph.D. degree is generally required for research positions.
- Opportunities are expected to be good.

Nature of the Work

The work of agricultural and food scientists plays an important role in maintaining the Nation's food supply by ensuring agricultural productivity and food safety. *Agricultural scientists* study farm crops and animals and develop ways of improving their quantity and quality. They look for ways to improve crop yield, 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. Some agricultural scientists look for ways to use agricultural products for fuels.

In recent years, advances in the study of genetics have spurred the growth of biotechnology. Some agricultural and food scientists use biotechnology to manipulate the genetic material of plants and crops, attempting to make these organisms more productive or resistant to disease. 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. Interest in the production of biofuels, or fuels manufactured from agricultural derivatives, has also increased. Some agricultural scientists work with biologists and chemists to develop more efficient processes for turning crops into energy sources, such as ethanol produced from corn.

Another emerging technology expected to affect agriculture is nanotechnology—a molecular manufacturing technology which promises to revolutionize methods of testing agricultural and food products for contamination or spoilage. Some food scientists are using nanotechnology to develop sensors that can quickly and accurately detect contaminant molecules in food.

Many agricultural scientists work in basic or applied research and development. Basic research seeks to understand the biological and chemical processes by which crops and livestock grow, such as determining the role of a particular gene in plant growth. Applied research uses this knowledge to discover mechanisms to improve the quality, quantity, and safety of agricultural products. Other agricultural scientists manage or administer research and development programs, or manage marketing or production operations in companies that produce food products or agricultural chemicals, supplies, and machinery. Some agricultural scientists are consultants to business firms, private clients, or government.

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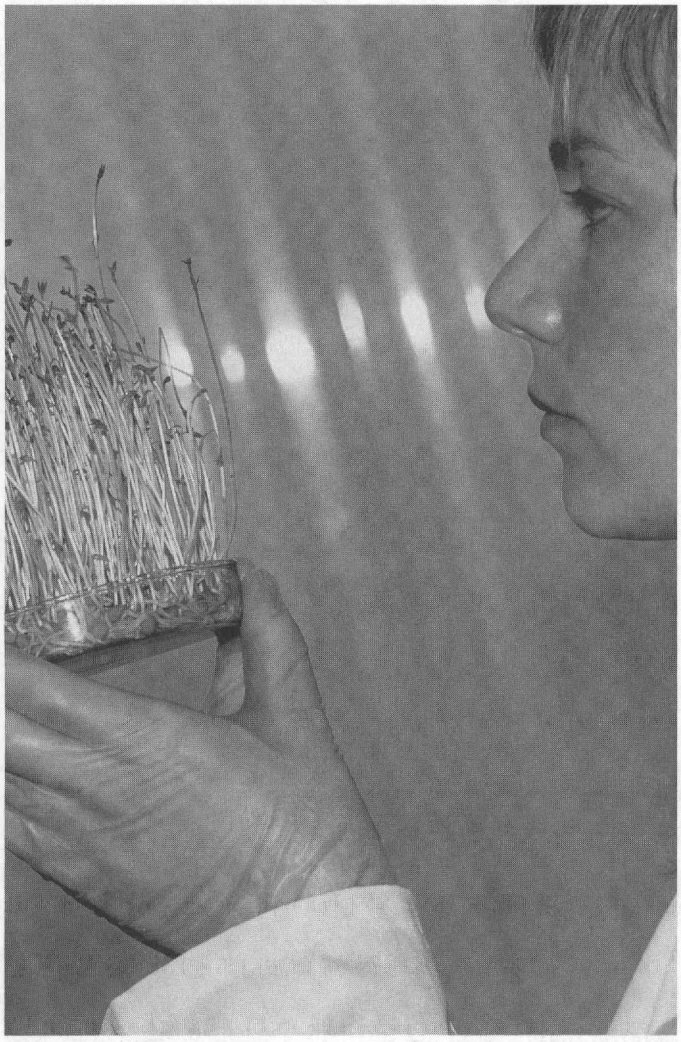

Some agricultural and food scientists conduct experiments on new varieties of crops.

Depending on the agricultural or food scientist's area of specialization, the nature of the work performed varies.

Food scientists and technologists usually work in the food processing industry, universities, or the Federal Government to create and improve food products. 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. Others engage in applied research, finding ways to improve the content of food or to remove harmful additives. They also develop ways to process, preserve, package, or store food according to industry and government regulations. Some continue to research improvements in traditional food processing techniques, such as baking, blanching, canning, drying, evaporation, and pasteurization. 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 improve the selection, preservation, processing, packaging, and distribution of food.

Plant scientists study plants, helping producers of food, feed, and fiber crops to feed a growing population and to conserve natural resources. *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. Some plant scientists develop new technologies to control or eliminate pests and to prevent their spread in ways appropriate to the specific environment. They also conduct research or oversee activities to halt the spread of insect-borne disease.

Soil scientists study the chemical, physical, biological, and mineralogical composition of soils as it relates to plant 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 and plants 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 work to ensure environmental quality and effective land use.

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, and growth 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 animal mortality rates, handle waste matter, or increase production of animal products, such as milk or eggs.

Work environment. 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 specialty and 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, farm animal facilities, or outdoors conducting research. Soil and crop scientists also spend time outdoors conducting research on farms and agricultural research stations.

Training, Other Qualifications, and Advancement

A bachelor's degree in agricultural science is sufficient for private industry jobs in product development or applied re-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Agricultural and food scientists	19-1010	31,000	35,900	4,800	16
Animal scientists	19-1011	3,700	4,200	500	13
Food scientists and technologists	19-1012	13,400	15,600	2,200	16
Soil and plant Scientists	19-1013	13,900	16,100	2,200	15

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

search, but a master's or doctoral degree is generally required for research jobs at universities.

Education and training. Training requirements for agricultural scientists depend on the type of work they perform. Most jobs in the farming and food processing industry require a bachelor's degree, but a master's or doctoral degree is usually required for research positions at universities. A Ph.D. in agricultural science is also needed for college teaching and for advancement to senior research positions. Degrees in related sciences such as biology, chemistry, or physics or in related engineering specialties also may qualify people for many 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 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 example, degrees in animal sciences may include courses on animal breeding, reproductive physiology, nutrition, and meat and muscle biology. Graduate students usually specialize in a subfield of agricultural science, such as animal breeding and genetics, crop science, or horticulture science, depending on their interests. For example, those interested in doing genetic and biotechnological research in the food industry need a strong background in life and physical sciences, such as cell and molecular biology, microbiology, and inorganic and organic chemistry. Undergraduate students, however, need not specialize. In fact, undergraduates who are broadly trained often have greater career flexibility.

Students preparing to be food scientists take courses such as food chemistry, food analysis, food microbiology, food engineering, and food processing operations. Those preparing to be soil and plant 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.

Licensure. Some States require soil scientists to be licensed to practice. Licensing requirements vary by State, but generally include holding a bachelor's degree with a certain number of credit hours in soil science, a certain number of years working under a licensed scientist, and passage of an examination.

Other qualifications. 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, the ability to apply statistical techniques, and the ability to use computers to analyze data and to control biological and chemical processing.

Certification and advancement. Agricultural scientists who have advanced degrees usually begin in research or teaching. With experience, they may advance to jobs as supervisors of research programs or managers of other agriculture-related activities.

The American Society of Agronomy certifies agronomists and crop advisors, and the Soil Science Society of America certifies soil scientists and soil classifiers. Certification is not necessary to work in these occupations, but it may improve opportunities by providing proof of a worker's qualifications. Certification in agronomy requires a bachelor's degree in agronomy or a related field and 5 years of experience, a master's degree and 3 years, or a doctoral degree and 1 year. Crop advising certification requires either 4 years of experience or a bachelor's degree in agriculture and 2 years of experience. To become certified in soil science or soil classification, applicants must have a bachelor's degree in soil science and 5 years of experience or a graduate degree and 3 years of experience. To receive any of these certifications, applicants must also pass designated examinations and agree to adhere to a code of ethics. Each certification is maintained through continuing education.

Employment

Agricultural and food scientists held about 31,000 jobs in 2008. Soil and plant scientists accounted for 13,900, food scientists and technologist for 13,400, while the remaining 3,700 were animal scientists. In addition, many people trained in these sciences held faculty positions in colleges and universities. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

About 20 percent worked for manufacturing companies, mainly in food and pharmaceutical manufacturing, and another 15 percent worked in educational institutions. The Federal Government employed about 7 percent, mostly in the U.S. Department of Agriculture. Other agricultural and food scientists worked for research and development laboratories and wholesale distributors. About 12 percent of agricultural scientists were self-employed in 2008, mainly as consultants.

Job Outlook

Job growth among agricultural and food scientists should be faster than the average for all occupations. Opportunities are

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expected to be good over the next decade, particularly in food science and technology and in agronomy.

Employment change. Employment of agricultural and food scientists is expected to grow by 16 percent between 2008 and 2018, faster than the average for all occupations. Job growth will stem primarily from efforts to increase the quantity and quality of food produced for a growing population. Additionally, an increasing awareness about the health effects of certain types of foods and the effects of food production on the environment, will give rise to research into the best methods of food production.

Emerging biotechnologies will continue to play a large role in agricultural research, and applying these advances will provide many employment opportunities for scientists. For example, they may use findings from genomics to create agricultural products with higher yields and resistance to pests and pathogens. New developments will also be used to improve the quality and safety of prepared food products bought by consumers.

Agricultural scientists will also be needed to balance increased agricultural output with protection and preservation of soil, water, and ecosystems. They increasingly will help develop sustainable agricultural practices by creating and implementing plans to manage pests, crops, soil fertility and erosion, and animal waste in ways that reduce the use of harmful chemicals and minimize damage to the natural environment. In addition, demand for biofuels—renewable energy sources derived from plants—is expected to increase. Agricultural scientists will be needed both to find new techniques for converting organic material into usable energy sources and to find ways to increase the output of crops used in these products.

Job growth for food scientists and technologists will be driven by the demand for new food products and food safety measures. Food research is expected to increase because of heightened public awareness of diet, health, food safety, and biosecurity—preventing the introduction of infectious agents into herds of animals. Advances in biotechnology and nanotechnology should also spur demand, as food scientists and technologists apply these technologies to testing and monitoring food safety.

Job prospects. Opportunities should be good for agricultural and food scientists in almost all fields. Those with a bachelor's degree should experience very good opportunities in food science and technology and in agronomy. Those with a master's or Ph.D. degree in agricultural and food science will also experience good opportunities, although positions in basic research and teaching at colleges and universities are limited.

Many people with bachelor's degrees in agricultural sciences also find work in positions related to agricultural or food science, rather than in jobs as agricultural or food scientists. A bachelor's degree in agricultural science is useful for managerial jobs in farm-related or ranch-related businesses, such as farm credit institutions or companies that manufacture or sell feed, fertilizer, seed, and farm equipment. In some cases, people with a bachelor's degree can provide consulting services or work in sales and marketing—promoting high-demand products such as organic foods. Bachelor's degrees in agricultural science also may help people become farmers, ranchers, and agricultural managers; agricultural inspectors; or purchasing agents 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 wages of food scientists and technologists were $59,520 in May 2008. The middle 50 percent earned between $43,600 and $81,340. The lowest 10 percent earned less than $33,790, and the highest 10 percent earned more than $104,520. Median annual wages of soil and plant scientists were $58,390 in May 2008. The middle 50 percent earned between $44,150 and $78,080. The lowest 10 percent earned less than $34,260, and the highest 10 percent earned more than $105,340. In May 2008, median annual wages of animal scientists were $56,030.

The average Federal salary in 2009 was $104,184 in animal science and $79,158 in soil science.

According to the National Association of Colleges and Employers, beginning salary offers in July 2009 for graduates with a bachelor's degree in animal sciences averaged $33,732 a year; plant sciences, $33,456 a year; and in other agricultural sciences, $34,699 a year.

Related Occupations

The work of agricultural scientists is closely related to that of other scientists, including:

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Biological scientists	181
Chemists and materials scientists	195
Conservation scientists and foresters	185
Medical scientists	189

Other occupations that relate to agricultural production include:

Farmers, ranchers, and agricultural managers	48

Another occupation that works closely with animals:

Veterinarians	402

Sources of Additional Information

Information on careers in agricultural science is available from Purdue University and the U.S. Department of Agriculture at: **http://www.agriculture.purdue.edu/USDA/careers**

Information on careers in food science and technology is available from:

➤ Institute of Food Technologists, 525 W. Van Buren, Suite 1000, Chicago, IL 60607. Internet: **http://www.ift.org**

Information on careers in plant and soil sciences is available from:

➤ American Society of Agronomy, 677 S. Segoe Rd., Madison, WI 53711-1086. Internet: **http://www.agronomy.org**

➤ Crop Science Society of America, 677 S. Segoe Rd., Madison, WI 53711-1086. Internet: **http://www.crops.org**

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➤ Soil Science Society of America, 677 S. Segoe Rd., Madison, WI 53711-1086. Internet: **http://www.soils.org**

Information on getting a job as an agricultural scientist with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, so charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos046.htm**

Biological Scientists

Significant Points

- Biotechnological research and development should continue to drive much faster than average employment growth.
- A Ph.D. is usually required for independent research, but a bachelor's degree is sufficient for some jobs in applied research or product development; temporary postdoctoral research positions are common.
- Competition for independent research positions in academia is expected.

Nature of the Work

Biological scientists study living organisms and their relationship to the environment. They perform research to gain a better understanding of fundamental life processes and apply that understanding to developing new products or processes. Research can be broken down into two categories: basic and applied. Basic research is conducted without any intended aim; the goal is simply to expand on human knowledge. Applied research is directed towards solving a particular problem. Most biological scientists specialize in one 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*.)

Basic research in biological sciences advances our knowledge of living organisms so that we can develop solutions to human health problems and improve the natural environment. These biological scientists mostly work in government, university, or private industry laboratories, often exploring new areas of research. Many expand on specialized research they started in graduate school.

Many biological scientists involved in basic research must submit grant proposals to obtain funding for their projects. Colleges and universities, private foundations, 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 apply knowledge gained through basic research to develop new drugs, treatments, and medical diagnostic tests; increase crop yields; and develop new biofuels. They usually have less freedom than basic researchers do to choose the emphasis of their research, and they spend more time working on marketable treatments to meet the business goals of their employers. Biological scientists doing applied research and product development often work in teams, interacting with engineers, scientists of other disciplines, business managers, and technicians. Those working 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. These scientists must consider the business effects of their work. Some biological scientists also work with customers or suppliers and manage budgets.

Scientists usually conduct research in laboratories using a wide variety of other equipment. Some conduct experiments involving animals or plants. This is particularly true of botanists, physiologists, and zoologists. Some biological research also takes place outside the laboratory. For example, a botanist might do field research in tropical rain forests to see which 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 fish, plankton, or other marine organisms.

Swift advances in knowledge of genetics and organic molecules spurred growth in the field of biotechnology, transforming the industries in which biological scientists work. Biological scientists can now manipulate the genetic material of animals and plants, attempting to make organisms more productive or resistant to disease. Those working on various genome (chromosomes with their associated genes) projects isolate genes and determine their function. This work continues to lead to the discovery of genes associated with specific diseases and inherited health risks, such as sickle cell anemia. Advances in biotechnology have created research opportunities in almost all areas of biology, with commercial applications in areas such as medicine, agriculture, and environmental remediation.

Most biological scientists specialize in the study of a certain type of organism or in a specific activity, although recent advances 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 are sometimes called oceanographers, a broader field that also includes the study of the physical characteristics of oceans and the ocean floor. (See the *Handbook* statement on geoscientists and hydrologists.)

Biochemists study the chemical composition of living things. They analyze the complex chemical combinations and reactions involved in metabolism, reproduction, and growth. Biochem-

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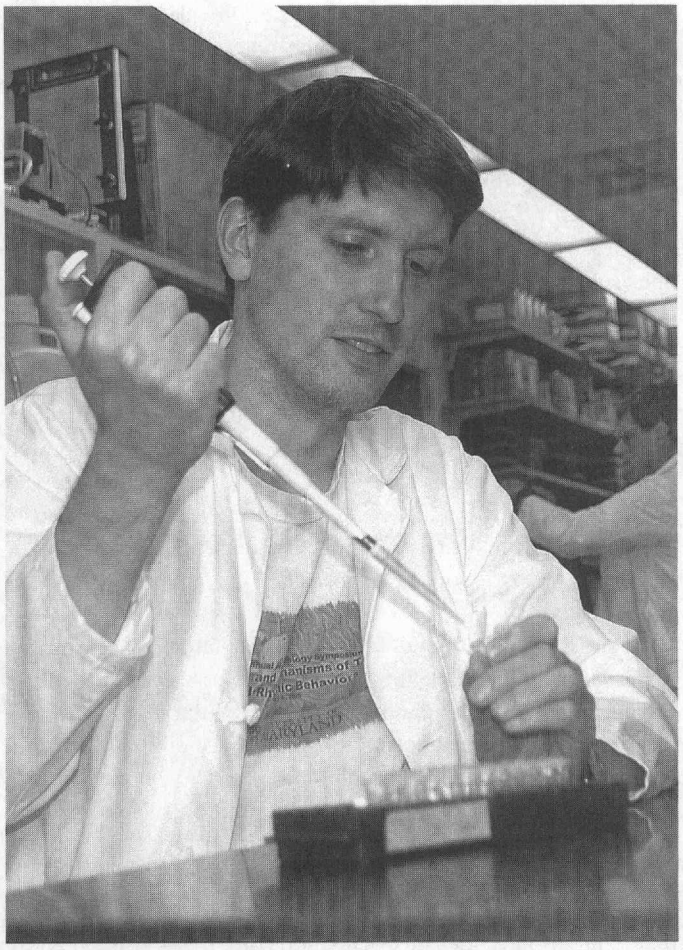

Biological scientists conduct research in college or university, private industry, and government laboratories.

ists do most of their work in biotechnology, which involves understanding the complex chemistry of life.

Biophysicists study how physics, such as electrical and mechanical energy, relates to living cells and organisms. They perform research in fields such as neuroscience or bioinformatics (the use of computers to process biological information, usually at the molecular level).

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); immunology (the study of mechanisms that fight infections); or bioinformatics. 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.

Botanists study plants and their environments. 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.

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 to study their structure. Zoologists and wildlife biologists also may collect and analyze biological data to determine the environmental effects of current and potential uses of land and water areas. Zoologists are usually identified by the animal group they study—ornithologists study birds, for example, mammalogists study mammals, herpetologists study reptiles, and ichthyologists study fish.

Ecologists investigate the relationships among organisms and between organisms and their environments. They examine the effects of population size, pollutants, rainfall, temperature, and altitude. Using knowledge of various scientific disciplines, ecologists may collect, study, and report data on the quality of air, food, soil, and water.

(Two other occupations closely related to biological scientists are covered in more detail elsewhere in the *Handbook*: agricultural and food scientists, who study domesticated plants and animals consumed as food, and medical scientists, who study human diseases and human health.)

Work environment. Most biologists spend their time in laboratories conducting research and in offices writing up results and keeping up with the latest research discoveries. Some biological scientists, particularly botanists, ecologists, and zoologists, do field studies that involve strenuous physical activity and primitive living conditions for extended periods of time. Biological scientists in the field may work in warm or cold climates, in all kinds of weather. Biological scientists 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, particularly those employed in academic settings, 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.

Biological scientists typically work regular hours. While the 40-hour workweek is common, some biological scientists work longer hours. Some researchers may be required to work odd hours in laboratories or other locations (especially while in the field), depending on the nature of their research.

Training, Other Qualifications, and Advancement

Most biological scientists need a Ph.D. in biology or one of its subfields to work in independent research or development positions. Other positions are available to those with a master's or bachelor's degree in the field.

Education and training. A Ph.D. is usually necessary for independent research, particularly in academia, as well as for advancement to administrative positions. A bachelor's or master's degree is sufficient for some jobs in applied research, product development, management, or inspection; it also may be sufficient to work as a research technician or a teacher. Many with a bachelor's degree in biology enter medical, dental, veterinary,

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Biological scientists	19-1020	91,300	110,500	19,200	21
Biochemists and biophysicists	19-1021	23,200	31,900	8,700	37
Microbiologists	19-1022	16,900	18,900	2,100	12
Zoologists and wildlife biologists	19-1023	19,500	22,000	2,500	13
Biological scientists, all other	19-1029	31,700	37,600	5,900	19

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

or other health profession schools, or find jobs as high school science teachers. (See the statement on teachers—kindergarten, elementary, middle, and secondary.)

In addition to required courses in chemistry and biology, undergraduate biological science majors usually study allied disciplines such as mathematics, physics, engineering, and computer science. Computer courses are beneficial for modeling and simulating biological processes, operating some laboratory equipment, and performing research in the emerging field of bioinformatics. Those interested in studying the environment also should take courses in environmental studies and become familiar with applicable legislation and regulations.

Most colleges and universities offer bachelor's degrees in biological science, and many offer advanced degrees. Advanced degree programs often emphasize a subfield, such as microbiology or botany, but not all universities offer curricula in all subfields. 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 typically include classroom and fieldwork, laboratory research, and a thesis or dissertation. A master's degree generally takes 2 years, and a doctoral degree 5-6 years of full-time study.

Biological scientists with a Ph.D. often take temporary postdoctoral positions that provide specialized research experience. Postdoctoral positions may offer the opportunity to publish research findings. A solid record of published research is essential in obtaining a permanent position performing basic research, especially for those seeking a permanent college or university faculty position.

Other qualifications. 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.

Advancement. As they gain experience, biological scientists typically gain greater control over their research and may advance to become lead researchers directing a team of scientists and technicians. Some work as consultants to businesses or to government agencies. However, those dependent on research grants are still constrained by funding agencies, and may spend much of their time writing grant proposals. Others choose to move into managerial positions and become natural science managers (see engineering and natural sciences managers elsewhere in the *Handbook*). They may plan and administer programs for testing foods and drugs, for example, or direct activities at zoos or botanical gardens. Those who pursue management careers spend much of their time preparing budgets and schedules. Some leave biology for nontechnical managerial, administrative, or sales jobs.

Employment

Biological scientists held about 91,300 jobs in 2008. In addition, many biological scientists held biology faculty positions in colleges and universities but are not included in these numbers. Those whose primary work involves teaching and research are considered postsecondary teachers. (See the statement on teachers—postsecondary elsewhere in the *Handbook.*)

About 40 percent 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 educational institutions.

Job Outlook

Employment of biological scientists is expected to increase much faster than the average for all occupations although there will continue to be competition for some basic research positions.

Employment change. Employment of biological scientists is projected to grow 21 percent over the 2008–18 decade, much faster than the average for all occupations, as biotechnological research and development continues to drive job growth. Biological scientists enjoyed very rapid employment gains over the past few decades—reflecting, in part, the growth of the biotechnology industry. Employment growth will moderate somewhat as the biotechnology industry matures, with fewer new firms being founded and existing firms merging or being absorbed by larger biotechnology or pharmaceutical firms. 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, understanding how certain genes function within an entire organism, so that medical treatments can be developed to treat various diseases. Even pharmaceutical and other firms not solely engaged in biotechnology use biotechnology techniques extensively, spurring employment for biological scientists. For example, biological

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scientists are continuing to help farmers increase crop yields by pinpointing genes that can help crops, such as wheat, grow in more extreme climate conditions.

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 will be needed to determine the environmental impact of industry and government actions and to prevent or correct environmental problems, such as the negative effects of pesticide use. Some biological scientists will find opportunities in environmental regulatory agencies, while others will use their expertise to advise lawmakers on legislation to save environmentally sensitive areas. New industrial applications of biotechnology, such as new methods for producing biofuels, also will spur demand for biological scientists.

The Federal Government is a major source of funding for basic research and development, including many areas of medical research that relate to biological science. Large budget increases at the National Institutes of Health in the early part of the decade led to increases in Federal basic research and development expenditures, with research grants growing both in number and dollar amount. However, the increase in expenditures slowed substantially in recent years. Going forward, the level of Federal funding will continue to impact competition for winning and renewing research grants.

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. Marine biology, despite its attractiveness as a career, is a very small specialty within biological science.

Job prospects. Doctoral degree holders are expected to face competition for basic research positions in academia. Furthermore, should the number of advanced degrees awarded continue to grow, applicants for research grants are likely to face even more competition. Currently, about 1 in 4 grant proposals are approved for long-term research projects. In general, applied research positions in private industry are somewhat easier to obtain, but may become more competitive if increasing numbers of scientists seek jobs in private industry because of the difficulty finding positions in colleges and universities.

Prospective marine biology students should be aware that those who would like to enter this specialty far outnumber the very few openings that occur each year for the type of glamorous research jobs that many would like to obtain. Almost all marine biologists who do basic research have a Ph.D.

People with bachelor's and master's degrees are expected to have more opportunities in nonscientist jobs related to biology, in fields like sales, marketing, publishing, and research management. Non-Ph.D.s also may fill positions as science or engineering technicians or as medical health technologists and technicians. Some become high school biology teachers.

Biological scientists are less likely to lose their jobs during recessions than those in 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 also could limit the possibility of extension or renewal of existing projects.

Earnings

Median annual wages of biochemists and biophysicists were $82,840 in May 2008. The middle 50 percent earned between $59,260 and $108,950. The lowest 10 percent earned less than $44,320, and the highest 10 percent earned more than $139,440. Median annual wages of biochemists and biophysicists employed in scientific research and development services were $85,870 in May 2008.

Median annual wages of microbiologists were $64,350 in May 2008. The middle 50 percent earned between $48,330 and $87,040. The lowest 10 percent earned less than $38,240, and the highest 10 percent earned more than $111,300.

Median annual wages of zoologists and wildlife biologists were $55,290 in May 2008. The middle 50 percent earned between $43,060 and $70,500. The lowest 10 percent earned less than $33,550, and the highest 10 percent earned more than $90,850.

According to the National Association of Colleges and Employers, beginning salary offers in July 2009 averaged $33,254 a year for bachelor's degree recipients in biological and life sciences.

In the Federal Government in March 2009, microbiologists earned an average annual salary of $97,264; ecologists, $84,283; physiologists, $109,323; geneticists, $99,752; zoologists, $116,908; and botanists, $72,792.

Related Occupations

Other life science research occupations include:

	Page
Agricultural and food scientists	177
Conservation scientists and foresters	185
Engineering and natural sciences managers	46
Epidemiologists	446
Medical scientists	189
Teachers—postsecondary	282

Other health-related specialists with similar levels of education include:

Dentists	363
Physicians and surgeons	381
Veterinarians	402

Sources of Additional Information

For information on careers in the biological sciences, contact:

➤ American Institute of Biological Sciences, 1444 I St. NW., Suite 200, Washington, DC 20005. Internet: **http://www.aibs.org**

➤ Federation of American Societies for Experimental Biology, 9650 Rockville Pike, Bethesda, MD 20814. Internet: **http://www.faseb.org**

For information on careers in biochemistry or molecular biology, contact:

➤ American Society for Biochemistry and Molecular Biology, 9650 Rockville Pike, Bethesda, MD 20814. Internet: **http://www.asbmb.org**

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For information on careers in botany, contact:
➤ The Botanical Society of America, P.O. Box 299, St. Louis, MO 63166. Internet: **http://www.botany.org**

For information on careers in cell biology, contact:
➤ American Society for Cell Biology, 8120 Woodmont Ave, Suite 750, Bethesda, MD 20814. Internet: **http://www.ascb.org**

For information on careers in ecology, contact:
➤ Ecological Society of America, 1990 M St. NW, Suite 700, Washington, DC 20036. Internet: **http://www.esa.org**

For information on careers in microbiology, contact:
➤ American Society for Microbiology, Career Information—Education Department, 1752 N St. NW., Washington, DC 20036. Internet: **http://www.asm.org**

For information on careers in physiology, contact:
➤ American Physiology Society, 9650 Rockville Pike, Bethesda, MD 20814. Internet: **http://www.the-aps.org**

Information on obtaining a biological scientist position with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, so charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos047.htm**

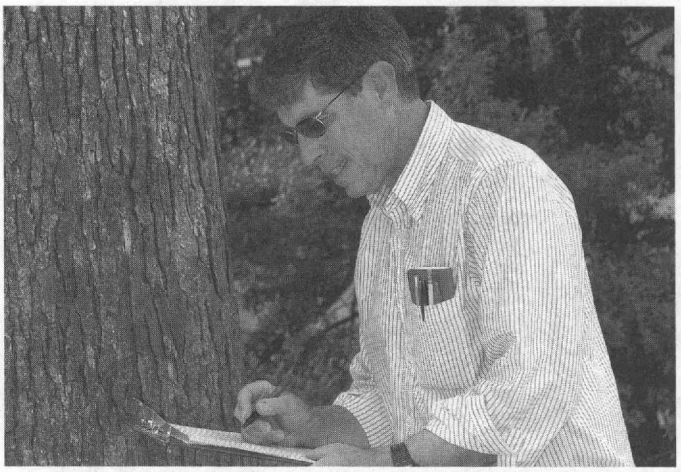
Conservation Scientists and Foresters

Significant Points

- About 68 percent of conservation scientists and foresters work for Federal, State, or local governments.
- Most jobs require a bachelor's degree; research and teaching positions usually require a graduate degree.
- Foresters and conservation scientists should enjoy working outdoors, be able to tolerate extensive walking and other types of physical exertion, and be willing to relocate to find work.
- In addition to job openings from growth, many openings are expected as today's conservation scientists and foresters retire.

Nature of the Work

Conservation scientists and foresters manage the use and development of forests, rangelands, and other natural resources. These lands supply wood products, livestock forage, minerals, and water. They serve as sites for recreational activities and provide habitats for wildlife. Some workers advise private landowners on the use and management of their land and may design and implement programs that make the land healthier and more productive. Others work to conserve or restore public or private lands. Conservation scientists and foresters often specialize in one of several areas, such as soil conservation, urban forestry, pest management, native species, or forest economics.



Conservation scientists and foresters often work outdoors.

Foresters oversee our Nation's forests and direct activities on them for economic, recreational, conservational, and environmental purposes. Individual landowners, the public, and industry own most of the forested land in this country, and they require the expertise of foresters to keep the forests healthy and sustainable. Often, this means coming up with a plan to keep the forests free from disease, harmful insects, and damaging wildfires by planning, for example, when and where to plant trees and vegetation and when to cut timber. It also may mean coming up with ways to make the land profitable but still protected for future generations.

Foresters have a wide range of duties, depending on whom they are working for. Some primary duties of foresters include drawing up plans to regenerate forested lands, monitoring the progress of those lands, and supervising harvests. Land management foresters choose and direct the preparation of sites on which trees will be planted. They oversee controlled burning and the use of 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 specialists in forest pest management to decide on the best treatment. When the trees reach a certain size, foresters decide which trees should be harvested and sold to sawmills.

Procurement foresters make up a large share of foresters. Their job is to buy timber, typically for a sawmill or wood products manufacturer, by contacting local forest owners and negotiating a sale. This activity typically involves taking inventory of the type, amount, and location of all standing timber on the property, a process known as timber cruising. They then appraise the timber's worth, negotiate its purchase, and draw up a contract for purchase. Next, the forester subcon-

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tracts with loggers or pulpwood cutters for tree removal and to aid in laying out roads to access the timber. Throughout the process, foresters maintain close contact with the subcontractor and the landowner to ensure that the work meets the landowner's requirements and Federal, State, and local environmental regulations.

Throughout the forest management and procurement processes, foresters often are responsible for conserving wildlife habitats and creek beds within forests, maintaining water quality and soil stability, and complying with environmental regulations. Foresters must balance the desire to conserve forested ecosystems with the need to use forest resources for recreational or economic purposes. For example, foresters increasingly are working with landowners to find ways to generate money from forested lands, such as using them for hunting or other recreational activity, without cutting down trees. A major concern of foresters is the prevention of devastating wildfires. Using a variety of techniques, including the thinning of forests and controlled burns (to clear brush), foresters work with governments and private landowners to minimize the impact of fire on the forest. During a fire, they work with or supervise firefighters and plan ways to contain the fire.

Some foresters, mostly in the Federal Government, perform research on issues facing forests and related natural resources. They may study tree improvement and harvesting techniques; global climate change; protection of forests from pests, diseases, and fire; improving wildlife habitats; forest recreation; and other topics. State foresters may perform some research, but more often work with private landowners in developing forest management plans. Both Federal and State foresters enforce relevant environmental laws, including laws on water quality and fire suppression.

Relatively new fields in forestry are urban forestry and conservation education. Urban foresters live and work in larger cities and manage urban trees. They are concerned with quality-of-life issues, such as air quality, shade, beautification, storm water runoff, and property values. Conservation education foresters train teachers and students about sound forest stewardship.

Conservation scientists manage, improve, and protect the country's natural resources. They work with landowners and Federal, State, and local governments to devise ways to use and improve the land while safeguarding the environment. Conservation scientists advise farmers, farm managers, and ranchers on how they can improve their land for agricultural purposes and to control erosion. A growing number of conservation scientists also are advising landowners and governments on recreational uses for the land.

Two of the more common conservation scientists are *range managers* and *soil conservationists*. 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 hundreds of millions of 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. Like foresters, range managers work to prevent and mitigate wildfires and invasive animal species. They also plan and implement revegetation of disturbed sites.

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. For private landowners, they develop programs 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 water quality, preserving water supplies, preventing groundwater contamination, and management and conservation of water resources.

Conservation scientists and foresters use a number of tools to perform their jobs. Clinometers measure the heights of trees, diameter tapes measure tree diameters, 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 or range areas and for detecting widespread trends of forest and land use. Once a map is generated, data are digitized to create a computerized inventory of information required to manage the land and its resources. Hand-held computers, global positioning systems (GPS), and Internet-based applications are used extensively.

Work environment. Working conditions vary considerably. Some foresters and conservation scientists work regular hours in offices or laboratories, but others may split their time between fieldwork and office work. Independent consultants and new, less experienced workers spend the majority of their time outdoors overseeing or participating in hands-on work. Fieldwork can involve long hours alone.

The work can be physically demanding. Some conservation scientists and foresters work outdoors in all types of weather, sometimes in isolated areas, and consequently may need to walk long distances through densely wooded land to carry out their work. Natural disasters may cause foresters and conservation scientists to work long hours during emergencies. For example, foresters often have to work long hours during fire season, and conservation scientists frequently are called to prevent erosion after a forest fire and to provide emergency help after floods, mud slides, and tropical storms.

Foresters employed by Federal and State governments usually work 40 hours a week, but not always on a standard schedule. In field positions, foresters often work for long blocks of

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time—10 days straight, followed by 4 days off, for example. Overtime may be necessary when working in firefighting, law enforcement, or natural-disaster response.

Training, Other Qualifications, and Advancement

Most forester and conservation scientist jobs require a bachelor's degree. Research and teaching positions usually require a graduate degree.

Education and training. A bachelor's degree in forestry, biology, natural resource management, environmental sciences, or a related discipline is the minimum educational requirement for careers in forestry. In the Federal Government, a combination of experience and appropriate education may substitute for a bachelor's degree, but competition for jobs makes this route to a career in the occupation less common. Foresters who wish to do research or to teach usually need an advanced degree, preferably a Ph.D.

Conservation scientists generally have at least a bachelor's degree in a field such as natural resource management, rangeland management, agricultural science, or environmental science. A master's degree or Ph.D. usually is required for teaching and research positions.

Most land-grant colleges and universities offer degrees in forestry. The Society of American Foresters accredits about 50 degree programs throughout the country. Curricula focus on four areas: forest ecology and biology, 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, wildlife habitat assessment, remote sensing, land surveying, GPS technology, integrated forest resource management, forest protection, and silviculture (the care and cultivation of forest trees). In addition, mathematics, statistics, and computer science courses are recommended. Courses in resource policy and administration—specifically, forest economics and business administration—also are helpful. Forestry curricula increasingly are including courses on wetlands analysis and sustainability and regulatory issues because prospective foresters need a strong grasp of Federal, State, and local policy issues and an understanding of complex environmental regulations.

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 in private industry. All schools encourage students to take summer jobs that provide experience in forestry or conservation work.

Range managers usually have a degree in range management or range science. Nine colleges and universities that are accredited by the Society of Range Management offer degrees in the subject. More than 40 other schools offer coursework in range science or in a closely related discipline. Range management courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include 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 one's qualifications for certain types of employment.

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; some 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, with at least 3 hours in soil science.

Licensure. Sixteen States sponsor some type of credentialing process for foresters. Alabama, California, Connecticut, Maine, Maryland, Massachusetts, and New Hampshire have licensing statutes. Arkansas, Georgia, Mississippi, North Carolina, and South Carolina have mandatory registration statutes, and Michigan, New Jersey, Oklahoma, and West Virginia have voluntary registration statutes. 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 may be required to pass a comprehensive written exam.

Other qualifications. Foresters and conservation scientists should enjoy working outdoors, be able to tolerate extensive walking and other types of physical exertion, and be willing to relocate to find work. The ability to use technology and quantitative tools also is important. Foresters and conservation scientists must work well with people and have good communication skills.

Certification and advancement. Over time, many conservation scientists and foresters advance to take on managerial duties. They also may conduct research or work on policy issues, often after gaining an advanced degree.

One option for advancement in these occupations is to become certified. The Society of American Foresters certifies foresters who have at least a bachelor's degree from one of the 50 forestry programs accredited by the Society or from a forestry program that, though not accredited by the Society, is substantially equivalent. In addition, the candidate must have 5 years of qualifying professional experience and pass an examination.

The Society for Range Management offers two types of certification: one as a certified professional in rangeland management and another as a certified range management consultant. Candidates seeking certification must have at least a bachelor's degree in range science or a closely related field, a minimum of 6 years of full-time work experience, and a passing score on an exam.

Recent forestry and conservation scientist graduates usually work under the supervision of experienced foresters or scientists. After gaining experience, they may advance to positions with more responsibilities. In the Federal Government, most entry-level foresters work in forest resource management. Experienced Federal foresters may supervise a ranger district and may advance to forest supervisor, regional forester, or a top administrative position in the national headquarters, where they may work on issues related to forest policy.

In private industry, foresters start by learning the practical and administrative aspects of the business and by acquiring

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Conservation scientists and foresters	19-1030	29,800	33,400	3,600	12
Conservation scientists	19-1031	18,300	20,500	2,200	12
Foresters	19-1032	11,500	12,900	1,400	12

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

comprehensive technical training. Then they are introduced to contract writing, timber harvesting, and decisionmaking. Some foresters work their way up to top managerial positions. Foresters in management usually leave 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 consultants, working alone or with one or several partners. They contract with State or local governments, private landowners, private industry, or other forestry consulting groups.

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.

Employment

Conservation scientists and foresters held about 29,800 jobs in 2008. Conservation scientist jobs are heavily concentrated in government, where 74 percent are employed. At the Federal level, soil conservationists are employed primarily in the U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service. Most range managers work in the USDA's Forest Service, the U.S. Department of the Interior's Bureau of Land Management, or the Natural Resource Conservation Service. A small number are self-employed and others work for nonprofit organizations or in consulting firms.

About 60 percent of all foresters work for Federal, State and local governments. Federal Government foresters are concentrated in the USDA's Forest Service. A few foresters are self-employed, generally working as consultants or procurement foresters. Others work for sawmills, wood products manufacturers, logging companies, and the forestry industry.

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, are employed in almost every county in the country. Some foresters and conservation scientists hold positions in colleges and universities.

Job Outlook

Employment is expected to grow about as fast as average. In addition to job openings from growth, many openings are expected as today's conservation scientists and foresters retire.

Employment change. Employment of conservation scientists and foresters is expected to grow by 12 percent during the 2008–18 decade, about as fast as the average for all occupations. A majority of conservation scientists and foresters are employed by Federal, State, and local governments, and a large percentage of new jobs will be found in these areas. In recent years, the prevention and mitigation of wildfires has become the primary concern for government agencies managing forests and rangelands. The development of previously unused lands, in addition to changing weather conditions, has contributed to increasingly devastating and costly fires. Increases in funding and new programs will create new opportunities for foresters and range managers. Workers will be needed to manage lands in order to minimize the risk of fires and mitigate their impact should they occur. Restoring lands affected by fires also will be a major task, particularly in the southwestern and western States, where such fires are most common.

Beyond wildfire management, several other factors will influence demand on the part of governments for conservation scientists and foresters. New city-planning and urban revitalization initiatives will increase the need for workers with expertise in urban forestry. Demand for soil and water scientists, whose main function is providing technical expertise to farmers and ranchers, will increase as the safety and sustainability of the food supply becomes more of a concern.

In addition, increased investments in conservation programs will contribute to job growth for conservation scientists and foresters. The use of forests to sequester carbon emissions will create a need for foresters with expertise in this area. The desire to develop renewable forms of energy will increase the need for wood and other biomass products; consequently, more workers will be needed to manage those resources. Many of these jobs will be in the private-sector consulting industry, although government workers will be needed as well to manage these activities on Federal and State lands.

Growth in other private-sector jobs is expected to vary among different types of employers and specific occupations. Companies involved in natural-resource exploration and land development need to manage the use of soil and water systems while complying with environmental regulations. Growth in these companies will create new opportunities for consultant range managers and soil and water scientists. Procurement foresters will see the fewest new jobs, as a result of overall slow growth in the timber and logging industry. Recent large-scale sales of forestlands by industry has resulted in a loss of jobs within the traditional forest industry while creating limited opportunities with timber investment management organizations and real estate investment trusts. Self-employed foresters, who

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advise private landowners on a contract basis, will see modest growth.

Job prospects. The Federal Government and some State governments expect a large number of their workers to retire over the next decade. As a result, there is likely to be a large number of job openings for foresters and conservation scientists in government. In general, workers with a 4-year degree from an accredited university program, along with good technical and communication skills, should have the best opportunities for entry-level work.

Earnings

Median annual wages of conservation scientists in May 2008 were $58,720. The middle 50 percent earned between $45,320 and $73,280. The lowest 10 percent earned less than $35,190, and the highest 10 percent earned more than $86,910.

Median annual wages of foresters in 2008 were $53,750. The middle 50 percent earned between $42,980 and $65,000. The lowest 10 percent earned less than $34,710, and the highest 10 percent earned more than $78,350.

For Federal Government workers in forestry, the average annual salary was $71,558 in March 2009. For Federal workers in rangeland management, it was $64,564, and for soil conservation workers it was $69,483.

Conservation scientists and foresters who work for Federal, State, and local governments, and those who work for large private firms, generally receive more generous benefits than do those working for smaller firms. Governments usually have good pension, health, and leave plans as well.

Related Occupations

Conservation scientists and foresters manage, develop, and protect natural resources. Other workers with similar responsibilities include:

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Agricultural and food scientists	177
Biological scientists	181
Environmental scientists and specialists	199
Farmers, ranchers, and agricultural managers	48
Geoscientists and hydrologists	202

Sources of Additional Information

For information about forestry careers and schools offering education in forestry, visit the Society of American Foresters' Web site or send a self-addressed, stamped business envelope to:

➤ Society of American Foresters, 5400 Grosvenor Ln., Bethesda, MD 20814-2198. Internet: **http://www.safnet.org**

Information about careers in forestry—particularly conservation forestry and land management—can be found through the Forest Guild:

➤ Forest Guild, P.O. Box 519, Santa Fe, NM 87504. Internet: **http://www.forestguild.org**

Information about a career as a range manager, as well as a list of schools offering training, is available from:

➤ Society for Range Management, 10030 West 27th Ave., Wheat Ridge, CO 80215-6601. Internet: **http://www.rangelands.org**

Information on getting a job as a conservation scientist or forester with the Federal Government is available from the Office of Personnel Management (OPM) through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos048.htm**

Medical Scientists

Significant Points

- Most medical scientists need a Ph.D. in a biological science; some also hold a medical degree.
- Some medical scientists work in research laboratories at universities and hospitals; others work for pharmaceutical or biotechnology companies.
- Medical scientists with both a Ph.D. and M.D. are likely to have the best opportunities.

Nature of the Work

Medical scientists research human diseases and conditions with the goal of improving human health. Most medical scientists conduct biomedical research and development to advance knowledge of life processes and of other living organisms that affect human health, including viruses, bacteria, and other infectious agents. Past research has resulted in advances in diagnosis, treatment, and prevention of many diseases. Basic medical research continues to build the foundation for new vaccines, drugs, and treatment procedures. Medical scientists engage in laboratory research, clinical investigation, technical writing, drug development, regulatory review, and related activities.

Medical scientists study biological systems to understand the causes of disease and other health problems. For example, some try to identify changes in cells or in chromosomes that signal the development of medical problems. They use this knowledge to develop treatments and design research tools and techniques that have medical applications. Medical scientists involved in cancer research may formulate a combination of drugs that will lessen the effects of the disease. They can then work with physicians to administer these drugs to patients in clinical trials, monitor their reactions, and observe the results. They may draw blood, excise tissue, or perform other invasive procedures. Medical scientists examine the results of clinical trials and adjust the dosage levels to reduce negative side effects or to induce better results. In addition to developing treatments for

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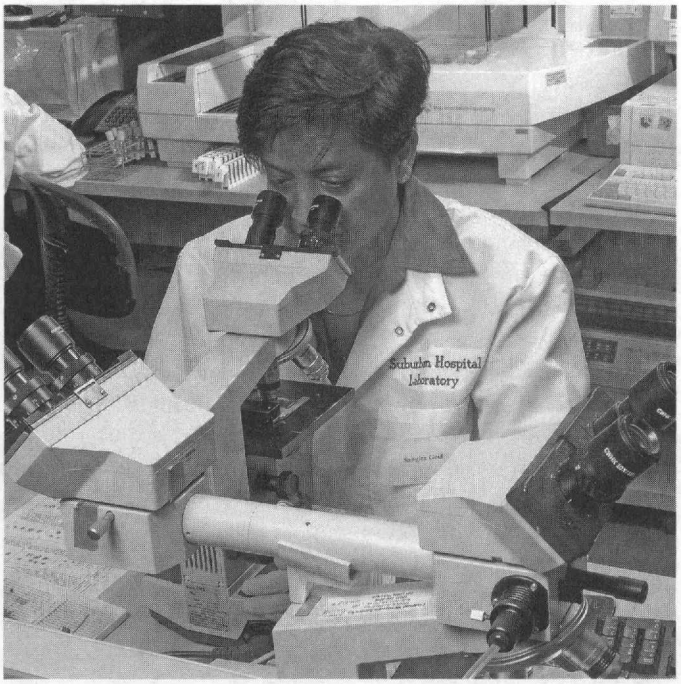

Research conducted by medical scientists has resulted in advanced treatments for many diseases.

medical conditions, medical scientists attempt to discover ways to prevent health problems. For example, they may study the link between smoking and lung cancer or between alcoholism and liver disease.

Many medical scientists conduct independent research in university, hospital, or government laboratories, exploring new areas of research or expanding on specialized research that they began 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. The Federal Government's National Institutes of Health (NIH) provides funding support for researchers whose proposals are determined to be financially feasible and to have the potential to advance new ideas or processes that benefit human health. Medical scientists who rely on grant money may be under pressure to meet deadlines and to conform to rigid grant-writing specifications when preparing proposals to seek new or extended funding.

Most medical scientists who work in private industry conduct applied research or support product development, using knowledge discovered through research to develop new drugs and medical treatments. They usually have less autonomy than do medical researchers in academia to choose the emphasis of their research. Medical scientists spend more time working on marketable treatments to meet the business goals of their employers. Medical scientists in private industry may also be required to explain their research plans or results to nonscientists who are in a position to reject or approve their ideas, potentially for business reasons rather than scientific merit. Medical scientists increasingly work as part of teams, interacting with engineers, scientists of other disciplines, business managers, and technicians.

Swift advances in basic medical knowledge related to genetics and organic molecules have spurred growth in the field of biotechnology. Discovery of important drugs, including human insulin and growth hormone, is the result of research using biotechnology techniques, such as recombining DNA. Many other substances not previously available in large quantities are now produced by biotechnological means; some may one day 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 to determine their functions. This work continues to lead to the discovery of genes associated with specific diseases and inherited health risks, such as sickle cell anemia. These advances in biotechnology have opened up research opportunities in almost all areas of medical science.

Work environment. Medical scientists who conduct research usually work in laboratories and use a wide variety of equipment. Some may work directly with individual patients or larger groups as they administer drugs and monitor patients during clinical trials. Often, these medical scientists also spend time working in clinics and hospitals. Medical scientists are not usually exposed to unsafe or unhealthy conditions; however, those scientists who work with dangerous organisms or toxic substances must follow strict safety procedures to avoid contamination.

Medical scientists typically work regular hours in offices or laboratories, but longer hours are not uncommon. Researchers may be required to work odd hours in laboratories or other locations, depending on the nature of their research.

Training, Other Qualifications, and Advancement

A Ph.D. in a biological science is the minimum education required for most prospective medical scientists. However, some medical scientists also earn medical degrees in order to perform clinical work. A period of postdoctoral work in the laboratory of a senior researcher is becoming increasingly common for medical scientists.

Education and training. A Ph.D. in the biological sciences typically qualifies people to research basic life processes or particular medical problems and to analyze the results of experiments. Some medical scientists obtain a medical degree, instead of a Ph.D., but do not become licensed physicians, because they prefer research to clinical practice. It is particularly helpful for medical scientists to earn both a Ph.D. and a medical degree.

Students planning careers as medical scientists should pursue 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, engineering, physics, and computer science. General humanities courses are also beneficial, as writing and communication skills are necessary for drafting grant proposals and publishing research results.

Once students have completed undergraduate studies, there are two main paths for prospective medical scientists. They can enroll in a university Ph.D. program in the biological sciences; these programs typically take about 6 years of study, and students specialize in one particular field, such as genetics, pathology, or bioinformatics. They can also enroll in a joint M.D./Ph.D. program at a medical college; these programs typically take 7 to 8 years of study, where students learn both the clinical

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Medical scientists, except epidemiologists	19-1042	109,400	153,600	44,200	40

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

skills needed to be a physician and the research skills needed to be a scientist.

In addition to formal education, medical scientists usually spend some time 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.

Licensure. 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 the statement on physicians and surgeons elsewhere in the *Handbook.*)

Other qualifications. 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 that they can provide instruction and advice to physicians and other healthcare professionals.

Advancement. Advancement among medical scientists usually takes the form of greater independence in their work, larger budgets, or tenure in university positions. Others choose to move into managerial positions and become natural science managers (see engineering and natural sciences managers elsewhere in the *Handbook*). Those who pursue management careers spend more time preparing budgets and schedules.

Employment

Medical scientists held about 109,400 jobs in 2008. About 31 percent of medical scientists were employed in scientific research and development services firms. Another 27 percent were employed in educational services; 13 percent were employed in pharmaceutical and medicine manufacturing; and 10 percent were employed in hospitals.

Job Outlook

Medical scientists are expected to grow much faster than average over the coming decade. Those with both a Ph.D. and M.D. are likely to experience the best opportunities.

Employment change. Employment of medical scientists is expected to increase 40 percent over the 2008-18 decade, much faster than the average for all occupations. Medical scientists have enjoyed rapid gains in employment since the 1980s—reflecting, in part, the growth of biotechnology as an industry. Much of the basic biological and medical research done in recent years has resulted in new knowledge, including the isolation and identification of genes. Medical scientists will be needed to take this knowledge to the next stage—understanding how certain genes function within an entire organism—so that medical treatments can be developed for various diseases. Even pharmaceutical and other firms not solely engaged in biotechnology have adopted biotechnology techniques, thus creating employment for medical scientists. However, job growth will moderate from its previous heights as the biotechnology industry matures and begins to grow at a slower rate. Some companies may also conduct more of their research and development in lower-wage countries, further limiting employment growth.

Employment growth should also occur as a result of the expected expansion in research related to illnesses such as AIDS, cancer, and avian flu, along with growing treatment problems, such as antibiotic resistance. Moreover, environmental conditions such as overcrowding and the increasing frequency of international travel will tend to spread existing diseases and give rise to new ones. Medical scientists will continue to be needed because they greatly contribute to the development of treatments and medicines that improve human health.

The Federal Government is a major source of funding for medical research. Large budget increases at the National Institutes of Health in the early part of the decade led to increases in Federal basic research and development expenditures, with research grants growing both in number and dollar amount. However, the increase in expenditures slowed substantially in recent years. Going forward, the level of Federal funding will continue to impact competition for winning and renewing research grants.

Job prospects. Medical scientists with both doctoral and medical degrees are likely to experience the best opportunities. Workers with both a biological and professional medical background will have a distinct advantage in competing for research funding, as certain opportunities are only open to those with both qualifications.

Medical scientists are less likely to lose their jobs during recessions than workers 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, particularly in areas of risky or innovative medical research. A recession also could limit extensions or renewals of existing projects.

Earnings

Median annual wages of medical scientists, except epidemiologists, were $72,590 in May 2008. The middle 50 percent of these workers earned between $51,640 and $101,290. The lowest 10 percent earned less than $39,870, and the highest 10 percent earned more than $134,770. Median annual wages in

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the industries employing the largest numbers of medical scientists were:

Drugs and druggists' sundries merchant wholesalers	$90,640
Pharmaceutical and medicine manufacturing	87,500
Scientific research and development services	79,210
General medical and surgical hospitals	74,230
Colleges, universities, and professional schools	52,880

Earnings are lower and benefits limited for medical scientists in postdoctoral placements; workers in permanent positions typically receive higher wages and excellent benefits, in addition to job security.

Related Occupations

Other life science research occupations include:

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Agricultural and food scientists	177
Biological scientists	181
Epidemiologists	446
Teachers—postsecondary	282

Other health specialists with similar levels of education include:

Dentists	363
Pharmacists	374
Physicians and surgeons	381
Veterinarians	402

Sources of Additional Information

For general information on medical scientists, contact:

➤ Federation of American Societies for Experimental Biology, 9650 Rockville Pike, Bethesda, MD 20814. Internet: **http://www.faseb.org**

For information on and a listing of M.D./Ph.D. programs, contact:

➤ National Association of M.D./Ph.D. Programs. Internet: **http://www.aamc.org/students/considering/research/mdphd/**

For information on pharmaceutical scientists, contact:

➤ American Association of Pharmaceutical Scientists (AAPS), 2107 Wilson Blvd., Suite 700, Arlington, VA 22201. Internet: **http://www.aapspharmaceutica.org**

For information on careers in pharmacology, contact:

➤ American Society for Pharmacology and Experimental Therapeutics, 9650 Rockville Pike, Bethesda, MD 20814. Internet: **http://www.aspet.org**

Information on obtaining a medical scientist position with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos309.htm**

Physical Scientists

Atmospheric Scientists

Significant Points

- About 34 percent of atmospheric scientists are employed by the Federal Government; most of these work in the National Weather Service.
- 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. degree is required for most basic research positions.
- Keen competition is expected for jobs; those with graduate degrees should enjoy better prospects than those with only a bachelor's degree.

Nature of the Work

Atmospheric science is the study of the atmosphere—the blanket of air covering the Earth. Atmospheric scientists study the atmosphere's physical characteristics, motions, and processes, and the way in which these factors affect the rest of our environment. The best-known application of this knowledge is forecasting the weather. In addition to predicting the weather, atmospheric scientists attempt to identify and interpret climate trends, understand past weather, and analyze current weather. Weather information and atmospheric research are also 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, and ozone depletion.

Atmospheric scientists who forecast the weather are known as *operational meteorologists*; they are the largest group of specialists. These scientists study the Earth's air pressure, temperature, humidity, and wind velocity, and they apply physical and mathematical relationships to make short-range and

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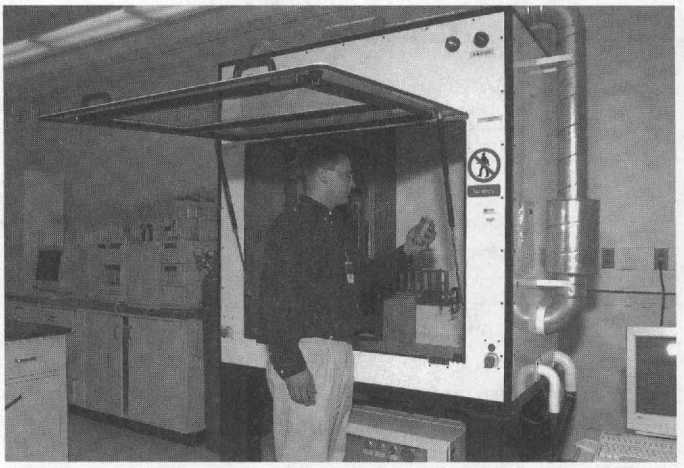
long-range weather forecasts. Their data come from weather satellites, radars, sensors, and stations in many parts of the world. Meteorologists use sophisticated computer models of the world's atmosphere to make long-term, short-term, and local-area forecasts. More accurate instruments for measuring 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 economic and safety reasons, such as the shipping, air transportation, agriculture, fishing, forestry, and utilities industries.

Meteorologists use data collected from sophisticated technologies like atmospheric satellite monitoring equipment and ground-based radar systems. Doppler radar, for example, can detect airflow patterns in violent storm systems, allowing forecasters to better predict thunderstorms, flash floods, tornadoes, and other hazardous winds, and to monitor the direction and intensity of storms. They also monitor surface weather stations and launch weather balloons, which carry equipment that measures wind, temperature, and humidity in the upper atmosphere.

While meteorologists study and forecast weather patterns in the short term, *climatologists* study seasonal variations in weather over months, years, or even centuries. They may collect, analyze, and interpret past records of wind, rainfall, sunshine, and temperature in specific areas or regions. Some look at patterns in weather over past years to determine, for example, whether a coming season will be colder or warmer than usual. Their studies are used to design buildings, plan heating and cooling systems, and aid in effective land use and agricultural production.

Some atmospheric scientists work exclusively 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 other atmospheric phenomena, such as the factors affecting the formation of clouds, rain, and snow; the dispersal of air pollutants over urban areas; and the mechanics of severe storms. 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.

Work environment. Weather stations are found everywhere—at airports, in or near cities, and in isolated and remote areas. In addition to analyzing information in offices, some atmospheric scientists also spend time observing weather conditions on the ground or 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. 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.



Atmospheric scientists monitor current weather conditions and make weather forecasts.

Most weather stations operate around the clock, 7 days a week, as weather conditions can change rapidly and timely information is essential, particularly during periods of severe weather. As a result, jobs in such facilities involve night, weekend, and holiday work, often with rotating shifts. During weather emergencies, such as hurricanes, meteorologists may work extended hours. Operational meteorologists also are often under pressure to meet forecast deadlines. Meteorologists and research scientists who are not involved in forecasting tasks work regular hours, usually in offices.

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. A master's degree is necessary for some positions, and a Ph.D. degree is required for most basic research positions.

Education and training. 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/atmospheric science courses, including 6 hours in the analysis and prediction of weather systems, 6 hours of atmospheric dynamics 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 (the study of the upper atmosphere), advanced thermodynamics, advanced electricity and magnetism, light and optics, and computer science.

Although positions in operational meteorology are available for those with only a bachelor's degree, obtaining a second bachelor's degree in a related technical field or a master's degree enhances employment opportunities, pay, and advance-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Atmospheric and space scientists	19-2021	9,400	10,800	1,400	15

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

ment potential. A Ph.D. typically is required only for research positions at universities. Students planning on a career in research and development do not necessarily need to 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. In 2009, the American Meteorological Society listed approximately 100 undergraduate and graduate atmospheric science programs. Many of these programs combine the study of meteorology with another field, such as agriculture, hydrology, 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.

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.

Students also should take courses in subjects that are most relevant to their desired area of specialization. For example, those who wish to become broadcast meteorologists for radio or television stations should develop excellent communication skills through courses in speech, journalism, and related fields. Students 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 to a permanent duty station.

Certification and advancement. The American Meteorological Society (AMS) offers the Certified Consulting Meteorologist professional certification for consulting meteorologists. Applicants must meet formal education requirements, 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. In addition, AMS also offers the Certified Broadcast Meteorologist designation for meteorologists in television and radio. Applicants must hold a bachelor's degree in atmospheric science or meteorology, complete an examination, and submit examples of their weather broadcasts for review. Both certifications also require periodic continuing education.

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.

Employment

Atmospheric scientists held about 9,400 jobs in 2008. This does not include individuals employed 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 teachers—postsecondary elsewhere in the *Handbook*.)

The Federal Government was the largest single employer of atmospheric scientists, accounting for about 34 percent of employment. 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. 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*.) Others worked for professional, scientific, and technical services firms, including private weather consulting services, and in radio and television broadcasting.

Job Outlook

Employment is expected to increase faster than average. Applicants face keen competition; those with graduate degrees should enjoy better prospects than those with only a bachelor's degree.

Employment change. Employment of atmospheric scientists is projected to grow 15 percent over the 2008-18 decade, faster than the average for all occupations. Most new jobs are expected to arise in private industry. As research leads to con-

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tinuing improvements in weather forecasting, demand should grow for private weather consulting firms to provide more detailed information than has formerly been available, especially to climate-sensitive industries. Farmers, commodity investors, insurance companies, utilities, and 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 climate-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, but related employment increases are expected to be small. Efforts toward making and improving global weather observations also could have a positive impact on employment.

Job prospects. Atmospheric scientists will face keen competition, as the number of graduates from college and university atmospheric sciences programs is expected to exceed the number of openings in the field. Although overall opportunities will be limited, the best prospects will be in private industry. Few opportunities are expected in government as atmospheric scientists will only need to be hired to replace workers who retire or leave the field. Openings for academic researchers will be limited due to the small number of positions. Workers with graduate degrees should enjoy better prospects than those with only a bachelor's degree.

Earnings

Median annual wages of atmospheric scientists in May 2008 were $81,290. The middle 50 percent earned between $55,140 and $101,340. The lowest 10 percent earned less than $38,990, and the highest 10 percent earned more than $127,100.

The average salary for meteorologists employed by the Federal Government was $93,661 in March 2009.

Related Occupations

Workers in other occupations concerned with the physical environment include:

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Chemists and materials scientists	195
Engineers	161
Environmental scientists and specialists	199
Geoscientists and hydrologists	202
Mathematicians	143
Physicists and astronomers	206

Sources of Additional Information

General information about careers in atmospheric sciences is provided by the University Corporation for Atmospheric Research at: **http://www.ucar.edu/student_recruiting**

Information about careers in meteorology and a listing of colleges and universities offering meteorology programs is provided by the American Meteorological Society at: **http://www.ametsoc.org**

Information about meteorology careers in the Federal Government can be obtained from the National Oceanic and Atmospheric Administration at: **http://www.careers.noaa.gov**

Information on obtaining a position as a meteorologist with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, so charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos051.htm**

Chemists and Materials Scientists

Significant Points

- A bachelor's degree in chemistry or a related discipline is the minimum educational requirement; however, many research jobs require a master's degree or a Ph.D.
- Job growth will occur in professional, scientific, and technical services firms as manufacturing companies continue to outsource their research and development and testing operations to these smaller, specialized firms.
- New chemists at all levels may experience competition for jobs, particularly in declining chemical manufacturing industries; graduates with a master's degree, and particularly those with a Ph.D., will enjoy better opportunities at larger pharmaceutical and biotechnology firms.

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 new knowledge about chemicals and use it to improve life. 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 such as improved oil refining and petrochemical processing that save energy and reduce pollution. Applications of materials science include studies of superconducting materials, graphite materials, integrated-circuit chips, and fuel cells. Research on the chemistry of living things spurs advances in medicine, agriculture, food processing, and other fields.

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Chemists and materials scientists develop new uses for substances and materials.

Many chemists and materials scientists work in research and development (R&D). In basic research, they investigate the properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances to each other. In applied R&D, these scientists create new products and processes or improve existing ones, often using knowledge gained from basic research. For example, the development of 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, simulation, and experimental analysis.

Developments in technology and the use of computers have allowed chemists and materials scientists to practice new, more efficient techniques, such as combinatorial chemistry. This technique makes and tests large quantities of chemical compounds simultaneously to find those with certain desired properties. Combinatorial chemistry allows chemists to produce thousands of compounds more quickly and less expensively than was formerly possible. In some cases, chemists use virtual libraries of millions of chemicals to find compounds with certain characteristics, allowing them to synthesize only the most promising candidates.

Scientific R&D in general has become more interdisciplinary in recent years; as a result, many chemists no longer work individually. Instead they will often be part of research teams that include other scientists, such as biologists and physicists; computer specialists; and engineers. (*Biochemists*, whose work encompasses both biology and chemistry, are discussed in the *Handbook* statement on biological scientists.)

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 ensure that these samples meet industry and government standards, including regulations governing pollution. Chemists report and document test results and analyze those results in hopes of improving existing theories or developing new test methods.

Chemists often specialize in a particular branch of the field. *Analytical chemists* determine the structure, composition, and nature of substances by examining and identifying their various elements or compounds. These chemists are crucial to the pharmaceutical industry because pharmaceutical companies need to know the identity of compounds that they hope to turn into drugs. Furthermore, analytical chemists develop techniques and study the relationships and interactions among the parts of compounds. They also identify the presence and concentration of chemical pollutants in water, soil, and the air.

Organic chemists study the chemistry of the vast number of carbon compounds that make up all living things. They synthesize elements or simple compounds to create new compounds or substances that have different properties and applications. These compounds have in turn been used to develop 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 they 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.

The work of materials chemists is similar to, but separate from, the work of *materials scientists*. Materials scientists tend to have a more interdisciplinary background, as they apply the principles of physics and engineering as well as chemistry to study all aspects of materials. Chemistry, however, plays the primary role in materials science because it provides information about the structure and composition of materials.

Materials scientists 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.

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Materials scientists often specialize in a specific type of material, such as ceramics or metals.

Work environment. 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 and advanced testing equipment. In addition to working in a laboratory, materials scientists also work with engineers and processing specialists in industrial manufacturing facilities. Chemists do some of their work in a chemical plant or outdoors—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.

Chemists and materials scientists typically work regular hours. A 40-hour workweek is usual, but longer hours are not uncommon. Researchers may be required to work odd hours in laboratories or other locations, depending on the nature of their research.

Training, Other Qualifications, and Advancement

A bachelor's degree in chemistry or a related discipline is the minimum educational requirement; however, many research jobs require a master's degree or, more often, a Ph.D.

Education and training. A bachelor's degree in chemistry, or in a related discipline together with a significant background in chemistry, usually is required for entry-level chemist jobs. Although some materials scientists hold a degree in materials science, these scientists also commonly have a degree in chemistry, physics, or electrical engineering. Most research jobs in chemistry and materials science require a master's degree or, more frequently, a Ph.D.

Many colleges and universities offer degree programs in chemistry. In 2009, the American Chemical Society (ACS) had approved about 650 bachelors, 310 masters, and 200 doctoral degree programs. In addition to these programs, other advanced degree programs in chemistry were offered at several hundred colleges and universities. The number of colleges that offer a degree program in materials science is small but gradually increasing; many engineering schools offer degrees in the joint field of materials science and engineering.

Students planning careers as chemists or materials scientists should take courses in science and mathematics, should like working with their hands to build scientific apparatus and perform laboratory experiments, and should like computer modeling.

In addition to taking required courses in analytical, inorganic, organic, and physical chemistry, undergraduate chemistry majors usually study biological sciences; mathematics; physics; and, increasingly, computer science. Computer courses are essential because employers prefer to hire job applicants who are able to apply computer skills to modeling and simulation tasks and are able to operate computerized laboratory equipment. These abilities are increasingly important as combinatorial chemistry and advanced screening techniques are more widely applied. Courses in statistics are useful because both chemists and materials scientists need the ability to apply basic statistical techniques.

People interested in environmental specialties also should take courses in environmental studies and become familiar with current legislation and regulations. Specific courses should include atmospheric, water, and soil chemistry and energy.

Graduate students studying chemistry commonly specialize in a subfield, 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 medicinal or synthetic organic chemistry. However, students normally need not specialize at the undergraduate level. In fact, undergraduates who are broadly trained have more flexibility when searching for jobs than if they have narrowly defined their interests. Most employers provide new graduates with additional training or education.

In government or industry, beginning chemists with a bachelor's degree work in quality control, perform analytical testing, or assist senior chemists in R&D laboratories. Many employers prefer to hire chemists and materials scientists with a Ph.D., or at least a master's degree, to lead basic and applied research. Within materials science, a broad background in various sciences is preferred. This broad base may be obtained through degrees in physics, engineering, or chemistry. Although many companies prefer hiring Ph.D.s, some may employ materials scientists with a bachelor's or master's degree.

Other qualifications. 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. Interaction among specialists in this field is increasing, especially for specialty 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.

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.

Perseverance, curiosity, and the ability to concentrate on detail and to work independently are essential.

Advancement. Advancement among chemists and materials scientists usually takes the form of greater independence in their work or larger budgets. Others choose to move into managerial positions and become natural sciences managers (covered in the *Handbook* statement on engineering and natural sciences managers). Those who pursue management careers spend more time preparing budgets and schedules and setting research strategy. Chemists or materials scientists who develop new products or processes sometimes form their own companies or join new firms to develop these ideas.

Employment

Chemists and materials scientists held about 94,100 jobs in 2008. Chemists accounted for about 84,300 of these, and ma-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Chemists and materials scientists	19-2030	94,100	97,300	3,300	3
Chemists	19-2031	84,300	86,400	2,100	2
Materials scientists	19-2032	9,700	10,900	1,200	12

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

terials scientists accounted for about 9,700 jobs. In addition, 24,800 chemists held faculty positions; these workers are covered in the statement on teachers—postsecondary, elsewhere in the *Handbook.*

About 42 percent of all chemists and material scientists were employed in manufacturing firms—mostly in the chemical manufacturing industry. Firms in this industry produce plastics and synthetic materials, drugs, soaps and cleaners, pesticides and fertilizers, paint, industrial organic chemicals, and other chemical products. About 18 percent of chemists and material scientists worked in scientific research and development services; 9 percent worked in testing labs. Companies whose products are made of metals, ceramics, plastics, and rubber employ most materials scientists.

Chemists and materials scientists are employed in all parts of the country, but they are mainly concentrated in large industrial areas.

Job Outlook

Job growth is expected to be slower than the average for all occupations. New chemists at all levels may experience competition for jobs, particularly in declining chemical manufacturing industries. Graduates with a master's degree or a Ph.D. will enjoy better opportunities, especially at larger pharmaceutical and biotechnology firms.

Employment change. Employment of chemists and materials scientists is expected to grow by 3 percent over the 2008-18 decade, slower than the average for all occupations. Job growth will occur in professional, scientific, and technical services firms as manufacturing companies continue to outsource their R&D and testing operations to these smaller, specialized firms. Chemists will see 2 percent growth as increases in biotechnology-related fields will be tempered by declines in other chemical manufacturing. Employment of materials scientists is projected to grow by 12 percent as manufacturers seek to improve the quality of their products by using new materials and manufacturing processes.

Demand for chemists is expected to be driven by 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.

The chemical manufacturing industry is expected to employ fewer chemists as companies divest their R&D operations. To control costs, most chemical companies, including many large pharmaceutical and biotechnology companies, will increasingly turn to scientific R&D services firms to perform specialized research and other work formerly done by in-house chemists. As a result, these firms will experience healthy job growth. Also, companies are expected to conduct an increasing amount of manufacturing and research in lower-wage countries, further limiting domestic employment growth. 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 employed 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, chemical manufacturing industries will continue to invest billions of dollars each year in technology that reduces pollution and cleans up existing waste sites. Research into traditional and alternative energy sources should also lead to employment growth among chemists.

Job prospects. New chemists at all levels may experience competition for jobs, particularly in declining chemical manufacturing industries. Pharmaceutical and biotechnology firms will continue to be a primary source of chemistry jobs, but graduates with a bachelor's degree in chemistry may also find science-related jobs in sales, marketing, and management. Some bachelor's degree holders become chemical technicians or technologists or high school chemistry teachers. In addition, they may qualify for assistant research positions at smaller research organizations.

Graduates with an advanced degree, particularly those with a Ph.D., are expected to enjoy somewhat better opportunities. Larger pharmaceutical and biotechnology firms provide openings for these workers at research laboratories, and many others work in colleges and universities. Furthermore, chemists with an advanced degree will continue to fill most senior research and upper management positions; however, similar to applicants in other occupations, chemist applicants face strong competition for the limited number of upper management jobs.

In addition to job openings resulting from employment growth, some job openings will result from the need to replace chemists and materials scientists who retire or otherwise leave the labor force.

During periods of economic recession, layoffs of chemists may occur—especially in the industrial chemicals industry. Layoffs are less likely in the pharmaceutical industry, where long development cycles generally overshadow short-term economic conditions. The traditional chemical industries, however, provide many raw materials to the automotive manufacturing

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and construction industries, both of which are vulnerable to temporary slowdowns during recessions.

Earnings

Median annual wages of chemists in May 2008 were $66,230. The middle 50 percent earned between $48,630 and $89,660. The lowest 10 percent earned less than $37,840, and the highest 10 percent earned more than $113,080. Median annual wages in the industries employing the largest numbers of chemists in 2008 are shown below:

Federal Executive Branch	$95,690
Scientific research and development services	76,450
Pharmaceutical and medicine manufacturing	66,520
Basic chemical manufacturing	63,630
Architectural, engineering, and related services	51,180

Median annual wages of materials scientists in May 2008 were $80,230. The middle 50 percent earned between $59,180 and $102,180. The lowest 10 percent earned less than $43,670, and the highest 10 percent earned more than $124,010.

According to the National Association of Colleges and Employers, beginning salary offers in July 2009 for graduates with a bachelor's degree in chemistry averaged $39,897 a year.

In March 2009, annual earnings of chemists in nonsupervisory, supervisory, and managerial positions in the Federal Government averaged $101,687.

Related Occupations

The research and analysis conducted by chemists and materials scientists is closely related to work done by:

	Page
Agricultural and food scientists	177
Biological scientists	181
Engineering and natural sciences managers	46
Engineers	161
Environmental scientists and specialists	199
Geoscientists and hydrologists	202
Medical scientists	189
Physicists and astronomers	206
Science technicians	230

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**

Information on obtaining a position as a chemist with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos049.htm**

Environmental Scientists and Specialists

Significant Points

- Federal, State, and local governments employ 44 percent of all environmental scientists and specialists.
- A bachelor's degree in any life or physical science is generally sufficient for most entry-level positions, although many employers prefer a master's degree.
- Job prospects are expected to be favorable, particularly for environmental health workers in State and local government.

Nature of the Work

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment by identifying problems and finding solutions that minimize hazards to the health of the environment and the population. They analyze measurements or observations of air, food, water, and soil to determine the way 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. They often use this understanding to design and monitor waste disposal sites, preserve water supplies, and reclaim contaminated land and water. They also write risk assessments, describing the likely affect of construction and other environmental changes; write technical proposals; and give presentations to managers and regulators.

The Federal Government and most State and local governments enact regulations to ensure that there is clean air to breathe, safe water to drink, and no hazardous materials in the soil. The regulations also place limits on development, particularly near sensitive parts of the ecosystem, such as wetlands. Many environmental scientists and specialists work for the government, ensuring that these regulations are followed and limiting the impact of human activity on the environment. Others monitor environmental impacts on the health of the population, checking for risks of disease and providing information about health hazards.

Environmental scientists also work with private companies to help them comply with environmental regulations and policies. They are usually hired by consulting firms to solve problems. Most consulting firms fall into two categories—large multidisciplinary engineering companies, the largest of which may employ thousands of workers, and small niche firms that may employ only a few workers. When looking for jobs, environmental scientists should consider the type of firm and the scope of the projects it undertakes. In larger firms, environmental scientists are more likely to engage in large, long-term projects in which they will work with people in other scientific disciplines. In smaller specialty firms, however, they work more often with

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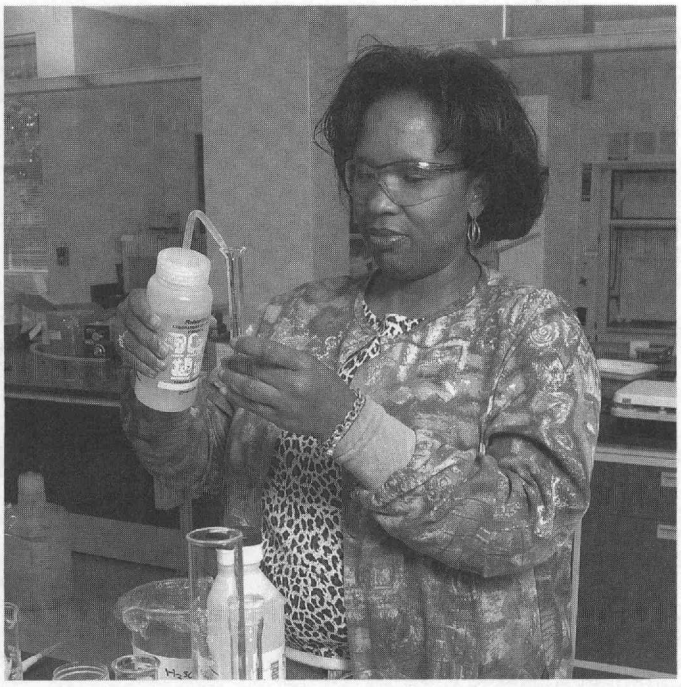

Environmental scientists research methods to reduce hazards that affect the environment or public health.

business professionals and clients in government and the private sector.

Environmental scientists who work on policy formation may help identify ways that human behavior can be modified in the future to avoid such problems as ground-water contamination and depletion of the ozone layer. Some environmental scientists work in managerial positions, usually after spending some time performing research or learning about environmental laws and regulations.

Many environmental scientists do work and have training that is similar to other physical or life scientists, but they focus on environmental issues. Many specialize in subfields such as environmental ecology and conservation, environmental chemistry, environmental biology, or fisheries science. Specialties affect the specific activities that environmental scientists perform, although recent understandings of the interconnectedness of life processes have blurred some traditional classifications. For example, *environmental ecologists* study the relationships between organisms and their environments and the effects of factors such as population size, pollutants, rainfall, temperature, and altitude, on both. They may collect, study, and report data on air, soil, and water using their knowledge of various scientific disciplines. *Ecological modelers* study ecosystems, pollution control, and resource management using mathematical modeling, systems analysis, thermodynamics, and computer techniques. *Environmental chemists* study the toxicity of various chemicals, that is, how those chemicals affect plants, animals, and people. (Information on geoscientists and hydrologists, who also study the Earth, is located elsewhere in the *Handbook*.)

Environmental scientists in research positions with the Federal Government or in colleges and universities often have to find funding for their work by writing grant proposals. Consultants face similar pressures to market their skills and write proposals so that they will have steady work.

Work environment. Many entry-level environmental scientists and specialists spend a significant amount of time in the field, while more experienced workers generally devote more time to office or laboratory work. Some environmental scientists, such as environmental ecologists and environmental chemists, 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. Travel often is required to meet with prospective clients.

Researchers and consultants might face stress when looking for funding. Occasionally, those who write technical reports to business clients and regulators may be under pressure to meet deadlines and thus have to work long hours.

Training, Other Qualifications, and Advancement

A bachelor's degree is sufficient for most jobs in government and private sector companies, although a master's degree is often preferred. A Ph.D. is usually only necessary for jobs in college teaching or research.

Education and training. A bachelor's degree in an earth science is adequate for entry-level positions, although many companies prefer to hire environmental scientists with a master's degree in environmental science or a related natural science. A doctoral degree generally is necessary only for college teaching and some research positions. Some environmental scientists and specialists have a degree in environmental science, but many earn degrees in biology, chemistry, physics, or the geosciences and then apply their education to the environment. They often need research or work experience related to 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. Undergraduate environmental science majors typically focus on data analysis and physical geography, which are particularly useful in studying pollution abatement, water resources, or ecosystem protection, restoration, and management. Understanding the geochemistry of inorganic compounds is becoming increasingly important in developing remediation goals. 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, which is the gathering of geologic data. An understanding of environmental regulations and government permit issues also is valuable.

For environmental scientists and specialists who consult, courses in business, finance, marketing, or economics may be useful. In addition, combining environmental science training with other disciplines such as engineering or business, qualifies these scientists for the widest range of jobs.

Other qualifications. Computer skills are essential for prospective environmental scientists. Students who have some experience with computer modeling, data analysis and integration, digital mapping, remote sensing, and Geographic Information Systems (GIS) will be the most prepared to enter the job market.

Environmental scientists and specialists usually work as part of a team with other scientists, engineers, and technicians, and they must often write technical reports and research proposals

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Environmental scientists and specialists, including health	19-2041	85,900	109,800	23,900	28

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

that communicate their research results or ideas to company managers, regulators, and the public. Environmental health specialists also work closely with the public, providing and collecting information on public health risks. As a result, strong oral and written communication skills are essential.

Advancement. Environmental scientists and specialists often begin their careers as field analysts or as research assistants or technicians in laboratories or offices. They are given more difficult assignments and more autonomy as they gain experience. Eventually, they may be promoted to project leader, program manager, or some other management and research position. (Information on engineering and natural sciences managers is located elsewhere in the *Handbook*.)

Employment

Environmental scientists and specialists held about 85,900 jobs in 2008. An additional 6,200 jobs were held by environmental science faculty; these workers are covered in the statement on teachers—postsecondary elsewhere in the *Handbook*.

About 37 percent of environmental scientists were employed in State and local governments; 21 percent in management, scientific, and technical consulting services; 15 percent in architectural, engineering and related services; and 7 percent in the Federal Government, primarily in the Environmental Protection Agency (EPA) and the Department of Defense.

Job Outlook

Employment is expected to grow much faster than the average for all occupations. Job prospects are expected to be favorable, particularly in State and local government.

Employment change. Employment of environmental scientists and specialists is expected to increase by 28 percent between 2008 and 2018, much faster than the average for all occupations. Job growth should be strongest in private-sector consulting firms. Growth in employment will be spurred largely by the increasing demands placed on the environment by population growth and increasing awareness of the problems caused by environmental degradation. Further demand should result from the need to comply with complex environmental laws and regulations, particularly those regarding ground-water decontamination and clean air.

Much job growth will result from a continued 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 restoring ecosystems. In addition, environmental scientists will be needed to help planners develop and construct buildings, transportation corridors, and utilities that protect water resources and reflect efficient and beneficial land use.

Many environmental scientists and specialists work in consulting. Consulting firms have hired these scientists to help businesses and government address issues related to underground tanks, land disposal areas, and other hazardous-waste-management facilities. Currently, environmental consulting is evolving from investigations to creating remediation and engineering solutions. At the same time, the regulatory climate is moving from a rigid structure to a more flexible risk-based approach. These factors, coupled with new Federal and State initiatives that integrate environmental activities into the business process itself, will result in a greater focus on waste minimization, resource recovery, pollution prevention, and the consideration of environmental effects during product development. This shift in focus to preventive management will provide many new opportunities for environmental scientists in consulting roles.

Job prospects. In addition to job openings due to growth, there will be additional demand for new environmental scientists to replace those who retire, advance to management positions, or change careers. Job prospects for environmental scientists will be good, particularly for jobs in State and local government.

During periods of economic recession, layoffs of environmental scientists and specialists may occur in consulting firms, particularly when there is a slowdown in new construction; layoffs are much less likely in government.

Earnings

Median annual wages of environmental scientists and specialists were $59,750 in May 2008. The middle 50 percent earned between $45,340 and $78,980. The lowest 10 percent earned less than $36,310, and the highest 10 percent earned more than $102,610.

According to the National Association of Colleges and Employers, beginning salary offers in July 2009 for graduates with bachelor's degrees in an environmental science averaged $39,160 a year.

Related Occupations

Other occupations that deal with preserving or researching the natural environment include:

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Atmospheric scientists	192
Biological scientists	181
Chemists and materials scientists	195
Conservation scientists and foresters	185
Engineering technicians	173
Engineers	161
Epidemiologists	446
Geoscientists and hydrologists	202
Physicists and astronomers	206
Science technicians	230
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	157

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Sources of Additional Information

Information on training and career opportunities for environmental scientists and specialists is available from:

➤ American Geological Institute, 4220 King St., Alexandria, VA 22302. Internet: **http://www.agiweb.org**

Information on obtaining a position as an environmental protection specialist with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos311.htm**

Geoscientists and Hydrologists

Significant Points

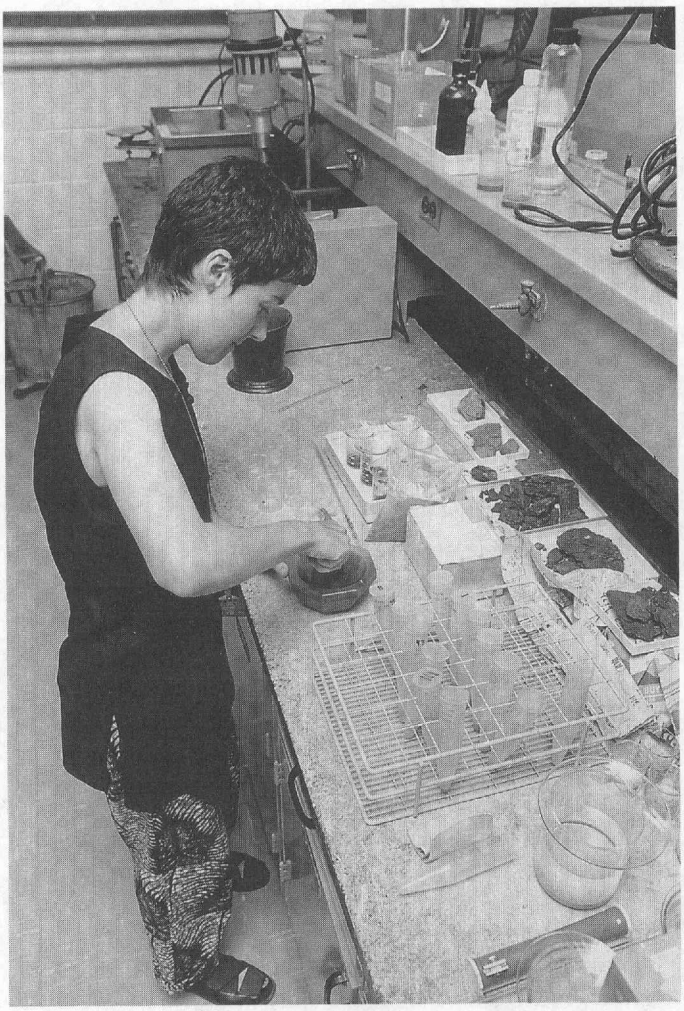
- Work at remote field sites is common.
- Twenty-three percent of all geoscientists and hydrologists are employed in government.
- Employers prefer applicants with a master's degree for most positions; a Ph.D. degree is required for most research and college teaching positions.
- Excellent job opportunities are expected for geoscientists with a master's degree.

Nature of the Work

Geoscientists and *hydrologists* study the composition, structure, and other physical aspects of the Earth, and the Earth's geologic past and present by using sophisticated instruments to analyze the composition of earth, rock, and water. Many geoscientists and hydrologists help to search for natural resources such as groundwater, minerals, metals, and petroleum. Others work closely with environmental and other scientists to preserve and clean up the environment.

Geoscientists usually study and work in one of several closely related geosciences fields, including geology, geophysics, and hydrology. *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. Hydrologists study the quantity, distribution, circulation, and physical properties of water and the water cycle.

Within these major geoscience fields, there are numerous subspecialties. For example, *petroleum geologists* map the subsurface of the ocean or land as they explore the terrain for oil and gas deposits. They use sophisticated 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, and study the environment surrounding rocks in order to find new mineral resources. *Sedimentologists* study the nature, origin, distribution, and alteration of sediments, such as sand, silt, and mud. These sediments may contain oil, gas, coal, and many other mineral deposits. *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 which formed them. *Volcanologists* investigate volcanoes and volcanic phenomena to try to predict the potential for future eruptions and hazards to human health and welfare. *Glacial geologists* study the physical properties and movement of glaciers and ice sheets. *Geochemists* study the nature and distribution of chemical elements in groundwater and earth materials.



Geoscientists study the earth, often looking for natural resources.

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Geophysicists specialize in areas such as geodesy, seismology, and 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 or on physicists and astronomers, both elsewhere in the *Handbook*.)

Hydrologists often specialize in either underground water or surface water. 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. Hydrologists use sophisticated techniques and instruments. For example, they may use remote sensing technology, data assimilation, and numerical modeling to monitor the change in regional and global water cycles. Some surface-water hydrologists use sensitive stream-measuring devices to assess flow rates and water quality.

Oceanographers use their knowledge of geosciences, in addition to biology and chemistry, to study the world's oceans and coastal waters. They study the motion and circulation of ocean waters; the physical and chemical properties of the oceans; and how these properties affect coastal areas, climate, and weather. (*Biological oceanographers*, often called marine biologists, study the distribution and migration patterns of the many diverse forms of sea life in the ocean; the statement on biological scientists discusses this occupation elsewhere in the *Handbook*.)

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 fund their research. Geoscientists in consulting jobs face similar pressures to market their skills and write proposals so that they will have steady work.

Work environment. Geoscientists and hydrologists can spend a large part of their time in the field, identifying and examining geological formation, studying data collected by remote sensing instruments, conducting geological surveys, constructing field maps, and using instruments to measure the Earth's gravity and magnetic field. They often perform seismic studies, for example, which involve bouncing energy waves off buried layers of rock, to search for oil and gas or to understand the structure of the subsurface layers. Similarly, they use seismic signals generated by an earthquake to determine the earthquake's location and intensity. In laboratories, they 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.

Some geoscientists and hydrologists spend the majority of their time in an office, but many others divide their time between fieldwork and office or laboratory work. Work at remote field sites is common. Some specialists, such as volcanologists, often take field trips that involve significant physical activity and some risk. In the field they work in warm or cold climates and 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. Geologists frequently travel to remote field sites by helicopter or 4-wheel-drive vehicles and cover large areas on foot. Many 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. Fieldwork often requires working long and irregular hours.

Training, Other Qualifications, and Advancement

A master's degree is the primary educational requirement for most positions. A Ph.D. is necessary for most research and college teaching positions.

Education and training. A bachelor's degree is adequate for a few entry-level positions, but most geoscientists and hydrologists need a master's degree, which is the preferred educational requirement for most research positions in private industry, Federal agencies, and State geological surveys. A Ph.D. is necessary for most high-level research and college teaching positions, but is generally not required for other jobs.

Many colleges and universities offer bachelor's and graduate degrees in the geosciences. Traditional geoscience courses emphasizing classical geologic methods and topics (such as mineralogy, petrology, paleontology, stratigraphy, and structural geology) are important for all geoscientists. People who study physics, chemistry, biology, mathematics, engineering, or computer science may also qualify for some geoscience positions if their course work includes geology.

Most universities do not offer degrees in hydrology, but instead offer concentrations in hydrology or water studies in their geoscience, environmental science, or engineering departments. Students interested in hydrology should take courses in the physical sciences, geophysics, chemistry, engineering science, soil science, mathematics, aquatic biology, atmospheric science, geology, oceanography, hydrogeology, and the management or conservation of water resources.

Licensure and certification. A number of States require geoscientists and hydrologists who offer their services directly to the public to obtain a license from a State licensing board. Licensing requirements vary by State but typically include education and experience requirements and a passing score on an examination. In States that do not require a license, workers can obtain voluntary certifications. For example, the American Institute of Hydrology offers certification programs in professional hydrology that have similar requirements to State licensure programs.

Other qualifications. Computer skills are essential for prospective geoscientists and hydrologists; students who have experience with computer modeling, data analysis and integration, digital mapping, remote sensing, and Geographic Information Systems (GIS) will be the most prepared entering the job market. Knowledge of the Global Positioning System (GPS)—a

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Geoscientists and hydrologists	–	41,700	49,100	7,400	18
Geoscientists, except hydrologists and geographers	19-2042	33,600	39,400	5,900	18
Hydrologists	19-2043	8,100	9,600	1,500	18

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

locator system that uses satellites—has also become essential. Some employers seek applicants with field experience, so a summer internship is often helpful.

Because geoscientists and hydrologists usually work as part of a team with other geoscientists and with environmental scientists, engineers, and technicians, they must have good interpersonal skills. Strong oral and written communication skills also are important because writing technical reports and research proposals and explaining research results in person are important aspects of the work. Some jobs, particularly for petroleum geologists, require foreign travel, and for these positions knowledge of a second language is beneficial.

These workers must be inquisitive, able to think logically, and capable of complex analytical thinking, including spatial visualization and the ability to infer conclusions from sparse data. Geoscientists and hydrologists involved in fieldwork must have physical stamina.

Advancement. Geoscientists and hydrologists often begin their careers in field exploration or as research assistants or technicians in laboratories or offices. As they gain experience, they take on more complex and difficult assignments. Eventually, some are promoted to project leader, program manager, or to a senior research position. Those who choose to work in management will spend more time scheduling, budgeting, and reporting to top executives or clients. (See the statement on engineering and natural sciences managers elsewhere in the *Handbook.*)

Employment

Geoscientists held about 33,600 jobs in 2008, while another 8,100 were employed as hydrologists. Many more individuals held 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 23 percent of geoscientists were employed in architectural, engineering, and related services and 19 percent worked for oil and gas extraction companies. State agencies such as State geological surveys and State departments of conservation employed another 9 percent of geoscientists. Eight percent worked for the Federal Government, 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.

Among hydrologists, 26 percent were employed in architectural, engineering, and related services, and 19 percent worked for management, scientific, and technical consulting services. The Federal Government employed about 27 percent of hydrologists, mostly within the U.S. Department of the Interior for the U.S. Geological Survey (USGS) and within the U.S. Department of Defense.

Job Outlook

Employment of geoscientists and hydrologists is expected to grow faster than the average for all occupations. Graduates with a master's degree in geoscience can expect excellent job opportunities, but Ph.D.s may face competition for research and college teaching jobs.

Employment change. Employment growth of 18 percent is expected for geoscientists and hydrologists between 2008 and 2018, which is faster than the average for all occupations. The need for energy, environmental protection, and responsible land and water management will spur employment demand. Employment in management, scientific, and technical consulting services should continue to grow as more geoscientists work as consultants. These services have increased their hiring of geoscientists in recent years because of increased government contracting and private corporations' need for technical assistance and environmental management plans. Moreover, many geoscientists and hydrologists monitor the quality of the environment, checking for problems such as deteriorating coastal environments and soil and water contamination—all of which will create employment growth for them. An expected increase in highway building and other infrastructure projects will also be a source of jobs for engineering geologists.

Many geoscientists work in the exploration and production of oil and gas. Historically, employment of petroleum geoscientists has been cyclical and affected considerably by the price of oil and gas. When prices are low, oil and gas producers curtail exploration activities and may lay off geologists. When prices are high, companies have the funds and incentive to renew exploration efforts and to hire geoscientists in larger numbers. In the long term, continued high oil prices are expected to maintain demand for workers who can find new resource deposits. Geoscientists who speak a foreign language and who are willing to work abroad should enjoy the best opportunities, as the need for energy, construction materials, and a broad range of geoscience expertise grows in developing nations.

Demand for hydrologists should also be strong as the population increases and moves to more environmentally sensitive locations. As people increasingly migrate toward coastal regions, for example, hydrologists will be needed to assess building sites for potential geologic hazards and to mitigate the effects of natural hazards such as floods, landslides, and hurricanes. Hydrologists also will be needed to study hazardous-waste sites and determine the effect of pollutants on soil and ground wa-

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ter so that engineers can design remediation systems. Increased government regulations, such as those regarding the management of storm water, and issues related to water conservation, deteriorating coastal environments, and rising sea levels also will stimulate employment growth for these workers.

Job prospects. Graduates with a master's degree in geoscience should have excellent opportunities, especially in consulting firms and in the oil and gas industry. In addition to demand resulting from job growth, replacing those who leave the occupation for retirement, managerial positions, or other careers will generate a number of jobs. A significant number of geoscientists are approaching retirement age, and without increases in the number of students earning master's degrees in the geosciences, job openings may exceed the number of qualified jobseekers over the 2008–18 projection period. However, geoscientists with doctoral degrees, who primarily work as college and university faculty or do research, may face competition. There are few openings for new graduates with only a bachelor's degree in geoscience, but these graduates may have favorable opportunities in related occupations, such as high school science teacher or science technician.

Job prospects for hydrologists should be favorable, particularly for those with field experience. Demand for hydrologists who understand both the scientific and engineering aspects of waste remediation should be strong.

There will be fewer opportunities for geoscientists and hydrologists in Federal and State government, mostly because of budget constraints at key agencies, such as the U.S. Geological Service, and the trend among governments toward contracting out to consulting firms instead of hiring new government employees. However, departures of geoscientists who retire or leave the government for other reasons will result in some job openings over the next decade.

Geoscientists may face layoffs during periods of economic recession, but the prices of commodities are a much more important source of volatility; for those working in the oil and gas or mining industries, the cyclical nature of commodity prices determines demand. When prices are high, jobs are plentiful, but when prices fall, positions become scarce.

Earnings

Median annual wages of geoscientists were $79,160 in May 2008. The middle 50 percent earned between $54,470 and $113,390; the lowest 10 percent earned less than $41,700, and the highest 10 percent more than $155,430.

The petroleum, mineral, and mining industries offer higher salaries, but less job security, than other industries because economic downturns sometimes cause layoffs. Median annual wages for the industries employing the largest number of geoscientists in May 2008 were as follows:

Oil and gas extraction	$127,560
Federal Executive Branch	90,220
Architectural, engineering, and related services	66,770
Management, scientific, and technical consulting services	62,070
State government	57,700

Median annual wages of hydrologists were $71,450 in May 2008. The middle 50 percent earned between $54,910 and $89,200; the lowest 10 percent earned less than $44,410, and the highest 10 percent more than $105,010.

In March 2009, the Federal Government's average salary was $94,085 for geologists, $108,118 for geophysicists, $89,404 for hydrologists, and $105,671 for oceanographers.

Related Occupations

Other occupations related to the physical environment include:

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Atmospheric scientists	192
Biological scientists	181
Chemists and materials scientists	195
Environmental scientists and specialists	199
Physicists and astronomers	206

Many geoscientists work in the petroleum and natural gas industry, an industry that also employs numerous other workers whose jobs deal with the scientific and technical aspects of the exploration and extraction of petroleum and natural gas, including:

Engineering technicians	173
Engineers	161
Science technicians	230
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	157

Sources of Additional Information

Information on training and career opportunities for geoscientists and hydrologists is available from:

➤ American Geological Institute, 4220 King St., Alexandria, VA 22302-1502. Internet: **http://www.agiweb.org**

Information on careers in petroleum geology is available from:

➤ American Association of Petroleum Geologists, P.O. Box 979, Tulsa, OK 74101. Internet: **http://www.aapg.org**

Information on careers and certification in hydrology is available from:

➤ American Institute of Hydrology, Engineering D–Mail Code 6603, Southern Illinois University Carbondale, 1230 Lincoln Dr., Carbondale, IL 62901. Internet: **http://www.aihydrology.org**

Information on obtaining a position as a geologist, geophysicist, hydrologist, or oceanographer with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos312.htm**

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Physicists and Astronomers

Significant Points

- Scientific research and development services firms and the Federal Government employ over half of all physicists and astronomers.
- Most jobs in basic research usually require a doctoral degree; master's degree holders qualify for some jobs in applied research and development; bachelor's degree holders often qualify as research assistants or for other physics-related occupations, such as technicians.
- Applicants may face competition for basic research positions due to limited funding; however, those with a background in physics or astronomy may have good opportunities in related fields, such as engineering and technology.

Nature of the Work

Physicists and astronomers conduct research to understand the nature of the universe and everything in it. These scientists observe, measure, interpret, and develop theories to explain celestial and physical phenomena using mathematics. From the vastness of space to the infinitesimal scale of subatomic particles, they study the fundamental properties of the natural world and apply the knowledge gained to design new technologies.

Physicists explore and identify basic principles and laws governing the motion, energy, structure, and interactions of matter. Some physicists study theoretical areas, such as the nature of time and the origin of the universe; others apply their knowledge of physics to practical areas, such as the development of advanced materials, electronic and optical devices, and medical equipment.

Physicists design and perform experiments with sophisticated equipment such as lasers, particle accelerators, electron microscopes, and mass spectrometers. On the basis of their observations and analysis, they attempt to discover and explain laws describing the forces of nature, such as gravity, electromagnetism, and nuclear interactions. Experiments also help physicists find ways to apply physical laws and theories to problems in nuclear energy, electronics, optics, materials, communications, aerospace technology, and medical instrumentation.

Astronomers use the principles of physics and mathematics to learn about the fundamental nature of the universe and its components, including the sun, moon, planets, stars, and galaxies. As such, astronomy is sometimes considered a subfield of physics. 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 and astronomers work in research and development. Some conduct basic research with the sole aim of increasing scientific knowledge. Others conduct applied research and development, which builds upon the discoveries made through basic research to develop practical applications of this knowledge, such as new devices, products, and processes. For example, knowledge gained through basic research in solid-state physics led to the development of transistors and, then, integrated circuits used in computers.

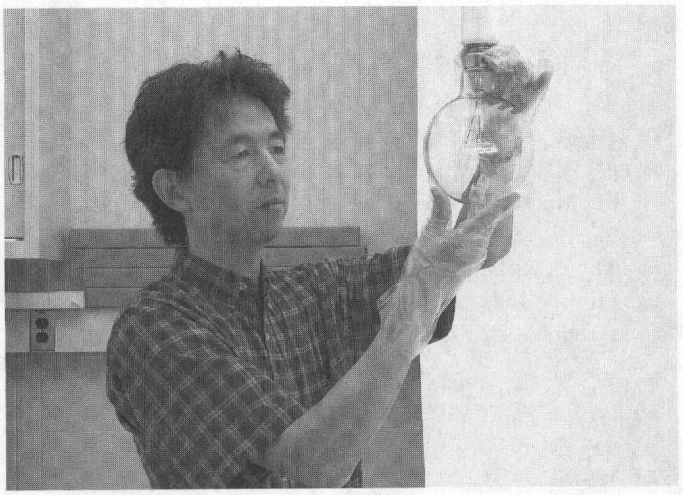
Physicists also design research equipment, which often has additional unanticipated uses. For example, lasers are used in surgery, microwave devices function in ovens, and measuring instruments can analyze blood or the chemical content of foods.

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 physics, as well as in some other areas of physics, require extremely large and expensive equipment, such as particle accelerators and nuclear reactors. Physicists in these subfields often work in large teams. Although physics research may require extensive experimentation in laboratories, research physicists still spend much time in offices planning, recording, analyzing, and reporting on research.

Physicists generally specialize in one of many subfields, such as elementary particle physics, nuclear physics, atomic and molecular physics, condensed matter physics, optics, acoustics, space physics, or plasma physics. 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. (Biophysicists are covered in the statement on biological scientists elsewhere in the *Handbook*).

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-based 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.



Research jobs for physicists and astronomers usually require a Ph.D.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Astronomers and physicists	19-2010	17,100	19,800	2,700	16
Astronomers	19-2011	1,500	1,700	200	16
Physicists	19-2012	15,600	18,100	2,500	16

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

For many years, satellites and other space-based instruments, such as the Hubble space telescope, have provided prodigious amounts of astronomical data. New technology has lead to improvements in analytical techniques and instruments, such as computers and optical telescopes and mounts, and is creating 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.

Work environment. Most physicists and astronomers 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 with ground-based telescopes may spend many hours working in observatories; this work usually involves travel to remote locations and may require working at night. Physicists and astronomers whose work depends on grant money often are under pressure to write grant proposals to keep their work funded.

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. Astronomers may need to work at odd hours to observe celestial phenomena, particularly those working with ground-based telescopes.

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. Master's degree holders qualify for some jobs in applied research and development, whereas bachelor's degree holders often qualify as research assistants or for jobs in other fields where a physics background is good preparation, such as engineering and technology.

Education and training. A Ph.D. degree in physics or closely related fields is typically required for basic research positions, independent research in industry, faculty positions, and advancement to managerial positions. Graduate study in physics prepares students for a career in research through rigorous training in theory, methodology, and mathematics. Most physicists specialize in a subfield during graduate school and continue working in that area afterwards.

Additional experience and training in a postdoctoral research appointment, although not required, is important for physicists and astronomers aspiring to permanent 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 may 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 are specifically preparing students for physics-related research and development that does not require a Ph.D. degree. These programs teach students specific research skills that can be used in private-industry jobs. In addition, a master's degree coupled with State certification usually qualifies one 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. Increasingly, some may qualify for applied research jobs in private industry or take on nontraditional physics roles, often in computer science, such as systems analysts or database administrators. Some become science teachers in secondary schools.

Holders of a bachelor's or master's degree in astronomy often enter an unrelated field where their strong analytical background provides good preparation. However, they are also 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, geoscientists, computer scientists, computer software engineers and computer programmers, and computer systems analysts elsewhere in the *Handbook.*)

Many 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.

Approximately 190 universities offer Ph.D. degrees in physics; more than 60 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; a typical Ph.D. program takes about 6 years to complete.

About 75 universities grant degrees in astronomy, either through an astronomy, physics, or combined physics-astronomy department. About half of all astronomy departments are combined with physics departments, while the remainder are administered separately. With about 40 doctoral programs in astronomy, applicants face considerable competition for available slots. Those planning a career in the subject should have a strong physics background. In fact, an undergraduate degree in

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either physics or astronomy is excellent preparation, followed by a Ph.D. in astronomy.

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 specialties or develop a broader understanding of related areas of research. Initial work may be under the close supervision of senior scientists. As they gain experience, physicists perform increasingly complex tasks and achieve greater independence in their work. Experience, either in academic laboratories or through internships, fellowships, or work-study programs in industry, also is useful. Some employers of research physicists, particularly in the information technology industry, prefer to hire individuals with several years of postdoctoral experience.

Other qualifications. 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 who do not have a physics background.

Certain sensitive research positions with the Federal Government and in fields such as nuclear energy may require applicants to be U.S. citizens and to hold a security clearance.

Advancement. Advancement among physicists and astronomers usually takes the form of greater independence in their work, larger budgets, or tenure in university positions. Others choose to move into managerial positions and become natural science managers (engineering and natural sciences managers are discussed elsewhere in the *Handbook*). Those who pursue management careers spend more time preparing budgets and schedules. Those who develop new products or processes sometimes form their own companies or join new firms to develop these ideas.

Employment

Physicists and astronomers held about 17,100 jobs in 2008. Physicists accounted for about 15,600 of these, while astronomers accounted for only about 1,500 jobs. In addition, there were about 15,500 physicists employed in faculty positions; these workers are covered in more detail in the statement on teachers—postsecondary elsewhere in the *Handbook*.

About 39 percent of physicists and astronomers worked for the scientific research and development services industry, which includes employees of the 36 Federally Funded Research and Development Centers. These centers, sometimes referred to as national laboratories, perform a significant amount of basic research in the physical sciences. They are funded by government agencies such as the Department of Energy and the Department of Defense, but are administered by universities or private corporations. The Federal Government directly employed another 22 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 nonfaculty research positions at educational institutions and hospitals.

Although physicists and astronomers are employed in all parts of the country, most work in areas in which universities, large research laboratories, or observatories are located.

Job Outlook

Physicists and astronomers should experience faster than average job growth, but may face competition for basic research positions due to limited funding. However, those with a background in physics or astronomy may have good opportunities in related occupations.

Employment change. Employment of physicists and astronomers is expected to grow 16 percent, faster than the average for all occupations during the 2008-18 decade.

Federal research expenditures are the major source of physics-related and astronomy-related research funds, especially for basic research. For most of the past decade there has been limited growth in Federal funding for physics and astronomy research as most of the growth in Federal research funding has been devoted to the life sciences. However, the America COMPETES Act, passed by Congress in 2007, sets a goal to double funding for the physical sciences through the National Science Foundation and the Department of Energy's Office of Science by the year 2016, and recent budgets for these agencies have seen large increases. If these increases continue, it will result in more opportunities in basic research for Ph.D. physicists and astronomers.

Although research and development expenditures 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, people with a physics background continue to be in demand in 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, or systems analyst or developer, rather than physicist.

Job prospects. In addition to job growth, the need to replace physicists and astronomers who retire or otherwise leave the occupation permanently will account for many job openings. In recent years the number of doctorates granted in physics has been somewhat greater than the number of job openings for traditional physics research positions in colleges and universities and in research centers. Recent increases in undergraduate physics enrollments may also lead to growth in enrollments in graduate physics programs, so that there may be an increase in the number of doctoral degrees granted that could intensify the competition for basic research positions. However, demand has grown in other related occupations for those with advanced training in physics. Prospects should be favorable for physicists in applied research, development, and related technical fields.

Opportunities should also be numerous for those with a master's degree, particularly graduates from programs preparing students for related work in applied research and development,

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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.

People with only a bachelor's degree in physics or astronomy are usually not qualified for physics or astronomy research jobs, but they may qualify for a wide range of positions related to engineering, mathematics, computer science, environmental science, and some nonscience fields, such as finance. Those who meet State certification requirements can become high school physics teachers, an occupation in strong demand in many school districts. Some States require new teachers to obtain a master's degree in education within a certain time. (See the statement on teachers—kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.) Despite competition for traditional physics and astronomy research jobs, graduates with a physics or astronomy degree at any level will find their knowledge of science and mathematics useful for entry into many other occupations.

Despite their small numbers, astronomers can expect good job prospects in government and academia over the projection period. Since astronomers are particularly dependent upon government funding, Federal budgetary decisions will have a sizable influence on job prospects for astronomers.

Earnings

Median annual wages of physicists were $102,890 in May 2008. The middle 50 percent earned between $80,040 and $130,980. The lowest 10 percent earned less than $57,160, and the highest 10 percent earned more than 159,400.

Median annual wages of astronomers were $101,300 in May 2008. The middle 50 percent earned between $63,610 and $133,630, the lowest 10 percent less than $45,330, and the highest 10 percent more than $156,720.

The average annual salary for physicists employed by the Federal Government was $118,971 in March 2009; for astronomy and space scientists, it was $130,833.

Related Occupations

The work of physicists and astronomers relates closely to that of other physical scientists and engineers, such as:

	Page
Atmospheric scientists	192
Chemists and materials scientists	195
Engineering and natural sciences managers	46
Engineers	161
Environmental scientists and specialists	199
Geoscientists and hydrologists	202

Physicists and astronomers also work extensively with computers and data, similar to the work of:

Computer scientists	132
Computer software engineers and computer programmers	134
Computer systems analysts	140
Mathematicians	143
Statisticians	148

Sources of Additional Information

Further information on career opportunities in physics is available from the following organizations:

➤ 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**

➤ American Physical Society, One Physics Ellipse, College Park, MD 20740-3844. Internet: **http://www.aps.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos052.htm**

Social Scientists and Related Occupations

Economists

Significant Points

- Slower than average job growth is expected, as the vast majority of bachelor's degree holders in economics find employment in closely related fields, such as business, finance, or insurance.
- Candidates who hold a master's or Ph.D. degree in economics will have the best employment prospects and advancement opportunities; some entry-level positions are available to those with a bachelor's degree.
- Quantitative skills are important in all economics specialties.

Nature of the Work

Economists study how society distributes 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 on a wide variety of issues, including energy costs, inflation, interest rates, exchange rates, business cycles, taxes, and employment levels, among others.

Economists develop methods 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 also is an important part of an economist's job, as is presenting economic and statistical concepts in a clear and meaningful way for those who do not

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have a background in economics. Some economists also perform economic analysis for the media.

Many economists specialize in a particular area of economics, although general knowledge of basic economic principles is essential. *Microeconomists* study the supply and demand decisions of individuals and firms, such as how profits can be maximized and the quantity of a good or service that consumers will demand at a certain price. *Industrial economists* and *organizational economists* study the market structure of particular industries in terms of the number of competitors within those industries and examine the market decisions of competitive firms and monopolies. These economists also may 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. *Monetary economists* and *financial economists* do work that is similar to that done by macroeconomists. These workers study the money and banking system and the effects of changing interest rates. *International economists* study global financial markets, currencies and exchange rates, and the effects of various trade policies such as tariffs. *Labor economists* and *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 of changing demographic trends, such as an aging population and increasing immigration, on labor markets. *Public finance economists* are involved primarily in studying the role of the government in the economy and the effects of tax cuts, budget deficits, and welfare policies. *Econometricians* investigate all areas of economics and apply mathematical techniques such as calculus, game theory, and regression analysis to their research. With these techniques, they formulate economic models that help explain economic relationships that can be used to develop forecasts about business cycles, the effects of a specific rate of inflation on the economy, the effects of tax legislation on unemployment levels, and other economic phenomena.

Many economists apply these areas of economics to health, education, agriculture, urban and regional economics, law, history, energy, the environment, and other issues. Economists working for corporations are involved primarily in microeconomic issues, such as forecasting consumer demand and sales of the firm's products. Some analyze their competitors' market share and advise their company on how to handle the competition. Others monitor legislation passed by Congress, such as environmental and worker safety regulations, and assess how new laws will affect the corporation. 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 is considering expanding.

Economists working in economic consulting or research firms sometimes perform the same tasks as economists working for corporations. However, economists in consulting firms also perform much of the macroeconomic analysis and forecasting conducted in the United States. Their analyses and forecasts are frequently published in newspapers and journal articles.

Another large employer of economists is government. Economists in the Federal Government administer most of the surveys and collect the majority of the economic data about 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 economists employed by the U.S. Department of Labor collect and analyze data on the domestic economy, including data on prices, wages, employment, productivity, and safety and health.

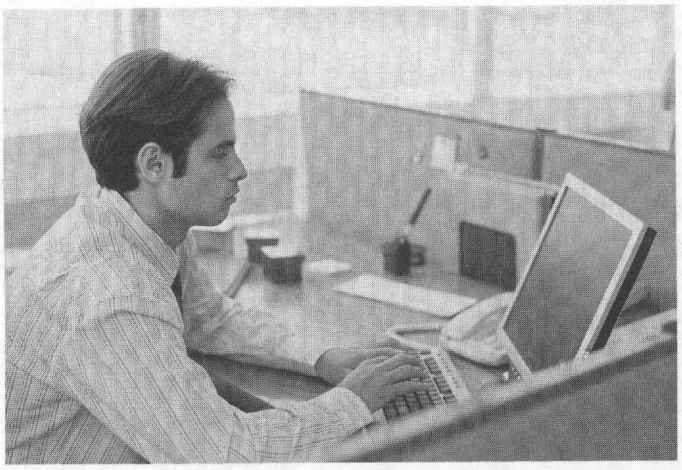
Economists who work for government agencies also assess economic conditions in the United States and abroad to estimate the effects of specific changes in legislation and public policy. Government economists advise policy makers in areas such as the deregulation of industries, the effects of changes to Social Security, the effects of tax cuts on the budget deficit, and the effectiveness of imposing tariffs on imported goods. 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 to project future spending needs.

Work environment. 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. Many 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. Some travel may be necessary.

Training, Other Qualifications, and Advancement

Some entry-level positions for economists are available to those with a bachelor's degree, but higher degrees are required for many positions. Prospective economists need good quantitative skills.

Education and training. A master's or Ph.D. degree in economics is required for many private sector economist jobs and for advancement to higher-level positions. In the Federal Government, candidates for entry-level economist positions must have a bachelor's degree with a minimum of 21 semester hours



Preparing reports on the results of economic research is an important part of an economist's job.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Economists	19-3011	14,600	15,500	900	6

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

of economics and 3 hours of statistics, accounting, or calculus, or a combination of education and experience.

Economics includes numerous specialties at the graduate level, such as econometrics, international economics, and labor economics. Students should select graduate schools that are strong in the specialties that interest them. Some schools help graduate students find internships or part-time employment in government agencies, economic consulting or research firms, or financial institutions before graduation.

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.

Whether working in government, industry, research organizations, or consulting firms, economists with a bachelor's degree usually qualify for entry-level positions as a research assistant, for marketing or finance positions, or for various sales jobs. A master's degree usually is required to qualify for more responsible research and administrative positions. A Ph.D. is necessary for top economist positions in many organizations.

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.

Other qualifications. Those considering careers as economists should be able to pay attention to details because much time is spent on precise data analysis. Candidates also should have strong computer and quantitative skills and be able to perform complex research. Patience and persistence are necessary qualities, given that economists must spend long hours on independent study and problem solving. Good communication skills also are useful, as economists must be able to present their findings, both orally and in writing, in a clear, concise manner.

Advancement. With experience or an advanced degree, economists may advance to positions of greater responsibility, including administration and independent research.

Many people with an economics background become teachers. (See the statement on teachers—postsecondary elsewhere in the *Handbook.*) A master's degree usually is the minimum requirement for a job as an instructor in a community college. In most colleges and universities, however, a Ph.D. is necessary for appointment as an instructor. A Ph.D. and publications in academic journals are required for a professorship, tenure, and promotion.

Employment

Economists held about 14,600 jobs in 2008. Government employed 53 percent of economists, in a wide range of agencies, with 31 percent in Federal Government and 22 percent in State and local government. The remaining jobs were spread throughout private industry, particularly in scientific research and development services and management, scientific, and technical consulting services. A number of economists combine a full-time job in government, academia, or business with part-time or consulting work in another setting.

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.

In addition to the previously mentioned jobs, economists who hold faculty positions in colleges and universities are counted as postsecondary teachers.

Job Outlook

Employment of economists is expected to grow more slowly than the average for all occupations. The demand for workers who have knowledge of economics is projected to grow faster, but these workers will commonly find employment in fields outside of economics, such as business, finance, or insurance. Job prospects for economists will be best for those with graduate degrees in economics.

Employment change. Employment of economists is expected to grow 6 percent from 2008 to 2018, which is slower than the average for all occupations. Demand for economic analysis should grow, but the increase in the number of economist jobs will be tempered as firms hire workers for niche areas with specialized titles. Many workers with economic backgrounds will work in related fields with more specific job titles, such as financial analyst, market analyst, public policy consultant, researcher or research assistant, purchasing manager, or a variety of positions in business and the insurance industry. Overall employment growth also will be slowed because of the relatively high number of economists—about 53 percent—employed in declining government sectors.

Employment growth should be fastest in private industry, especially in management, scientific, and technical consulting services. Rising demand for economic analysis in virtually every industry should stem from the growing complexity of the global economy, the effects of competition on businesses, and increased reliance on quantitative methods for analyzing and forecasting business, sales, and other economic trends. Some corporations choose to hire economic consultants to fill these

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needs, rather than keeping an economist on staff. This practice should result in more economists being employed in consulting services.

Job prospects. In addition to job openings from growth, the need to replace experienced workers who retire or leave the labor force for other reasons will create openings for economists.

Individuals with a background in economics should have opportunities in various occupations. Some examples of job titles often held by those with an economics background are financial analyst, market analyst, public policy consultant, researcher or research assistant, and purchasing manager.

People who have a master's or Ph.D. degree in economics, who are skilled in quantitative techniques and their application to economic modeling and forecasting, and who also have good communications skills, should have the best job opportunities. Like those in many other disciplines, some economists leave the occupation to become professors, but competition for tenured teaching positions will remain keen.

Bachelor's degree holders will face competition for the limited number of economist positions for which they qualify. However, they will qualify for a number of other positions that can use their broad-based economics knowledge. Many graduates with bachelor's degrees will find jobs in business, finance, insurance, or related fields. Numerous positions in sales should also be available. Bachelor's degree holders with good quantitative skills and a strong background in mathematics, statistics, survey design, and computer science also may be hired 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—kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

Earnings

Median annual wage and salary wages of economists were $83,590 in May 2008. The middle 50 percent earned between $59,390 and $113,590. The lowest 10 percent earned less than $44,050, and the highest 10 percent earned more than $149,110.

In March 2009, the average annual salary for economists employed by the Federal Government was $108,010. Starting salaries were higher in selected geographical areas where the prevailing local pay was higher.

Related Occupations

Other workers who are concerned with understanding and interpreting financial matters include:

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Accountants and auditors	86
Actuaries	125
Budget analysts	93
Cost estimators	100
Financial analysts	103
Financial managers	52
Insurance underwriters	106
Loan officers	109
Personal financial advisors	118
Purchasing managers, buyers, and purchasing agents	79

Economists also rely heavily on quantitative analysis, as do:

Mathematicians	143
Operations research analysts	145
Statisticians	148

Other occupations involved in market research and data collection are:

Management analysts	111
Market and survey researchers	212

Economists also study consumer behavior, similar to the work of:

Sociologists and political scientists	223

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. Internet: **http://www.nabe.com**

Information on obtaining positions as economists with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.gov** or through an interactive voice response telephone system at (703) 724-1850. The number is not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos055.htm**

Market and Survey Researchers

Significant Points

- Market and survey researchers can enter the occupation with a bachelor's degree, but those with a master's or Ph.D. in marketing or a social science should enjoy the best opportunities.
- Researchers need strong quantitative skills and, increasingly, knowledge of conducting web-based surveys.
- Employment is expected to grow much faster than average.

Nature of the Work

Market and survey researchers gather information about what people think. Market research analysts help companies understand what types of products people want, determine who will buy them and at what price. Gathering statistical data on competitors and examining prices, sales, and methods of marketing and distribution, they analyze data on past sales to predict future sales.

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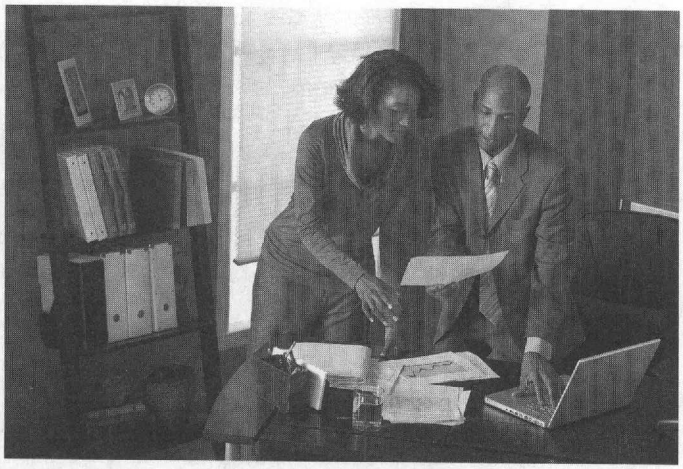

Market and survey researchers often use surveys to assess consumer preferences.

Market research analysts devise methods and procedures for obtaining the data they need by designing surveys to assess consumer preferences. While a majority of surveys are conducted through the Internet and telephone, other methods may include focus group discussions, mail responses, or setting up booths in public places, such as shopping malls, for example. Trained interviewers usually conduct the surveys under a market research analyst's direction.

Market opinion research has contributed greatly to a higher standard of living as most products and services consumers purchase are available with the aid of market research. By making recommendations to their client or employer, market research analysts provide companies with vital information to help them make decisions on the promotion, distribution, and design of products or services. For example, child proof closures on medicine bottles exist because research helped define the most workable design; and the growing variety of ready to cook meals, such as microwaveable soups and prepackaged meat products, exist because of increasing public demand for fast and convenient meals. The information also may be used to determine whether the company should add new lines of merchandise, open new branches, or otherwise diversify the company's operations. Market research analysts also help develop advertising brochures and commercials, sales plans, and product promotions such as rebates and giveaways based on their knowledge of the consumer being targeted.

Survey researchers also gather information about people and their opinions, but these workers focus exclusively on designing and conducting surveys. They work for a variety of clients—such as corporations, government agencies, political candidates—gathering information to help make fiscal or policy decisions, measure the effectiveness of those decisions, and improve customer satisfaction. Survey researchers may conduct opinion research to determine public attitudes on various issues; the research results may help political or business leaders measure 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, telephone interviews, or questionnaires sent through the mail. They also may supervise interviewers who conduct surveys in person or over the telephone.

Survey researchers design surveys in many different formats, depending upon the scope of their research and the method of collection. Interview surveys, for example, are common because they can increase 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.

Work environment. Market and survey researchers generally have structured work schedules. They often work alone, writing reports and preparing statistical charts on computers, but they sometimes may be part of a research team. Market researchers who conduct personal interviews have frequent contact with the public. Most work under pressure of deadlines and tight schedules, which may require overtime. Travel may be necessary.

Training, Other Qualifications, and Advancement

While a bachelor's degree is often sufficient for entry-level market and survey research jobs, higher degrees are usually required for advancement and more technical positions. Strong quantitative skills and keeping current with the latest methods of developing, conducting, and analyzing surveys and other data also are important for advancement.

Education and training. A bachelor's degree is the minimum educational requirement for many market and survey research jobs. However, a master's degree is usually required for more technical positions.

In addition to completing courses in business, marketing, and consumer behavior, prospective market and survey researchers should take social science courses, including economics, psychology 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. Market and survey researchers often earn advanced degrees in business administration, marketing, statistics, communications, or other closely related disciplines.

While in college, aspiring market and survey researchers should gain experience gathering and analyzing data, conducting interviews or surveys, and writing reports on their findings. This experience can prove invaluable toward obtaining a full-time position in the field, because much of the work may center on these duties. 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.

Other qualifications. Market and survey researchers spend a lot of time performing precise data analysis, so being detail-oriented is critical. Patience and persistence are also necessary qualities because these workers devote long hours to independent study and problem solving. At the same time, they must work well with others as market and survey researchers sometimes oversee the interviewing of individuals. Communication skills are important, too, because the wording of surveys is critical, and researchers must be able to present their findings both orally and in writing.

Certification and advancement. Market research analysts often begin their careers by assisting others prior to being assigned independent research projects. With experience, con-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Market and survey researchers	19-3020	273,200	350,500	77,200	28
Market research analysts	19-3021	249,800	319,900	70,100	28
Survey researchers	19-3022	23,400	30,500	7,100	30

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

tinuing education, and advanced degrees, they may advance to more responsible positions in this occupation. Those with expertise in marketing or survey research may choose to teach. (See the statement on teachers—postsecondary elsewhere in the *Handbook.*) While a master's degree is often sufficient to teach as a marketing or survey research instructor in junior and community colleges, most colleges and universities require instructors to hold a Ph.D. A Ph.D. and extensive publications in academic journals are needed for professorship, tenure, and promotion. Others advance to supervisory or managerial positions. Many corporation and government executives have a strong background in marketing.

Advancement in this occupation may be helped by obtaining certification. The Marketing Research Association (MRA) offers a certification program for professional researchers who wish to demonstrate their expertise. The Professional Researcher Certification (PRC) is awarded for two levels of knowledge: practitioner and expert. Prior to gaining certification, each level of knowledge requires certain criteria to be met, consisting largely of education and experience, and also previous membership to at least one professional marketing research organization. Those who have been granted the PRC designation require continuing education within their particular discipline, and individuals must apply to renew their certification every 2 years.

Employment

Market and survey researchers held about 273,200 jobs in 2008, most of which—249,800—were held by market research analysts. Because of the applicability of market research to many industries, market research analysts are employed throughout the economy. The industries that employed the largest number of market research analysts in 2008 were management, scientific, and technical consulting services; management of companies and enterprises; computer systems design and related services; insurance carriers; and other professional, scientific, and technical services—which includes marketing research and public opinion polling.

Survey researchers held about 23,400 jobs in 2008. Most were employed primarily by firms in other professional, scientific, and technical services—which include market research and public opinion polling; scientific research and development services; and management, scientific, and technical consulting services. About 9 percent of survey researchers worked in educational services—which includes colleges, universities, and professional schools.

A number of market and survey researchers combine a full-time job in government, academia, or business with part-time consulting work in another setting. About 7 percent of market and survey researchers are self-employed.

Besides holding the previously mentioned jobs, many people who perform market and survey research held faculty positions in colleges and universities. These workers are counted as postsecondary teachers rather than market and survey researchers.

Job Outlook

Employment growth of market and survey researchers is projected to be much faster than average. Job opportunities should be best for jobseekers with a master's or Ph.D. degree in marketing or a social science and with strong quantitative skills.

Employment change. Overall employment of market and survey researchers is projected to grow 28 percent from 2008 to 2018, much faster than the average for all occupations. Market research analysts, the larger specialty, will experience much faster than average job growth because competition between companies seeking to expand their market and sales of their products will generate a growing need for marketing professionals. Marketing research provides organizations valuable feedback from purchasers, allowing companies to evaluate consumer satisfaction and adjust their marketing strategies and plan more effectively for the future. Future locations of stores and shopping centers, for example, will be determined by marketing research, as will consumer preference of virtually all products and services. In addition, globalization of the marketplace creates a need for more market researchers to analyze foreign markets and competition.

Survey researchers, a much smaller specialty, will also increase much faster than average as public policy groups and all levels of governments increasingly use public opinion research to help determine a variety of issues, such as the best mass transit systems, social programs, and special services for school children and senior citizens that will be needed. Survey researchers will also be needed to meet the growing demand for market and opinion research as an increasingly competitive economy requires businesses and organizations to allocate advertising funds and other expenditures more effectively and efficiently.

Job prospects. Bachelor's degree holders may face competition for market research jobs, as many positions, especially technical ones, require a master's or doctoral degree. Among bachelor's degree holders, those with good quantitative skills, including a strong background in mathematics, statistics, survey design, and computer science, will have the best opportunities. Those with a background in consumer behavior or an undergraduate degree in a social science—psychology, sociology, or economics—may qualify for less technical positions, such as a public opinion researcher. Obtaining the Professional Re-

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searcher Certification also can be important as it demonstrates competence and professionalism among potential candidates. Overall, job opportunities should be best for jobseekers with a master's or Ph.D. degree in marketing or a related field and with strong quantitative skills. Market research analysts should have the best opportunities in consulting firms and marketing research firms as companies find it more profitable to contract for market research services rather than support their own marketing department. However, other organizations, including computer systems design companies, software publishers, financial services organizations, healthcare institutions, advertising firms, and insurance companies, may also offer job opportunities for market research analysts. Increasingly, market research analysts not only collect and analyze information, but also help clients implement ideas and recommendations.

There will be fewer job opportunities for survey researchers since it is a relatively smaller occupation and a greater number of candidates qualify for these positions. The best prospects will come from growth in the market research and public opinion polling industry, which employs many survey researchers.

Earnings

Median annual wages of market research analysts in May 2008 were $61,070. The middle 50 percent earned between $43,990 and $85,510. The lowest 10 percent earned less than $33,770, and the highest 10 percent earned more than $112,410. Median annual wages in the industries employing the largest numbers of market research analysts in May 2008 were:

Computer systems design and related services	$77,170
Management of companies and enterprises	65,880
Other professional, scientific, and technical services	58,480
Advertising, public relations, and related services	56,730
Management, scientific, and technical consulting services	55,570

Median annual wages of survey researchers in May 2008 were $36,220. The middle 50 percent earned between $22,290 and $54,480. The lowest 10 percent earned less than $17,650, and the highest 10 percent earned more than $75,940. Median annual wages of survey researchers in other professional, scientific, and technical services were $26,440.

Related Occupations

Market and survey researchers perform research to find out how well the market will receive products, services, and ideas. This research may include planning, implementing, and analyzing surveys to determine the needs and preferences of people. Other jobs using these skills include:

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Economists	209
Management analysts	111
Operations research analysts	145
Psychologists	215
Sociologists and political scientists	223
Statisticians	148
Urban and regional planners	220

Market and survey researchers often work closely with:

Advertising, marketing, promotions, public relations, and sales managers	32

When analyzing data, market and survey researchers must use quantitative skills similar to those of:

Actuaries	125
Cost estimators	100
Mathematicians	143

Market and survey researchers often are concerned with public opinion, as are:

Public relations specialists	350

Sources of Additional Information

For information about careers and certification in market research, contact:

➤ Marketing Research Association, 110 National Dr., 2nd Floor, Glastonbury, CT 06033. Internet: **http://www.mra-net.org**

For information about careers in survey research, contact:

➤ Council of American Survey Research Organizations, 170 North Country Rd., Suite 4, Port Jefferson, NY 11777. Internet: **http://www.casro.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos013.htm**

Psychologists

Significant Points

- About 34 percent of psychologists are self-employed, mainly as private practitioners and independent consultants.
- Employment growth will vary by specialty; for example, clinical, counseling, and school psychologists will have 11 percent growth; industrial-organizational psychologists, 26 percent growth; and 14 percent growth is expected for all other psychologists.
- Acceptance to graduate psychology programs is highly competitive.
- Job opportunities should be the best for those with a doctoral degree in a subfield, such as health; those with a master's degree will have good prospects in industrial-organization; bachelor's degree holders will have limited prospects.

Nature of the Work

Psychologists study mental processes and human behavior by observing, interpreting, and recording how people and other animals relate to one another and the environment. To do this, psychologists often look for patterns that will help them understand and predict behavior using scientific methods, principles, or procedures to test their ideas. Through such research studies, psychologists have learned much that can help increase understanding between individuals, groups, organizations, institutions, nations, and cultures.

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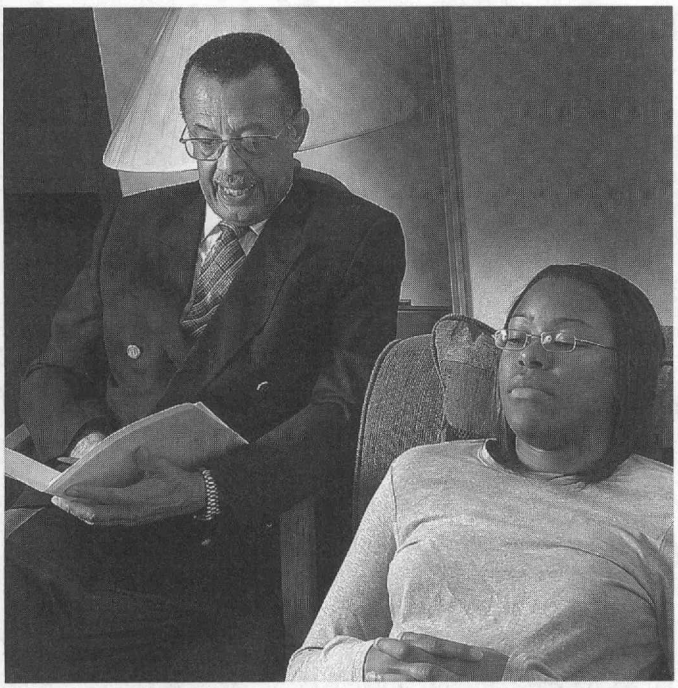

Psychologists who deal directly with patients must be emotionally stable, mature, sensitive, and have strong communication skills.

Like other social scientists, psychologists formulate theories, or hypotheses, which are possible explanations for what they observe. But unlike other social science disciplines, psychologists often concentrate on individual behavior and, specifically, in the beliefs and feelings that influence a person's actions.

Research methods vary with the topic which they study, but by and large, the chief techniques used are observation, assessment, and experimentation. Psychologists sometimes gather information and evaluate behavior through controlled laboratory experiments, hypnosis, biofeedback, psychoanalysis, or psychotherapy, or by administering personality, performance, aptitude, or intelligence tests. Other methods include interviews, questionnaires, clinical studies, surveys, and observation—looking for cause-and-effect relationships between events and for broad patterns of behavior.

Research in psychology seeks to understand and explain thought, emotion, feelings, or behavior. The research findings of psychologists have greatly increased our understanding of why people and animals behave as they do. For example, psychologists have discovered how personality develops and how to promote healthy development. They have gained knowledge of how to diagnose and treat alcoholism and substance abuse, how to help people change bad habits and conduct, and how to help students learn. They understand the conditions that can make workers more productive. Insights provided by psychologists can help people function better as individuals, friends, family members, and workers.

Psychologists may perform a variety of duties in a vast number of industries. For example, those working in health service fields may provide mental health care in hospitals, clinics, schools, or private settings. Psychologists employed in applied settings, such as business, industry, government, or nonprofit organizations, may provide training, conduct research, design organizational systems, and act as advocates for psychology.

Psychologists apply their knowledge to a wide range of endeavors, including health and human services, management, education, law, and sports. They usually specialize in one of many different areas.

Clinical psychologists—who constitute the largest specialty—are concerned with the assessment, diagnosis, treatment, and prevention of mental disorders. While some clinical psychologists specialize in treating severe psychological disorders, such as schizophrenia and depression, many others may help people deal with personal issues, such as divorce or the death of a loved one. Often times, clinical psychologists provide an opportunity to talk and think about things that are confusing or worrying, offering different ways of interpreting and understanding problems and situations. They are trained to use a variety of approaches aimed at helping individuals, and the strategies used are generally determined by the specialty they work in.

Clinical psychologists often interview patients and give diagnostic tests in their own private offices. They may provide individual, family, or group psychotherapy and may design and implement behavior modification programs. Some clinical psychologists work in hospitals where they 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. A few work in physical rehabilitation settings, treating patients with spinal cord injuries, chronic pain or illness, stroke, arthritis, or neurological conditions. Others may work in community mental health centers, crisis counseling services, or drug rehabilitation centers, offering evaluation, therapy, remediation, and consultation.

Areas of specialization within clinical psychology include health psychology, neuropsychology, geropsychology, and child psychology. *Health psychologists* study how biological, psychological, and social factors affect health and illness. They promote healthy living and disease prevention through counseling, and they focus on how patients adjust to illnesses and treatments and view their quality of life. *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. Work may include helping older persons cope with stresses that are common in late life, such as loss of loved ones, relocation, medical conditions, and increased care-giving demands. Clinical psychologists may further specialize in these fields by focusing their work in a number of niche areas including mental health, learning disabilities, emotional disturbances, or substance abuse. The emergence and growth of these, and other, specialties reflects the increasing participation of psychologists in direct services to special patient populations.

Often, clinical psychologists consult with other medical personnel regarding the best treatment for patients, especially treatment that includes medication. Clinical psychologists generally are not permitted to prescribe medication to treat patients; only

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psychiatrists and other medical doctors may prescribe most medications. (See the statement on physicians and surgeons elsewhere in the *Handbook*.) However, two States—Louisiana and New Mexico—currently allow appropriately trained clinical psychologists to prescribe medication with some limitations.

Counseling psychologists advise people on how to deal with problems of everyday living, including problems in the home, place of work, or community, to help improve their quality of life. They foster well-being by promoting good mental health and preventing mental, physical, and social disorders. They work in settings such as university or crisis counseling centers, hospitals, rehabilitation centers, and individual or group practices. (See also the statements on counselors and social workers elsewhere in the *Handbook*.)

School psychologists work with students in early childhood and elementary and secondary schools. They collaborate with teachers, parents, and school personnel to create safe, healthy, and supportive learning environments for all students. School psychologists address students' learning and behavioral problems, suggest improvements to classroom management strategies or parenting techniques, and evaluate students with disabilities and gifted and talented students to help determine the best way to educate them.

They improve teaching, learning, and socialization strategies based on their understanding of the psychology of learning environments. They also may evaluate the effectiveness of academic programs, prevention 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 the quality of worklife. They also are involved in research on management and marketing problems. They screen, train, and counsel applicants for jobs, as well as perform organizational development and analysis. An industrial psychologist might work with management to reorganize the work setting in order to enhance productivity. Industrial psychologists frequently act as consultants, brought in by management to solve a particular problem.

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. Developmental psychologists 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. Many social psychologists specialize in a niche area, such as 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 the behavior of both 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.

Forensic psychologists use psychological principles in the legal and criminal justice system to help judges, attorneys, and other legal professionals understand the psychological findings of a particular case. They are usually designated as an expert witness and typically specialize in one of three areas: family court, civil court, and criminal court. Forensic psychologists who work in family court may offer psychotherapy services, perform child custody evaluations, or investigate reports of child abuse. Those working in civil courts may assess competency, provide second opinions, and provide psychotherapy to crime victims. Criminal court forensic psychologists often conduct evaluations of mental competency, work with child witnesses, and provide assessment of juvenile or adult offenders.

Work environment. Psychologists' work environments vary by subfield and place of employment. For example, clinical, school, and counseling psychologists in private practice frequently have their own offices and set their own hours. However, they usually offer evening and weekend hours to accommodate their clients. Those employed in hospitals, nursing homes, and other health care facilities may work shifts that include evenings and weekends, and those who work in schools and clinics generally work regular daytime hours. Most psychologists in government and industry have structured schedules.

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.

Increasingly, a good number of psychologists work as part of a team, consulting with other psychologists and medical professionals. Many experience pressures because of deadlines, tight schedules, and overtime.

Training, Other Qualifications, and Advancement

A master's or doctoral degree, and a license, are required for most psychologists.

Education and training. A doctoral degree usually is required for independent practice as a psychologist. Psychologists with a Ph.D. or Doctor of Psychology (Psy.D.) qualify for a wide range of teaching, research, clinical, and counseling positions in universities, health care services, elementary and secondary schools, private industry, and government. Psychologists with a doctoral degree often work in clinical positions or in private practices, but they also sometimes teach, conduct research, or carry out administrative responsibilities.

A doctoral degree generally requires about 5 years of full-time graduate study, culminating in a dissertation based on original research. Courses in quantitative experimental methods and research design, 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. degree may be based on practical work and examinations rather than a dissertation. In clinical, counseling, and school psychology, the requirements for the doctoral degree usually include an additional year of post-doctoral supervised experience.

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A specialist degree or its equivalent is required in most States for an individual to work as a school psychologist, although some States credential school psychologists with master's degrees. A specialist (Ed.S.) degree in school psychology requires a minimum of 2 years of full-time graduate study (at least 60 graduate semester hours) and a 1-year full-time internship during the third year. Because their professional practice addresses educational and mental health components of students' development, school psychologists' training includes coursework in both education and psychology.

People with a master's degree in psychology may work as industrial-organizational psychologists. They also may work as psychological assistants conducting research under the direct supervision of doctoral-level psychologists. 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 psychology programs is keen. Some universities require applicants to have an undergraduate major in psychology. Others prefer only coursework in basic psychology with additional courses in the biological, physical, and social sciences, and in 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. Bachelor's degree holders may also work as administrative assistants for psychologists. Many, however, find employment in other areas, such as sales, service, or business management.

In the Federal Government, candidates must have a bachelor's degree with a minimum of 24 semester hours in psychology, or a combination of education and experience to qualify for entry-level positions. However, competition for these jobs is keen because this is one of the few ways 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, as well as institutions that provide internships for doctoral students in school, clinical, and counseling psychology. The National Association of School Psychologists, with the assistance of the National Council for Accreditation of Teacher Education, helps to approve advanced degree programs in school psychology.

Clinical psychologists in Louisiana and New Mexico who prescribe medication are required to complete a post-doctoral master's degree in clinical psychopharmacology and pass a National exam approved by the State Board of Examiners of psychologists.

Licensure. Psychologists in a solo or group 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 need a doctorate in psychology, 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. Some States require continuing education for renewal of the license.

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, rather than State, level. Currently, 31 States recognize the NCSP and allow those with the certification to transfer credentials from one State to another without taking a new certification exam. In States that recognize the NCSP, the requirements for certification or licensure and those for the NCSP often are the same or similar. Requirements for the NCSP include the 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.

Other qualifications. 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 people wishing to do clinical work and counseling. Research psychologists should be capable of detailed work both independently and as part of a team. Patience and perseverance are vital qualities, because achieving results in the psychological treatment of patients or in research may take a long time.

Certification and advancement. The American Board of Professional Psychology (ABPP) recognizes professional achievement by awarding specialty certification in 13 different areas, such as psychoanalysis, rehabilitation, forensic, group, school, clinical health, and couple and family. To obtain board certification in a specialty, candidates must meet general criteria which consist of having a doctorate in psychology, as well as State licensure. Each candidate must then meet additional criteria of the specialty field, which is usually a combination of postdoctoral training in their specialty, several years of experience, and professional endorsements, as determined by the ABPP. Applicants are then required to pass the specialty board examination.

Psychologists can improve their advancement opportunities by earning an advanced degree and by participation in continuing education. Many psychologists opt to start their own private practice after gaining experience working in the field.

Employment

Psychologists held about 170,200 jobs in 2008. Educational institutions employed about 29 percent of psychologists in positions other than teaching, such as counseling, testing, research, and administration. About 21 percent were employed in health care, primarily in offices of mental health practitioners, hospitals, physicians' offices, and outpatient mental health and substance abuse centers. Government agencies at the State and local levels employed psychologists in correctional facilities, law enforcement, and other settings.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Psychologists	19-3030	170,200	190,000	19,700	12
Clinical, counseling, and school psychologists	19-3031	152,000	168,800	16,800	11
Industrial-organizational psychologists	19-3032	2,300	2,900	600	26
Psychologists, all other	19-3039	15,900	18,300	2,300	14

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

After several years of experience, some psychologists—usually those with doctoral degrees—enter private practice or set up private research or consulting firms. About 34 percent of psychologists were self-employed in 2008—mainly as private practitioners.

In addition to the previously mentioned jobs, many psychologists held faculty positions at colleges and universities and as high school psychology teachers. (See the statements on teachers—postsecondary and teachers—kindergarten, elementary, middle, and secondary elsewhere in the *Handbook.*)

Job Outlook

Employment of psychologists is expected to grow as fast as average. Job prospects should be the best for people who have a doctoral degree from a leading university in an applied specialty, such as counseling or health, and those with a specialist or doctoral degree in school psychology. Master's degree holders in fields other than industrial-organizational psychology will face keen competition. Opportunities will be limited for bachelor's degree holders.

Employment change. Employment of psychologists is expected to grow 12 percent from 2008 to 2018, about as fast as the average for all occupations. Employment will grow because of increased demand for psychological services in schools, hospitals, social service agencies, mental health centers, substance abuse treatment clinics, consulting firms, and private companies.

Demand for school psychologists will be driven by a growing awareness of how students' mental health and behavioral problems, such as bullying, affect learning. School psychologists will also be needed for general student counseling on a variety of other issues, including working with students with disabilities or with special needs, tackling drug abuse, and consulting and managing personal crisis.

Spurring demand for clinical psychologists will continue to be the rising healthcare costs associated with unhealthy lifestyles, such as smoking, alcoholism, and obesity, which have made prevention and treatment more critical. An increase in the number of employee assistance programs, which help workers deal with personal problems, also should lead to employment growth for clinical and counseling specialties. More 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 growing number of elderly will increase the demand for psychologists trained in geropsychology to help people deal with the mental and physical changes that occur as individuals grow older. There also will be increased need for psychologists to work with returning veterans.

Industrial-organizational psychologists also 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.

Job prospects. Job prospects should be best for people who have a doctoral degree from a leading university in an applied specialty, such as counseling or health, and those with a specialist or doctoral degree in school psychology. Psychologists with extensive training in quantitative research methods and computer science may have a competitive edge over applicants without such background.

Master's degree holders in fields other than 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 collection and analysis. Those who meet State certification requirements may become high school psychology teachers.

Earnings

Median annual wages of wage and salary clinical, counseling, and school psychologists were $64,140 in May 2008. The middle 50 percent earned between $48,700 and $82,800. The lowest 10 percent earned less than $37,900, and the highest 10 percent earned more than $106,840. Median annual wages in the industries employing the largest numbers of clinical, counseling, and school psychologists were:

Offices of other health practitioners	$68,400
Elementary and secondary schools	65,710
State government	63,710
Outpatient care centers	59,130
Individual and family services	57,440

Median annual wages of wage and salary industrial-organizational psychologists were $77,010 in May 2008. The middle 50 percent earned between $54,100 and $115,720. The lowest

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10 percent earned less than $38,690, and the highest 10 percent earned more than $149,120.

In 2008, about 31 percent of all psychologists were members of a union.

Related Occupations

Psychologists work with people, developing relationships and comforting them. Other occupations with similar duties include:

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Clergy	824
Counselors	234
Funeral directors	58
Human resources, training, and labor relations managers and specialists	61
Market and survey researchers	212
Recreation workers	522
Social workers	246
Sociologists and political scientists	223
Teachers—special education	294

Psychologists also sometimes diagnose and treat problems and help patients recover. These duties are similar to those for:

Audiologists	358
Dentists	363
Optometrists	371
Physicians and surgeons	381
Radiation therapists	387
Speech-language pathologists	399

Sources of Additional Information

For information on careers, educational requirements, financial assistance, and licensing in all fields of psychology, contact:

➤ American Psychological Association, Center for Psychology Workforce Analysis and Research and Education Directorate, 750 First St. NE., Washington, DC 20002. Internet: **http://www.apa.org/students**

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. Internet: **http://www.asppb.org**

Information about psychology specialty certifications is available from:

➤ American Board of Professional Psychology, 600 Market St., Suite 300, Chapel Hill, NC 27516. Internet: **http://www.abpp.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos056.htm**

Urban and Regional Planners

Significant Points

- Local governments employ about 66 percent of urban and regional planners.
- Employment is projected to grow 19 percent, which is faster than the average.
- Most new jobs will be in affluent, rapidly growing communities.
- Job prospects will be best for those with a master's degree; bachelor's degree holders with additional skills in GIS or mapping may find entry-level positions, but advancement opportunities are limited.

Nature of the Work

Urban and *regional planners* develop long- and short-term plans for the use of land and the growth and revitalization of urban, suburban, and rural communities and the region in which they are located. They help local officials alleviate social, economic, and environmental problems by recommending locations for roads, schools, and other infrastructure and suggesting zoning regulations for private property—work that requires forecasting the future needs of the population. Because local governments employ the majority of urban and regional planners, they often are referred to as community or city planners.

Planners promote the best use of a community's land and resources for residential, commercial, institutional, and recreational purposes. They address environmental, economic, and social health issues of a community as it grows and changes. They may formulate plans relating to the construction of new school buildings, public housing, or other kinds of infrastructure. Planners also may help to make decisions about developing resources and protecting ecologically sensitive regions. Some planners are involved in environmental issues including pollution control, wetland preservation, forest conservation, and the location of new landfills. Planners also may help to draft legislation on environmental, social, and economic issues, such as planning a new park, sheltering the homeless, or making the region more attractive to businesses.

Before preparing plans for community development, planners study and 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, planners try to optimize land use for buildings and other public facilities. Planners prepare reports showing how their programs can be carried out and what they will cost.

Planners examine proposed community facilities, such as schools, to ensure that these facilities will meet the needs of a growing or changing population. They keep abreast of economic and legal issues related to zoning codes, building codes,

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Urban and regional planners develop plans to use land for the growth and revitalization of communities.

and environmental regulations. Planners also deal with land-use issues created by population movements. For example, as suburban growth and economic development create more jobs outside cities, the need for public transportation that gets workers to those jobs increases. In response, planners develop and model possible transportation systems and explain them to planning boards and the general public.

Planners use computers to record and analyze information and to prepare reports and recommendations for government executives, developers and builders. Computer databases, spreadsheets, and analytical techniques are used to project program costs and forecast future trends in employment, housing, transportation, or population. Widespread use of computerized geographic information systems (GIS) 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.

Urban and regional planners often work 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 to explain and defend their proposals.

Most urban and regional planners focus on one or more areas of specialization, such as transportation planning, urban design, community development and redevelopment, and land-use or code enforcement. While planners may specialize in these, and other, areas, they are also required to keep the bigger picture in mind and do what's best for the community as a whole.

Work environment. Urban and regional planners often travel to sites intended for development or regulation to inspect the features of the land. Those involved in site development inspections may 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.

Training, Other Qualifications, and Advancement

A master's degree from an accredited planning program provides the best training for a wide range of planning positions. Experience and acquiring certification lead to the best opportunities for advancement.

Education and training. Most entry-level jobs in Federal, State, and local governments require a master's degree from an accredited program in urban or regional planning or a related field, such as urban design, environmental planning, or geography. Students are admitted to master's degree programs in planning with a wide range of undergraduate backgrounds, such as a bachelor's degree in economics, geography, political science, or environmental design. Several schools offer a bachelor's degree in urban planning, and graduates from these programs qualify for some entry-level positions, but their advancement opportunities are often limited unless they acquire an advanced degree.

In 2009, 67 colleges and universities offered an accredited master's degree program, and 15 offered an accredited bachelor's degree program, in planning. Accreditation for these programs is from the Planning Accreditation Board, which consists of three sponsoring organizations: the American Institute of Certified Planners, the American Planning Association, and the Association of Collegiate Schools of Planning.

Most college and university planning departments offer specialization in areas such as community development and redevelopment, land-use or code enforcement, transportation planning, environmental and natural resources planning, urban design, and economic planning and development.

Highly recommended also are courses in related disciplines, such as architecture, law, earth sciences, demography, geography, economics, finance, health administration, and management. Because familiarity with computer models and statistical techniques is important, courses in statistics, computer science, and GIS also are recommended or required.

Graduate students spend considerable time in seminars, workshops, and laboratory courses, learning to analyze and solve planning problems. They are often required to work in a planning office part time or during the summer. Local government planning offices frequently offer students internships,

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Urban and regional planners	19-3051	38,400	45,700	7,300	19

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

providing experience that proves invaluable in obtaining a full-time planning position after graduation.

Licensure. As of 2009, New Jersey was the only State that required planners to be licensed, although Michigan required registration to use the title "community planner." Licensure in New Jersey is based on two examinations—one testing general knowledge of planning and another testing specific New Jersey planning laws. Registration as a community planner in Michigan is based on professional experience and national and State examinations.

Other qualifications. 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.

Certification and advancement. The American Institute of Certified Planners (AICP), a professional institute within the American Planning Association, grants certification to individuals who have the appropriate combination of education and professional experience and pass an examination. Professional development activities are required to maintain certification, which can be very helpful for promotion.

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 occupations, such as director of community or economic development.

Employment

Urban and regional planners held about 38,400 jobs in 2008. About 66 percent 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.

Job Outlook

Faster than average employment growth is projected for urban and regional planners. Most new jobs will be in affluent, rapidly expanding communities. Job prospects will be best for those with a master's degree; bachelor's degree holders with additional skills in GIS or mapping may find entry level positions, but advancement opportunities are limited.

Employment change. Employment of urban and regional planners is expected to grow 19 percent from 2008 to 2018, faster than the average for all occupations. 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 also create employment growth.

The fastest job growth for urban and regional planners will occur in the private sector, primarily in the professional, scientific, and technical services industries. Specifically, planners will be employed by architecture and engineering firms to assist private developers and builders with broader issues, such as those related to storm water management, permits, and environmental regulation, to more specific ones, such as helping to design security measures for a building that are effective but also subtle and able to blend in with the surrounding area.

Many additional jobs for urban and regional planners will be in local government, as planners will be needed to address an array of problems associated with population growth, especially in affluent, rapidly expanding communities. For example, new housing developments require roads, sewer systems, fire stations, schools, libraries, and recreation facilities that must be planned for within budgetary constraints.

Job prospects. Besides opportunities from employment growth, job openings 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 master's degree from an accredited program should have much better job opportunities than those with only a bachelor's degree. Additionally, AICP certified planners should have the best opportunities for advancement. Computers and software—especially GIS software—are increasingly being used in planning; therefore, candidates with strong computer skills and GIS experience will have an advantage in the job market.

Earnings

Median annual wages of urban and regional planners were $59,810 in May 2008. The middle 50 percent earned between $47,050 and $75,630. The lowest 10 percent earned less than $37,960, and the highest 10 percent earned more than $91,520. Median annual wages in the industries employing the largest numbers of urban and regional planners in May 2008 were:

Architectural, engineering, and related services	$63,770
Scientific research and development services	60,750
Management, scientific, and technical consulting services	59,160
Local government	58,260
Colleges, universities, and professional schools	57,520

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Related Occupations

Urban and regional planners develop plans for the growth of urban, suburban, and rural communities. Others whose work is similar include:

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Architects, except landscape and naval	151
Civil engineers	161
Environmental engineers	161
Geographers	226
Landscape architects	154
Market and survey researchers	212
Property, real estate, and community association managers	76
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	157

Sources of Additional Information

Information on careers, salaries, and certification in urban and regional planning is available from:

➤ American Planning Association, 1776 Massachusetts Ave. NW., Suite 400, Washington, DC 20036. 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**

For additional information on urban and regional planning and on related occupations, see "Geography jobs" in the Spring 2005 *Occupational Outlook Quarterly*. The article is online at **http://www.bls.gov/opub/ooq/2005/spring/art01.pdf**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos057.htm**

Sociologists and Political Scientists

Significant Points

- The vast majority of bachelor's degree holders in sociology and political science find employment in niche areas with specialized titles, such as market analyst, research assistant, writer, or policy analyst.
- Employment growth of sociologists is projected to grow much faster than average; political scientists, faster than the average.
- Candidates who hold a master's or Ph.D. degree will have the best employment prospects and advancement opportunities; competition for teaching positions, while keen, should ease as the expected number of retirements increases.
- Quantitative and qualitative skills are important for all workers.

Nature of the Work

Sociologists and *political scientists* study all aspects of human society and political systems—from social behavior and the origin of social groups to the origin, development, and operation of political systems. Their research provides insights into different ways individuals, groups, and governments make decisions, exercise power, and respond to change. Through their studies and analyses, sociologists and political scientists suggest solutions to social, business, personal, and governmental problems. In fact, many work as public *policy analysts* for government or private organizations. (Archaeologists, anthropologists, geographers, and historians, whose work is closely related to that of sociologists and political scientists, are discussed elsewhere in the *Handbook*.)

Sociologists study society and social behavior by examining the groups, cultures, organizations, and social institutions people form. They also study the activities in which people participate, including activities conducted in social, religious, political, economic, and business organizations. They study the behavior of, and interaction among, groups, organizations, institutions, and nations, and how they react to phenomena such as the spread of technology, crime, social movements, and epidemics of illness. They also trace the origin and growth of these groups and interactions. Sociologists analyze how social influences affect different individuals and groups, and the ways organizations and institutions affect the daily lives of those same people. To analyze these social patterns, sociologists usually begin by designing research projects that incorporate a variety of methods, including historical analysis, comparative analysis, and quantitative and qualitative techniques. Through this process of applied research, they construct theories and produce information that attempts to explain certain social trends or that will enable people to make better decisions or manage their affairs more effectively. The results of sociological research aid educators, lawmakers, administrators, and others who are interested in resolving social problems and formulating public policy. Most sociologists work in one or more specialties, such as social organization, stratification, and mobility; racial and ethnic relations; education; the family; social psychology;



Sociologists study the behavior of groups, organizations, institutions, and nations, and how they react to phenomena such as the spread of technology, crime, social movements, and epidemics of illness.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Sociologists and political scientists	–	9,000	10,900	1,900	21
Sociologists	19-3041	4,900	6,000	1,100	22
Political scientists	19-3094	4,100	4,900	800	19

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

urban, rural, political, and comparative sociology; gender relations; demography; gerontology; criminology; and sociological practice.

Political scientists 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 major metropolises, and the decisions of the U.S. Supreme Court. Studying and evaluating topics such as public opinion, political decisionmaking, ideology, and public policy, they analyze the structure and operation of governments, as well as various other entities. Depending on the topic, a political scientist might analyze a public-opinion survey, study election results or public documents, or interview public officials. Occasionally, they may collaborate with government economists to assess the effects of specific changes in legislation or public policy, such as the effects of the deregulation of industries or of changes in Social Security. Through academic publications, written reports, or public presentations, political scientists present their research reports and often identify new issues for research and analysis. Many political scientists forecast political, social, and economic trends.

Political scientists frequently work as policy analysts for government or in labor, political, or professional organizations, some of which are nonprofit. These workers gather and analyze information to assist in the planning, development, review, and interpretation of government or industrial policies. They use the results of their research to raise public awareness of social issues, such as crime prevention, access to healthcare, and protection of the environment, hoping to influence government action. Most political scientists—about 63 percent—work for the Federal Government. Some find work in research and development firms performing work for the Federal Government on a contract basis. The relatively few who work in the Foreign Service may help formulate and implement foreign policy.

Work environment. Most sociologists and political 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. Some sociologists may be required to attend meetings. Political scientists on foreign assignment must adjust to unfamiliar cultures, climates, and languages.

Sociologists and political scientists employed by colleges and universities usually have flexible work schedules, often dividing their time among teaching, research, writing, consulting, and administrative responsibilities. Those who teach in these settings are classified as postsecondary teachers. (See the statement on teachers—postsecondary elsewhere in the *Handbook.*)

Training, Other Qualifications, and Advancement

Some entry-level positions for sociologists and political scientists are available to those with a bachelor's degree, but higher degrees are required for the majority of positions. Prospects need good quantitative and qualitative skills.

Education and training. Whether working in government, industry, research organizations, or consulting firms, sociologists and political scientists with a bachelor's degree usually qualify for entry-level positions as a market analyst, research assistant, writer, or policy analyst. Graduates with master's degrees in applied specialties usually qualify for most administrative and research positions, while a Ph.D. degree is typically required for college and university teaching positions.

Training in statistics and mathematics is essential for many political scientists, who increasingly are using mathematical and quantitative research methods. The ability to use computers for research purposes is mandatory in most disciplines.

Many sociology and political science students can benefit greatly from internships. Numerous government agencies, as well as nonprofit and other organizations, offer internships or volunteer research opportunities. Also, the vast majority of colleges and universities have student organizations devoted to specific public policy issues, and many provide opportunities for debates, often hosted by the political science department.

While in college, aspiring sociologists and political scientists should gain experience gathering and analyzing data, conducting interviews or surveys, and writing reports on their findings. This experience can prove invaluable later in obtaining a full-time position in the field, because much of the work, especially in the beginning, may center on these duties.

Other qualifications. Sociologists and political scientists need excellent written and oral communication skills to report research findings and to collaborate on research. Successful workers also need intellectual curiosity and creativity because they constantly are seeking new information about people, things, and ideas. The ability to think logically and methodically also is essential in analyzing complicated issues, such as the relative merits of various forms of government.

Advancement. Many sociologists and political scientists choose to teach in their field, often while pursuing their own research. These workers are usually classified as postsecondary teachers. The minimum requirement for most positions in colleges and universities is a Ph.D. degree. Graduates with a master's degree in sociology or political science may qualify for teaching positions in community colleges.

Employment

Sociologists and political scientists held about 9,000 jobs in 2008, of which 4,900 were held by sociologists. Most

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sociologists worked as researchers, administrators, and counselors for a wide range of employers. The industries that employed the largest number of sociologists in 2008 were scientific research and development services, social advocacy organizations, and State and local government, excluding education and hospitals.

Many sociologists—about 37 percent—teach in colleges and universities and in secondary and elementary schools. (For more information, see teachers—postsecondary and teachers—kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

Political scientists held about 4,100 jobs in 2008. About 63 percent worked for the Federal Government. Most of the remainder worked in scientific research and development services and religious, grantmaking, civic, professional, and similar organizations.

Job Outlook

Employment growth of sociologists and political scientists is projected to grow much faster than the average. Job opportunities should be best for jobseekers with a master's or PhD degree in a social science and with strong quantitative skills.

Employment change. Overall employment of sociologists and political scientists is expected to grow 21 percent from 2008 to 2018, much faster than the average for all occupations. Sociologists will experience much faster than average job growth because the incorporation of sociology into research in other fields continues to increase. Sociologists possess broad training and education in analytical, methodological, conceptual, and quantitative and qualitative analysis and research, so their skills can be applied to many different occupations. As a result, many workers with sociology backgrounds will find work in niche areas with specialized titles, such as market analyst, research assistant, writer, and policy analyst. Some sociologists may find work conducting policy research for consulting firms, and their knowledge of society and social behavior may be used as well by a variety of companies in product development, marketing, and advertising. Demand for sociologists also will stem from growth in the number of social, political, and business associations and organizations, including many nonprofit organizations, to conduct various evaluations and statistical work.

Employment of political scientists is projected to grow faster than average, reflecting the growing importance of public policy and research. Demand for political science research is growing because of increasing interest in politics, foreign affairs, and public policy, including social and environmental policy issues, healthcare, and immigration. Political scientists will use their knowledge of political institutions to further the interests of nonprofit, political lobbying, and social and civic organizations. Job growth also may be driven by the budget constraints of public resources. As a growing population exerts excess demand on certain public services, political scientists will be needed to analyze the effects and efficiencies of those services, as well as to offer solutions.

Job prospects. In addition to opportunities arising from employment growth, a growing number of job openings will come from the need to replace those who retire, enter teaching or other occupations, or leave their social science occupation for other reasons.

People seeking sociologist and political scientist positions may face competition for jobs, and those with higher educational attainment will have the best prospects. Many jobs in policy, research, or marketing, for which bachelor's degree holders qualify, are not advertised exclusively as sociologist or political scientist positions. Because of the wide range of skills and knowledge possessed by these workers, many compete for jobs with other workers, such as anthropologists and archaeologists, geographers, historians, market and survey researchers, psychologists, engineers, and statisticians.

Some people with a Ph.D. degree in sociology will find opportunities as university faculty rather than as applied sociologists. Although there will be competition for tenured positions, the number of faculty expected to retire over the decade and the increasing number of part-time or short-term faculty positions will lead to better opportunities in colleges and universities than in the past. The growing importance and popularity of social science subjects in secondary schools also is strengthening the demand for social science teachers at that level.

People who have a master's or Ph.D. degree in political science, who are skilled in quantitative and qualitative techniques, and who also have specialized skills should have the best opportunities. Some will find jobs in the Federal Government as the expected number of retirements increases.

Earnings

Median annual wages of sociologists in May 2008 were $68,570. The middle 50 percent earned between $51,110 and $92,220. The lowest 10 percent earned less than $40,720, and the highest 10 percent earned more than $122,130. Median annual wages of sociologists in scientific research and development services were $72,170.

Median annual wages of political scientists in May 2008 were $104,130. The middle 50 percent earned between $74,040 and $124,490. The lowest 10 percent earned less than $47,220, and the highest 10 percent earned more than $146,880.

In March 2009, the Federal Government's average salary was $100,824 for sociologists. Beginning salaries were higher in selected areas of the country where the prevailing local pay level was higher.

Related Occupations

The duties and training of sociologists are similar to those of other social scientists, including the following:

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Many sociologists conduct surveys, study social problems, teach, and work in museums, performing tasks similar to those of the following professionals:

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Archivists, curators, and museum technicians	265
Counselors	234
Social workers	246
Statisticians	148
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—postsecondary	282

Political scientists often research the legal system and analyze current events, as do the following workers:

Judges, magistrates, and other judicial workers	253
Lawyers	257
News analysts, reporters, and correspondents	344
Paralegals and legal assistants	261

Sources of Additional Information

Information about careers in sociology is available from:

➤ American Sociological Association, 1430 K St. NW., Suite 600, Washington, DC 20005. Internet: **http://www.asanet.org**

For information about careers in political science, contact:

➤ American Political Science Association, 1527 New Hampshire Ave. NW., Washington, DC 20036. Internet: **http://www.apsanet.org**

For information about careers in public policy, contact:

➤ National Association of Schools of Public Affairs and Administration, 1029 Vermont Ave. NW., Suite 1100, Washington, DC 20005. Internet: **http://www.naspaa.org**

For information about careers in policy analysis, an important task for some social scientists, see "Policy analysts: Shaping society through research and problem-solving," online at **http://www.bls.gov/opub/ooq/2007/spring/art03.pdf** and in the spring 2007 issue of the *Occupational Outlook Quarterly*.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos314.htm**

Social Scientists, Other

Significant Points

- Projected job growth varies by specialty; for example, anthropologists and archaeologists can expect 28 percent employment growth; geographers, 26 percent; and historians, 11 percent.
- Candidates who hold a master's or Ph.D. degree in a social science will have the best employment prospects and advancement opportunities; some entry-level positions are available to those with a bachelor's degree.
- Despite much faster than average job growth overall, applicants are likely to face competition because the number of qualified candidates is expected to exceed the number of positions available.

Nature of the Work

The major social science occupations covered in this statement are anthropologists, archaeologists, geographers, and historians. (Sociologists, political scientists, 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 into the different ways individuals, groups, and institutions make decisions, exercise power, and respond to change. They look at data in detail, such as studying the data they've collected, reanalyzing already existing data, analyzing historical records and documents, and interpreting the effect of location on culture and other aspects of society. Through their studies and analyses, social scientists offer insight into the physical, social, and cultural development of humans, as well as the links between human activity and the environment. Following are brief discussions of several major types of social scientists. Specialists in one field may find that their research overlaps work being conducted in another discipline.

Anthropologists study the origin, development, and behavior of humans. They examine the ways of life, languages, archaeological remains, and physical characteristics of people in various parts of the world. They also examine the customs, values, and social patterns of different cultures, often through comparative analyses. Some anthropologists study current human concerns, such as overpopulation, warfare, and poverty, while others study the prehistory of *Homo sapiens*, including the evolution of the human brain. Anthropologists usually concentrate on one of four subfields: sociocultural, linguistics, biological, and physical anthropology. *Sociocultural anthropologists* study the customs, cultures, and social lives of groups in settings that range from unindustrialized societies to modern urban centers. They often do this through observation or face-to-face interviews with a particular group, comparing findings of one particular group with that of another. For example, they may seek to learn the reasons behind face painting or scarification of individuals within a society to better understand the overall culture of that society. Such an analysis usually takes form of a specific focus—for example, economics, politics, religion, or art. *Linguistic anthropologists* investigate the history of, role of, and changes to, language over time in various cultures. *Biological anthropologists* research the evolution of the human body, look for the earliest evidences of human life, and analyze how culture and biology influence one another. *Physical anthropologists* examine human remains found at archaeological sites in order to understand population demographics and factors, such as nutrition and disease, that affected these populations.

Archaeologists examine and recover material evidence, including tools, pottery, cave paintings, the ruins of buildings, and other objects remaining from past human cultures in order to learn about the history, customs, and living habits of earlier civilizations. With continued technological advances making it increasingly possible to detect the presence of underground anomalies without digging, archaeologists can now target excavation sites better than they previously could.

Most archaeologists work at consulting and research firms—specifically, at cultural resource management (CRM) firms whose services often are contracted by developers, construc-

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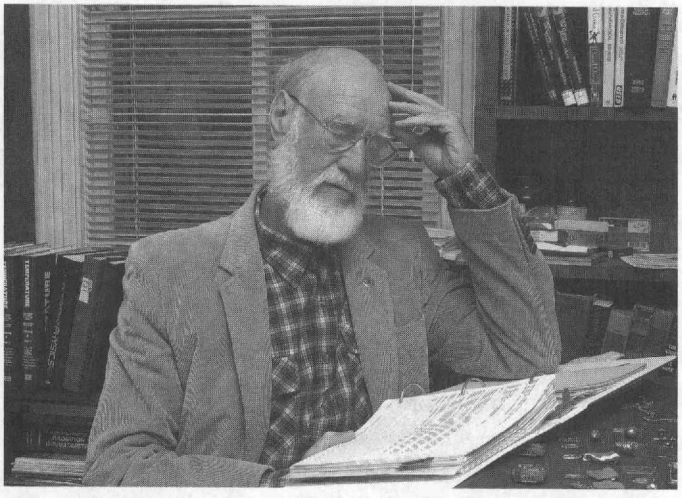
tion companies, and, sometimes, the Federal Government. CRM workers are responsible mainly for identifying, assessing, and preserving archaeological and historical sites on private and public land, such as National parks, to ensure that the builder is complying with legislation pertaining to preservation. Archaeologists in museums and historic sites often handle the locale's artifacts collection, educate the public through interactive programs and presentations, or become administrators who supervise programs related to research, collections, and exhibitions. Another large employer of archaeologists is the government. Many archaeologists in the Federal Government conduct research for the U.S. Department of Interior's National Park Service. Some also work as administrators.

Geographers study the earth and its land, features, inhabitants, and phenomena. Most geographers work in one of two main branches of geography: physical and cultural. *Physical geographers* examine the physical aspects of a region, including its land forms, climates, soils, vegetation, water, plants, and animals. *Cultural geographers* analyze the spatial implications of human activities within a given area, including its economic activities, social characteristics, and political organization, and are further classified on the basis of their specific focus. For example, *economic geographers* study the distribution of resources and economic activities. *Political geographers* are concerned with the relationship of geography to political phenomena. *Urban* and *transportation geographers* study cities and metropolitan areas. *Regional geographers* study the physical, economic, political, and cultural characteristics of regions ranging in size from a congressional district to entire continents. *Medical geographers* investigate health care delivery systems, epidemiology (the study of the causes and control of epidemics), and the effect of the environment on health.

Geographers incorporate many different technologies into their work, such as geographic information systems (GISs), global positioning systems (GPSs), and remote sensing. For example, a geographer may use GIS and GPS to track information on population growth, traffic patterns, environmental hazards, natural resources, and weather patterns, all in digital format. By overlaying remotely sensed aerial or satellite images with GIS data, such as population density, they create computerized maps that can advise governments, businesses, and the general public on a variety of issues, including the impact of natural disasters and the development of houses, roads, and landfills. As more of these systems are created and refined, a good number of mapping specialists are being called *geographic information specialists*. In addition, many of the people who study geography and work with GIS technology are classified into other occupations, such as surveyors, cartographers, photogrammetrists, and survey and mapping technicians (who develop maps and other location-based information), urban and regional planners (who help to decide on and evaluate the locations of building and roads and other aspects of physical society), and geoscientists (who study earthquakes and other physical aspects of the Earth). (These occupations are described elsewhere in the *Handbook*.)



Social scientists often read and write research articles or reports.

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. Many communicate their research and findings through books, articles, or essays.

The majority of historians conduct some form of research and analysis for State and local government. Others help study and preserve archival materials and artifacts in museums, visitor centers, and historic buildings and sites. Those with a bachelor's degree in history may work as high school history teachers. (See the statement on teachers—kindergarten, elementary, middle, and secondary elsewhere in the *Handbook*.)

Work environment. Most social scientists have regular hours. Although they work most often as an integral part of a research team, they sometimes work alone, writing reports of their findings. Travel may be necessary to collect information or attend meetings, and those 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, and administrative responsibilities. Those who teach in these settings are classified as postsecondary teachers. (See the statement on teachers—postsecondary elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

The educational attainment of social scientists is among the highest of all occupations, with most positions requiring a master's or Ph.D. degree. Some entry-level positions are available to those with a bachelor's degree. All social scientists need good analytical skills.

Education and training. Graduates with master's degrees in applied specialties usually are qualified for positions outside of colleges and universities, although requirements vary by field. A Ph.D. degree may be required for higher level teaching positions. Bachelor's degree holders have limited opportunities;

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Social scientists, other	–	11,100	13,500	2,400	22
Anthropologists and archeologists	19-3091	5,800	7,400	1,600	28
Geographers	19-3092	1,300	1,600	300	26
Historians	19-3093	4,100	4,500	500	11

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

however, a bachelor's degree does provide a suitable background for many different kinds of entry-level jobs in related occupations, such as research assistant, writer, management trainee, and market analyst. In addition, bachelor's degree holders in history often qualify for elementary, middle, and high school teaching positions.

Training in statistics and mathematics is essential for many social scientists, most of whom increasingly are using mathematical and quantitative research methods. The ability to use computers for research purposes is mandatory in most disciplines. Social scientists also must keep up to date on the latest technological advances that affect their discipline and research. For example, most geographers use GIS technology extensively, and a growing number of archaeologists are beginning to incorporate the technology into their work.

Many social science students also benefit from internships or field experience. Numerous local museums, historical societies, government agencies, and nonprofit and other organizations offer internships or volunteer research opportunities. Archaeological field schools instruct future anthropologists, archaeologists, and historians in how to excavate, record, and interpret historical sites.

Other qualifications. Social scientists need excellent written and oral communication skills to report research findings and to collaborate on research. The ability to think logically and methodically also is essential in analyzing complicated issues. Objectivity, an open mind, and systematic work habits are important in all kinds of social science research. Perseverance, too, often is necessary, as when an anthropologist spends years studying artifacts from an ancient civilization before making a final analysis and interpretation.

Certification and advancement. The GIS Certification Institute (GISCI) has voluntary certification programs for geography professionals in GIS. To qualify for professional distinction, individuals must meet education and experience requirements and pass a written examination. The professional recognition these certifications bestow can often help geographers find employment—especially those who do not have a master's or Ph.D. degree. Workers in these jobs, however, may not be called "geographers," but instead may be referred to by a different title, such as "GIS analyst" or "GIS specialist."

Some social scientists advance to top-level research and administrative positions. Advancement often depends on the number and quality of reports that social scientists publish or their ability to design studies.

Employment

Anthropologists and archaeologists, geographers, and historians held about 11,100 jobs in 2008. Professional, scientific, and technical services employed 37 percent of all workers. A small amount—about 2 percent—was self-employed.

Job Outlook

Overall employment is projected to grow much faster than average, but varies by detailed occupation. For anthropologists and archaeologists, opportunities will be best with management, scientific, and technical consulting services companies. For geographers, opportunities will be best for those who have GIS experience or knowledge. Keen competition is expected for historian jobs because the number of applicants typically outnumbers the number of positions available.

Employment change. Overall employment of anthropologists and archaeologists, geographers, and historians is expected to grow by 22 percent from 2008 to 2018, which is much faster than the average for all occupations. Anthropologists and archaeologists, the largest specialty, is expected to grow by 28 percent, driven by growth in the management, scientific, and technical consulting services industry. Anthropologists who work as consultants will be needed to apply their analytical skills and knowledge to problems ranging from economic development to forensics. A growing number of anthropologists also will be needed in specific segments of the Federal Government, such as the U.S. Department of Defense, to assess the regional customs and values—or "cultural terrain"—of a particular society in specific parts of the world. Employment growth of archaeologists will be driven by higher levels of overall construction, including large-scale transportation projects and upgrades to the Nation's infrastructure. As construction projects increase, more archaeologists will be needed to ensure that Federal laws related to the preservation of archaeological and historical sites and artifacts are met.

Employment of geographers is expected to increase by 26 percent because the Federal Government—the largest employer—is projected to grow faster than in the past. Outside of the Federal Government, geographers will be needed to advise businesses, local municipalities, real estate developers, utilities, and telecommunications firms regarding where to build new roads, buildings, powerplants, and cable lines. Geographers also will be needed to advise about environmental matters, such as where to build a landfill and where to preserve wetland habitats.

Employment of historians is expected to grow by 11 percent, reflecting the relatively few jobs outside of Federal, State, and local Government. Nonetheless, historians possess broad training and education in writing, analytical research, and coherent thinking, so their skills can be applied to many different occupations. As a result, many workers with a history

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background will find work in niche areas with specialized titles, such as researcher, writer, or policy analyst.

Job prospects. In addition to opportunities arising from employment growth, some job openings for social scientists will come from the need to replace those who retire or who leave the occupation for other reasons. Some social scientists leave the occupation to become professors, but competition for tenured teaching positions will be keen.

Overall, people seeking social science positions are likely to face competition for jobs. Candidates who have a master's or Ph.D. degree in a social science, who are skilled in quantitative research methods, and who also have good written and communications skills are likely to have the best job opportunities. In addition, many jobs in policy, research, or marketing, for which social scientists qualify, are not advertised exclusively as social scientist positions.

Anthropologists and archaeologists will experience the best job prospects at management, scientific, and technical consulting firms. Those with a bachelor's degree in archaeology usually qualify to be a field technician.

Geographers with a background in GIS will find numerous job opportunities applying GIS technology in nontraditional areas, such as emergency assistance, where GISs can track the locations of ambulances, police, and fire rescue units and their proximity to the emergency. Workers in these jobs may not be called "geographers," but instead may be referred to by a different title, such as "GIS analyst" or "GIS specialist."

Historians will find jobs mainly in policy or research. Historians may find opportunities with historic preservation societies or by working as a consultant as public interest in preserving and restoring historical sites increases. Many workers with a history background also choose to teach in elementary, middle, and secondary schools.

Earnings

Wages of anthropologists and archaeologists, geographers, and historians vary. Median annual wages for anthropologists and archaeologists were $53,910 in May 2008. The middle 50 percent earned between $39,200 and $70,980. The lowest 10 percent earned less than $32,150, and the highest 10 percent earned more than $89,490.

Median annual wages of geographers were $66,600 in May 2008. The middle 50 percent earned between $51,390 and $82,590. The lowest 10 percent earned less than $38,780, and the highest 10 percent earned more than $97,540.

For historians, median annual wages were $54,530 in May 2008. The middle 50 percent earned between $33,570 and $77,290. The lowest 10 percent earned less than $25,670, and the highest 10 percent earned more than $96,530.

In March 2009, the Federal Government's average annual salary for anthropologists was $88,302; for archaeologists, $70,606; for geographers, $79,223; and for historians, $87,730. Beginning salaries were higher in selected areas of the country where the prevailing local pay level was higher.

Related Occupations

The duties and training of anthropologists and archaeologists, geographers, and historians are similar to those of other social scientists, including the following:

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Urban and regional planners	220

Many social scientists conduct surveys, study social problems, teach, and work in museums, performing tasks similar to those of the following professionals:

Archivists, curators, and museum technicians	265
Counselors	234
Social workers	246
Statisticians	148
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—postsecondary	282

Geographers often study the Earth's environment and natural resources, as do:

Atmospheric scientists	192
Conservation scientists and foresters	185
Environmental scientists and specialists	199
Geoscientists and hydrologists	202

Geographers also use GIS computer technology to make maps. Other workers in occupations with similar duties include the following:

Computer scientists	132
Computer network, systems, and database administrators	128
Surveyors, cartographers, photogrammetrists, and surveying and mapping technicians	157

Sources of Additional Information

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:

➤ Archaeological Institute of America, 656 Beacon St., 6th Floor, Boston, MA 02215. Internet: **http://www.archaeological.org**

➤ Society for American Archaeology, 900 2nd St. NE., Suite 12, Washington, DC 20002. Internet: **http://www.saa.org**

For information about careers in geography, contact:

➤ Association of American Geographers, 1710 16th St. NW., Washington, DC 20009. Internet: **http://www.aag.org**

See also "Geography jobs," online at **http://www.bls.gov/opub/ooq/2005/spring/art01.pdf** and in the spring 2005 issue of the *Occupational Outlook Quarterly.*

Information on careers for historians is available from:

➤ American Historical Association, 400 A St. SE., Washington, DC 20003. Internet: **http://www.historians.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos315.htm**

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Science Technicians

Significant Points

- Many science technicians work indoors in laboratory settings, but certain technicians work outdoors, sometimes in remote locations.
- Most science technicians need some postsecondary training, such as an associate degree or a certificate in applied science or science-related technology; biological and forensic science technicians usually need a bachelor's degree.
- Overall growth is expected to be about as fast as average, although growth will vary by specialty.
- Job opportunities are expected to be best for graduates of applied science technology programs who are well trained on equipment used in laboratories or production facilities.

Nature of the Work

Science technicians use the principles and theories of science and mathematics to assist 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. Those who perform production work monitor manufacturing processes and may ensure 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, the role of science technicians in research and development has expanded. In addition to performing routine tasks, many technicians, under the direction of scientists, now develop and adapt laboratory procedures to achieve the best results, interpret data, and devise solutions to problems. Technicians must develop expert knowledge of laboratory equipment so that they can adjust settings when necessary and recognize when equipment is malfunctioning.

Most science technicians specialize, learning their 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 and food science technicians work with related scientists to conduct research, development, and testing on food and other agricultural products. Agricultural technicians are involved 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 breed animals for the purpose of investigating nutrition. Food science technicians assist food scientists and technologists in research and development, production technology, and quality control. For example, food science technicians may conduct tests on food additives and preservatives to ensure compliance with Food and Drug Administration regulations regarding color, texture, and nutrients. These technicians 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 medicines. Those working in the field of microbiology generally work as laboratory assistants, studying living organisms and infectious agents. Biological technicians also analyze organic substances, such as blood, food, and drugs. Biological technicians working in biotechnology apply knowledge and techniques gained from basic research, including gene splicing and recombinant DNA, and apply them to 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 technicians who work in experimental laboratories and process control technicians who work in manufacturing or other industrial plants. Many chemical technicians working in research and development 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 they may produce compounds through complex organic synthesis. Most process technicians work in manufacturing, testing packaging for design, integrity of materials, and environmental acceptability. Often, process technicians who work in plants focus on quality assurance, monitoring product quality or production processes and developing new production techniques. A few work in shipping to provide technical support and expertise.

Environmental science and protection technicians perform laboratory and field tests to monitor environmental resources and determine the contaminants and sources of pollution in the environment. They may collect samples for testing or be involved in abating and controlling sources of environmental pollution. Some are responsible for waste management operations, control and management of hazardous materials inventory, or general activities involving regulatory compliance. Many environmental science technicians employed at private consulting firms work directly under the supervision of an environmental scientist.

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 on substances such as fiber, glass, hair, tissue, and body fluids to determine their significance to the investigation. Proper collection and storage methods are important to protect the evidence. Forensic science technicians also prepare reports to document their findings and the laboratory techniques used, and they may provide information and expert opinions to

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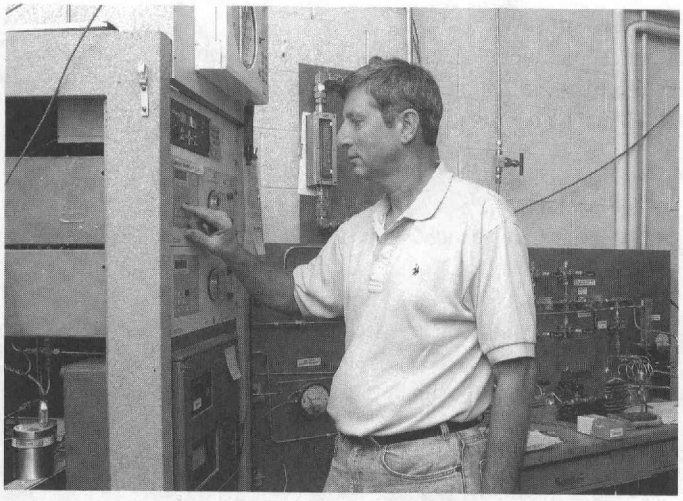

Science technicians monitor experiments and record the results.

investigators. When criminal cases come to trial, forensic science technicians often give testimony as expert witnesses on laboratory findings by identifying and classifying substances, materials, and other evidence collected at the scene of a crime. Some forensic science technicians work closely with other experts or technicians. For example, a forensic science technician may consult either a medical expert about the exact time and cause of a death or another technician who specializes in DNA typing in hopes of matching a DNA type to a suspect.

Forest and conservation technicians compile data on the size, content, and condition of natural lands, such as rangeland and forests. These workers usually work under the supervision of a conservation scientist or forester, doing specific tasks such as measuring timber, tracking wildlife movement, assisting in road building operations, and locating property lines and features. They may gather basic information, such as data on water and soil quality, disease and insect damage to trees and other plants, and conditions that may pose a fire hazard. In addition, forest and conservation technicians train and lead forest and conservation workers in seasonal activities, such as planting tree seedlings and maintaining recreational facilities. Increasing numbers of forest and conservation technicians work in urban forestry—the study of individual trees in cities—and other nontraditional specialties, rather than in forests or rural areas.

Geological and petroleum technicians assist in oil and gas exploration operations, collecting and examining geological data or testing geological samples to determine their petroleum content and their mineral and element composition. Some petroleum technicians, called scouts, collect information about oil well 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-controlled equipment to manipulate radioactive materials or materials exposed to radioactivity. Workers who control nuclear reactors are classified as *nuclear power reactor operators*, and are not included in this statement. (See the statement on power plant operators, distributors, and dispatchers elsewhere in the *Handbook*.)

Other science technicians perform a wide range of activities. Some collect weather information or assist oceanographers; others work as laser technicians or radiographers.

Work environment. 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.

Advances in automation and information technology require technicians to operate more sophisticated laboratory equipment. Science technicians make extensive use of computers, electronic measuring equipment, and traditional experimental apparatus.

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.

Training, Other Qualifications, and Advancement

Most science technicians need some formal postsecondary training, such as an associate degree or a certificate in applied science or science-related technology. Biological and forensic science technicians usually need a bachelor's degree. Science technicians with a high school diploma and no college degree typically begin work as trainees under the direct supervision of a more experienced technician, and they eventually earn a 2-year degree in science technology.

Education and training. There are many ways to qualify for a job as a science technician. Most employers prefer applicants who have at least 2 years of specialized postsecondary training or an associate degree in applied science or science-related technology. Some science technicians have a bachelor's degree in the natural sciences, while others have no formal postsecondary education and learn their skills on the job.

Some science technician specialties have higher education requirements. For example, biological technicians often need a bachelor's degree in biology or a closely related field. Forensic science positions also typically require a bachelor's degree, either in forensic science or another natural science. Knowledge and understanding of legal procedures also can be helpful. Chemical technician positions in research and development also often require a bachelor's degree, but most chemical process technicians have a 2-year degree instead, usually an associate degree in process technology.

Many technical and community colleges offer programs in a specific technology or more general education in science and mathematics. A number of associate degree programs are designed to provide easy transfer to bachelor's degree programs

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at colleges or universities. Technical institutes usually offer technician training, but they provide less theory and general education than community colleges. The length of programs at technical institutes varies, although 1-year certificate programs and 2-year associate degree programs are common. Some schools offer cooperative-education or internship programs, allowing students the opportunity to work at a local company or some other workplace while attending classes during alternate terms. Participation in such programs can significantly enhance a student's employment prospects.

Whatever their formal education, science technicians usually need hands-on training, which they can receive either in school or on the job. Job candidates with extensive hands-on experience using a variety of laboratory equipment, including computers and related equipment, usually require only a short period of on-the-job training. Those with a high school diploma and no college degree typically have a more extensive training program where they work as trainees under the direct supervision of a more experienced technician.

People 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 chemistry, physics, and math is vital.

Other qualifications. Communication skills are important because technicians are often required to report their findings both orally and in writing. In addition, technicians should be able to work well with others. Because computers often are used in research and development laboratories, technicians should also have strong computer skills, especially in computer modeling. Organizational ability and skill in interpreting scientific results are important as well, as are high mechanical aptitude, attention to detail, and analytical thinking.

Advancement. Technicians usually begin work as trainees in routine positions under the direct supervision of a scientist or a more experienced technician. As they gain experience, technicians take on more responsibility and carry out assignments under only general supervision, and some eventually become supervisors. Technicians who have a bachelor's degree often are able to advance to scientist positions in their field after a few years of experience working as a technician or after earning a graduate degree.

Employment

Science technicians held about 270,800 jobs in 2008. As indicated by the following tabulation, chemical and biological technicians accounted for 54 percent of all jobs:

Biological technicians	79,500
Chemical technicians	66,100
Environmental science and protection technicians, including health	35,000
Forest and conservation technicians	34,000
Agricultural and food science technicians	21,900
Geological and petroleum technicians	15,200
Forensic science technicians	12,800
Nuclear technicians	6,400

About 30 percent of biological technicians worked in professional, scientific, or technical services firms; most other biological technicians worked in educational services, government, or pharmaceutical and medicine manufacturing. Chemical technicians primarily worked in chemical manufacturing and professional, scientific, or technical services firms. Most environmental science and protection technicians worked for professional, scientific, and technical services firms and for State and local governments. About 75 percent of forest and conservation technicians held jobs in the Federal Government, mostly in the Forest Service. Around 34 percent of agricultural and food science technicians worked in educational institutions and 25 percent worked for food manufacturing companies. Forensic science technicians worked primarily for State and local governments. Approximately 56 percent of all geological and petroleum technicians worked in the mining and oil and gas industries, while 51 percent of nuclear technicians worked for utilities.

Job Outlook

Employment of science technicians is projected to grow about as fast as the average for all occupations, although employment change will vary by specialty. Job opportunities are expected to be best for graduates of applied science technology programs who are well trained on equipment used in laboratories or production facilities.

Employment change. Overall employment of science technicians is expected to grow by 12 percent during the 2008–18 decade, about as fast as the average for all occupations. The continued growth of scientific and medical research—particu-

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Science technicians	–	270,800	302,600	31,800	12
Agricultural and food science technicians	19-4011	21,900	23,800	1,900	9
Biological technicians	19-4021	79,500	93,500	14,000	18
Chemical technicians	19-4031	66,100	65,500	-500	-1
Geological and petroleum technicians	19-4041	15,200	15,400	200	2
Nuclear technicians	19-4051	6,400	7,000	600	9
Environmental science and protection technicians, including health	19-4091	35,000	45,200	10,100	29
Forensic science technicians	19-4092	12,800	15,300	2,500	20
Forest and conservation technicians	19-4093	34,000	36,900	2,900	9

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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larly research related to biotechnology—will be the primary driver of employment growth, but the development and production of technical products should also stimulate demand for science technicians in many industries.

Employment of biological technicians should increase by 18 percent, faster than average, as the growing number of agricultural and medicinal products developed from the results of biotechnology research boosts demand for these workers. Also, an aging population and continued competition among pharmaceutical companies are expected to contribute to the need for innovative and improved drugs, further spurring demand. Most growth in employment will be in professional, scientific, and technical services and in educational services.

Job growth for chemical technicians is projected to decline by 1 percent, signifying little or no change. The chemical manufacturing industry, except pharmaceutical and medicine manufacturing, is anticipated to experience a decline in overall employment as companies downsize and turn to outside contractors and overseas production. However, there will still be a need for chemical technicians, particularly in pharmaceutical research.

Employment of environmental science and protection technicians is expected to grow much faster than average, at a rate of 29 percent; these workers will be needed 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. Most of this growth is expected to be in firms that assist other companies in environmental monitoring, management, and regulatory compliance.

Employment of forest and conservation technicians is expected to grow by 9 percent, about as fast as average. Opportunities at State and local governments within specialties such as urban forestry may provide some new jobs. In addition, an increased emphasis on specific conservation issues, such as environmental protection, preservation of water resources, and control of exotic and invasive pests, will spur demand.

Employment of agricultural and food science technicians is projected to grow by 9 percent, about as fast as average. Research in biotechnology and other areas of agricultural science will increase as it becomes more important to balance greater agricultural output with protection and preservation of soil, water, and the ecosystem. In addition, there will be increased research into the use of agricultural products as energy sources, also known as biofuels.

Jobs for forensic science technicians are expected to increase by 20 percent, much faster than average. Employment growth in State and local government should be driven by the increasing application of forensic science techniques, such as DNA analysis, to examine, solve, and prevent crime.

Employment growth of about 2 percent, representing little or no change, is expected for geological and petroleum technicians as oil companies continue to search for new resource deposits to meet world demand for petroleum products and natural gas. The outlook for these workers is strongly tied to the price of oil; historically, when prices are low, companies limit exploration and curtail hiring of technicians, but when prices are high, they expand exploration activities. In the long run, continued high oil prices will maintain demand for these workers.

Nuclear technicians should grow by 9 percent, about as fast as average, as more are needed to monitor the Nation's aging fleet of nuclear reactors and research future advances in nuclear power. Although no new nuclear power plants have been built for decades in the United States, energy demand has recently renewed interest in this form of electricity generation and may lead to future construction. Technicians 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.

Job prospects. In addition to job openings created by growth, many openings should arise from the need to replace technicians who retire or leave the labor force for other reasons. Job opportunities are expected to be best for graduates of applied science technology programs who are well trained on equipment used in laboratories or production facilities. As the instrumentation and techniques used in industrial research, development, and production become increasingly more complex, employers will seek individuals with highly developed technical skills.

Earnings

Median hourly wages of science technicians in May 2008 were as follows:

Nuclear technicians	$32.64
Geological and petroleum technicians	25.65
Forensic science technicians	23.97
Chemical technicians	20.25
Environmental science and protection technicians, including health	19.34
Biological technicians	18.46
Agricultural and food science technicians	16.34
Forest and conservation technicians	15.39

In March 2009, the average annual salary in the Federal Government was $39,538 for biological science technicians, $55,527 for physical science technicians, and $42,733 for forestry technicians.

Related Occupations

Other technicians who apply scientific principles and who usually have some postsecondary education include

	Page
Broadcast and sound Engineering technicians and radio operators	173
Clinical laboratory technologists and technicians	337
Diagnostic medical sonographers	411
Drafters	416
Engineering technicians	170
Radiologic technologists and technicians	438

Sources of Additional Information

General information on a variety of technology fields is available from the Pathways to Technology Web site: **http://www.pathwaystotechnology.org**

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For information about a career as a biological technician, contact:

➤ Bio-Link, 1855 Folsom St., Ste 643, San Francisco, CA 94103. Internet: **http://www.bio-link.org**

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, 410 North 21st St., Colorado Springs, CO, 80904. Internet: **http://www.aafs.org**

For general information on forestry technicians and a list of schools offering education in forestry, contact:

➤ Society of American Foresters, 5400 Grosvenor Ln., Bethesda, MD 20814. Internet: **http://www.safnet.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos115.htm**

Community and Social Services Occupations

Counselors

Significant Points

- People interested in counseling should have a strong desire to help others and should be able to inspire respect, trust, and confidence.
- Education and training requirements vary by State and specialty, but a master's degree is required to become a licensed counselor.
- Projected job growth varies by specialty, but job opportunities should be favorable as job openings are expected to exceed the number of graduates from counseling programs.

Nature of the Work

Counselors work in diverse community settings designed to provide a variety of counseling, rehabilitation, and support services. Their duties vary greatly, depending on their specialty, which is determined by the setting in which they work and the population they serve. Although the specific setting may have an implied scope of practice, counselors frequently are challenged with children, adolescents, adults, or families that have multiple issues, such as mental health disorders and addiction, disability and employment needs, school problems or career counseling needs, and trauma. Counselors must recognize these issues in order to provide their clients with appropriate counseling and support.

Educational, vocational, and school counselors provide individuals and groups with career, personal, social and educational counseling. School counselors assist students of all levels, from elementary school to postsecondary education. They advocate for students and work with other individuals and organizations to promote the academic, career, personal, and social development of children and youth. School counselors help students evaluate their abilities, interests, talents, and personalities to develop realistic academic and career goals. Counselors use interviews, counseling sessions, interest and aptitude assessment tests, and other methods to evaluate and advise students. They also operate career information centers and career education programs. Often, counselors work with students who have academic and social development problems or other special needs.

Elementary school counselors provide individual, small-group, and classroom guidance services to students. Counselors observe children during classroom and play activities and confer with their teachers and parents to evaluate the children's strengths, problems, or special needs. In conjunction with teachers and administrators, they make sure that the curriculum addresses both the academic and the developmental needs of students. Elementary school counselors do less vocational and academic counseling than high school counselors do.

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.

School counselors at all levels help students to understand and deal with social, behavioral, and personal problems. These counselors emphasize preventive and developmental counseling to enhance students' personal, social, and academic growth and to provide students with the life skills needed to deal with problems before they worsen. Counselors provide special services, including alcohol and drug prevention programs and conflict resolution classes. They also try to identify cases of domestic abuse and other family problems that can affect a student's development.

Counselors interact with students individually, in small groups, or as an entire class. They consult and collaborate with parents, teachers, school administrators, school psychologists, medical professionals, and social workers to develop and implement strategies to help students succeed.

Vocational counselors, also called *employment counselors* or *career counselors*, usually provide career counseling outside the school setting. Their chief focus is helping individuals with career decisions. Vocational counselors explore and evaluate the client's education, training, work history, interests,

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skills, and personality traits. They may arrange for aptitude and achievement tests to help the client make career decisions. They also work with individuals to develop their job-search skills and assist clients in locating and applying for jobs. In addition, career counselors provide support to people 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 both physical and emotional disabilities resulting from birth defects, illness or disease, accidents, or other causes. They evaluate the strengths and limitations of individuals, provide personal and vocational counseling, offer case management support, 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 with physicians, psychologists, employers, and physical, occupational, and speech therapists to determine the capabilities and skills of the individual. They develop individual rehabilitation programs by conferring with the client. These programs often include training to help individuals develop job skills, become employed, and provide opportunities for community integration. Rehabilitation counselors are trained to recognize and to help lessen environmental and attitudinal barriers. Such help may include providing education, and advocacy services to individuals, families, employers, and others in the community. Rehabilitation counselors work toward increasing the person's capacity to live independently by facilitating and coordinating with other service providers.

Mental health counselors work with individuals, families, and groups to address and treat mental and emotional disorders and to promote mental health. They are trained in a variety of therapeutic techniques used to address issues such as depression, anxiety, addiction and substance abuse, suicidal impulses, stress, trauma, low self-esteem, and grief. They also help with job and career concerns, educational decisions, mental and emotional health issues, and relationship problems. In addition, they may be involved in community outreach, advocacy, and mediation activities. Some specialize in delivering mental health services for the elderly. 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 psychologists, registered nurses, social workers, and physicians and surgeons, which includes psychiatrists, appears elsewhere in the *Handbook*.)

Substance abuse and behavioral disorder counselors help people who have problems with alcohol, drugs, gambling, and eating disorders. They counsel individuals to help them to identify behaviors and problems related to their addiction. Counseling can be done on an individual basis, but is frequently done in a group setting and can include crisis counseling, daily or weekly counseling, or drop-in counseling supports. Counselors are trained to assist in developing personalized recovery programs that help to establish healthy behaviors and provide coping strategies. Often, these counselors also will work with family members who are affected by the addictions of their loved ones. Some counselors conduct programs and community outreach aimed at preventing addiction and educating the public. Counselors must be able to recognize how addiction affects the entire person and those around him or her.



Counselors work in diverse community settings designed to provide a variety of counseling, rehabilitation, and support services.

Marriage and family therapists apply family systems theory, principles, and techniques to address and treat mental and emotional disorders. In doing so, they modify people's perceptions and behaviors, enhance communication and understanding among family members, and help to prevent family and individual crises. They may work with individuals, families, couples, and groups. Marriage and family therapy differs from traditional therapy because less emphasis is placed on an identified client or internal psychological conflict. The focus is on viewing and understanding their clients' symptoms and interactions within their existing environment. Marriage and family therapists also may make appropriate referrals to psychiatric resources, perform research, and teach courses in human development and interpersonal relationships.

Work environment. The work environment can vary greatly, depending on the occupational specialty. School counselors work predominantly in schools, where they usually have an office but also may work in classrooms. Other counselors may work in a private practice, community health organizations, day treatment programs, or hospitals. Many counselors work in an office where they see clients throughout the day, although counselors may frequently be required to provide services out in the community.

Training, Other Qualifications, and Advancement

Education and training requirements for counselors are often very detailed and vary by State and specialty, but a master's degree usually is required to become a licensed counselor. Prospective counselors should check with State and local governments, prospective employers, and national voluntary certification organizations to determine which requirements apply.

Education and training. Education requirements vary with the occupational specialty and State licensure and certification requirements. A master's degree usually is required to be licensed or certified as a counselor. Counselor education programs in colleges and universities often are found in depart-

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ments of education, psychology, or human services. Fields of study may include college student affairs, elementary or secondary school counseling, education, gerontological counseling, marriage and family therapy, substance abuse or addictions counseling, rehabilitation counseling, agency or community counseling, clinical mental health counseling, career counseling, and related fields. Courses frequently are grouped into core areas, including human growth and development, social and cultural diversity, relationships, group work, career development, counseling techniques, assessment, research and program evaluation, and professional ethics and identity. In an accredited master's degree program, 48 to 60 semester hours of graduate study, including a period of supervised clinical experience in counseling, typically are required.

Some employers provide training for newly hired counselors. Others may offer time off or tuition assistance to complete a graduate degree. Often, counselors must participate in graduate studies, workshops, and personal studies to maintain their certificates and licenses.

Licensure. Licensure requirements differ greatly by State, occupational specialty, and work setting. Some States require school counselors to hold a State school counseling certification and to have completed at least some graduate coursework; most require the completion of a master's degree. Some States require school counselors to be licensed, which generally entails completing continuing education credits. Some States require public school counselors to have both counseling and teaching certificates and to have had some teaching experience.

For counselors based outside of schools, 49 States and the District of Columbia have some form of counselor licensure that governs the practice of counseling. In addition, all 50 States and the District of Columbia have some licensure requirement for marriage and family therapists. Requirements for both counselors and marriage and family therapists typically include the completion of a master's degree in counseling or marriage and family therapy, 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 completion of annual continuing education credits. However, counselors working in certain settings or in a particular specialty may face different licensure requirements. For example, a career counselor working in private practice may need a license, but a counselor working for a college career center may not. In addition, substance abuse and behavior disorder counselors generally are governed by a different State agency or board than are other counselors. The criteria for their licensure can vary greatly, and in some cases these counselors may need only a high school diploma and certification. Those interested in entering the field must research State and specialty requirements to determine what qualifications are necessary.

Other qualifications. People interested in counseling should have a strong desire to help others and should be able 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.

Counselors must possess high physical and emotional energy to handle the array of problems that they address. Dealing daily with these problems can cause stress.

Certification and advancement. Some counselors elect to be certified by the National Board for Certified Counselors, which grants a general practice credential of National Certified Counselor. This national certification is voluntary and is distinct from State licensing. However, in some States, those who pass the national exam are exempt from taking a State certification exam. The board also offers specialty certifications in school, clinical mental health, and addiction counseling.

The Commission on Rehabilitation Counselor Certification offers voluntary national certification for rehabilitation counselors. Many State and local governments and other employers require rehabilitation counselors to have this certification. To become certified, rehabilitation counselors usually must graduate from an accredited educational program, complete an internship, and pass a written examination. Certification requirements vary, however, 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. To maintain their certification, counselors must successfully retake the certification exam or complete 100 credit hours of acceptable continuing education every 5 years.

Other counseling organizations also offer certification in particular counseling specialties. Usually, becoming certified is voluntary, but having certification may enhance one's job prospects.

Prospects for advancement vary by counseling field. School counselors can become directors or supervisors of counseling, guidance, or pupil personnel services; or, usually with further graduate education, they may become counselor educators, counseling psychologists, or school administrators. (Psychologists and education administrators are covered elsewhere in the *Handbook*.) Some counselors choose to work for a State's department of education.

Some marriage and family therapists, especially those with doctorates in family therapy, become supervisors, teachers, researchers, or advanced clinicians in the discipline. Counselors also may become supervisors or administrators in their agencies. Some counselors move into research, consulting, or college teaching or go into private or group practice. Some may choose to pursue a doctoral degree to improve their chances for advancement.

Employment

Counselors held about 665,500 jobs in 2008. Employment was distributed among the counseling specialties as follows:

Educational, vocational, and school counselors	275,800
Rehabilitation counselors	129,500
Mental health counselors	113,300
Substance abuse and behavioral disorder counselors	86,100
Marriage and family therapists	27,300
Counselors, all other	33,400

A growing number of counselors are self-employed and work in group practices or private practice, due in part to laws allowing counselors to be paid for their services by insurance

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Counselors	21-1010	665,500	782,200	116,800	18
Substance abuse and behavioral disorder counselors	21-1011	86,100	104,200	18,100	21
Educational, vocational, and school counselors	21-1012	275,800	314,400	38,600	14
Marriage and family therapists	21-1013	27,300	31,300	3,900	14
Mental health counselors	21-1014	113,300	140,400	27,200	24
Rehabilitation counselors	21-1015	129,500	154,100	24,500	19
Counselors, all other	21-1019	33,400	37,800	4,400	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

companies and to the growing recognition that counselors are well-trained, effective professionals.

Job Outlook

Employment is expected to grow faster than the average for all occupations. Projected job growth varies by specialty, but job opportunities should be favorable because job openings are expected to exceed the number of graduates from counseling programs, especially in rural areas.

Employment change. Overall employment of counselors is expected to increase by 18 percent between 2008 and 2018, which is faster than the average for all occupations. However, growth is expected to vary by specialty.

Employment of substance abuse and behavioral disorder counselors is expected to grow by 21 percent, which is much faster than the average for all occupations. As society becomes more knowledgeable about addiction, more people are seeking treatment. Furthermore, drug offenders are increasingly being sent to treatment programs rather than to jail.

Employment for educational, vocational, and school counselors is expected to grow by 14 percent, which is faster than the average for all occupations. Demand for vocational or career counselors should grow as multiple job and career changes become common and as workers become increasingly aware of counseling services. States require elementary schools to employ counselors. Expansion of the responsibilities of school counselors also is likely to lead to increases in their employment. 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 helping their students to achieve academic success, budget constraints at every school level will dampen the job growth of school counselors. Federal grants and subsidies may help to offset tight budgets and allow the reduction in student-to-counselor ratios to continue.

Employment of mental health counselors is expected to grow by 24 percent, which is much faster than the average for all occupations. Under managed care systems, insurance companies increasingly are providing for reimbursement of counselors as a less costly alternative to psychiatrists and psychologists. In addition, there has been increased demand for mental health services as individuals become more willing to seek help.

Jobs for rehabilitation counselors are expected to grow by 19 percent, which is faster than the average for all occupations. The number of people who will need rehabilitation counseling will increase as the size of the elderly population, whose members become injured or disabled at a higher rate than other age groups, increases and as treatment for mental health related disabilities increases.

Marriage and family therapists will experience growth of 14 percent, which is faster than the average for all occupations, in part because of an increased recognition of the field. It is becoming more common for people to seek help for their marital and family problems than it was in the past.

Job prospects. Job opportunities should be favorable because job openings are expected to exceed the number of graduates from counseling programs, particularly in rural areas. Substance abuse counselors should enjoy particularly good job prospects.

Earnings

Median annual wages of educational, vocational, and school counselors in May 2008 were $51,050. The middle 50 percent earned between $38,740 and $65,360. The lowest 10 percent earned less than $29,360, and the highest 10 percent earned more than $82,330. School counselors can earn additional income by working summers in the school system or in other jobs. Median annual wages in the industries employing the largest numbers of educational, vocational, and school counselors were as follows:

Elementary and secondary schools	$57,800
Junior colleges	50,440
Colleges, universities, and professional schools	43,980
Vocational rehabilitation services	35,220
Individual and family services	33,780

Median annual wages of substance abuse and behavioral disorder counselors in May 2008 were $37,030. The middle 50 percent earned between $29,410 and $47,290. The lowest 10 percent earned less than $24,240, and the highest 10 percent earned more than $59,460. Median annual wages in the industries employing the largest numbers of substance abuse and behavioral disorder counselors were as follows:

General medical and surgical hospitals	$44,130
Local government	41,660
Outpatient care centers	36,650
Individual and family services	35,210
Residential mental retardation, mental health and substance facilities	31,300

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Median annual wages of mental health counselors in May 2008 were $36,810. The middle 50 percent earned between $28,930 and $48,580. The lowest 10 percent earned less than $23,580, and the highest 10 percent earned more than $63,100. Median annual wages in the industries employing the largest numbers of mental health counselors were as follows:

Local government	$45,510
Offices of other health practitioners	40,880
Outpatient care centers	37,590
Individual and family services	36,130
Residential mental retardation, mental health and substance abuse facilities	29,950

Median annual wages of rehabilitation counselors in May 2008 were $30,930. The middle 50 percent earned between $24,110 and $41,240. The lowest 10 percent earned less than $20,150, and the highest 10 percent earned more than $56,550. Median annual wages in the industries employing the largest numbers of rehabilitation counselors were as follows:

State government	$45,350
Local government	38,800
Vocational rehabilitation services	29,060
Individual and family services	28,290
Residential mental retardation, mental health and substance facilities	25,950

Median annual wages of marriage and family therapists in May 2008 were $44,590. The middle 50 percent earned between $34,840 and $56,320. The lowest 10 percent earned less than $27,810, and the highest 10 percent earned more than $70,830. Median annual wages in the industries employing the largest numbers of marriage and family therapists were as follows:

State government	$50,770
Local government	48,220
Outpatient care centers	46,830
Offices of other health practitioners	41,220
Individual and family services	39,690

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:

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Human resources, training, and labor relations managers and specialists	61
Occupational therapists	369
Physicians and surgeons	381
Psychologists	215
Registered nurses	392
Social and human service assistants	244
Social workers	246
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—special education	294

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. Internet: **http://www.counseling.org**

For information on school counselors, contact:

➤ American School Counselors Association, 1101 King St., Suite 625, Alexandria, VA 22314. Internet: **http://www.schoolcounselor.org**

For information on mental health counselors, contact:

➤ American Mental Health Counselors Association, 801 N. Fairfax St., Suite 304, Alexandria, VA 22314. Internet: **http://www.amhca.org**

For information on marriage and family therapists, contact:

➤ American Association for Marriage and Family Therapy, 112 South Alfred St., Alexandria, VA 22314. Internet: **http://www.aamft.org**

For information on accredited counseling and related training programs, contact:

➤ Council for Accreditation of Counseling and Related Educational Programs, American Counseling Association, 1001 N. Fairfax St., Suite 510, Alexandria, VA 22314. Internet: **http://www.cacrep.org**

For information on national certification requirements for counselors, contact:

➤ National Board for Certified Counselors, Inc, 3 Terrace Way, Greensboro, NC 27403. Internet: **http://www.nbcc.org**

State departments of education can supply information on colleges and universities offering guidance and counseling training that meets State certification and licensure requirements.

State employment service offices have information about job opportunities and entrance requirements for counselors.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos067.htm**

Health Educators

Significant Points

- 51 percent of health educators work in health care and social assistance, and an additional 23 percent work in government.
- A bachelor's degree is the minimum requirement for entry-level jobs, but a master's degree may be required for certain positions or for advancement.
- Faster than average job growth is expected.

Nature of the Work

Health educators work to encourage healthy lifestyles and wellness through educating individuals and communities about

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behaviors that can prevent diseases, injuries, and other health problems.

Health educators attempt to prevent illnesses by informing and educating individuals and communities about health-related topics, such as proper nutrition, the importance of exercise, how to avoid sexually transmitted diseases, and the habits and behaviors necessary to avoid illness. They begin by assessing the needs of their audience, which includes determining the appropriate topics to cover. For example, they may hold programs on self-examination for breast cancer to women or may teach classes on the effects of binge drinking to college students. Health educators must take the cultural norms of their audience into account. For example, programs targeted at the elderly need to be different from those aimed at a college-aged population.

After assessing their audiences' needs, health educators must decide how to meet those needs. Health educators have a lot of options in putting together programs. They may organize an event, such as a lecture, class, demonstration or health screening, or they may develop educational material, such as a video, pamphlet or brochure. Often, these tasks require working with other people in a team or on a committee. Health educators must plan programs that are consistent with the goals and objectives of their employers. For example, many nonprofit organizations educate the public about one disease or health topic, and, therefore, limit the programs they issue.

Next, health educators need to implement their proposed plan. This may require locating funding by applying for grants, writing curriculums for classes, or creating materials that would be made available to the public. Also, programs may require dealing with logistical tasks, such as finding speakers or locations for the event.

Generally, after a program is presented, health educators evaluate its success. Methods of evaluation vary based on the program in question. For example, they may ask participants to provide feedback using a survey about the program. Through evaluation, health educators can improve plans for the future by learning from mistakes and capitalizing on strengths.

Although programming is a large part of their job, health educators also serve as a resource on health topics. This may include locating services, reference material, and other resources and referring individuals or groups to organizations or medical professionals.

Even though all health educators share the same overarching goal, their duties can vary depending on where they work. Most health educators work in medical care settings, colleges and universities, schools, public health departments, nonprofit organizations, and private business.

Within medical care facilities, health educators tend to work one-on-one with patients and their families. In this setting, a health educator's goal is to educate individual patients on their diagnosis and how that may change or affect their lifestyle. To this end, they may explain the necessary procedures or surgeries as well as how patients will need to alter their lifestyles to manage their illness or return to full health. They may also direct patients to outside resources, such as support groups, home health agencies, or social services. Often, health educators work closely with physicians, nurses, and other staff to create educational programs or materials, such as brochures, Web sites, and classes. In some cases, health educators train hospital staff about how to better interact with patients.

Health educators in colleges and universities work primarily with students. Generally, these educators create programs on topics that affect young adults, such as sexual activity, smoking, and alcohol. They may need to alter their teaching methods to attract audiences to their events. For example, health educators might show a popular movie followed by a discussion or hold programs in dormitories or cafeterias. They may teach courses for credit or give lectures on health-related topics. Often, they train students as peer educators to lead their own programs.

Health educators in schools are typically employed in secondary schools, where they may teach health class. They develop lesson plans that are relevant and age appropriate to their students. Educators may need to cover sensitive topics, such as sexually transmitted diseases or alcohol and drug abuse and may also teach another subject concurrently, such as science or physical education. Sometimes, they may develop the health education curriculum for the school or for the entire school district. (For more information, see the statement on secondary school teachers elsewhere in the *Handbook*.)

Heath educators in public health are employed primarily by State and local departments of public health and administer State-mandated programs. They also develop educational materials for use by other public health officials. During an emergency, health educators may be responsible for disseminating information to both the media and the public. They work closely with nonprofit organizations to help them get the resources they need, such as funding. Educators often serve as members of statewide councils or national committees on topics such as aging. As part of this work, they inform other professionals in changes to health policy.

In nonprofits, which may be referred to community health organizations, health educators provide the public with information related to health and educate people about the resources available to help people in the community. While some organizations target a particular audience, others educate the community regarding one disease or health issue. Therefore, health educators may be limited in either the topics they cover, the populations they serve, or both. Work in this setting may include creating print-based material for distribution to the community, often in conjunction with organizing lectures, health screenings, and activities related to increasing health awareness. Health educators may also form and lead community coalitions to address public health issues ranging from water quality to healthy food availability or access to safe exercise areas. They can work to set policy that will improve public health. Examples include working to advance legislation for prohibition of smoking in public areas and limitation of junk food in vending machines in schools.

When working in private businesses, health educators create programs to inform its employees and that fit into workers' schedules by arranging lunchtime speakers or daylong health screenings so that workers may come when attendance is convenient. Educators in these business settings must align their work with the overall goals of their employers.

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Work environment. Health educators work in various environments based on the industry in which they are employed. In public health, nonprofit organizations, corporations and businesses, colleges and universities, and medical care settings, they primarily work in offices. However, they may spend a lot of time away from the office implementing and attending programs, meeting with community organizers, speaking with patients, or teaching classes. Health educators in schools spend the majority of their day in classrooms.

Health educators generally work 40-hour weeks. When programs, events, or meetings are scheduled, however, they may need to work evenings or weekends.

Training, Other Qualifications, and Advancement

A bachelor's degree is generally required for entry-level health educator positions, but some employers prefer a bachelor's degree and some related experience gained through an internship or volunteer work. A master's degree may be required for some positions and is usually required for advancement.

Education and training. Entry-level health educator positions generally require a bachelor's degree from a health education program. These programs teach students the theories and methods of health education and develop the skills necessary to implement health education programs. Courses in psychology, human development, and a foreign language are helpful, and experience gained through an internship or other volunteer opportunities can make applicants more appealing to employers.

Graduate programs in health education are often offered under titles such as community health education, school health education, public health education, or health promotion. These programs lead to a Master of Arts, Master of Science, Master of Education, or a Master of Public Health degree. Many students pursue a master's in health education after majoring in or working in a related field, such as nursing or psychology. A master's degree is required for most health educator positions in public health.

Some employers may require and pay for educators to take continuing education courses to keep their skills up to date.

Other qualifications. Health educators spend much of their time working with people and must be comfortable working with both individuals and groups. They need to be good communicators and comfortable speaking in public as they may need to teach classes or give presentations. Health educators often work with diverse populations, so they must be sensitive to cultural differences and open to working with people of varied backgrounds. Health educators often create new programs or materials, so they should be creative and skilled writers.

Certification and advancement. Health educators may choose to become a Certified Health Education Specialist (CHES), a credential offered by the National Commission of Health Education Credentialing, Inc. The certification is awarded after candidates pass an examination on the basic areas of responsibility for a health educator. The exam is aimed at entry-level educators who have already completed at least a bachelor's degree in health education or are within 3 months of completion. In addition, to maintain certification, health educators must complete 75 hours of approved continuing education courses or seminars over a 5-year period. Some employers prefer to hire applicants who are certified, and some States may require health educator certification to work in a public health department. However, many employers do not require their workers to have the certification.



Health educators attempt to prevent illnesses by informing and educating individuals and communities about health-related topics.

A graduate degree is usually required to advance past an entry-level position to jobs such as executive director, supervisor, or senior health educator. Workers in these positions may spend more time on planning and evaluating programs than on their implementation but may need to supervise other health educators who implement the programs. Some health educators pursue a doctoral degree in health education and may transfer to research positions or become professors of health education. (See the statement on postsecondary teachers elsewhere in the *Handbook.)*

Employment

Health educators held about 66,200 jobs in 2008. They work primarily in two industries, with 51 percent working in health care and social assistance and 23 percent working in government. In addition, a small percent of health educators work in grant-making services and social advocacy organizations.

Job Outlook

Employment of health educators is expected to grow faster than the average for all occupations, and job prospects are expected to be favorable.

Employment change. Employment of health educators is expected to grow by 18 percent, which is faster than the average for all occupations through 2018. Growth will result from the rising cost of healthcare.

The rising cost of healthcare has increased the need for health educators. As healthcare costs continue to rise, insurance companies, employers, and governments are attempting to find ways to curb costs. One of the more cost-effective ways is to employ health educators to teach people how to live healthy lives and avoid costly treatments for illnesses. There are a number of illnesses, such as lung cancer, HIV, heart disease and skin cancer, that may be avoided with lifestyle changes. Health educators are necessary to help the public better understand the effects of their behavior on their health. Other illnesses, such as breast

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Health educators	21-1091	66,200	78,200	12,000	18

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

and testicular cancer, are best treated with early detection, so it is important for people to understand how to detect possible problems on their own. The need to provide the public with this kind of information will result in State and local governments, hospitals, and businesses employing a growing number of health educators.

Demand for health educators is expected to increase in most industries, but their employment may decrease in secondary schools. Many schools, facing budget cuts, ask teachers trained in other fields, such as science or physical education, to teach the subject of health education.

Job prospects. Job prospects for health educators are expected to be favorable, but those who have acquired experience through internships or volunteer jobs will have better prospects. A graduate degree is preferred by employers in public health and for non-entry-level positions.

Earnings

Median annual wages of health educators were $44,000 in May 2008; the middle 50 percent earned between $33,170 and $60,810. The lowest 10 percent earned less than $26,210, and the highest 10 percent earned more than $78,260.

Median annual wages in the industries employing the largest numbers of health educators in May 2008 were as follows:

General medical and surgical hospitals	$56,390
Colleges, universities and professional schools	49,050
Local government	43,040
Outpatient care centers	36,830
Individual and family services	36,050

Related Occupations

Health educators work closely with people to alter their behavior. Other occupations with similar skills include:

	Page
Counselors	234
Psychologists	215
Registered nurses	392
Social and human service assistants	244
Social workers	246
Teachers- kindergarten, elementary, middle, and secondary	288

Sources of Additional Information

For further information about health educators, contact:

➤ American Association for Health Education, 1900 Association Drive, Reston, VA 20191-1598. Internet: **http://www.aahperd.org/aahe/**

➤ Society for Public Health Education, 10 G Street, NE, Suite 605, Washington, DC 20002-4242. Internet: **http://www.sophe.org**

For information on voluntary credentialing and job opportunities, contact:

➤ The National Commission for Health Education Credentialing, Inc. 1541 Alta Drive, Suite 303, Whitehall, PA 18052-5642. Internet: **http://www.nchec.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos063.htm**

Probation Officers and Correctional Treatment Specialists

Significant Points

- State and local governments employ most of these workers.
- A bachelor's degree in social work, criminal justice, psychology, or a related field is usually required.
- Employment growth, which is projected to be faster than the average, is dependent on government funding.
- Job opportunities are expected to be excellent.

Nature of the Work

Many people who are convicted of crimes are placed on probation, instead of being sent to prison. People who have served time in prison are often released on parole. During probation and parole, offenders must stay out of trouble and meet various other requirements. Probation officers, parole officers, and correctional treatment specialists work with and monitor offenders to prevent them from committing new crimes.

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* or *correctional counselors*, counsel offenders and create rehabilitation plans for them to follow when they are no longer in prison or on parole. *Parole officers* perform many of the same duties that probation officers perform. The difference is that parole officers supervise offenders who have been released from prison, whereas probation officers work with those who are sentenced to probation instead of prison. *Pretrial services officers* conduct pretrial investigations, the findings of which help determine whether suspects should be released before their trial. In most jurisdictions, probation is a county function and parole is a State function.

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Probation and parole officers supervise offenders on probation or parole through personal contact with the offenders and their families. Instead of requiring offenders to come to them, 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 officers can monitor their location and movements. Probation and parole officers may arrange for offenders to get substance abuse rehabilitation or job training. Probation officers usually work with either adults or juveniles exclusively. Juvenile probation is also called aftercare. Only in small, usually rural, jurisdictions do probation officers counsel both adults and juveniles. In some States, the jobs of parole and probation officers are combined.

Probation officers also spend much of their time working for the courts. They investigate the backgrounds of the accused, write presentence reports, and recommend sentences. They review sentencing recommendations with offenders and their families before submitting them to the court. Probation officers may be required to testify in court as to their findings and recommendations. They also attend hearings to update the court on offenders' efforts at rehabilitation and compliance with the terms of their sentences.

Correctional treatment specialists work in jails, prisons, or parole or probation agencies. In jails and prisons, they monitor the progress of inmates. They may evaluate inmates using questionnaires and psychological tests. They also work with inmates, probation officers, and other agencies to develop parole and release plans. Their case reports, which discuss the inmate's history and likelihood of committing another crime, are provided to the appropriate parole board when their clients are eligible for release. In addition, correctional treatment specialists plan education and training programs to improve offenders' job skills and provide them with coping, anger management, and drug and 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.

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 homes. Other technological advancements, such as electronic monitoring devices, reporting kiosks, and drug screening, also assist probation officers and correctional treatment specialists in supervising and counseling offenders.

Pretrial services officers conduct pretrial investigations, the findings of which help determine whether suspects should be released before their trial. When suspects are released before their trial, pretrial services officers supervise them to make sure they adhere to the terms of their release and that they show up for trial. In most jurisdictions, including the Federal courts system, probation officers perform the functions of pretrial services officers.

Work environment. Probation officers and correctional treatment specialists work with criminal offenders, some of whom may be dangerous. While 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.

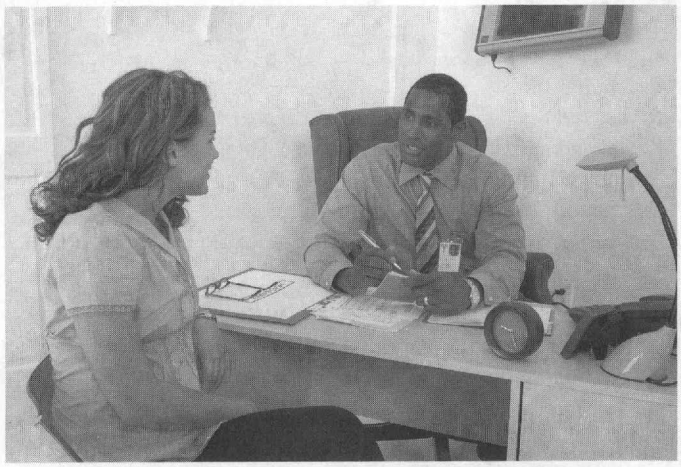
Probation officers and correctional treatment specialists are required to meet many court-imposed deadlines, which contribute to heavy workloads. In addition, extensive travel and fieldwork may be required to meet with offenders who are on probation or parole. Workers may be required to carry a firearm or other weapon for protection. They 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.

Probation officers and correctional treatment specialists generally work a 40-hour week, but some may work longer. They may be on call 24 hours a day to supervise and assist offenders at any time.

Training, Other Qualifications, and Advancement

Qualifications vary by agency, but a bachelor's degree is usually required. Most employers require candidates to pass oral, written, and psychological examinations.

Education and training. A bachelor's degree in social work, criminal justice, psychology, or a related field is usually required. Some employers require a master's degree in criminal justice, social work, psychology, or a related field for can-



Probation and parole officers supervise offenders on probation or parole through personal contact with the offenders and their families.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Probation officers and correctional treatment specialists	21-1092	103,400	123,300	19,900	19

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

didates who do not have previous related experience. Different employers have different requirements for what counts as related experience. It may include work in probation, pretrial services, parole, corrections, criminal investigations, substance abuse treatment, social work, or counseling.

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. Most probation officers and correctional treatment specialists work as trainees or on a probationary period for up to a year before being offered a permanent position.

Other qualifications. Applicants usually take written, oral, psychological, and physical examinations. 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. A valid driver's license is often required.

Familiarity with the use of computers is often required, due to the 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 have strong writing skills because they are required to prepare many reports. They should also have excellent listening and interpersonal skills to work effectively with offenders.

Advancement. A typical agency has probation and parole officers and correctional treatment specialists with varying amounts of experience, as well as supervisors. Advancement is primarily based on experience and performance. A graduate degree, such as a master's degree in criminal justice, social work, or psychology, may be helpful or required for advancement.

Employment

Probation officers and correctional treatment specialists held about 103,400 jobs in 2008. Most jobs are in State or local governments. Depending on the State, probation officers and correctional treatment specialists may be employed solely by State or local government, or they are employed at both levels. Jobs are more plentiful in urban areas than in rural ones. In the Federal Government, probation officers are employed by the U.S. courts, and correctional treatment specialists are employed by the U.S. Department of Justice's Bureau of Prisons.

Job Outlook

Employment of probation officers and correctional treatment specialists is projected to grow faster than the average for all occupations through 2018. Job opportunities are expected to be excellent.

Employment change. Employment of probation officers and correctional treatment specialists is projected to grow about 19 percent between 2008 and 2018, faster than the average for all occupations. Mandatory sentencing guidelines calling for longer sentences and reduced parole for inmates have resulted in a large increase in the prison population. However, mandatory sentencing guidelines are being reconsidered in many States because of budgetary constraints, court decisions, and doubts about the guidelines' effectiveness. Instead, there may be more emphasis in many States on rehabilitation and alternate forms of punishment, such as probation, that will spur demand for probation and parole officers and correctional treatment specialists. Additionally, there will be a need for parole officers to supervise the large number of currently incarcerated people when they are released from prison.

However, employment growth depends primarily on the amount of government funding that is allocated to corrections, and especially to probation and parole 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.

Job prospects. 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. This occupation is not attractive to some potential entrants due to relatively low earnings, heavy workloads, and high stress. For these reasons, job opportunities are expected to be excellent.

Earnings

Median annual wages of probation officers and correctional treatment specialists in May 2008 were $45,910. The middle 50 percent earned between $35,990 and $60,430. The lowest 10 percent earned less than $29,490, and the highest 10 percent earned more than $78,210. In May 2008, median annual wages for probation officers and correctional treatment specialists employed in State government were $46,580; those employed in local government earned $46,420. Higher wages tend to be found in urban areas.

Related Occupations

Other workers who help treat and care of people include:

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Counselors	234
Social and human service assistants	244
Social workers	246

Other workers who help protect communities include:

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Correctional officers	467
Firefighters	470
Police and detectives	473

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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

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos265.htm**

Social and Human Service Assistants

Significant Points

- A high school diploma is the minimum educational requirement, but employers often seek individuals with relevant work experience or education beyond high school.
- Employment is projected to grow much faster than the average for all occupations.
- Job opportunities should be excellent, particularly for applicants with appropriate postsecondary education; but wages remain low.

Nature of the Work

Social and human service assistants help social workers, healthcare workers, and other professionals to provide services to people. Social and human service assistant is a generic term for workers 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 skills counselor*, *social services aide*, *youth worker*, *psychological aide*, *client advocate*, or *gerontology aide*. They usually work under the direction of workers from a variety of fields, such as nursing, psychiatry, psychology, or social work. The amount of responsibility and supervision they are given varies a great deal. Some have little direct supervision. For example, they may run a group home. Others work under close direction.

Social and human service assistants provide services to clients to help them improve their quality of life. They assess clients' needs, investigate their eligibility for benefits and services such as food stamps, Medicaid and welfare, and help clients obtain them. They also arrange for transportation, if necessary, and provide emotional support. They 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 the community. For example, they may organize and lead group activities, assist clients in need of counseling or crisis intervention, or administer food banks or emergency fuel programs. In halfway houses, group homes, and government-supported housing programs, they assist adults who need supervision with personal hygiene and daily living tasks. They review clients' records, ensure that they take prescribed medication, talk with family members, and confer with medical personnel and other caregivers to provide insight into clients' needs. Assistants also give emotional support and help clients become involved in community recreation programs and other activities.

In psychiatric hospitals, rehabilitation programs, and outpatient clinics, social and human service assistants work with psychiatrists, psychologists, social workers, and others to help clients master everyday living skills, communicate more effectively, and live well with others. They support the client's participation in a treatment plan, such as individual or group counseling or occupational therapy.

The work, while satisfying, can be emotionally draining. Understaffing and relatively low pay can add to the pressure.

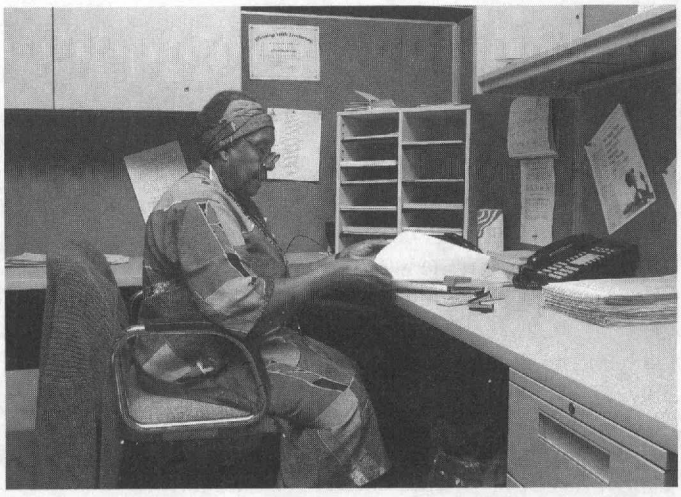
Work environment. Working conditions of social and human service assistants vary. Some work in offices, clinics, and hospitals, while others work in group homes, shelters, and day programs. Traveling to see clients is required for some jobs. Sometimes working with clients can be dangerous, even though most agencies do everything they can to ensure their workers' safety. Some work in the evening and on weekends.

Training, Other Qualifications, and Advancement

A high school diploma is the minimum education requirement, but employers often seek individuals with relevant work experience or education beyond high school.

Education and training. Many employers prefer to hire people with some education beyond high school. Certificates or associate degrees in subjects such as human services, gerontology or one of the social or behavioral sciences meet many 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



Social and human service assistants help social workers, healthcare workers, and other professionals to provide services to people.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Social and human service assistants	21-1093	352,000	431,500	79,400	23

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

problem-solving techniques, handle crisis intervention matters, and use proper case management and referral procedures. Many programs utilize field work to give students hands-on experience. General education courses in liberal arts, sciences, and the humanities also are part of most curriculums. Most programs also offer specialized courses related to addictions, gerontology, child protection, and other areas. Many degree programs require completion of a supervised internship.

Workers level of education often determines the kind of work they are assigned and the degree of responsibility that is given to them. For example, workers with no more than a high school education are likely to work in direct-care services and helping clients to fill out paperwork. They may receive extensive on-the-job training on how to perform these tasks. Workers with a college degree, however, might do supportive counseling, coordinate program activities, or manage a group home. Social and human service assistants with proven leadership ability, especially acquired from paid or volunteer experience in social services, often have greater autonomy in their work. Regardless of the academic or work background of employees, most employers provide some form of in-service training, such as seminars and workshops, to their employees.

Other qualifications. These workers should have a strong desire to help others, effective communication skills, a 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; so patience and understanding are also highly valued characteristics.

It is becoming more common for employers to require a criminal background check, and in some settings, workers may be required to have a valid driver's license.

Advancement. Formal education is almost always necessary for advancement. In general, advancement to case management, or social work jobs requires a bachelor's or master's degree in human services, counseling, rehabilitation, social work, or a related field.

Employment

Social and human service assistants held about 352,000 jobs in 2008. More than 65 percent were employed in the health care and social assistance industries and almost 24 percent were employed by State and local governments.

Job Outlook

Employment of social and human service assistants is expected to grow much faster than the average for all occupations. Job prospects are expected to be excellent, particularly for applicants with relevant postsecondary education.

Employment change. The number of social and human service assistants is expected to grow by nearly 23 percent between 2008 and 2018, which is much faster than the average for all occupations. This is due in large part to the aging population and increased demand for mental health and substance abuse treatment.

As the elderly population continues to grow, the demand for social and human service assistants will expand. This is due in large part to the increased need for social services demanded by this population, such as adult day care, meal delivery programs and support during medical crises. Social and human service assistants, who assist in locating and providing these services, will be needed to meet this increased demand.

Opportunities are expected to be good in private social service agencies. 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.

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 and with the number of services contracted out to private organizations.

Job prospects. Job prospects for social and human service assistants are expected to be excellent, particularly for individuals with appropriate education after high school. Job openings will come from job growth, but also 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 ones, but qualified applicants should have little difficulty finding employment.

Earnings

Median annual wages of social and human service assistants were $27,280 in May 2008. The middle 50 percent earned between $21,860 and $34,590. The top 10 percent earned more than $43,510, while the lowest 10 percent earned less than $17,900.

Median annual wages in the industries employing the largest numbers of social and human service assistants in May 2008 were:

State government.....$35,510
Local government.....32,560
Individual and family services.....26,250
Vocational rehabilitation services.....23,910
Residential mental retardation, mental health and substance abuse facilities.....23,580

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Related Occupations

Workers in other occupations that require skills similar to those of social and human service assistants include:

	Page
Child care workers	510
Correctional officers	467
Counselors	234
Eligibility interviewers, government programs	591
Health educators	238
Home health aides and personal and home care aides	449
Occupational therapist assistants and aides	462
Probation officers and correctional treatment specialists	241
Psychologists	215
Recreational therapists	389
Social workers	246

Sources of Additional Information

For information on programs and careers in human services, contact:

➤ Council for Standards in Human Services Education, 1935 S. Plum Grove Road, PMB 297, Palatine, IL 60067. Internet: **http://www.cshse.org**

➤ National Organization for Human Services, 5341 Old Highway 5, Suite 206, #214, Woodstock, GA 30188. Internet: **http://www.nationalhumanservices.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.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos059.htm**

Social Workers

Significant Points

- Employment is projected to grow faster than the average for all occupations.
- About 54 percent of jobs were in health care and social assistance industries, and 31 percent work for government.
- While a bachelor's degree is necessary for entry-level positions, a master's degree in social work or a related field is necessary for some positions.
- Job prospects are expected to be favorable, particularly for social workers who specialize in the aging population or work 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* assist people by helping them cope with and solve issues in their everyday lives, such as family and personal problems and dealing with relationships. Some social workers help clients who face a disability, life-threatening disease, social problem, such as inadequate housing, unemployment, or substance abuse. Social workers also assist families that have serious domestic conflicts, sometimes involving child or spousal abuse. Additionally, they may conduct research, advocate for improved services, or become involved in planning or policy development. Many social workers specialize in serving a particular population or working in a specific setting. In all settings, these workers may also be called *licensed clinical social workers*, if they hold the appropriate State mandated license.

Child, family, and school social workers provide social services and assistance to improve the social and psychological functioning of children and their families. Workers in this field assess their client's needs and offer assistance to improve their situation. This often includes coordinating available services to assist a child or family. They may assist single parents in finding day care, arrange adoptions, or help find foster homes for neglected, abandoned, or abused children. These workers may specialize in working with a particular problem, population or setting, such as child protective services, adoption, homelessness, domestic violence, or foster care.

In schools, social workers often serve as the link between students' families and the school, working with parents, guardians, teachers, and other school officials to ensure that students reach their academic and personal potential. They also assist students in dealing with stress or emotional problems. Many school social workers work directly with children with disabilities and their families. In addition, they address problems such as misbehavior, truancy, teenage pregnancy, and drug and alcohol problems and advise teachers on how to cope with difficult students. School social workers may teach workshops to entire classes on topics like conflict resolution.

Child, family, and school social workers may be known as child welfare social workers, family services social workers, or child protective services social workers. These workers often work for individual and family services agencies, schools, or State or local governments.

Medical and public health social workers provide psychosocial support to individuals, families, or vulnerable populations so they can 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 from hospitals. They may arrange for at-home services, such as meals-on-wheels or home care. Some work on interdisciplinary teams that evaluate certain kinds of patients, such as geriatric or organ transplant patients.

Some specialize in services for senior citizens and their families. These social workers may run support groups for the adult children of aging parents. Also, they may assess, coordinate, and monitor services such as housing, transportation, and long-term care. These workers may be known as gerontological social workers.

Medical and public health social workers may work for hospitals, nursing and personal care facilities, individual and family services agencies, or local governments.

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Mental health and substance abuse social workers assess and treat individuals with mental illness or substance abuse problems. Such services include individual and group therapy, outreach, crisis intervention, social rehabilitation, and teaching skills needed for everyday living. They also may help plan for supportive services to ease clients' return to the community when leaving in-patient facilities. They may provide services to assist family members of those who suffer from addiction or other mental health issues. These workers may work in outpatient facilities, where clients come in for treatment and then leave, or in inpatient programs, where patients reside at the facility. Some mental health and substance social workers may work in employee-assistance programs. In this setting, they may help people cope with job-related pressures or with personal problems that affect the quality of their work. Other social workers work in private practice, where they are employed directly by the client. These social workers may be known as *clinical social workers*, *occupational social workers*, or *substance abuse social workers*. (Counselors and psychologists, who may provide similar services, are discussed elsewhere in the *Handbook*.)

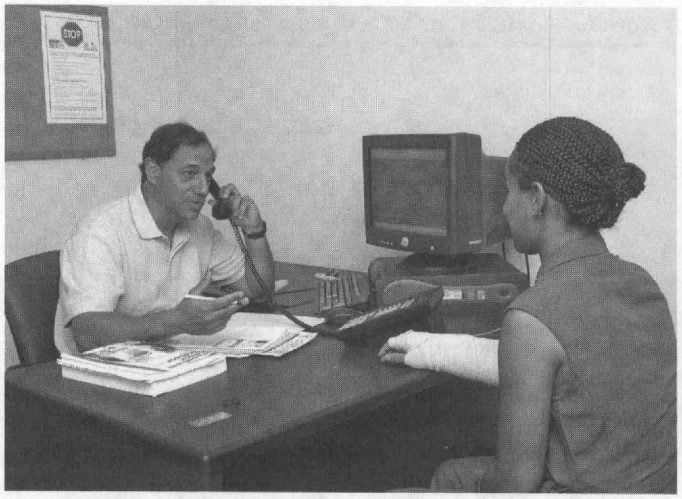
Other types of social workers include *social work administrators*, *researchers*, *planners* and *policymakers*, who develop and implement programs to address issues such as child abuse, homelessness, substance abuse, poverty, and violence. These workers research and analyze policies, programs, and regulations. They identify social problems and suggest legislative and other solutions. They may help raise funds or write grants to support these programs.

Work environment. Social workers usually spend most of their time in an office or residential facility, but they also may travel locally to visit clients, meet with service providers, or attend meetings. Some may meet with clients in one of several offices within a local area. Social work, while satisfying, can be challenging. Understaffing and large caseloads add to the pressure in some agencies. Full-time social workers usually work a standard 40-hour week, but some occasionally work evenings and weekends to meet with clients, attend community meetings, and handle emergencies. Some work part time, particularly in voluntary nonprofit agencies.

Training, Other Qualifications, and Advancement

A bachelor's degree is the minimum requirement for entry into the occupation, but some positions require an advanced degree. All States and the District of Columbia have some licensure, certification, or registration requirement; but these regulations vary.

Education and training. A bachelor's degree in social work (BSW) is the most common minimum requirement to qualify for a job as a social worker; however, majors in psychology, sociology, and related fields may 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 is required for some positions. A master's degree in social work (MSW) is typically required for positions in health and school settings and is required for clinical work, as well. Some jobs in public and private agencies may require an advanced degree, such as an MSW with a concentration in



Social workers help people resolve issues in their lives.

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 June 2009, the Council on Social Work Education accredited 468 bachelor's programs and 196 master's programs. The Group for the Advancement of Doctoral Education listed 74 doctoral programs in social work (DSW or Ph.D.) in the United States. Bachelor degree programs prepare graduates for direct service positions, such as caseworker, mental health assistant, group home worker and residential counselor. These programs include courses in social work values and ethics, dealing with a culturally diverse clientele and 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 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, take on supervisory roles, and explore new ways of drawing upon social services to meet the needs of clients. Master's programs usually 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 degree 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.

Licensure. All States and the District of Columbia have licensing, certification, or registration requirements regarding social work practice and the use of professional titles. Most States require 2 years or 3,000 hours of supervised clinical experience for licensure of clinical social workers. Due to some limitations on what settings unlicensed social workers may work and some variation in the requirements to obtain a license, those

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Social workers	21-1020	642,000	745,400	103,400	16
Child, family, and school social workers	21-1021	292,600	328,700	36,100	12
Medical and public health social workers	21-1022	138,700	169,800	31,100	22
Mental health and substance abuse social workers	21-1023	137,300	164,100	26,800	20
Social workers, all other	21-1029	73,400	82,800	9,400	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

interested in becoming a social worker should research requirements in their State.

Other qualifications. 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 can help people test their interest in this field.

Certification and advancement. Advancement to supervisor, program manager, assistant director, or executive director of a social service agency or department usually requires an advanced degree and related work experience. Other career options for social workers include teaching, research, and consulting. Some of these workers 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.

Employment

Social workers held about 642,000 jobs, in 2008. About 54 percent jobs were in health care and social assistance industries, and 31 percent were employed by government agencies. Although most social workers are employed in cities or suburbs, some work in rural areas. Employment by type of social worker, in 2008, follows:

Child, family and school social workers 292,600
Medical and public health social workers 138,700
Mental health and substance abuse social workers 137,300
Social workers, all other 73,400

Job Outlook

Employment for social workers is expected to grow faster than the average for all occupations through 2018. Job prospects are expected to be favorable, particularly for social workers who specialize in the aging population or work in rural areas.

Employment change. Employment of social workers is expected to increase by 16 percent during the 2008–18 decade, which is faster than the average for all occupations. The growing elderly population and the aging baby boom generation will create greater demand for health and social services, resulting in rapid job growth among gerontological social workers. Employment of social workers in private social service agencies also will increase.

Employment of child, family, and school social workers is expected to grow by about 12 percent, which is as fast as the average for all occupations. Demand for child and family social workers should continue, as these workers are needed to investigate child abuse cases, place children in foster care and with adoptive families. However, growth for these workers may be hampered by the budget constraints of state and local governments, who are amongst the largest employers of these workers. Furthermore, demand for school social workers will continue and lead to more jobs as efforts are expanded to respond to rising student enrollments, as well as the continued emphasis on integrating children with disabilities into the general school population. There could be competition for school social work jobs in some areas because of the limited number of openings. The availability of Federal, State, and local funding will be a major factor in determining the actual job growth in schools.

Mental health and substance abuse social workers will grow by almost 20 percent over the 2008–18 decade, which is much faster than the average. In particular, social workers specializing in substance abuse will experience strong demand. Substance abusers are increasingly being placed into treatment programs instead of being sentenced to prison. Also, growing numbers of the substance abusers sentenced to prison or probation are, increasingly being required by correctional systems to have substance abuse treatment added as a condition to their sentence or probation. As this trend grows, demand will strengthen for treatment programs and social workers to assist abusers on the road to recovery. Opportunities for social workers in private practice will expand, as they are preferred over more costly psychologists. Furthermore, the passage of legislation that requires insurance plans offered by employers to cover mental health treatment in a manner that is equal to treatment of physical health may increase the demand for mental health treatment.

Growth of medical and public health social workers is expected to be about 22 percent, which is much faster than the average for all occupations. One of the major contributing factors is the rise in the elderly population. These social workers will be needed to assist in finding the best care and assistance for the aging, as well as to support their families. Employment opportunities for social workers with backgrounds in gerontology should be excellent, particularly in the growing numbers of assisted-living and senior-living communities. The expanding senior population also will spur demand for social workers in nursing homes, long-term care facilities, home care agencies, and hospices.

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Job prospects. Job prospects are expected to be favorable. Many job openings will stem from growth and the need to replace social workers who leave the occupation. However, competition for social worker jobs is expected in cities where training programs for social workers are prevalent. 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.

Earnings

Median annual wages of child, family, and school social workers were $39,530 in May 2008. The middle 50 percent earned between $31,040 and $52,080. The lowest 10 percent earned less than $25,870, and the top 10 percent earned more than $66,430. Median annual wages in the industries employing the largest numbers of child, family, and school social workers in May 2008 were:

Elementary and secondary schools	$53,860
Local government	46,650
State government	39,600
Individual and family services	34,450
Other residential care facilities	34,270

Median annual wages of medical and public health social workers were $46,650 in May 2008. The middle 50 percent earned between $35,550 and $57,690. The lowest 10 percent earned less than $28,100, and the top 10 percent earned more than $69,090. Median annual wages in the industries employing the largest numbers of medical and public health social workers in May 2008 were:

General medical and surgical hospitals	$51,470
Home health care services	46,930
Local government	44,140
Nursing care facilities	41,080
Individual and family services	38,370

Median annual wages of mental health and substance abuse social workers were $37,210 in May 2008. The middle 50 percent earned between $28,910 and $48,560. The lowest 10 percent earned less than $21,770, and the top 10 percent earned more than $61,430. Median annual wages in the industries employing the largest numbers of mental health and substance abuse social workers in May 2008 were:

Outpatient care centers	$36,660
Individual and family services	35,900
Residential mental retardation, mental health and substance abuse facilities	33,950

Median annual wages of social workers, all other were $46,220 in May 2008. The middle 50 percent earned between $34,420 and $60,850. The lowest 10 percent earned less than $27,400, and the top 10 percent earned more than $74,040. Median annual wages in the industries employing the largest numbers of social workers, all other in May 2008 were:

General medical and surgical hospitals	$55,940
Local government	51,700
Individual and family services	36,660
Residential mental retardation, mental health and substance abuse facilities	36,460
Community food and housing, and emergency and other relief services	31,890

About 24 percent of social workers are members of a union or covered by a union contract.

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:

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Clergy	824
Counselors	234
Health educators	238
Probation officers and correctional treatment specialists	241
Psychologists	215
Social and human service assistants	244

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**

➤ Center for Clinical Social Work, 27 Congress St., Suite 501, Salem, MA 01970. Internet: **http://www.centercsw.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**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos060.htm**

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Legal Occupations

Court Reporters

Significant Points

- Job prospects are expected to be excellent, especially for those with certification.
- Demand for real-time broadcast captioning and translating will spur employment growth.
- The amount of training required to become a court reporter varies by specialization; licensure requirements vary by State.

Nature of the Work

Court reporters usually create verbatim transcripts of speeches, conversations, legal proceedings, meetings, and other events. Written accounts of spoken words are sometimes necessary for correspondence, records, or legal proof, and court reporters provide those accounts. Court reporters play a critical role not only in judicial proceedings, but also 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 provide closed-captioning and real-time translating services to the deaf and hard-of-hearing community.

There are several methods of court reporting; the most common is called stenographic. Using a stenotype machine, stenotypists document all statements made in official proceedings. The machine allows them to press multiple keys at once to record combinations of letters representing sounds, words, or phrases. These symbols are electronically recorded and then translated and displayed as text in a process called computer-aided transcription (CAT). In real-time court reporting, the stenotype machine is linked to computers for real-time captioning, often of television programs. As the reporter keys in the symbols, the spoken words instantly appear as text on the screen.

Another method of court reporting is electronic reporting. This method uses audio equipment to record court proceedings. The court reporter monitors the process, takes notes to identify speakers, and listens to the recording to ensure its clarity and quality. The equipment used may include analog tape recorders or digital equipment. Electronic reporters and transcribers often are responsible for producing a written transcript of the recorded proceeding.

Voice writing is yet another method of court reporting. Using the voice-writing method, a court reporter speaks directly into a voice silencer—a hand-held mask containing a microphone. As the reporter repeats the testimony into the recorder, the mask prevents 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. Written transcripts are prepared afterwards from the recordings.

Court reporters are responsible for a number of duties both before and after transcribing events. Stenographic or voice-writing reporters must create and maintain the computer dictionary that they use to translate their keystroke codes or voice 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, stenographic reporters must edit the computer-generated translation for correct grammar. All reporters are responsible for accurate identification of proper names and places. Electronic reporters ensure that the record or testimony is discernible. Reporters usually prepare written transcripts, make copies, and provide information from the transcript to courts, counsels, parties, and the public on request. Court reporters also develop procedures for easy storage and retrieval of all stenographic notes, voice files, (commonly referred to as "stenograms"), or audio recordings in paper or digital format.

Although many court reporters record official proceedings in the courtroom, others work outside the courts. For example, court reporters, called webcasters or Internet information reporters, capture sales meetings, press conferences, product introductions, and technical training seminars and instantly transmit them to all parties involved via computers. As participants speak into telephones or microphones, the words appear on all of the participants' computer monitors simultaneously. Still other court reporters capture the proceedings taking place in government agencies at all levels, from the U.S. Congress to State and local governing bodies. Court reporters who specialize in captioning live television programming for people with hearing loss are commonly known as broadcast captioners. They work for television networks or cable stations, captioning news, emergency broadcasts, sporting events, and other programming.

A version of the captioning process that allows reporters to provide more personalized services for deaf and hard-of-hearing people is Communication Access Real-time Translation (CART). CART reporters often work with hard-of-hearing students and people who are learning English as a second language, captioning high school and college classes and providing transcripts at the end of the sessions. CART reporters also accompany deaf clients to events, including conventions, doctor's appointments, or wherever communication access is needed. CART providers are increasingly furnishing this service remotely, because an Internet or phone connection allows for immediate communication access regardless of location. With CART and broadcast captioning, the level of understanding gained by a person with hearing loss depends entirely on the skill of the court reporter. In an emergency, such as a tornado or a hurricane, people's safety may depend on the accuracy of information provided in the form of captioning.

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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-enabled voice writers pursue not only court reporting careers, but also careers as closed captioners, CART reporters for hearing-impaired individuals, and Internet streaming text providers or caption providers.

Work environment. The majority of court reporters work in comfortable settings, such as offices of attorneys, courtrooms, legislatures, and conventions. An increasing number of court reporters are working from home-based offices as independent contractors or freelancers.

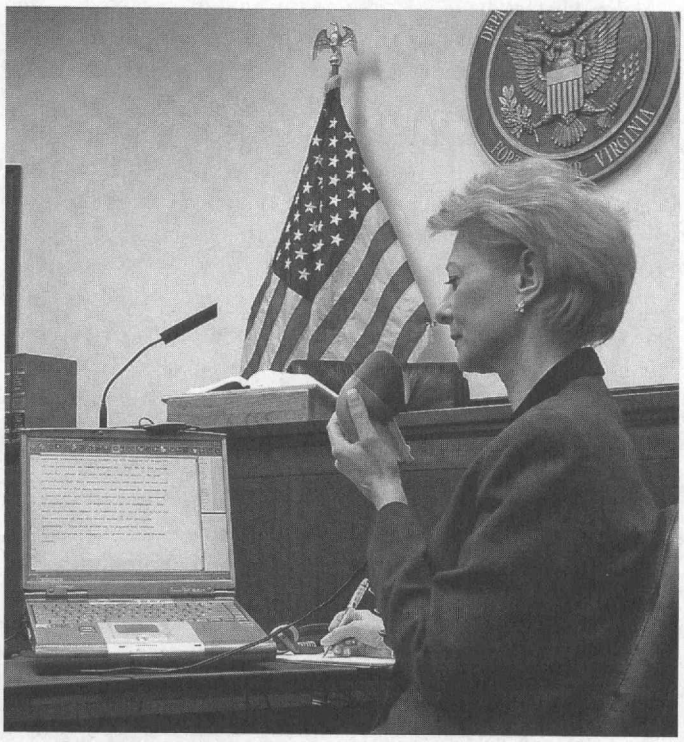
Work in this occupation presents few hazards, although sitting in the same position for long periods can be tiring and workers can suffer wrist, back, neck, or eye strain. Workers also risk repetitive stress injuries such as carpal tunnel syndrome. In addition, the pressure to be accurate and fast can be stressful.

Many official court reporters work a standard 40-hour week, and they often work additional hours at home preparing transcripts. Self-employed court reporters, or freelancers, usually work flexible hours, including part time, evenings, and weekends, or they may be on call.

Training, Other Qualifications, and Advancement

The amount of training required to become a court reporter varies by specialization. Licensure requirements vary by State.

Education and training. 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 novice voice writer, although it takes at least 2 years to become proficient at real-time voice writing. Electronic reporters and transcribers learn their skills on the job. The average length of time it takes to become a real-time stenographic court reporter is 33 months. Training is offered by about 100 postsecondary vocational and technical schools and colleges. The National Court Reporters Association (NCRA) has certified more than 60 programs, all of which offer courses in stenotype computer-aided transcription and real-time reporting. NCRA-certified programs require students to capture a minimum of 225 words per minute, a requirement for Federal Government employment as well.



Voice writers record everything that is said by judges, witnesses, attorneys, and others in a court proceeding, and prepare written transcripts.

Electronic court reporters use audio-capture technology and, therefore, usually learn their skills on the job. Students read manuals, review them with their trainers, and observe skilled electronic transcribers perform procedures. Court electronic transcribers generally obtain initial technical training from a vendor when the audio -capture technology is placed in service, with further court-specific training provided on the job. In a private company or organization, hands-on training occurs under direct supervision of an established practitioner or firm.

Licensure. Some States require voice writers to pass a test and to earn State licensure. As a substitute for State licensure, the National Verbatim Reporters Association offers three national certifications to voice writers: Certified Verbatim Reporter (CVR), Certificate of Merit (CM), and Real-Time Verbatim Reporter (RVR). Earning these certifications is sufficient for licensure in States where the voice method of court reporting is permitted. Candidates for the CVR must pass a written test involving spelling, punctuation, and vocabulary, legal and medical terminology, as well as three 5-minute dictation and transcription examinations that test for speed, accuracy, and silence. The CM requires additional levels of speed, knowledge, and accuracy. The RVR certification measures the candidate's skill at real-time transcription, judicial reporting, CART reporting, and captioning, including webcasting. 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.

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 test administered by a board of examiners.

Other qualifications. In addition to possessing speed and accuracy, court reporters must have excellent listening skills and hearing, good English grammar and vocabulary, and punctuation skills. Court reporters also must work well under time and deadline pressures and be able to concentrate for long periods. They must be aware of business 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. Voice writers must learn to listen and speak simultaneously and very quickly and quietly, while also identifying speakers and describing peripheral activities in the courtroom or deposition room.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Court reporters	23-2091	21,500	25,400	3,900	18

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

Certification and advancement. Certifications can help court reporters get jobs and advance in their careers. Several associations offer certifications for different types of reporters.

The National Court Reporters Association 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 court reporter may obtain additional certifications that demonstrate higher levels of experience and competency, such as Registered Merit Reporter (RMR) and Registered Diplomate Reporter (RDR). The NCRA also offers the designations Certified Realtime Reporter (CRR), Certified Broadcast Captioner (CBC), and Certified CART Provider (CCP), designed primarily for those who caption media programs or assist people who are deaf.

With experience and education, court reporters also can receive certification in administrative and management, consulting, or teaching positions.

The United States Court Reporters Association offers another voluntary certification designation, the Federal Certified Realtime Reporter (FCRR), for court reporters working in Federal courts. The exam is designed to test the basic real-time skills of Federal court reporters and is recognized by the Administrative Office for the United States District Courts for purposes of real-time certification.

The American Association of Electronic Reporters and Transcribers (AAERT) certifies electronic court reporters. Certification is voluntary and includes a written and a practical examination. To be eligible to take the exams, candidates must have at least 2 years of court reporting or transcribing experience, must be eligible for notary public commissions in their States, and must have completed high school. AAERT offers three types of certificates: Certified Electronic Court Reporter (CER), Certified Electronic Court Transcriber (CET), and Certified Electronic Court Reporter and Transcriber (CERT). Some employers may require electronic court reporters and transcribers to obtain certificates once they are eligible.

Employment

Court reporters held about 21,500 jobs in 2008. A little more than half 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 were employed by court reporting agencies.

Job Outlook

Employment is projected to grow by 18 percent, reflecting the demand for real-time broadcast captioning and translating. Job opportunities should be excellent, especially for those with certification.

Employment change. Employment of court reporters is projected to grow 18 percent, faster than the average for all occupations between 2008 and 2018. Demand for court reporter services will be spurred by the continuing need for accurate transcription of proceedings in courts and in pretrial depositions, by the growing need to create captions for live television, and by the need to provide other real-time broadcast captioning and translating services for the deaf and the hard of hearing.

Increasing numbers of civil and criminal cases are expected to create new jobs for court reporters, but 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, because of the difficulty in attracting court reporters and in controlling costs, some courtrooms have installed tape recorders that are maintained by electronic court reporters and transcribers to record court proceedings. However, because courts use electronic reporters and transcribers only in a limited capacity, traditional stenographic court reporters will continue to be used in felony trials and other proceedings. Despite the use of audiotape and videotape technology, court reporters can quickly turn spoken words into readable, searchable, permanent text, and they will continue to be needed to produce written legal transcripts and proceedings for publication.

Voice writers have become more widely accepted as the accuracy of speech recognition technology improves. Still, many courts allow only stenotypists to perform court reporting duties.

Increasingly, court reporters will be needed for captioning outside of legal proceedings. Not only is there Federal legislation mandating that all new television programming be captioned for the deaf and the hard of hearing, but all new Spanish-language programming likewise must be captioned by 2010. In addition, the Americans with Disabilities Act gives deaf and hard-of-hearing students in colleges and universities the right to request access to real-time translation in their classes. These factors are expected to continue to increase the demand for court reporters who provide CART services. Although such services forgo transcripts and differ from traditional court reporting, they require the same skills that court reporters learn in their training.

Job prospects. Job opportunities for court reporters are expected to be excellent as job openings continue to outnumber jobseekers in some areas. Court reporters with certification and those who choose to specialize in providing CART, broadcast captioning, or webcasting services should have the best job opportunities. Court reporters who are willing to relocate to rural areas or large cities, where demand for court reporters' services is very high, should have good job opportunities. The favorable job market also reflects the fact

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that fewer people are entering this profession, particularly as stenographic typists.

Earnings

Court reporters had median annual wages of $49,710 in May 2008. The middle 50 percent earned between $35,390 and $67,430. The lowest paid 10 percent earned less than $25,360, and the highest paid 10 percent earned more than $83,500. Median annual wages in May 2008 were $51,150 for court reporters working in local government and $44,670 for those working in business support services.

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. Official court reporters earn a salary and a per-page fee for transcripts. Many salaried court reporters supplement their income by doing freelance work. Freelance court reporters are paid per job and receive a per-page fee for transcripts. CART providers are paid by the hour. Captioners receive a salary and benefits if they work as employees of a captioning company. Captioners working as independent contractors are paid by the hour.

Related Occupations

Other workers who type, record information, and process paperwork include:

	Page
Data entry and information processing workers	590
Human resources assistants, except payroll and timekeeping	592
Interpreters and translators	340
Medical transcriptionists	457
Receptionists and information clerks	570
Secretaries and administrative assistants	583

Other workers who provide legal support include:

Paralegals and legal assistants	261

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:

➤ American Association of Electronic Reporters and Transcribers, 2900 Fairhope Road, Wilmington, DE 19810. Internet: **http://www.aaert.org**

➤ National Court Reporters Association, 8224 Old Courthouse Rd., Vienna, VA 22182. Internet: **http://www.ncraonline.org**

➤ National Verbatim Reporters Association, 629 North Main St., Hattiesburg, MS 39401. Internet: **http://www.nvra.org**

➤ United States Court Reporters Association, 4725 N. Western Ave., Suite 240, Chicago, IL 60625-2012. Internet: **http://www.uscra.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos152.htm**

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Judges, Magistrates, and Other Judicial Workers

Significant Points

- A bachelor's degree and work experience are the minimum requirements for a judgeship or magistrate position, but most workers have law degrees and some are elected; training requirements for arbitrators, mediators, and conciliators vary.
- Overall employment is projected to grow more slowly than average, but this varies by occupational specialty.
- Competition is expected for judge or magistrate jobs because of the prestige associated with serving on the bench.

Nature of the Work

Judges, magistrates, and other judicial workers apply the law and oversee the legal process in courts. 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. All judicial workers must ensure that trials and hearings are conducted fairly and that the court safeguards the legal rights of all parties involved.

The most visible responsibility of judges is presiding over trials or hearings and listening as attorneys represent their clients. Judges rule on the admissibility of evidence and the methods of conducting testimony, and they may be called on 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, judges interpret the law to determine how the trial will proceed.

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 people charged with crimes should be held in jail pending trial, or they may set conditions for their release. In civil cases, judges and magistrates occasionally impose restrictions on 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 cases. In such instances, the judge determines guilt in criminal cases and imposes sentences on the guilty; in civil cases, the judge awards relief—such as compensation for damages—to the winning parties to the lawsuit.

Judges also work outside the courtroom, in their chambers or private offices. There, 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 court's 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 that transcend 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 judges or *administrative law judges*. Appellate court judges overrule decisions 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 contact with litigants—the people who bring the case or who are on trial. Instead, they usually base their decisions on the lower court's records and on lawyers' written and oral arguments.

Many State court judges hear only 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 these judges, but some States allow them to handle cases involving domestic relations, probate, contracts, and other selected areas of the law.

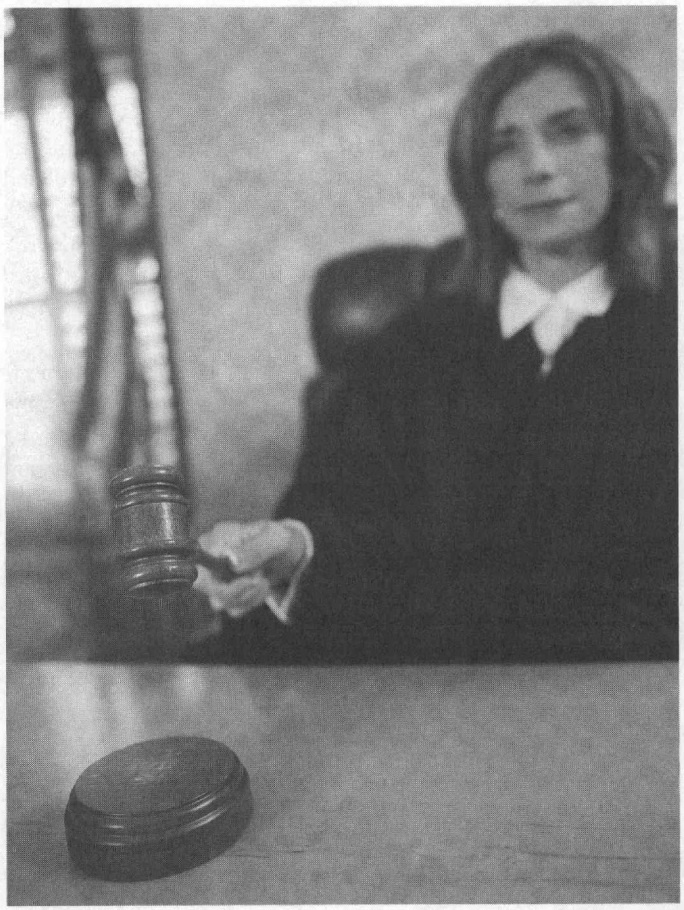
Administrative law judges, sometimes called *hearing officers* or *adjudicators*, are employed by government agencies to make determinations for administrative agencies. These judges make decisions on, for example, (1) a person's eligibility for various Social Security or workers' compensation benefits, (2) protection of the environment, (3) the enforcement of health and safety regulations, (4) employment discrimination, and (5) compliance with economic regulatory requirements.

Some people work as *arbitrators*, *mediators*, or *conciliators* instead of as judges or magistrates. They assist with alternative dispute resolution—a collection of processes used to settle disputes outside of court. All hearings are private and confidential, and the processes are less formal than a court trial. If no settlement is reached, no statements made during the proceedings are admissible as evidence in any subsequent litigation.

There are two main types of arbitration: compulsory and voluntary. During compulsory arbitration, opposing parties submit their dispute to one or more impartial persons, called arbitrators, for a final and nonbinding decision. Either party may reject the ruling and request a trial in court. Voluntary arbitration is a process in which opposing parties choose one or more arbitrators to hear their dispute and submit a final, binding decision.

Arbitrators usually are attorneys or businesspeople with expertise in a particular field. In arbitration, parties identify, in advance, the issues to be resolved, the scope of the relief to be awarded, and many of the procedural aspects of the process.

Mediators are neutral parties who help people to resolve their disputes outside of court. Parties to a dispute often use mediators when they wish to preserve their relationship. A mediator may offer suggestions, but resolution of the dispute rests with the parties themselves. Mediation proceedings also are 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 share the cost of mediation. However, many mediators volunteer their services, or they may be court staff. Courts ask that mediators provide their services at the lowest possible rate and that the parties split the cost.



Judges decide cases when the law does not require a jury trial or when the parties waive their right to a jury.

Conciliation, or facilitation, 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.

Arbitrators, mediators, or conciliators also use other forms of dispute resolution, including executive minitrials, early neutral evaluations, and summary jury trials. An executive minitrial is a process that involves negotiation including senior executives who have no involvement with the issues that led to the disagreement. Senior executives from each side listen to a summary of key elements of the dispute presented by each of the parties. The presentations may be made to the executives on their own, or by agreement of the parties, a neutral third party may be present. In early neutral evaluation, a person experienced in the subject matter of a litigated dispute will hold a brief, nonbinding meeting to hear the parties outline the key elements of their cases. The evaluator will identify the main issues and explore the possibility of settlement. If a settlement can't be reached, the evaluator may assist the parties by indicating procedural recommendations. A summary jury trial is a form of alternative dispute resolution in which jurors are asked to render a nonbinding verdict after an expedited hearing. The verdict may be binding if the parties consent.

Work environment. 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

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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 of the proceedings is kept. Arbitrators, mediators, and conciliators often travel to a site chosen for negotiations, but some work from home. Arbitrators, mediators, and conciliators usually work a standard 35- to 40-hour week. However, longer hours might be necessary when contract agreements are being prepared and negotiated.

Training, Other Qualifications, and Advancement

A bachelor's degree and work experience usually constitute the minimum requirements for judges and magistrates, but most workers have law degrees and some are elected. Training requirements for arbitrators, mediators, and conciliators vary.

Education and training. Most judges have been lawyers. In fact, Federal and State judges usually are required to be lawyers, which means that they have attended law school and passed an examination. 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.

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 few days to 3 weeks. More than half of all States, as well as Puerto Rico, require judges to take continuing education courses while serving on the bench.

Training for arbitrators, mediators, and conciliators is available through independent mediation programs, national and local mediation membership organizations, and postsecondary schools. To practice in State-funded or court-funded mediation programs, mediators usually must meet specific training or experience standards, which vary by State and court. Most mediators complete a 40-hour basic course and a 20-hour advanced training course. Some people receive training by volunteering at a community mediation center or by co-mediating cases with an experienced mediator. Others go on to complete an advanced degree that consists of a 2-year master's program in dispute resolution or conflict management, a 4-year to 5-year doctoral program, or a certificate program in conflict resolution at a college or university. Many mediators have a law (JD) degree, but master's degrees in public policy, law, and related fields also provide good background for prospective arbitrators, mediators, and conciliators.

Licensure. There are no national credentials or licensure requirements for arbitrators, mediators, and conciliators. In fact, State regulatory requirements vary widely. Some States require arbitrators to be experienced lawyers. Some States license mediators while other States register or certify them. Currently, only five States—Florida, New Hampshire, North Carolina, South Carolina, and Virginia—have certification programs. In addition, at the Federal level, the U.S. Department of the Navy certifies mediators who have met the Department's requirements.

Increasingly, credentialing programs are being offered through professional organizations. For example, the American Arbitration Association requires mediators listed on its mediation panel to complete their training course, receive recommendations from the trainers, and complete an apprenticeship.

Other qualifications. Judges and magistrates must be appointed or elected a procedure that often takes political support. 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 district courts—to serve in a U.S. district court for 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 to 6 years for some trial court judgeships to as long as 14 years or even life for other trial or appellate court judgeships. 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.

Arbitrators, mediators, and conciliators must have knowledge of different mediation techniques and processes as well as knowledge of dispute resolution methods in order to be able to do their jobs successfully. They also must have good communication and listening skills and the ability to run successful meetings and negotiate a solution to a dispute. The ability to evaluate large amounts of information that are sometimes complex is essential. Good writing skills and technical problem-solving skills also is a must. Arbitrators, mediators, and conciliators who specialize in a particular area, such as construction or insurance, may need to have knowledge of that industry and must be able to relate well to people from different cultures and backgrounds.

Advancement. Some judicial workers move to higher courts or to courts with broader jurisdiction. Advancement for alternative-dispute workers includes taking on more complex cases, starting a business, practicing law, or becoming district court judges.

Employment

Judges, magistrates, and other judicial workers held 51,200 jobs in 2008. Judges, magistrate judges, and magistrates held 26,900 jobs, all in State and local governments. Administrative law judges, adjudicators, and hearing officers held 14,400 jobs, with 24 percent in the Federal Government. Arbitrators, mediators, and conciliators held another 9,900 jobs. Approximately 26 percent worked for State and local governments. The remainder worked for labor organizations, law offices, insurance carriers, and other private companies and organizations that specialize in providing dispute resolution services.

Job Outlook

Overall employment is projected to grow more slowly than average, but varies by specialty. Judges and magistrates are ex-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Judges, magistrates, and other judicial workers	23-1020	51,200	53,100	1,800	4
Administrative law judges, adjudicators, and hearing officers	23-1021	14,400	15,500	1,200	8
Arbitrators, mediators, and conciliators	23-1022	9,900	11,300	1,400	14
Judges, magistrate judges, and magistrates	23-1023	26,900	26,200	-700	-3

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

pected to encounter competition for jobs because of the prestige associated with serving on the bench.

Employment change. Overall employment of judges, magistrates, and other judicial workers is expected to grow 4 percent over the 2008–18 projection period, slower than the average for all occupations. Budgetary pressures at all levels of government are expected to hold down the hiring of judges despite rising caseloads, particularly in Federal courts. However, the continued need to cope with crime and settle disputes, as well as the public's willingness to go to court to settle disputes, should spur demand for judges.

Demographic shifts in the population also will spur demand for judges. For instance, the number of immigrants migrating to the United States will continue to rise, thereby increasing the demand for judges to handle the complex issues associated with immigrants. In addition, demand for judges will increase because, as the U.S. population ages, the courts are expected to reform guardianship policies and practices and develop new strategies to address elder abuse. Both the quantity and the complexity of judges' work have increased because of developments in information technology, medical science, electronic commerce, and globalization.

Employment of arbitrators, mediators, and conciliators is expected to grow faster than the average for all occupations through 2018. 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. Demand also will continue to increase for arbitrators, mediators, and conciliators because all jurisdictions now have some type of alternative dispute resolution program. Some jurisdictions have programs requiring disputants to meet with a mediator in certain circumstances, such as when attempting to resolve child custody issues.

Job prospects. The prestige associated with serving on the bench will ensure continued competition for judge and magistrate positions. However, a growing number of candidates are choosing to forgo the bench and work in the private sector, where pay may be significantly higher. This trend may lessen the competition somewhat. Turnover is low among judges, and most job openings will arise as they retire. Additional openings will occur when new judgeships are authorized by law or when judges are elevated to higher judicial offices.

Jobs should be available for arbitrators, mediators, and conciliators, but opportunities may be limited because, as with judges, turnover is low. Once these workers have the appropriate qualifications and skills, they tend to remain in the occupation for many years. Those with certification and specialization in one or more areas of arbitration, mediation, or conciliation should have the best job opportunities.

Earnings

Judges, magistrate judges, and magistrates had median annual wages of $110,220 in May 2008. The middle 50 percent earned between $51,760 and $141,190. The top 10 percent earned more than $162,140, while the bottom 10 percent earned less than $32,290. Median annual wages in the industries employing the largest numbers of judges, magistrate judges, and magistrates in May 2008 were $126,080 in State government and $77,390 in local government. Administrative law judges, adjudicators, and hearing officers earned annual median wages of $76,940, and arbitrators, mediators, and conciliators earned an annual median of $50,660.

In the Federal court system, the Chief Justice of the U.S. Supreme Court earned $217,400 in January 2008, and the Associate Justices averaged $208,100. Federal court-of-appeals judges earned an average of $179,500 a year, while district court judges had average salaries of $169,300, as did judges in the Court of Federal Claims and the Court of International Trade. Federal judges with limited jurisdiction, such as magistrates and bankruptcy judges, had average salaries of $155,756.

According to a 2008 survey by the National Center for State Courts, salaries of chief justices of State highest courts averaged $150,850 and ranged from $107,404 to $228,856. Annual salaries of associate justices of the State highest courts averaged $145,194 and ranged from $106,185 to $218,237. Salaries of State intermediate appellate court judges averaged $141,263 and ranged from $105,050 to $204,599. Salaries of State judges of general jurisdiction trial courts averaged $130,533 and ranged from $99,234 to $178,789.

Most salaried judges are provided health, life, and dental insurance; pension plans; judicial immunity protection; expense accounts; vacation, holiday, and sick leave; and contributions to retirement plans made on their behalf. In many States, judicial compensation committees, which make recommendations on the amount of salary increases, determine judicial salaries. States without commissions have statutes that regulate judicial salaries, link judicial salaries to increases in pay for Federal judges, or adjust annual pay according to the change in the Consumer Price Index, calculated by the U.S. Bureau of Labor Statistics.

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Related Occupations

Other occupations that require legal training and mediation skills include:

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Counselors	234
Law clerks	824
Lawyers	257
Paralegals and legal assistants	261
Private detectives and investigators	477
Title examiners, abstractors, and searchers	825

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 23185-4147. Internet: **http://www.ncsc.org**

Information on arbitrators, mediators, and conciliators may be obtained from:

➤ American Arbitration Association, 1633 Broadway, Floor 10, New York, NY 10019. Internet: **http://www.adr.org**

Information on Federal judges is available from:

➤ Administrative Office of the United States Courts, One Columbus Circle, NE., Washington, DC 20544. Internet: **http://www.uscourts.gov**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos272.htm**

Lawyers

Significant Points

- About 26 percent of lawyers are self-employed, either as partners in law firms or in solo practices.
- Formal requirements to become a lawyer usually include a 4-year college degree, 3 years of law school, and passing a written bar examination; however, some requirements may vary by State.
- Competition for admission to most law schools is intense.
- Competition for job openings should be keen because of the large number of students graduating from law school each year.

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 system, linking it to society in numerous ways. 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 about 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 clients.

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 spend the majority of their time outside the courtroom, conducting research, interviewing clients and witnesses, and handling other details in preparation for a trial.

Lawyers may specialize in a number of areas, such as bankruptcy, probate, international, elder, or environmental law. Those specializing in, for example, environmental law may represent interest groups, waste disposal companies, or construction firms in their dealings with the U.S. Environmental Protection Agency and other Federal and State agencies. These lawyers help clients prepare and file for licenses and applications for approval before certain activities are permitted to occur. Some lawyers specialize in the growing field of intellectual property, helping to protect clients' claims to copyrights, artwork under contract, product designs, and computer programs. Other lawyers advise insurance companies about the legality of insurance transactions, guiding the company in writing insurance policies to conform to the law and to protect the 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 in private practice, concentrating 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—concentrating on particular causes and choosing cases that might have an impact on the way law is applied. Lawyers sometimes are 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 involve 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. Some work for State attorneys general, prosecutors, and public defenders in criminal courts. 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.

Lawyers are increasingly using various forms of technology to perform more efficiently. Although all lawyers continue to use law libraries to prepare cases, most supplement

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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 materials. Lawyers must be geographically mobile and able to reach their clients in a timely matter, so they might use electronic filing, Web and videoconferencing, mobile electronic devices, and voice-recognition technology to share information more effectively.

Work environment. 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. They also may face particularly heavy pressure when a case is being tried. Preparation for court includes understanding the latest laws and judicial decisions.

Salaried lawyers usually have structured work schedules. Lawyers who are in private practice or those who work for large firms may work irregular hours, including weekends, while conducting research, conferring with clients, or preparing briefs during nonoffice hours. Lawyers often work long hours; of those who work full time, about 33 percent work 50 or more hours per week.

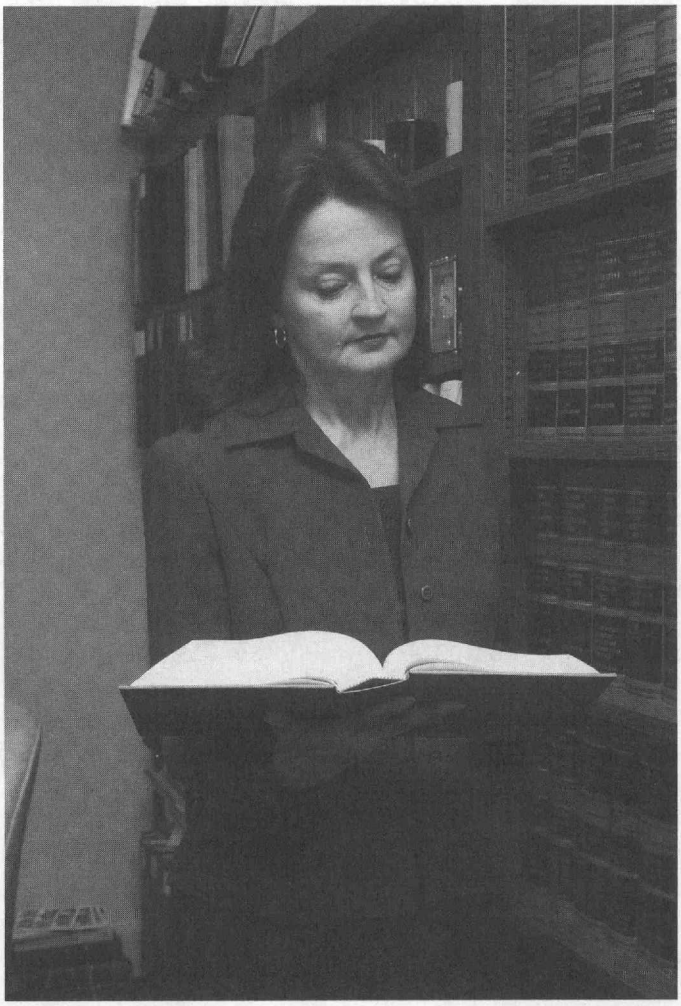
Training, Other Qualifications, and Advancement

Formal requirements to become a lawyer usually include a 4-year college degree, 3 years of law school, and passing a written bar examination; however, some requirements vary by State. Competition for admission to most law schools is intense. Federal courts and agencies set their own qualifications for those practicing before or in them.

Education and training. Becoming a lawyer 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 admission. To meet the needs of students who can attend only part time, a number of law schools have night or part-time divisions.

Although there is no recommended "prelaw" undergraduate 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 law. 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 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.



Trial lawyers spend most of their time outside the courtroom conducting research, interviewing clients and witnesses, and handling other details in preparation for a trial.

All law schools approved by the American Bar Association (ABA) require applicants to take the LSAT. As of June 2008, there were 200 ABA-accredited law schools; others were approved by State authorities only. Nearly all law schools require applicants to have certified transcripts sent to the Law School Data Assembly Service, which then submits the applicants' LSAT scores and their standardized records of college grades to the law schools of their choice. The Law School Admission Council administers both this service and the LSAT. Competition for admission to many law schools—especially the most prestigious ones—is usually intense, with the number of applicants 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 choose specialized courses in fields such as tax, labor, or corporate law. Law students often gain practical experience by participating in school-sponsored legal clinics; 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 journals.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Lawyers	23-1011	759,200	857,700	98,500	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

A number of law schools have clinical programs in which students gain legal experience through practice trials and projects under the supervision of lawyers and law school faculty. Law school clinical programs might include work in, for example, legal-aid offices or on 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. Law school graduates receive the degree of *juris doctor* (J.D.), a first professional degree.

Advanced law degrees may be desirable for those planning to specialize, perform 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 business administration or public administration.

After graduation, lawyers must keep informed about legal and nonlegal developments that affect their practices. In 2008, 46 States and jurisdictions required lawyers to participate in mandatory continuing legal education. Many law schools and State and local bar associations provide continuing education courses that help lawyers stay abreast of recent developments. Some States allow continuing education credits to be obtained through participation in seminars on the Internet.

Licensure. 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 States also require applicants to pass a separate written ethics examination. Lawyers who have been admitted to the bar in one State occasionally may be admitted to the bar in another without taking another examination if they meet the latter jurisdiction's standards of good moral character and a specified period of legal experience. In most cases, however, lawyers must pass the bar examination in each State in which they plan to practice. 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 must earn a college degree and graduate from a law school accredited by the ABA or the proper State authorities. ABA accreditation signifies that the law school—particularly its library and faculty—meets certain standards. 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.

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 their overall bar examination; the MBE is not required in Louisiana or Washington. The MBE covers a broad range of issues, and sometimes a locally prepared State bar examination is given in addition to it. 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 also require the Multistate Performance Test to test the practical skills of beginning lawyers. Requirements vary by State, although the test usually is taken at the same time as the bar exam and is a one-time requirement.

In 2008, law school graduates 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.

Other qualifications. 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.

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.

Advancement. Most beginning lawyers start in salaried positions. Newly hired attorneys usually start as associates and work with more experienced lawyers or judges. After several years, some lawyers are admitted to partnership in their firm, which means that they are partial owners of the 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 is often viewed as a way to gain administrative experience and rise in the ranks of management.

Employment

Lawyers held about 759,200 jobs in 2008. Approximately 26 percent of lawyers were self-employed, practicing either as partners in law firms or in solo practices. Most salaried lawyers held positions in government, in law firms or other corporations, or in nonprofit organizations. Most government-employed lawyers worked at the local level. In the Federal Government, lawyers

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Paralegals and legal assistants	23-2011	263,800	337,900	74,100	28

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

worked for many different agencies, but were concentrated in the Departments of Justice, Treasury, and Defense. Many salaried lawyers working outside of government were employed as house counsel by public utilities, banks, insurance companies, real-estate agencies, manufacturing firms, and other business firms and nonprofit organizations. Some also had part-time independent practices, while others worked part time as lawyers and full time in another occupation.

A relatively small number of trained attorneys work in law schools and are not included in the employment estimate for lawyers. 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.)

Job Outlook

About as fast as the average employment growth is projected, but job competition is expected to be keen.

Employment change. Employment of lawyers is expected to grow 13 percent during the 2008-18 decade, about as fast as the average for all occupations. Growth in the population and in the level of business activity is expected to create more legal transactions, civil disputes, and criminal cases. Job growth among lawyers also will result from increasing demand for legal services in such areas as health care, intellectual property, bankruptcy, corporate and security litigation, antitrust law, and environmental law. In addition, the wider availability and affordability of legal clinics should result in increased use of legal services by middle-income people. However, growth in demand for lawyers will be constrained as businesses increasingly use 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 are increasingly being used as alternatives to litigation.

Job 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. 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 grow 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 the law, which encourages specialization, along with the cost of maintaining up-to-date legal research materials, favors larger firms.

Job prospects. 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 highly regarded law schools will have the best job opportunities. Perhaps as a result of competition for attorney positions, lawyers are increasingly finding work in less traditional 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 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. This service allows companies to hire lawyers on an "as-needed" basis and permits beginning lawyers to develop practical skills.

Because of the keen competition for jobs, a law graduate's geographic mobility and work experience are assuming greater importance. 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 increasingly are seeking graduates who have advanced law degrees and experience in a specialty, such as tax, patent, or admiralty law.

Job opportunities often 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 restrict their budgets. 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—all requiring legal action.

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 than in big cities, and new lawyers may find it easier to establish a reputation among potential clients.

Earnings

In May 2008, the median annual wages of all wage-and-salaried lawyers were $110,590. The middle half of the occupation earned between $74,980 and $163,320. Median annual wages

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in the industries employing the largest numbers of lawyers in May 2008 were:

Management of companies and enterprises	$145,770
Federal Executive Branch	126,080
Legal services	116,550
Local government	82,590
State government	78,540

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 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.

Median salaries of lawyers 9 months after graduation from law school in 2007 varied by type of work, as indicated in table 1.

Table 1. Median salaries, 9 months after graduation

Employer	Salary
All graduates	$68,500
Private practice	108,500
Business	69,100
Government	50,000
Academic/judicial clerkships	48,000

SOURCE: National Association of Law Placement

Most salaried lawyers are provided health and life insurance, and contributions are made to retirement plans on their behalf. 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:

	Page
Judges, magistrates, and other judicial workers	253
Law clerks	824
Paralegals and legal assistants	261
Title examiners, abstractors, and searchers	825

Sources of Additional Information

Information on law schools and a career in law may be obtained from the following organizations:

➤ American Bar Association, 321 North Clark St., Chicago, IL 60654. Internet: **http://www.abanet.org**

➤ National Association for Law Placement, 1025 Connecticut Ave. NW., Suite 1110, Washington, DC 20036. Internet: **http://www.nalp.org**

Information on the LSAT, the Law School Data Assembly Service, the law school application process, and financial aid available to law students may be obtained from:

➤ Law School Admission Council, 662 Penn St., Newtown, PA 18940. Internet: **http://www.lsac.org**

Information on obtaining positions as lawyers with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The requirements for admission to the bar in a particular State or other jurisdiction 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.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos053.htm**

Paralegals and Legal Assistants

Significant Points

- Despite projected much faster-than-average employment growth, competition for jobs is expected.
- Formally trained, experienced paralegals should have the best employment opportunities.
- Most entrants have an associate's degree in paralegal studies, or a bachelor's degree in another field and a certificate in paralegal studies.
- About 71 percent work for law firms.

Nature of the Work

Although lawyers assume ultimate responsibility for legal work, they often delegate many of their tasks to paralegals. In fact, *paralegals*—also called *legal assistants*—are continuing to assume new responsibilities in legal offices and perform many of the same tasks as lawyers. Nevertheless, they are explicitly prohibited from carrying out duties considered to be within the scope of 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 might 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. If 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.

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In addition to this preparatory work, paralegals perform a number of other functions. For example, they help draft contracts, mortgages, and separation agreements. They also may assist in preparing tax returns, establishing trust funds, and planning estates. Some paralegals coordinate the activities of other law office employees and maintain financial office records.

Computer software packages and the Internet are used to search legal literature stored in computer databases and on CD-ROM. In litigation involving many supporting documents, paralegals usually 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 are used to perform tax computations and explore the consequences of various tax strategies for clients.

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 becomes more complex, paralegals become more specialized. Within specialties, functions are often broken down further. For example, paralegals specializing in labor law may concentrate exclusively on employee benefits. In small and medium-size law firms, duties are often more general.

The tasks of paralegals differ widely according to the type of organization for which they work. *Corporate paralegals* 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 minutes' record resolutions, and prepare forms to secure loans for the corporation. Corporate paralegals often monitor and review government regulations to ensure that the corporation is aware of new requirements and is operating within the law. Increasingly, experienced corporate paralegals or paralegal managers are assuming additional supervisory responsibilities, such as overseeing team projects.

The duties of paralegals who work in the public sector usually vary by agency. In general, *litigation paralegals* analyze legal material for internal use, maintain reference files, conduct research for attorneys, and collect and analyze evidence for agency hearings. They may 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 who are in need of legal assistance. They file forms, conduct research, prepare documents, and, when authorized by law, may represent clients at administrative hearings.

Work environment. Paralegals 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 in offices and law libraries. Occasionally, they travel to gather information and perform other duties.

Paralegals employed by corporations and government usually work a standard 40-hour week. Although most paralegals work year round, some are temporarily employed during busy times of the year. Paralegals who work for law firms sometimes work very long hours when they are under pressure to meet deadlines.

Training, Other Qualifications, and Advancement

Most entrants have an associate's degree in paralegal studies, or a bachelor's degree in another field and a certificate in paralegal studies. Some employers train paralegals on the job.

Education and training. There are several ways to become a paralegal. The most common is through a community college paralegal program that leads to an associate degree. Another common method of entry, mainly for those who already have a college degree, is earning a certificate in paralegal studies. A small number of schools offer bachelor's and master's degrees in paralegal studies. Finally, some employers train paralegals on the job.

Associate's and bachelor's degree programs usually combine paralegal training with courses in other academic subjects. Certificate programs vary significantly, with some taking only a few months to complete. Most certificate programs provide intensive paralegal training for individuals who already hold college degrees.

More than 1,000 colleges and universities, law schools, and proprietary schools offer formal paralegal training programs. Approximately 260 paralegal programs are approved by the American Bar Association (ABA). Although not required by many employers, graduation from an ABA-approved program can enhance employment opportunities. Admission requirements vary. Some schools require certain college courses or a bachelor's degree, while others accept high school graduates or those with legal experience. A few schools require standardized tests and personal interviews.

The quality of paralegal training programs varies; some programs may include job placement services. If possible, prospective students should examine the experiences of recent graduates before enrolling in a paralegal program. Training programs usually include courses in legal research and the legal applications of computers. Many paralegal training programs also offer an internship, in which students gain practical experience by working for several months in a private law firm, the



In litigation involving many supporting documents, paralegals usually use computer databases to retrieve, organize, and index various materials.

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office of a public defender or attorney general, a corporate legal department, a legal aid organization, a bank, or a government agency. Internship experience is a valuable asset in seeking a job after graduation.

Some employers train paralegals on the job, hiring college graduates with no legal experience or promoting experienced legal secretaries. Some entrants have experience in a technical field that is useful to law firms, such as a background in tax preparation or criminal justice. Nursing or health administration experience is valuable in personal-injury law practices.

Certification and other qualifications. Although most employers do not require certification, earning voluntary certification from a professional national or local paralegal organization may offer advantages in the labor market. Many national and local paralegal organizations offer voluntary paralegal certifications by requiring students to pass an exam. Other organizations offer voluntary paralegal certifications by meeting certain criteria such as experience and education.

The National Association of Legal Assistants (NALA), for example, has established standards for certification that require various combinations of education and experience. Paralegals who meet these standards are eligible to take a 2-day examination. Those who pass the exam may use the Certified Legal Assistant (CLA) or Certified Paralegal (CP) credential. NALA certification is for a period of five years and 50 hours of continuing education is required for recertification. According to the NALA, as of September 4, 2009, there were 15,652 Certified Paralegals in the United States. NALA also offers the Advanced Paralegal Certification for experienced paralegals who want to specialize. The Advanced Paralegal Certification program is a curriculum-based program offered on the Internet.

The American Alliance of Paralegals, Inc., offers the American Alliance Certified Paralegal (AACP) credential, a voluntary certification program. Paralegals seeking the AACP certification must possess at least 5 years of paralegal experience and meet one of three educational criteria. Certification must be renewed every 2 years, including the completion of 18 hours of continuing education.

In addition, the National Federation of Paralegal Associations (NFPA) offers the Registered Paralegal (RP) designation to paralegals with a bachelor's degree and at least 2 years of experience who pass an exam. To maintain the credential, workers must complete 12 hours of continuing education every 2 years. The National Association of Legal Secretaries (NALS) offers the Professional Paralegal (PP) certification to those who pass a four-part exam. Recertification requires 75 hours of continuing education.

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 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 knowledge of the law. In fact, all paralegals in California must complete 4 hours of mandatory continuing education in either general law or a specialized area of law.

Because paralegals frequently deal with the public, they should be courteous and uphold the ethical standards of the legal profession. The NALA, the NFPA, and a few States have established ethical guidelines for paralegals to follow.

Advancement. Paralegals usually are given more responsibilities and require less supervision as they gain work experience. Experienced paralegals who work in large law firms, corporate legal departments, or 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.

Employment

Paralegals and legal assistants held about 263,800 jobs in 2008. Private law firms employed 71 percent; 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 the 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.

Job Outlook

Despite projected much faster-than-average employment growth, competition for jobs is expected to continue as many people seek to go into this profession; experienced, formally trained paralegals should have the best employment opportunities.

Employment change. Employment of paralegals and legal assistants is projected to grow 28 percent between 2008 and 2018, much faster than the average for all occupations. Employers are trying to reduce costs and increase the availability and efficiency of legal services by hiring paralegals to perform tasks once done by lawyers. Paralegals are performing a wider variety of duties, making them more useful to businesses.

Demand for paralegals also is expected to grow as an expanding population increasingly requires legal services, especially in areas such as intellectual property, health care, international law, elder issues, criminal law, and environmental law. The growth of prepaid legal plans also should contribute to the demand for legal services.

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 also hire paralegals. Corporations in particular are expected to increase their in-house legal departments to cut costs. The wide range of tasks paralegals can perform has helped to increase their employment in small and medium-size establishments of all types.

Job prospects. In addition to new jobs created by employment growth, more job openings will arise as people leave the occupation. There will be demand for paralegals who specialize in areas such as real estate, bankruptcy, medical malprac-

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tice, and product liability. Community legal service programs, which provide assistance to the poor, elderly, minorities, and middle-income families, will employ additional paralegals to minimize expenses and serve the most people. Job opportunities also are expected in Federal, State, and local government agencies, consumer organizations, and the courts. However, this occupation attracts many applicants, creating competition for jobs. Experienced, formally trained paralegals should have the best job prospects.

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. However, during recessions, corporations and individuals are more likely to face 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

Wages of paralegals and legal assistants vary greatly. Salaries depend on education, training, experience, the type and size of employer, and the 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 May 2008, full-time wage-and-salary paralegals and legal assistants earned $46,120. The middle 50 percent earned between $36,080 and $59,310. The top 10 percent earned more than $73,450, and the bottom 10 percent earned less than $29,260. Median annual wages in the industries employing the largest numbers of paralegals were:

Federal Executive Branch	$58,540
Management of companies and enterprises	55,910
Insurance carriers	52,200
Employment services	50,050
Legal services	44,480

In addition to earning a salary, many paralegals receive bonuses, in part to compensate them for sometimes having to work long hours. Paralegals also receive vacation, paid sick leave, a savings plan, life insurance, personal paid time off, dental insurance, and reimbursement for continuing legal education.

Related Occupations

Among the other occupations that call for a specialized understanding of the law, but that do not require the extensive training of a lawyer are:

	Page
Claims adjusters, examiners, and investigators	96
Law clerks	824
Occupational health and safety specialists	428
Occupational health and safety technicians	431
Title examiners, abstractors, and searchers	825

Sources of Additional Information

General information on a career as a paralegal can be obtained from:

➤ Standing Committee on Paralegals, American Bar Association, 321 North Clark St., Chicago, IL 60654. Internet: **http://www.abanet.org/legalservices/paralegals**

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 the Paralegal Advanced Competency Exam, paralegal careers, paralegal training programs, job postings, and local associations is available from:

➤ National Federation of Paralegal Associations, P.O. Box 2016, Edmonds, WA 98020. 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, 19 Mantua Rd., Mt. Royal, NJ 08061. Internet: **http://www.aafpe.org**

Information on paralegal careers, certification, and job postings is available from:

➤ American Alliance of Paralegals, Inc., Suite 134-146, 4001 Kennett Pike, Wilmington, DE, 19807. Internet: **http://www.aapipara.org**

For information on the Professional Paralegal exam, schools that offer training programs in a specific State, and standards and guidelines for paralegals, contact:

➤ National Association of Legal Secretaries, 8159 E. 41st St., Tulsa, OK 74145. Internet: **http://www.nals.org**

Information on obtaining positions as a paralegal or legal assistant with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at **http://www.bls.gov/opub/ooq/2004/summer/art01.pdf.**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos114.htm**

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Education, Training, Library, and Museum Occupations

Archivists, Curators, and Museum Technicians

Significant Points

- Most worked in museums, historical sites, and similar venues; in educational institutions; or in Federal, State, or local government.
- A graduate degree and related work experience are required for most positions; museum technicians may enter with a bachelor's degree.
- Keen competition is expected for most jobs because qualified applicants generally outnumber job openings.

Nature of the Work

Archivists, curators, and museum technicians work for museums, governments, zoos, colleges and universities, corporations, and other institutions that require experts to preserve important records and artifacts. These workers preserve important objects and documents, including works of art, transcripts of meetings, photographs, coins and stamps, and historic objects.

Archivists and curators plan and oversee the arrangement, cataloguing, and exhibition of collections. They also maintain collections with technicians and conservators. They acquire and preserve important documents and other valuable items for permanent storage or display. They also describe, catalogue, and analyze, valuable objects for the benefit of researchers and the public.

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: archivists mainly handle records and documents that are retained because of their importance and potential value, while curators usually handle objects with cultural, biological, or historical significance, such as sculptures, textiles, and paintings.

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, and electronic data files in a wide variety of formats, as well as more traditional paper records, letters, and documents.

In accordance with accepted standards and practices, archivists maintain records to ensure the long-term preservation and easy retrieval of documents and information. Records may be saved on any medium, including paper, film, videotape, audiotape, computer disk, or DVD. They also may be copied onto some other format to protect the original and to make the records more user accessible. As various storage media evolve, archivists must keep abreast of technological advances in electronic information storage.

Generally, computers are used to generate and maintain archival records. Professional standards for the use of computers in handling archival records, especially electronic, are still evolving. However, computer capabilities will continue to expand and more records will be stored and exhibited electronically, providing both increased access and better protection for archived documents.

Archivists often specialize in an area of history so they can more accurately determine which 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, web sites, photographs, cartographic records, motion pictures, or sound recordings.

Curators administer museums, zoos, aquariums, botanical gardens, nature centers, and historic sites. The museum director often is a curator. 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 often oversee and help conduct the institution's research projects and related educational programs. Today, 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.

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 a number of 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 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. In addition to their conservation work, conservators participate in outreach programs, research topics in their area of specialty, and write articles for scholarly journals. They may be employed by museums or work on a freelance basis.

Museum technicians, commonly known as registrars, assist curators by performing various preparatory and maintenance tasks on museum items. Registrars may also answer public in-

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quiries and assist curators and outside scholars in using collections. Archives technicians help archivists organize, maintain, and provide access to historical documentary materials.

Work environment. 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 reduces the opportunity to work with others. Those who restore and install exhibits or work with bulky, heavy record containers may lift objects, climb, or stretch. Those in zoos, botanical gardens, and other outdoor museums and historic sites frequently walk great distances. Conservators work in conservation laboratories. The size of the objects in the collection they are working with determines the amount of effort involved in lifting, reaching, and moving objects.

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.

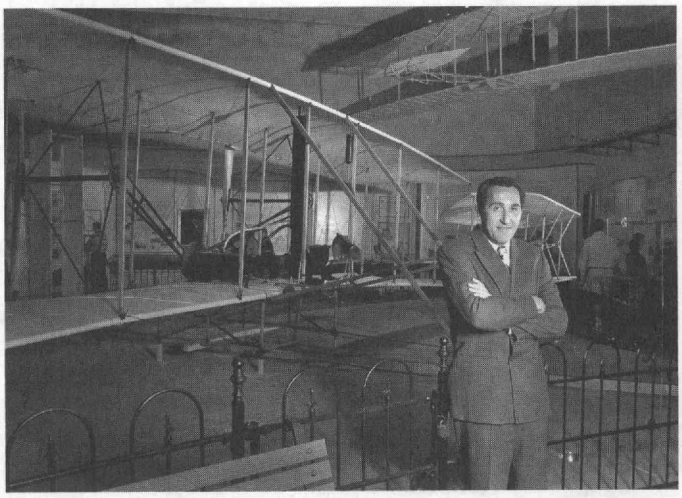
Training, Other Qualifications, and Advancement

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 "hands-on" experience. Registrars often start work with a bachelor's degree.

Education and training. Although archivists earn a variety of undergraduate degrees, a graduate degree in history or library science with courses in archival science is preferred by most employers. Many colleges and universities offer courses or practical training in archival techniques as part of their history, library science, or other curriculum. A few institutions offer master's degrees in archival studies. Some positions may require knowledge of the discipline related to the collection, such as computer science, business, or medicine. There are many archives that offer volunteer opportunities where students can gain experience.

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 in museum studies. Some 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—may give a candidate a distinct advantage in a competitive job market. In small museums, curatorial positions may be available to individuals with a bachelor's degree. Because curators, particularly those in small museums, may have administrative and managerial responsibilities, courses in business administration, public relations, marketing, and fundraising also are recommended. For some positions, an internship of full-time museum work supplemented by courses in museum practices is needed.

When hiring conservators, employers look for a master's degree in conservation or in a closely related field, together with 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 also is 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, is a more difficult and increasingly scarce route into the conservation profession.



Archivists and curators plan and oversee the arrangement, cataloguing, and exhibition of collections.

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. 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.

Certification and other qualifications. The Academy of Certified Archivists offers voluntary certification for archivists. The designation "Certified Archivist" can be 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 skills and analytical ability to understand the content of documents and the context in which they were created. They must also be able to decipher deteriorated or poor-quality printed matter, handwritten manuscripts, photographs, or 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

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Archivists, curators, and museum technicians	25-4010	29,100	35,000	5,900	20
Archivists	25-4011	6,300	6,700	400	7
Curators	25-4012	11,700	14,400	2,700	23
Museum Technicians and Conservators	25-4013	11,100	13,900	2,800	26

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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 very important. Because electronic records are becoming the prevalent form of recordkeeping, and archivists must create searchable databases, knowledge of Web technology may be required.

Curatorial positions often require knowledge in a number of fields. For historic and artistic conservation, courses in chemistry, physics, and art are desirable. 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, including 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.

Advancement. Continuing education is available through meetings, conferences, and workshops sponsored by archival, historical, and museum associations. Some larger organizations, such as the National Archives in Washington, D.C., offer such training in-house.

Many archives, including one-person shops, are very small and have limited opportunities for promotion. Archivists typically advance by transferring to a larger unit that has 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.

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.

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.

Employment

Archivists, curators, and museum technicians held about 29,100 jobs in 2008. About 39 percent were employed in museums, historical sites, and similar institutions and 18 percent worked for public and private educational services. Around 30 percent of archivists, curators, and museum technicians worked in Federal, State, and local government, excluding educational institutions. 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 U.S. 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 firm's 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. Most Federal conservators work for the Smithsonian Institution, Library of Congress, and National Archives and Records Administration.

Job Outlook

Much faster than average employment growth is projected. Keen competition is expected for most jobs as archivists, curators, and museum technicians because qualified applicants generally outnumber job openings.

Employment change. Employment of archivists, curators, and museum technicians is expected to increase 20 percent over the 2008-18 decade, which is much faster than the average for all occupations. Jobs for archivists are expected to increase as public and private organizations require organization of and access to increasing volumes of records and information. Public interest in science, art, history, and technology will continue, creating opportunities for curators, conservators, and museum technicians. Museum attendance is expected to continue to be good. Many museums remain financially healthy and will schedule building and renovation projects as money is available.

Demand for archivists who specialize in electronic records and records management will grow more rapidly than the demand for archivists who specialize in older media formats.

Job prospects. Keen competition is expected for most jobs as archivists, curators, and museum technicians because qualified applicants generally outnumber job openings. Graduates with highly specialized training, such as master's degrees in both library science and history, with a concentration in archives

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or records management and extensive computer skills, should have the best opportunities for jobs as archivists. Opportunities for those who manage electronic records are expected to be better than for those who specialize in older media formats.

Curator jobs, in particular, are attractive to many people, and many applicants have the necessary training and knowledge of the subject. But because there are relatively few openings, 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, research, exhibit design, or restoration, as well as database management skills, will be necessary for permanent status.

Conservators also can expect competition for jobs. Competition is stiff for the limited number of openings in conservation graduate programs, and applicants need a technical background. Conservator program graduates with knowledge of a foreign language and a willingness to relocate will have better job opportunities.

Museums and other cultural institutions can be subject to cuts in funding during recessions or periods of budget tightening, reducing demand for these workers. Although the number of archivists and curators who move to other occupations is relatively low, the need to replace workers who retire or leave the occupation will create some job openings. However, workers in these occupations tend to work beyond the typical retirement age of workers in other occupations.

Earnings

Median annual wages of archivists in May 2008 were $45,020. The middle 50 percent earned between $34,050 and $60,150. The lowest 10 percent earned less than $26,600, and the highest 10 percent earned more than $76,790. Median annual wages of curators in May 2008 were $47,220. The middle 50 percent earned between $34,910 and $63,940. The lowest 10 percent earned less than $26,850, and the highest 10 percent earned more than $83,290. Median annual wages of museum technicians and conservators in May 2008 were $36,660. The middle 50 percent earned between $28,030 and $49,170. The lowest 10 percent earned less than $22,320, and the highest 10 percent earned more than $66,060.

In March 2009, the average annual salary for archivists in the Federal Government was $83,758; for museum curators, $90,205; for museum specialists and technicians, $62,520; and for archives technicians, $43,662.

Related Occupations

Other occupations that preserve, organize, and display objects or information of interest include:

	Page
Artists and related workers	301
Librarians	270

Social scientists, other (such as anthropologists, archeologists, or historians)

Sources of Additional Information

For information on archivists and on schools offering courses in archival studies, contact:

➤ Society of American Archivists, 17 North State St., Suite 1425, Chicago, IL 60602-3315. 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, 1156 15th St. NW., Suite 320, Washington, DC 20005-1714. Internet: **http://www.conservation-us.org**

For information about archivists and archivist certification, contact:

➤ Academy of Certified Archivists, 1450 Western Ave. Suite 101, Albany, NY 12203. Internet: **http://www.certifiedarchivists.org**

For information about government archivists, contact:

➤ National Association of Government Archivists and Records Administrators, 1450 Western Ave. Suite 101, Albany, NY 12203. Internet: **http://www.nagara.org**

Information on obtaining positions as archivists, curators, and museum technicians with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at **http://www.usajobs.opm.gov** or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos065.htm**

Instructional Coordinators

Significant Points

- Many instructional coordinators have experience as teachers or education administrators.
- A master's degree is required for positions in public schools and preferred for jobs in other settings.
- Employment is projected to grow much faster than average, reflecting the need to meet new educational standards, train teachers, and develop new materials.
- Favorable job prospects are expected.

Nature of the Work

Instructional coordinators—also known as curriculum specialists, *personnel development specialists*, *instructional coaches*, or *directors of instructional material*—play a large role in im-

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proving the quality of education in the classroom. They develop curricula, select textbooks and other materials, train teachers, and assess educational programs for quality and adherence to regulations and standards. They also assist in implementing new technology in the classroom. At the primary and secondary school levels, instructional coordinators often specialize in a specific subject, such as reading, language arts, mathematics, or science.

Instructional coordinators evaluate how well a school or training program's curriculum, or plan of study, meets students' needs. Based on their research and observations of instructional practice, they recommend improvements. They research teaching methods and techniques and develop procedures to ensure that instructors are implementing the curriculum successfully and meeting program goals. To aid in their evaluation, they may meet with members of educational committees and advisory groups to explore how curriculum materials relate to occupations and meet students' needs. Coordinators also may develop questionnaires and interview school staff about the curriculum.

Some instructional coordinators review textbooks, software, and other educational materials to make recommendations. They monitor the ways in which teachers use materials in the classroom and supervise workers who catalogue, distribute, and maintain a school's educational materials and equipment.

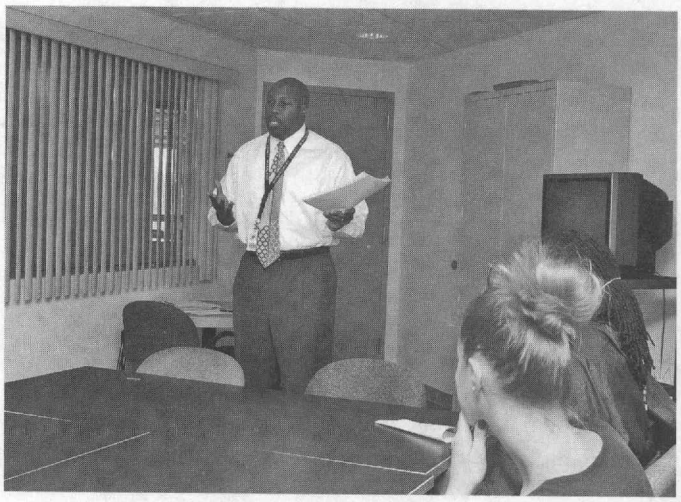
Some instructional coordinators find ways to use technology to enhance student learning and monitor the introduction of new technology into a school's curriculum. In addition, instructional coordinators might recommend educational software, such as interactive books and exercises designed to enhance student literacy and develop math skills. Instructional coordinators may invite experts to help integrate technological materials into the curriculum.

Besides developing curriculum and instructional materials, many of these workers plan and provide onsite education for teachers and administrators. Instructional coordinators mentor new teachers and train experienced ones in the latest instructional methods. This role becomes especially important when a school district introduces new content, programs, or a different organizational structure. For example, when a State or school district introduces standards or tests that students must pass, instructional coordinators often advise teachers on the content of those standards and provide instruction on how to implement them in the classroom.

Work environment. Many instructional coordinators work long hours. They often work year round. Some spend much of their time traveling between schools and 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 they are continually accountable to school administrators.

Training, Other Qualifications, and Advancement

The minimum educational requirement for most instructional coordinator positions in public schools is a master's degree or higher—usually in education—plus a State teacher or administrator license. A master's degree also is preferred for positions in other settings.



Instructional coordinators evaluate how well a school or training program's curriculum meets students' needs.

Education and training. Instructional coordinators should have training in curriculum development and instruction or in the specific field for which they are responsible, such as mathematics or history. Courses in research design teach how to create and implement research studies to determine the effectiveness of a given method of instruction or curriculum and how to measure and improve student performance.

Instructional coordinators are usually required to take continuing education courses to keep their skills current. Topics may include teacher evaluation techniques, curriculum training, new teacher orientation, consulting and teacher support, and observation and analysis of teaching.

Licensure. Instructional coordinators must be licensed to work in public schools. Some States require a teaching license, whereas others require an education administrator license.

Other qualifications. Instructional coordinators must have a good understanding of how to teach specific groups of students and expertise in developing educational materials. As a result, many people become instructional coordinators after working for several years as teachers. Also beneficial is work experience in an education administrator position, such as a principal or assistant principal, or in another advisory role, such as a master teacher, department chair or lead teacher.

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 technical information for students and teachers.

Advancement. Depending on experience and educational attainment, instructional coordinators may advance to higher administrative positions in a school system or to management or executive positions in private industry.

Employment

Instructional coordinators held about 133,900 jobs in 2008. About 70 percent worked in public or private educational institutions. Other employing industries included State and local

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Instructional coordinators	25-9031	133,900	165,000	31,100	23

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

government, individual and family services, and child day care services.

Job Outlook

Much faster than average job growth is projected. Job opportunities should be favorable, particularly for those with experience in math and reading curriculum development.

Employment change. The number of instructional coordinators is expected to grow by 23 percent over the 2008–18 decade, which is much faster than the average for all occupations. These workers will be instrumental in developing new curricula to meet the demands of a changing society and in training teachers. Although budget constraints may limit employment growth to some extent, a continuing emphasis on improving the quality of education should result in an increasing demand for these workers. The emphasis on accountability also should increase at all levels of government and cause more schools to focus on improving standards of educational quality and student performance. Growing numbers of coordinators will be needed to incorporate the new standards into existing curricula and ensure that teachers and administrators are informed of changes.

Additional job growth for instructional coordinators will stem from an 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.

Job prospects. Favorable job prospects are expected. Opportunities should be best for those who specialize in subjects targeted for improvement by the No Child Left Behind Act—reading, math, and science. There also will be a need for more instructional coordinators to show teachers how to use technology in the classroom.

Earnings

Median annual wages of instructional coordinators in May 2008 were $56,880. The middle 50 percent earned between $42,070 and $75,000. The lowest 10 percent earned less than $31,800, and the highest 10 percent earned more than $93,250.

Related Occupations

Instructional coordinators are professionals involved in education, training, and development. Occupations with similar characteristics include:

	Page
Counselors	234
Education administrators	41
Human resources, training, and labor relations managers and specialists	61
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—postsecondary	282
Teachers—preschool, except special education	286
Teachers—special education	294

Sources of Additional Information

Information on requirements and job opportunities for instructional coordinators is available from local school systems and State departments of education.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos269.htm**

Librarians

Significant Points

- Librarians use the latest information technology to perform research, classify materials, and help students and library patrons seek information.
- A master's degree in library science is required for most librarian positions, although school librarians also often need to meet State teaching license requirements.
- Growth is expected to be as fast as the average and job opportunities are expected to be favorable, as a large number of librarians are likely to retire in the coming decade.

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 electronic resources, including the Internet, digital libraries, and remote access to a wide range of information sources. Consequently, *librarians*, often called information professionals, combine traditional duties with tasks involving quickly changing technology. Librarians help people find information and use it effectively for personal and professional purposes. They must have knowledge of a wide variety of scholarly and public information sources and must follow trends related to publishing, computers, and the media to oversee the selection and organization of library materials. Librarians manage staff and develop and direct information programs and systems for the public and ensure that information is organized in a manner that meets users' needs.

Librarian positions focus on one of three aspects of library work: user services, technical services, and administrative services. Librarians in user services, such as reference and chil-

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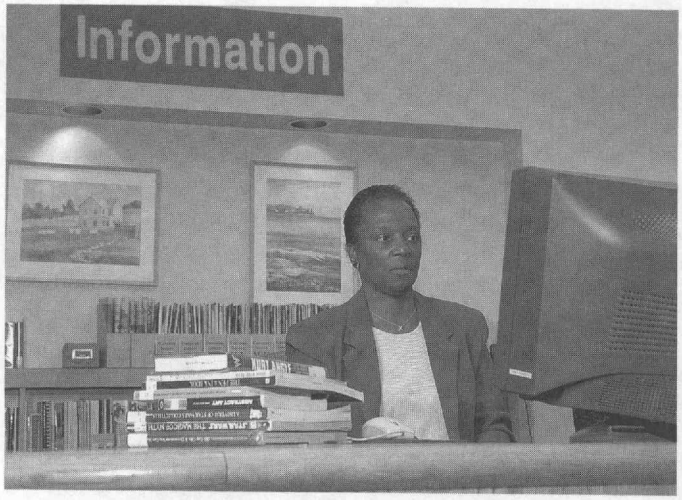
dren's librarians, work with patrons to help them find the information they need. The job involves analyzing users' needs to determine what information is appropriate and searching for, acquiring, and providing the information. The job also includes an instructional role, such as showing users how to find and evaluate information. For example, librarians commonly help users navigate the Internet so they can search for and evaluate information efficiently. Librarians in technical services, such as acquisitions and cataloguing, acquire, prepare, and classify materials so patrons can find it easily. Some write abstracts and summaries. Often, these librarians do not deal directly with the public. Librarians in administrative services oversee the management and planning of libraries: they 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 library operations. 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, classifying them by subject matter and describing books and other library materials to make them easy to find. Librarians supervise assistants, who enter classification information and descriptions of materials into electronic catalogs. In large libraries, librarians often specialize in a single area, such as acquisitions, cataloguing, bibliography, reference, special collections, or administration. Therefore, good teamwork is important.

Librarians also recommend materials. Many analyze collections and compile lists of books, periodicals, articles, audiovisual materials, and electronic resources on particular subjects. 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. Some conduct classes, publicize services, write grants, and oversee other administrative matters.

Many libraries have access to remote databases and maintain their own computerized databases. The widespread use of electronic resources makes database-searching skills important for librarians. Librarians develop and index databases and help train users to develop searching skills. Some libraries are forming consortiums with other libraries to allow patrons to access a wider range of databases and to submit information requests to several libraries simultaneously. The Internet also has greatly expanded the amount of available reference information. Librarians must know how to use these resources and inform the public about the wealth of information they contain.

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. Librarians in special libraries work in information centers or libraries maintained by government agencies or corporations, law firms, advertising agencies, museums, professional associations, unions, medical centers, hospitals, religious organizations, or research laboratories. They acquire and arrange an



Librarians help people find information and use it effectively for personal and professional purposes.

organization's information resources, which usually are limited to subjects of special interest to the organization. They 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 in a variety of depository libraries in each of the States, preserve and disseminate government publications, records, and other documents that make up a historical record of government actions.

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 and acquire materials for classroom instruction. They also conduct classes for students on how to use library resources for research projects.

Librarians with computer and information systems skills can work as *automated-systems librarians*, planning and operating computer systems, and as information architects, 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 section on computer scientists elsewhere in the *Handbook*.) Automated information systems enable librarians to focus on administrative and budgeting responsibilities, grant writing, and specialized research requests, while delegating more routine services responsibilities to technicians. (See the section on library technicians and library assistants elsewhere in the *Handbook*.)

More and more, librarians apply 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

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own consulting practices, acting as freelance librarians or information brokers and providing services to other libraries, businesses, or government agencies.

Work environment. 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, although most modern libraries have readily accessible stacks. Librarians in small settings without support staff sometimes shelve books themselves.

Twenty-five percent of librarians work part time. Public and college librarians often work weekends, evenings, and 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.

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. School librarians may not need an MLS but must meet State teaching license requirements.

Education and training. Entry into a library science graduate program requires a bachelor's degree, but any undergraduate major is acceptable. Many colleges and universities offer library science programs, but employers often prefer graduates of the 49 schools in the United States accredited by the American Library Association. Most programs take 1 year to complete; some take 2. A typical graduate program includes courses in the foundations of library and information science, such as 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, research methods and strategies, and user services. Prospective librarians also study online reference systems, Internet search methods, and automated circulation systems. Elective course options include resources for children or young adults; classification, cataloguing, indexing, and abstracting; and library administration. 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. in library and information science is advantageous for a college teaching position or a top administrative job in a college or university library or large public library system.

Licensure. States generally have certification requirements for librarians in public schools and local libraries, though there are wide variations among States. School librarians in 20 States need a master's degree, either an MLS or a master's in education with a specialization in library media. In addition, over half of all States require that school librarians hold teacher certifications, although not all require teaching experience. Some States may also require librarians to pass a comprehensive assessment. Most States also have developed certification standards for local public libraries, although in some States these guidelines are voluntary.

Other qualifications. In addition to an MLS degree, librarians in a special library, such as a law or corporate library, usually supplement their education with knowledge of the field 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 hold both library science and law degrees, while medical librarians should have a strong background in the sciences. In some jobs, knowledge of a foreign language is needed.

Librarians participate in continuing education and training to stay up to date with new information systems and technology.

Advancement. Experienced librarians can advance to administrative positions, such as department head, library director, or chief information officer.

Employment

Librarians held about 159,900 jobs in 2008. About 59 percent were employed by public and private educational institutions and 27 percent were employed by local government.

Job Outlook

Job growth is expected to be as fast as the average and job opportunities are expected to be favorable, as a large number of librarians are likely to retire in the coming decade.

Employment change. Employment of librarians is expected to grow by 8 percent between 2008 and 2018, which is as fast as the average for all occupations. Growth in the number of librarians will be limited by government budget constraints and the increasing use of electronic resources. Both will result in the hiring of fewer librarians and the replacement of librarians with less costly library technicians and assistants. As electronic resources become more common and patrons and support staff become more familiar with their use, fewer librarians are needed to maintain and assist users with these resources. In addition, many libraries are equipped for users to access library resources directly from their homes or offices through library Web sites. Some users bypass librarians altogether and conduct research on their own. However, librarians continue to be in

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Librarians	25-4021	159,900	172,400	12,500	8

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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demand to manage staff, help users develop database-searching techniques, address complicated reference requests, choose materials, and help users to define their 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.

Job prospects. Job prospects are expected to be favorable. On average, workers in this occupation tend to be older than workers in the rest of the economy. As a result, there may be more workers retiring from this occupation than other occupations. However, relatively large numbers of graduates from MLS programs may cause competition in some areas and for some jobs.

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 wages of librarians in May 2008 were $52,530. The middle 50 percent earned between $42,240 and $65,300. The lowest 10 percent earned less than $33,190, and the highest 10 percent earned more than $81,130. Median annual wages in the industries employing the largest numbers of librarians in May 2008 were as follows:

Junior colleges	$55,250
Colleges, universities, and professional schools	55,180
Elementary and secondary schools	54,650
Other information services	48,060
Local government	47,940

The average annual salary for all librarians in the Federal Government in nonsupervisory, supervisory, and managerial positions was $84,796 in March 2009.

About 30 percent librarians were members of a union in 2008 or were covered under a union contract.

Related Occupations

Librarians play an important role in the transfer of knowledge and ideas by providing people with information. Jobs requiring similar analytical, organizational and communication skills include:

	Page
Archivists, curators, and museum technicians	265
Computer scientists	132
Computer systems analysts	140
Teachers—kindergarten, elementary, middle, secondary	288
Teachers—postsecondary	282

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/ala/educationcareers/index.cfm**

For information on a career as a special librarian, contact:

➤ Special Libraries Association, 331 South Patrick St., Alexandria, VA 22314-3501. Internet: **http://www.sla.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, 105 W. Adams Street, Suite 3300, Chicago, IL 60603. 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 East Wacker Place, Suite 1900, Chicago, IL 60601-7246. Internet: **http://www.mlanet.org**

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. Internet: **http://www.loc.gov/hr**

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.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos068.htm**

Library Technicians and Library Assistants

Significant Points

- Improved technology enables library technicians to perform tasks once done by librarians.
- Training requirements range from a high school diploma to an associate degree, but computer skills are necessary for all workers.
- Job prospects should be good.

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Nature of the Work

Library technicians and assistants help librarians acquire, prepare, and organize materials and assist users in locating the appropriate resources. These workers usually work under the supervision of a librarian, although they sometimes work independently. In small libraries, they handle a range of duties, while those in large libraries usually specialize. The duties of technicians and assistants are expanding and evolving as libraries increasingly use the Internet and other technologies to share information. They are increasingly responsible for daily library operations. Depending on where they work, these workers can have other titles, such as library technical assistant, media aide, library media assistant, library aide, or circulation assistant.

In some libraries, library technicians may have more responsibilities than library assistants. Technicians may be responsible for administering library programs, working with librarians to acquire new materials, and overseeing lower level staff. Assistants may be assigned more clerical duties, like shelving books, checking in returned material and assisting patrons with basic questions and requests.

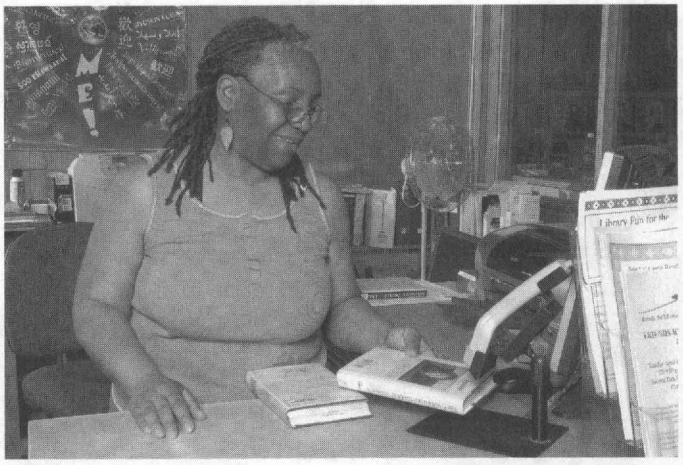
Library technicians and assistants direct library users to standard references, organize and maintain periodicals, prepare volumes for binding, handle interlibrary loan requests, prepare invoices, perform routine cataloguing and coding of library materials and, retrieve information from computer databases. Some of these workers may supervise other support staff.

At the circulation desk, library technicians and assistants loan and collect books, periodicals, videotapes, and other materials. When an item is borrowed, assistants scan it and the patron's library card to record the transaction in the library database; they then stamp the due date on the item or print a receipt with the due date. When an item is returned, assistants inspect it for damage and scan it to record its return. Electronic circulation systems automatically generate notices reminding patrons that their materials are overdue, but library assistants may review the record for accuracy before sending out the notice. Library assistants also register new patrons and issue them library cards. They answer patrons' questions or refer them to a librarian.

The automation of recordkeeping has reduced the amount of clerical work performed by library technicians and assistants. Many libraries now offer self-service registration and circulation areas, where patrons can register for library cards and check out materials themselves. These technologies decrease the time library technicians spend recording and inputting records. At the same time, these systems require more of the technicians' time to ensure they continue to operate smoothly.

Throughout the library, assistants and technicians sort returned books, periodicals, and other items and put them on their designated shelves, in the appropriate files, or in storage areas. Before reshelving returned materials, they look for any damage and try to make repairs. For example, they may use tape or paste to repair torn pages or book covers and use other specialized processes to repair more valuable materials.

These workers may also locate materials being loaned to a patron or another library. Because nearly all library catalogs are computerized, they must be familiar with computers. They sometimes help patrons with computer searches.



Library technicians and assistants help librarians acquire, prepare, and organize materials and assist users in locating the appropriate resources.

Some library technicians and assistants specialize in helping patrons who have vision problems. Sometimes referred to as braille-and-talking-books clerks, these assistants review the borrower's list of desired reading materials, and locate those materials or close substitutes from the library collection of large-type or braille volumes and books on tape. They then give or mail the materials to the borrower.

Technicians and assistants also market library services. They participate in and help plan reader advisory programs, used-book sales, and outreach programs. They may also design posters, bulletin boards, or displays to inform patrons of library events and services.

As libraries increasingly use the Internet, virtual libraries, and other electronic resources, the duties of library technicians and assistants are changing. In fact, new technologies allow some of these workers to assume responsibilities which were previously performed only by librarians. They now catalog most new acquisitions and oversee the circulation of all library materials. They often maintain, update, and help customize electronic databases. They also may help to maintain the library's Web site and instruct patrons how to use the library's computers.

Some of these workers operate and maintain audiovisual equipment, such as projectors, tape and CD players, and DVD and videocassette players. They also assist users with microfilm or microfiche readers.

In school libraries, technicians and assistants encourage and teach students to use the library and media center. They also help teachers obtain instructional materials, and they assist students with assignments.

Some work in special libraries maintained by government agencies, corporations, law firms, advertising agencies, museums, professional societies, medical centers, or research laboratories. These technicians conduct 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 that are often run by library technicians and assistants. They take bookmobiles—trucks stocked with books—to shopping centers, apartment complexes, schools, nursing homes, and other places. They may operate a bookmo-

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bile alone or with other library employees. Those who drive bookmobiles are responsible for answering patrons' questions, receiving and checking out books, collecting fines, maintaining the book collection, shelving materials, and occasionally operating audiovisual equipment to show slides or movies. They keep track of mileage and sometimes are responsible for maintenance of the vehicle and any equipment, such as photocopiers, in it. Many bookmobiles are equipped with personal computers linked to the main library Internet system, allowing patrons access to electronic resources.

Work environment. Library technicians and assistants who prepare library materials sit at desks or computer terminals for long periods and can develop headaches or eyestrain. They may lift and carry books, climb ladders to reach high stacks, and bend low to shelve books on bottom shelves. Workers who work in bookmobiles 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.

Workers in school libraries work regular school hours. Those in public libraries and college and university libraries may work weekends, evenings, and some holidays. In corporate libraries, workers usually work normal business hours, although they often work overtime as well. The schedules of workers who drive bookmobiles often depend on the size of the area being served. About 61 percent of library assistants work part time, making the job appealing to retirees, students, and others interested in flexible schedules.

Training, Other Qualifications, and Advancement

Training requirements for library technicians vary widely, ranging from a high school diploma to specialized postsecondary training. Some employers only hire individuals who have library work experience or college training related to libraries; others train inexperienced workers on the job.

Library assistants receive most of their training on the job. No formal education is required, although familiarity with computers is helpful.

Education and training. Most libraries prefer to hire technicians who have earned a certificate or associate degree, but some smaller libraries may hire individuals with only a high school diploma.

Many library technicians in public schools must meet the same requirements as teacher assistants. Those in Title 1 schools—schools that receive special funding because of the high percentage of low income students enrolled—must hold an associate or higher degree, have a minimum of 2 years of college, or pass a rigorous State or local exam.

Associate degree and certificate programs for library technicians include courses in liberal arts and subjects related to libraries. Students learn about library organization and operation and how to order, process, catalogue, locate, and circulate library materials and media. They often learn to use library automation systems. Libraries and associations offer continuing education courses to inform technicians of new developments in the field.

Training requirements for library assistants are generally minimal; most libraries prefer to hire workers with a high school diploma or GED, although libraries also hire high school students for these positions. No formal postsecondary training is expected. Some employers hire individuals with experience in other clerical jobs; others train inexperienced workers on the job.

Other qualifications. Given the rapid spread of automation in libraries, computer skills are a necessity. Knowledge of databases, library automation systems, online library systems, online public access systems, and circulation systems is particularly valuable. Many bookmobile drivers must have a commercial driver's license. Knowledge of databases and other library automation systems is especially useful. These workers should be able to pay close attention to detail, as the proper shelving or storage of materials is essential.

Advancement. Library technicians and assistants usually advance by assuming added responsibilities. For example, they 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. Some advance to supervisory positions and are in charge of the day-to-day operation of their departments or, sometimes, a small library. Those who earn a graduate degree in library sciences can become librarians.

Employment

Library technicians held about 120,600 jobs in 2008; about 51 percent were employed by local governments. The Federal Government employs library technicians primarily at the U.S. Department of Defense.

Library assistants held about 122,000 jobs in 2008. About 52 percent of these workers were employed by local governments.

Job Outlook

Employment of library technicians and assistants is expected to grow about 10 percent, which is about as fast as the average for all occupations. Opportunities will be best for those with specialized postsecondary library training. Prospects should be good, because many workers leave these jobs and need to be replaced.

Employment change. Between 2008 and 2018, the number of library technicians is expected to grow about 9 percent, which is about as fast as the average for all occupations and the number of library assistants is expected to grow by about 11 percent, which is about as fast as the average for all occupations. Increasing use of library automation creates more opportunities for these workers. Electronic information systems have simplified some tasks, enabling them to be performed by technicians, rather than librarians, and spurring demand for technicians. However, job growth in educational institutions will be limited by slowing enrollment growth. In addition, public libraries often face budget pressures, which hold down overall growth in library services. However, this may result in the hiring of more of these workers, because they are paid less than librarians and, thus, represent a lower-cost way to offer some library services. Employment should grow more rapidly in special libraries because increasing numbers of professionals and other workers use those libraries. Because these workers are largely employed by public institutions, they are not directly affected by the ups

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Library technicians and library assistants	–	242,500	266,700	24,200	10
Library technicians	25-4031	120,600	131,200	10,600	9
Library assistants, clerical	43-4121	122,000	135,500	13,500	11

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

and downs of the business cycle, but they may be affected by changes in the level of government funding for libraries.

Job prospects. Job prospects should be favorable. In addition to job openings from employment growth, some openings will result from the need to replace library technicians who transfer to other occupations or leave the labor force. Opportunities will be best for library technicians with specialized postsecondary library training. Each year, many people leave this relatively low-paying occupation for other occupations that offer higher pay or full-time work. This creates good job opportunities for those who want to become library assistants.

Earnings

Median hourly wages of library technicians in May 2008 were $13.86. The middle 50 percent earned between $10.55 and $17.77. The lowest 10 percent earned less than $8.23, and the highest 10 percent earned more than $22.01. Median hourly wages in the industries employing the largest numbers of library technicians in May 2008 were as follows:

Colleges, universities, and professional schools	$15.91
Junior colleges	15.15
Other information services	13.59
Local government	13.22
Elementary and secondary schools	13.03

Salaries of library technicians in the Federal Government averaged $44,265 in March 2009.

Median hourly wages of library assistants were $10.88 in May 2008. The middle 50 percent earned between $8.52 and $14.18. The lowest 10 percent earned less than $7.47, and the highest 10 percent earned more than $17.61.

Median hourly wages in the industries employing the largest numbers of library assistants in May 2008 were as follows:

Colleges, universities and professional schools	$12.92
Junior colleges	12.07
Elementary and secondary schools	11.79
Local government	10.21
Other information services	9.61

Related Occupations

Library technicians and assistants perform organizational and administrative duties. Workers in other occupations with similar duties include:

	Page
Librarians	270
Medical records and health information technicians	423
Receptionists and information clerks	570
Teacher assistants	276

Sources of Additional Information

For general career information on library technicians, including information on training programs, contact:

➤ American Library Association, Office for Human Resource Development and Recruitment, 50 East Huron St., Chicago, IL 60611. Internet: **http://www.ala.org/ala/educationcareers/index.cfm**

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. Internet: **http://www.loc.gov/hr**

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 that report openings for library technicians.

State departments of education can furnish information on requirements and job opportunities for school library technicians.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos316.htm**

Teacher Assistants

Significant Points

- Almost 40 percent of teacher assistants work part time.
- Educational requirements range from a high school diploma to some college training.
- Favorable job prospects are expected.
- Opportunities should be best for those with at least 2 years of formal postsecondary education, those with experience in helping special education students, or those who can speak a foreign language.

Nature of the Work

Teacher assistants provide instructional and clerical support for classroom teachers, allowing teachers more time for lesson planning and teaching. They support 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,

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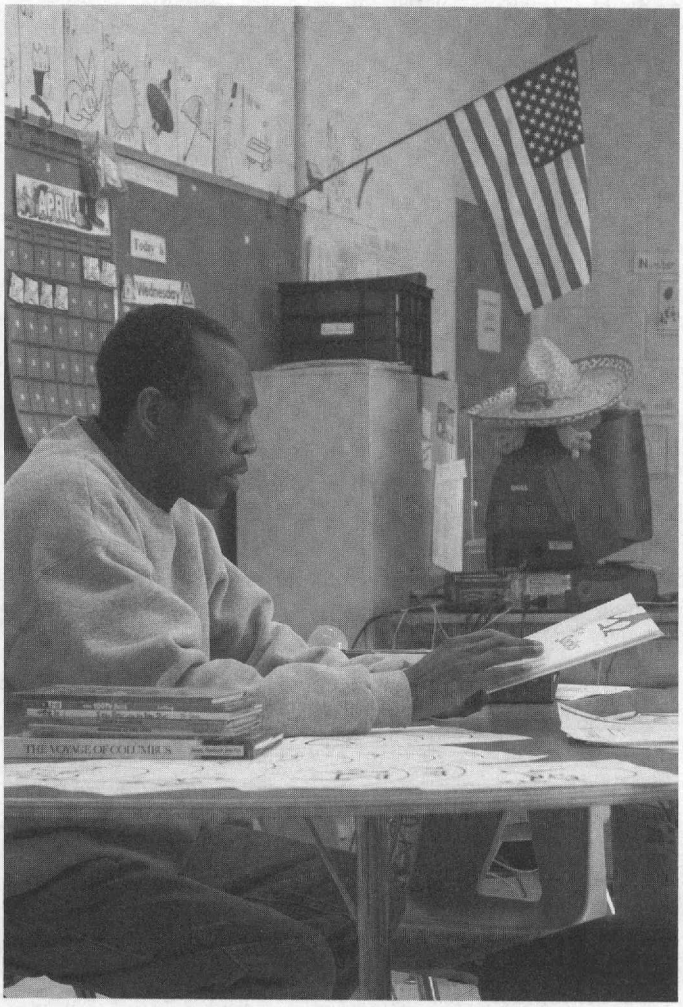
or on field trips; they record grades, set up equipment, and help prepare materials for instruction. Teacher assistants also are called teacher aides or instructional aides. Some assistants refer to themselves as paraprofessionals or paraeducators.

Some teacher assistants perform exclusively non-instructional 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 to use computers and educational software programs.

In addition to instructing, assisting, and supervising students, teacher assistants may 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.



Teacher assistants support and assist children in learning class material, using the teacher's lesson plans.

Many teacher assistants work extensively with special education students. As schools become more inclusive and integrate special education students into general education classrooms, teacher assistants in both general education and special education classrooms increasingly assist students with disabilities. They attend to the physical needs of students with disabilities, including feeding, teaching grooming habits, and assisting students riding the school bus. They also provide personal attention to students with other special needs, such as those who speak English as a second language and those who need remedial education. Some work with young adults to help them obtain a job or to help them apply for community services that will support them after their schooling ends. Teacher assistants help assess a student's progress by observing the student's performance and recording relevant data.

Although the majority of teacher assistants work in primary and secondary educational settings, others work in preschools and other child care centers. Often, one or two assistants will work with a lead teacher in order to better provide the individual attention that young children require. In addition to assisting in educational instruction, teacher assistants supervise the children at play and assist in feeding and other basic care activities.

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 behaviorally.

Work environment. Teacher assistants work in a variety of settings—including preschools, child care centers, and religious and community centers, where they work with young adults—but most work in classrooms in elementary, middle, and secondary schools. They also may work outdoors, supervising recess when weather allows, and they may spend time standing, walking, or kneeling. However, many spend much of the day sitting while working with students.

Approximately 40 percent of teacher assistants work part time. Most assistants who provide educational instruction work the traditional 9-month to 10-month school year.

Seeing students develop and learn 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 entering data.

Training, Other Qualifications, and Advancement

Training requirements for teacher assistants vary by State or school district and range from a high school diploma to some college training. Increasingly, employers are preferring applicants with some related college coursework.

Education and training. Many teacher assistants need only a high school diploma and on-the-job training. However, a college degree or related coursework in child development improves job opportunities. In fact, teacher assistants who work in Title 1 schools—those with a large proportion of students from low-income households—must have college train-

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Teacher assistants	25-9041	1,312,700	1,447,600	134,900	10

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

ing or proven academic skills. They face Federal mandates that require assistants to hold a 2-year or higher degree, have a minimum of 2 years of college, or pass a rigorous State or local assessment.

A number of colleges offer associate degrees or certificate programs that either prepare graduates to work as teacher assistants or provide additional training for current teacher assistants.

All teacher assistants receive some on-the-job training. Teacher assistants need to become familiar with the school system and with the operation and rules of the school they work in. Those who tutor and review lessons must learn and understand the class materials and instructional methods used by the teacher. Teacher assistants also must know how to operate audiovisual equipment, keep records, and prepare instructional materials, as well as have adequate computer skills.

Other qualifications. Many schools require previous experience in working with children and a valid driver's license. Most require the applicant to pass a background check. 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. 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 for a certain length of time in the school district.

Employment

Teacher assistants held about 1.3 million jobs in 2008. Many worked for public and private educational institutions. Child care centers and religious organizations employed most of the rest.

Job Outlook

Many job openings are expected for teacher assistants due to turnover and about as fast as the average employment growth in this large occupation, resulting in favorable job prospects.

Employment change. Employment of teacher assistants is expected to grow by 10 percent between 2008 and 2018, which is about as fast as the average for all occupations. School enrollments are projected to increase slowly over the next decade, but faster growth is expected among special education students and students for whom English is a second language, and those students will increase as a share of the total school-age population. Teacher assistants often are necessary to provide these students with the attention they require.

Legislation that requires both students with disabilities and nonnative English speakers to receive an education equal to that of other students will continue to generate jobs for teacher assistants, who help to accommodate these students' special needs. Children with special needs require more personal attention, and teachers rely heavily on teacher assistants to provide much of that attention. An increasing number of afterschool programs and summer programs also will create new opportunities for teacher assistants.

The greater focus on school quality and accountability that has prevailed in recent years is likely to lead to an increased demand for teacher assistants as well. Growing numbers of teacher assistants may be needed to help teachers prepare students for standardized testing and to provide extra assistance to students who perform poorly on the tests. Job growth of assistants may be moderated, however, if schools are encouraged to hire more teachers for instructional purposes.

Job prospects. Favorable job prospects are expected. Opportunities for teacher assistant jobs should be best for those with at least 2 years of formal postsecondary education, those with experience in helping special education students, and those who can speak a foreign language. Demand is expected to vary by region of the country. Regions in which the population and school enrollments are expected to grow faster, such as many communities in the South and West, should have rapid growth in the demand for teacher assistants.

In addition to job openings stemming from employment growth, numerous openings will arise as assistants leave their jobs and must be replaced. Many assistant jobs require limited formal education and offer relatively low pay, so many workers transfer to other occupations or leave the labor force to assume family responsibilities, return to school, or for other reasons.

Although opportunities will be favorable, there may be a limited number of full-time positions because many school districts prefer to hire these workers part time.

Earnings

Median annual wages of teacher assistants in May 2008 were $22,200. The middle 50 percent earned between $17,610 and $28,180. The lowest 10 percent earned less than $15,340, and the highest 10 percent earned more than $33,980.

Full-time workers usually receive health coverage and other benefits. Teacher assistants who work part time ordinarily do not receive benefits. In 2008, about 37 percent of teacher assistants belonged to unions or were covered by a union contract—

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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

	Page
Child care workers	510
Library technicians and library assistants	273
Occupational therapist assistants and aides	462
Teachers—kindergarten, elementary, middle and secondary	288
Teachers—preschool, except special education	286
Teachers—special education	294
Teachers—vocational	298

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. Internet: **http://www.aft.org/psrp/index.html**

➤ National Education Association, Educational Support Personnel Division, 1201 16th Street, NW., Washington, DC 20036. Internet: **http://www.nea.org/esphome**

➤ National Resource Center for Paraprofessionals, 6526 Old Main Hill, Utah State University, Logan, UT 84322. Internet: **http://www.nrcpara.org**

Human resource departments in school systems, school administrators, and State departments of education also can provide details about employment opportunities and required qualifications for teacher assistant jobs.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos153.htm**

Teachers—Adult Literacy and Remedial Education

Significant Points

- Many adult literacy and remedial education teachers work part time and receive no benefits.
- Many programs require teachers to have at least a bachelor's degree; a public school teaching license may be required for publicly run programs in most States.
- Job opportunities are expected to be favorable, particularly for teachers of English to speakers of other languages.

Nature of the Work

Adult literacy and remedial education teachers instruct adults and out-of-school youths in reading, writing, speaking English, and math—skills to equip them to solve problems, improve their job opportunities, and further their education. The instruction provided by these teachers can be divided into three principal categories: 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 instruction for adults with limited proficiency in English. Many students in these adult education classes traditionally have been those who did not graduate from high school or who passed through school without acquiring the knowledge needed to meet their educational or career goals. Increasingly, 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).

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 these subjects. 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, students' skills must be assessed beforehand. This assessment may be performed by the teacher, but is often performed by another member of the program staff. In many programs, the assessment is used to develop an individualized education plan for each student. Teachers are required to formally evaluate students periodically to determine their progress and potential for advancement to the next level. However, they informally evaluate their progress continuously.

Teachers in adult basic education may assist students in acquiring effective study skills and the self-confidence they need to reenter an academic environment. They also may encounter students with learning or physical disabilities that require additional expertise. These workers 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 face and provide them with access to a broader system of additional services to address these challenges.

Adult secondary education or GED teachers provide help in acquiring the necessary knowledge and skills to pass the test required to earn a GED. Earning a GED requires passing a series of five tests in reading, writing, mathematics, science, and social studies; most teachers instruct students in all subject areas. To help students pass the tests and succeed later in life, teachers not only provide subject matter instruction but also focus on improving the communication, information-processing, problem-solving, and critical-thinking skills necessary for further education and successful careers.

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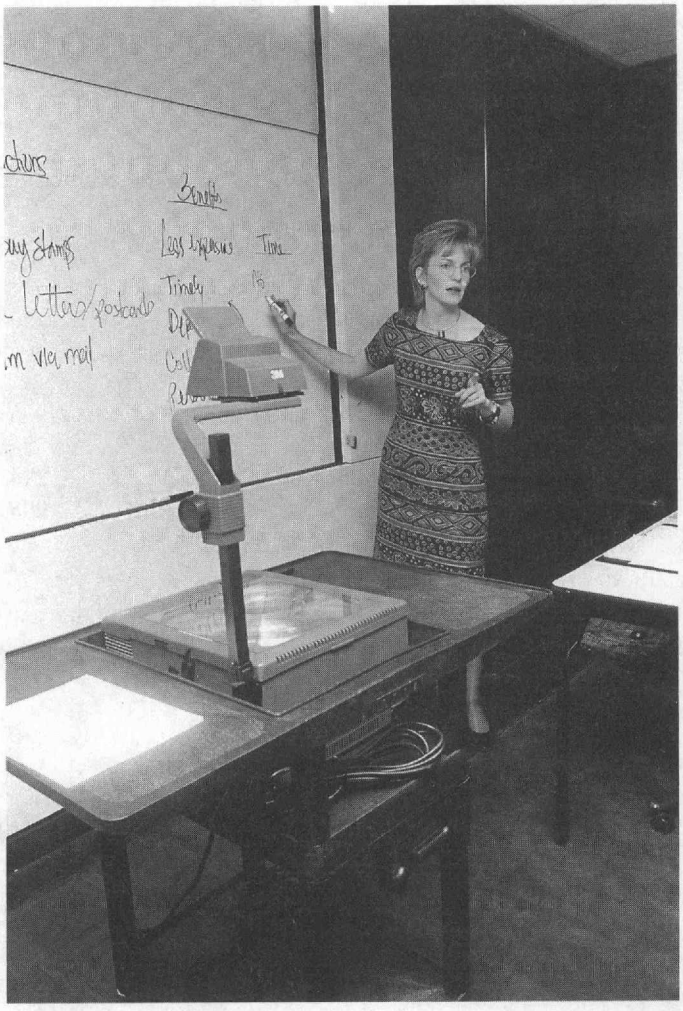
ESOL teachers or English Language Learners Teachers help adults to speak, listen, read, and write in English, often in the context of real-life situations to promote learning. Students learn writing and conversational skills or may focus on learning more academic or job-related communication skills depending on their skill level. ESOL teachers work with adults from a wide range of backgrounds. They need to be prepared to work with learners of all ages and from many different language backgrounds. Some students may have extensive educational experiences in their native countries, while others may have very little. As a result, some students may progress faster than others, so teachers must be able to tailor their instruction to the needs and abilities of their students. Because the teacher and students often do not share a common native language, creativity is an important part of fostering communication in the classroom and achieving learning goals. These workers teach students from a variety of cultural backgrounds and, therefore, they must be sensitive to differences in culture and backgrounds.

Teachers at all levels assist their students with finding additional resources in the community. This may include helping them find community resources such as healthcare, job placement agencies or other educational institutions for additional education, like community colleges or other postsecondary institutions.

All adult literacy and remedial teachers must prepare lessons beforehand, do any related paperwork, and stay current in their fields. Attendance for students is mostly voluntary and coursework is rarely graded. Because computers are increasingly being used to supplement instruction in basic skills and in teaching ESOL, many teachers also must learn the latest applications for computers in the classroom.

Work environment. Because many adult literacy and remedial education 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 may bring years of experience to the classroom—attributes that can make teaching these students rewarding and satisfying. However, some students may have had difficult experiences learning particular subjects or material in the past that creates roadblocks to learning that teachers must work to overcome. Also, many adult education programs are located in cramped facilities that lack modern amenities, which can be frustrating for teachers.

A large number of these 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 job or family responsibilities, so evening and weekend work is common.



Adult literacy and remedial education teachers instruct adults in reading, writing, speaking English, and math.

Training, Other Qualifications, and Advancement

Nearly all programs require teachers to have at least a bachelor's degree, but some require a master's degree in adult education or ESOL instruction. Some States require teachers to have a public school teacher license or a license specifically for adult education teachers.

Education and training. In most States, adult education teachers need at least a bachelor's degree, although some programs prefer or require a master's degree. Programs may also prefer to hire those with teaching experience, especially with adults. Many colleges and universities offer master's degrees or graduate certificates in teaching adult education or ESOL, although some adult education programs offer classes or workshops on related topics relevant for their teachers. These include classes 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.

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

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Adult literacy, remedial education, and GED teachers and instructors	25-3011	96,000	110,400	14,500	15

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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.

Licensure. Many States require teachers in these programs to have some form of license if they are employed in a State or local government-run program. Some States have specific licenses for adult education teachers, while others require a public school teacher license. Requirements for a license typically consist of a bachelor's degree and completion of an approved teacher training program.

Other qualifications. Adult education and literacy teachers must have the ability to work with students who come from a variety of cultural, 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.

Advancement. Opportunities for advancement for adult education and literacy teachers 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 to perform research or to write teaching materials.

Employment

Teachers of adult literacy and remedial education held about 96,000 jobs in 2008. Additional teachers worked as unpaid volunteers. Many of the jobs are Federally funded, with additional funds coming from State and local governments. The majority of these teachers are employed by the educational services industry.

Job Outlook

Employment is expected to grow faster than average, and many job openings are expected due to the need to replace people who leave the occupation or retire. Job opportunities are expected to be favorable, particularly for teachers of English to speakers of other languages.

Employment change. Employment of adult literacy and remedial education teachers is expected to grow by 15 percent through 2018, which is faster than the average for all occupations. 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 improve their English skills. In addition, greater proportions of these groups are expected to take ESOL classes.

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 may relax their standards and hire workers without a degree or GED or good proficiency in English. As the economy softens, employers can be more selective, and more students may find that they need additional education to get a job. In addition, 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 particular, budget pressures may limit Federal funding of adult education, which may cause programs to rely more on volunteers if other organizations and governments do not make up the difference. Other factors such as immigration policies and the relative prosperity of the United States compared with other countries also may have an impact on the number of immigrants entering this country and, consequently, on the demand for ESOL teachers.

Job prospects. Job prospects should be favorable as high turnover among part-time workers creates many openings. Opportunities will be best for ESOL teachers, particularly in States that have large populations of residents who have limited English skills—such as California, Florida, Texas, and New York. However, many other parts of the country have begun to attract large numbers of immigrants, making good opportunities in this field widely available.

Earnings

Median hourly wages of adult literacy and remedial education teachers were $22.26 in May 2008. The middle 50 percent earned between $16.65 and $29.78. The lowest 10 percent earned less than $12.48, and the highest 10 percent earned more than $38.95. Part-time adult literacy and remedial education instructors are usually paid by the hour or for each class that they teach, and receive few or no benefits. 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

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. They may also work with people who

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speak different languages. Workers in other occupations that require these aptitudes include:

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Counselors	234
Interpreters and translators	340
Social workers	246
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—postsecondary	282
Teachers—preschool, except special education	286
Teachers—special education	294
Teachers—vocational	298

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, Potomac Center Plaza, 400 Maryland Ave. SW., Washington, DC 20202. Internet: **http://www.ed.gov/about/offices/list/ovae/index.html**

For information on teaching English as a second language, contact:

➤ The Center for Adult English Language Acquisition, 4646 40th St. NW., Suite 200, Washington, DC 20016. Internet: **http://www.cal.org/caela**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos289.htm**

Teachers—Postsecondary

Significant Points

- Many postsecondary teachers find the environment intellectually stimulating and rewarding because they are surrounded by others who enjoy the subject.
- Educational qualifications range from expertise in a particular field to a Ph.D., depending on the subject taught and the type of educational institution.
- Competition is expected for tenure-track positions; better opportunities are expected for part-time or non-tenure-track positions.
- Ph.D. recipients should experience the best job prospects.

Nature of the Work

Postsecondary teachers instruct students in a wide variety of academic and vocational subjects beyond the high school level. Most of these students are working toward a degree, but many others are studying for a certificate or certification to improve their knowledge or career skills. Postsecondary teachers include college and university faculty, postsecondary career and technical education teachers, and graduate teaching assistants. Teaching in any venue involves forming a lesson plan, presenting material to students, responding to students learning needs, and evaluating students' progress. In addition to teaching, postsecondary teachers, particularly those at 4-year colleges and universities, perform a significant amount of research in the subject they teach. They also must keep up with new developments in their field and may consult with government, business, nonprofit, and community organizations.

College and university faculty make up the majority of postsecondary teachers. Faculty usually are organized into departments or divisions based on academic subject or field. They typically teach several related courses in their subject—algebra, calculus, and 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 up with developments in their field by reading current literature, talking with colleagues, and participating in professional conferences. They also are encouraged to do their own research to expand knowledge in their field by performing experiments, collecting and analyzing data, or examining original documents, literature, and other source material. They publish their findings in scholarly journals, books, and electronic media.

Most postsecondary teachers use computer technology extensively, including the Internet, e-mail, and software programs. 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. The use of e-mail, instant messages, and other computer utilities has improved communications greatly between students and teachers.

Some instructors use the Internet to teach courses to students at remote sites. These distance-learning courses are becoming an increasingly popular option for students who work while attending school. Faculty who teach these courses must be able to adapt existing courses to make them successful online or design a new course that takes advantage of the online format.

Most full-time faculty members serve on academic or administrative committees that deal with the policies of their institution, departmental matters, academic issues, curricula, budgets, purchases of equipment, 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. The teaching load often is heavier in 2-year

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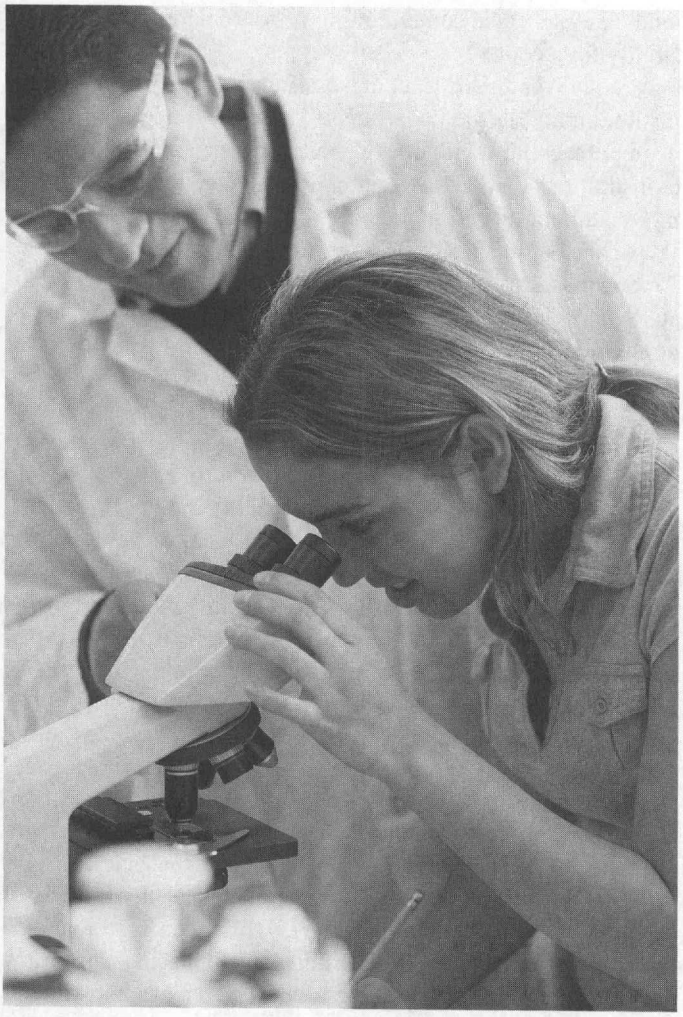

Postsecondary teachers instruct students in a wide variety of academic and vocational subjects beyond the high school level.

colleges and somewhat lighter at 4-year institutions. At all types of institutions, full professors—those who have reached the highest level in their field—usually spend a larger portion of their time conducting research than do assistant professors, instructors, and lecturers.

An increasing number of postsecondary educators are working in alternative schools or in programs aimed at providing career-related education for working adults. Courses usually are offered online or on nights and weekends. Instructors at these programs generally work part time and are responsible only for teaching, with little to no administrative and research responsibilities.

Graduate teaching assistants, often referred to as graduate TAs, assist faculty, department chairs, or other professional staff at colleges and universities by teaching or performing teaching-related duties. In addition, assistants have their own school commitments as students working toward earning a graduate degree, such as a Ph.D. Some teaching assistants have full responsibility for teaching a course, usually one that is introductory. Such teaching can include preparing lectures and exams, as well as assigning final grades to students. Others help faculty members by doing a variety of tasks such as grading papers, monitoring exams, holding office hours or help sessions for students, conducting laboratory sessions, and administering quizzes to the class. Because each faculty member has his or her own needs, 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. For example, some faculty members prefer assistants to sit in on classes, whereas others assign them other tasks to do during class time. Graduate teaching assistants may work one-on-one with a faculty member, or, in large classes, they may be one of several assistants.

Work environment. Many postsecondary teachers find the environment intellectually stimulating and rewarding because they are surrounded by others who enjoy the subject. The ability to share their expertise with others also is appealing to many.

Most postsecondary teachers 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.

Classes typically are scheduled to take place during weekdays, although some occur at night or on the weekend. For teachers at 2-year community colleges or institutions with large enrollments of older students who have full-time jobs or family responsibilities, night and weekend classes are common. Most colleges and universities require teachers to work 9 months of the year, which allows them time to teach additional courses, do research, travel, or pursue nonacademic interests during the summer and on school holidays.

About 29 percent of postsecondary teachers worked part time in 2008. Some part-timers, known as adjunct faculty, have primary jobs outside of academia—in government, private-industry, or nonprofit research organizations—and teach on the side. Others have multiple part-time teaching positions at different institutions. Most graduate teaching assistants work part time while pursuing their graduate studies. The number of hours that they work may vary with their assignments.

University faculty may experience a conflict between their responsibility 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 in support workers and the hiring of more part-time faculty have put a greater administrative burden on full-time faculty. In addition, requirements to teach online classes have added greatly to the workloads of postsecondary teachers. Many find that developing the courses to put online is very time consuming, especially when they have to familiarize themselves with the format and answer large amounts of e-mail.

Like college and university faculty, graduate TAs usually have flexibility in their work schedules, but they also must spend a considerable amount of time pursuing their own academic coursework and studies. 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, which is especially helpful for those who seek to become college faculty members after completing their degree.

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Training, Other Qualifications, and Advancement

The education and training required of postsecondary teachers varies widely, depending on the subject taught and the educational institution employing them. Educational requirements for teachers generally are highest at research universities, where a Ph.D. is the most commonly held degree.

Education and training. Four-year colleges and universities usually require candidates for full-time, tenure-track positions to hold a doctoral degree. However, they may hire master's degree holders or doctoral candidates for certain disciplines, such as the arts, or for part-time and temporary jobs.

Doctoral programs take an average of 6 years of full-time study beyond the bachelor's degree, including time spent completing a master's degree and a dissertation. Some programs, such as those in the humanities, may 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—and also take courses covering the entire discipline. Programs typically include 20 or more increasingly specialized courses and seminars, plus comprehensive examinations in all major areas of the field. Candidates also must complete a dissertation—a paper 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 often do theoretical or 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 2-year colleges, master's degree holders fill most full-time teaching positions. However, in certain fields where there may be more applicants than available jobs, institutions can be more selective in their hiring practices. In these fields, master's degree holders may be passed over in favor of candidates holding Ph.D.s. 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, especially at smaller institutions, because those with dual degrees can teach more subjects.

Other qualifications. 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. In addition, they must be self-motivated and able to work in an environment in which they receive little direct supervision.

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 programs that are now independent. These programs 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, 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 of faculty. 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.

Some degree holders, particularly those with degrees in the natural sciences, do postdoctoral research before taking a faculty position. Some Ph.D.s are able to extend postdoctoral appointments or take new ones if they are unable to find a faculty job. Most of these appointments offer a nominal salary.

Advancement. For faculty a major goal in the traditional academic career is attaining tenure, which can take approximately 7 years, with faculty moving up the ranks in tenure-track positions as they meet specific criteria. The ranks are instructor, assistant professor, associate professor, and professor. Colleges and universities usually hire new tenure-track faculty as instructors or assistant professors under term contracts. At the end of the period, their record of teaching, research, and overall contribution to the institution is reviewed, and tenure may be 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 member's academic freedom—the ability to advocate controversial or unpopular ideas through teaching and conducting research without fear of being fired. Tenure also gives both faculty and institutions the stability needed for effective research and teaching, and it 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 declining as institutions seek flexibility in dealing with financial matters and changing student interests. Institutions are relying more heavily on limited-term contracts and part-time, or adjunct, faculty, thus shrinking the total pool of tenured faculty. Limited-term

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Postsecondary teachers	25-1000	1,699,200	1,956,100	256,900	15

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

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contracts, typically for 2 to 5 years, may be terminated or extended when they expire and generally do not lead to the granting of tenure. In addition, some institutions have limited the percentage of the faculty that can be tenured.

For tenured postsecondary teachers, further advancement involves a move into an administrative or managerial position, such as departmental chairperson, dean, or president. At 4-year institutions, such advancement requires a doctoral degree. At 2-year colleges, a doctorate is helpful but not usually required for advancement, except for advancement to some top administrative positions, which generally required a doctorate. (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.)

Employment

Postsecondary teachers held nearly 1.7 million jobs in 2008. The following tabulation shows postsecondary teaching jobs in specialties having 20,000 or more jobs in 2008:

Graduate teaching assistants	159,700
Health specialties teachers	155,300
Vocational education teachers	120,200
Art, drama, and music teachers	93,800
Business teachers	85,400
English language and literature teachers	74,800
Education teachers	70,200
Biological science teachers	64,700
Nursing instructors and teachers	55,100
Mathematical science teachers	54,800
Engineering teachers	40,600
Psychology teachers	38,900
Computer science teachers	38,800
Foreign language and literature teachers	32,100
Communications teachers	29,900
History teachers	26,000
Philosophy and religion teachers	25,100
Chemistry teachers	24,800
Recreation and fitness studies teachers	21,000
Sociology teachers	20,300
Postsecondary teachers, all other	298,000

Job Outlook

Job openings will stem from faster than the average employment growth and many expected retirements. Competition is expected for tenure-track positions; better opportunities are expected for part-time or non-tenure-track positions. Ph.D. recipients should experience the best job prospects.

Employment change. Postsecondary teachers are expected to grow by 15 percent between 2008 and 2018, which is faster than the average for all occupations. Projected growth in the occupation will be due primarily to increases in college and university enrollment over the next decade. This enrollment growth stems mainly from the expected increase in the population of 18- to 24-year-olds, who constitute the majority of students at postsecondary institutions, and from the increasing number of high school graduates who choose to attend these institutions. Adults returning to college to enhance their career prospects or to update their skills also 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, so expansion of public higher education will be limited by State and local budgets.

Job prospects. Competition is expected for tenure-track positions; better opportunities are expected for part-time or non-tenure-track positions. A significant number of openings in this occupation will be created by growth in enrollments and 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 the 1970s to teach members of the baby-boom generation, and they are expected to retire in growing numbers in the years ahead. Ph.D. recipients should experience the best job prospects.

Although competition will remain tight for tenure-track positions at 4-year colleges and universities, there will be available a considerable number of part-time and renewable term appointments at these institutions and at community colleges. Opportunities will be available for master's degree holders because there will be considerable growth at community colleges, career education programs, and other institutions that employ them.

Opportunities for graduate teaching assistants are expected to be good, reflecting expectations of higher undergraduate enrollments. Graduate teaching assistants play an integral role in the postsecondary education system, and they are expected to continue to do so in the future.

One of the main reasons students attend postsecondary institutions is to prepare themselves for careers, so the best job prospects for postsecondary teachers are likely to be in rapidly growing fields that offer many nonacademic career options, such as business, nursing and other health specialties, and biological sciences.

Earnings

Median annual earnings of all postsecondary teachers in May 2008 were $58,830. The middle 50 percent earned between $41,600 and $83,960. The lowest 10 percent earned less than $28,870, and the highest 10 percent earned more than $121,850.

Earnings for college faculty vary with the rank and type of institution, geographic area, and field. According to a 2008–09 survey by the American Association of University Professors, salaries for full-time faculty averaged $79,439. By rank, the average was $108,749 for professors, $76,147 for associate professors, $63,827 for assistant professors, $45,977 for instructors, and $52,436 for lecturers. In 2008–09, full-time faculty salaries averaged $92,257 in private independent institutions, $77,009 in public institutions, and $71,857 in religiously affiliated private colleges and universities. Faculty in 4-year institutions earn higher salaries, on average, than do those in 2-year schools. In fields with high-paying nonacademic alternatives—medicine, law, engineering, and business, among others—earnings exceed these averages. In others fields, such as the humanities and education, earnings are lower. Earnings for postsecondary career and technical education teachers vary widely by subject, academic credentials, experience, and region of the country.

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Many faculty members have significant earnings from consulting, teaching additional courses, research, writing for publication, or other employment, in addition to their base salary. Many college and university faculty enjoy unique benefits, including access to campus facilities, tuition waivers for dependents, housing and travel allowances, and paid leave for sabbaticals. Part-time faculty and instructors usually have fewer benefits than full-time faculty have.

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:

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Authors, writers, and editors	333
Counselors	234
Education administrators	41
Management analysts	111
Librarians	270
Public relations specialists	350
Teachers—kindergarten, elementary, middle, and secondary school	288
Teachers—vocational	298

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:

➤ Council of Graduate Schools, One Dupont Circle NW., Suite 230, Washington, DC 20036-1173. Internet: **http://www.preparing-faculty.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos066.htm**

Teachers—Preschool, Except Special Education

Significant Points

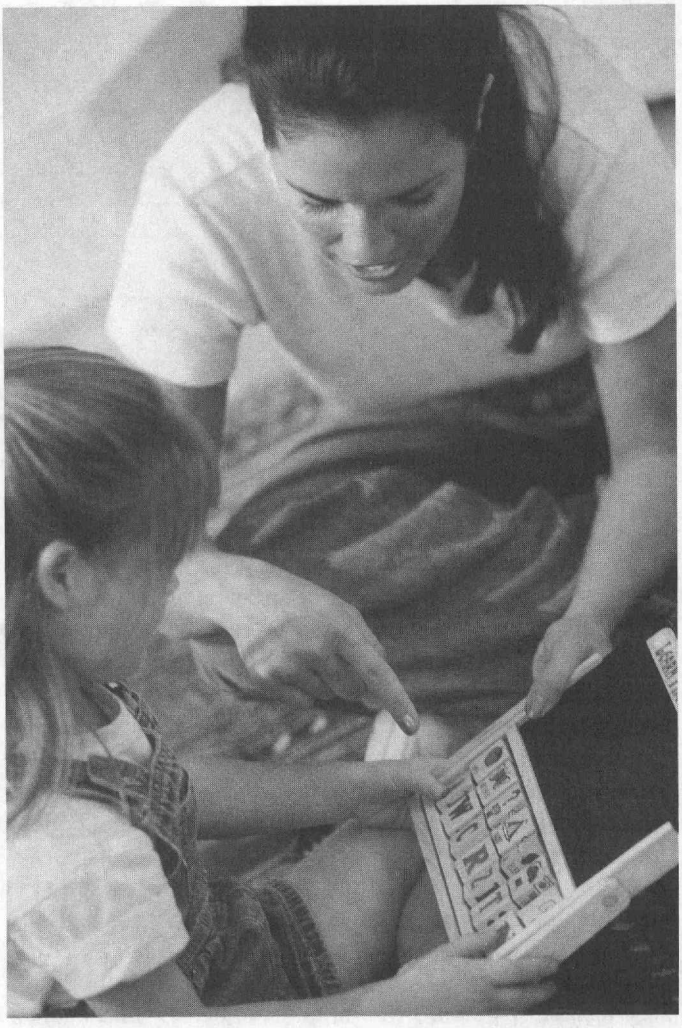
- Training requirements are set by each State and range from a high school diploma to a college degree, although a high school diploma and a little experience is adequate for many preschool teaching jobs.
- Employment of preschool teachers is projected to grow faster than the average through 2018. Job prospects are expected to be excellent due to high turnover.

Nature of the Work

Preschool teachers nurture, teach, and care for children who have not yet entered kindergarten. They provide early childhood care and education through a variety of teaching strategies. They teach children, usually aged 3 to 5, both in groups and one on one. They do so by planning and implementing a curriculum that covers various areas of a child's development, such as motor skills, social and emotional development, and language development.

Preschool teachers play a vital role in the development of children. They introduce children to reading and writing, expanded vocabulary, creative arts, science, and social studies. They use games, music, artwork, films, books, computers, and other tools to teach concepts and skills.

Preschool children learn mainly through investigation, play, and formal teaching. 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, an approach that includes small and large group activities, one-on-one instruction, and learning through



Preschool teachers nurture, teach, and care for children who have not yet entered kindergarten.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Preschool teachers, except special education	25-2011	457,200	543,900	86,700	19

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

creative activities such as art, dance, and music, is adopted to teach preschool children. Letter recognition, phonics, numbers, and awareness of nature and science are introduced at the preschool level to prepare students for kindergarten.

Preschool 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 be able 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.

Work environment. Seeing students develop new skills and gain an appreciation of knowledge and learning can be very rewarding. Preschool teachers in private programs and schools generally enjoy smaller class sizes and more control over establishing the curriculum and setting standards for performance and discipline.

Part-time schedules are common among preschool teachers. Many 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 day care settings often work year round.

Training, Other Qualifications, and Advancement

Education requirements vary greatly from State to State and range from a high school diploma to a college degree. The requirements also vary based on employer requirements and the source of the funding of the preschool program.

Education and training. The training and qualifications required of preschool teachers vary widely. Each State has its own licensing requirements that regulate caregiver training. These requirements range from a high school diploma and a national Child Development Associate (CDA) credential to community college courses or a college degree in child development or early childhood education.

Different public funding streams may set other education and professional development requirements. For example, many States have separate funding for prekindergarten programs for 4-year-old children and typically set higher education degree requirements for those teachers, including those providing prekindergarten in a child care center. Head Start programs must meet Federal standards for teacher requirements. For example, by 2011 all Head Start teachers must have at least an associate degree.

Some employers may prefer workers who have taken secondary or postsecondary courses in child development and early childhood education or who have work experience in a child care setting. Other employers require their own specialized training. An increasing number of employers require at least an associate degree in early childhood education

Other qualifications. In addition to being knowledgeable about the subjects they teach, preschool teachers must have the ability to communicate, inspire trust and confidence, and motivate students, as well as an understanding of the students' educational and emotional needs. Preschool 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. Private schools associated with religious institutions also desire candidates who share the values that are important to the institution.

Advancement. 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. Those 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.

Employment

Preschool teachers, except special education, held 457,200 jobs in 2008. They are most often employed in child day care services (65 percent), and public and private educational services (15 percent). Employment of teachers is geographically distributed much the same as the population.

Job Outlook

Employment of preschool teachers is projected to grow faster than the average through 2018. Job prospects are expected to be excellent due to high turnover.

Employment change. Employment of preschool teachers is expected to grow by 19 percent from 2008 to 2018, which is faster than the average for all occupations. Continued emphasis on early childhood education is increasing the demand for preschool teachers. Some States are instituting programs to improve early childhood education, such as offering full day and universal preschool. These programs, along with projected higher enrollment growth for preschool age children, will create new jobs for preschool teachers.

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However, this growth will be moderated by slower growth in the number of children aged 3 to 5, the age group most often enrolled in preschool programs. In addition, these workers are often assisted by child care workers and teachers assistants and higher demand for these workers may temper growth for preschool teachers.

Job prospects. High replacement needs should create good job opportunities for preschool teachers. Qualified persons who are interested in this work should have little trouble finding and keeping a job. Many preschool teachers must be replaced each year as they leave the occupation to fulfill family responsibilities, to study, or for other reasons. Others leave because they are interested in pursuing other occupations or because of low wages.

Earnings

Median annual wages of preschool teachers were $23,870 in May 2008; the middle 50 percent earned $18,840 to $31,430; the bottom 10 percent earned less than $16,030 and the top 10 percent earned more than $41,660.

Related Occupations

Preschool teaching requires a talent for working with young children; related occupations include the following:

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Child care workers	510
Teachers assistants	276
Teachers—kindergarten, elementary, middle, secondary	288
Teachers—special education	294

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.

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, 1313 L St. NW., Suite 500, Washington, DC 20005. Internet: **http://www.naeyc.org**

➤ Council for Professional Recognition, 2460 16th St. NW., Washington, DC 20009-3575. Internet: **http://www.cdacouncil.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos317.htm**

Teachers—Kindergarten, Elementary, Middle, and Secondary

Significant Points

- Public school teachers must be licensed, which typically requires a bachelor's degree and the completion of an approved teacher education program; private school teachers do not have to be licensed but may still need a bachelor's degree.
- Many States offer alternative licensing programs to attract people into teaching, especially for hard-to-fill positions.
- Teachers must have the ability to communicate, inspire trust and confidence, and motivate students, as well as understand students' educational and emotional needs.
- Job prospects are best for teachers in high-demand fields, such as mathematics, science, and bilingual education, and in less desirable urban or rural school districts.

Nature of the Work

Teachers play an important role in fostering the intellectual and social development of children during their formative years. The education that students acquire is key to determining the future of those students. Whether in elementary or high schools or in private or public schools, teachers provide the tools and the environment for their students to develop into responsible adults.

Teachers act as facilitators or coaches, using classroom presentations or individual instruction to help students learn and apply concepts in subjects such as science, mathematics, and English. They plan, evaluate, and assign lessons; prepare, administer, and grade tests; listen to oral presentations; and maintain classroom discipline. Teachers observe and evaluate a student's performance and potential. They are increasingly 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 the 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.

Many teachers use a hands-on approach that utilizes props to help children understand abstract concepts, solve problems, and develop critical thinking skills. For example, they may teach the concepts of numbers or of addition and subtraction by playing board games. As the children get older, teachers use more sophisticated approaches, such as demonstrating science experiments or working with computers. They also encourage collaboration in solving problems by having students work in groups to discuss and solve the problems together. To be prepared for success later in life, students must be able to interact

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with others, adapt to new technology, and think through problems logically.

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. 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.

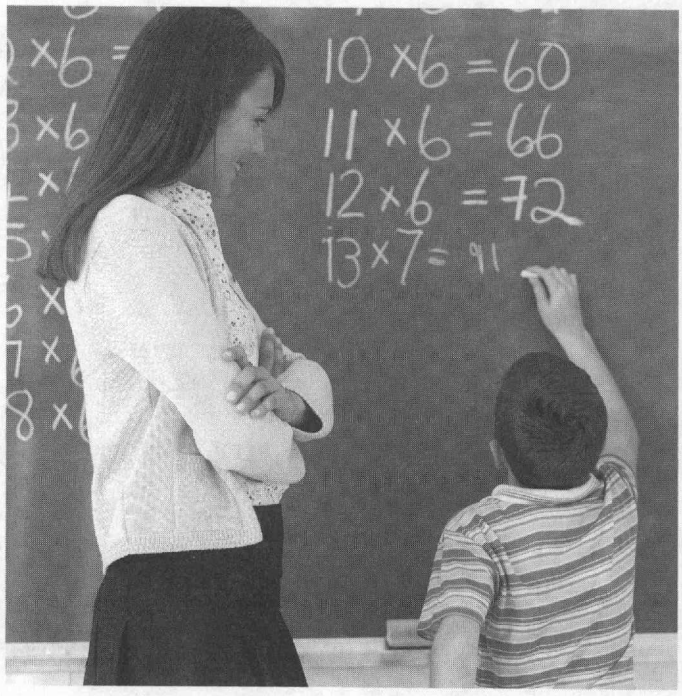
Kindergarten teachers use play and hands-on teaching, but academics begin to take priority in kindergarten classrooms. Letter recognition, phonics, numbers, and awareness of nature and science, introduced at the preschool level, are taught primarily in kindergarten.

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 may teach subjects that are career oriented. Additional responsibilities of middle and secondary school teachers may include career guidance and job placement, as well as following up with students after graduation. (Special education teachers, who instruct elementary and secondary school students with a variety of disabilities, and vocational teachers, who provide career and technical education, are elsewhere in the Handbook.)

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 who have 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.

Computers play an integral role in the education teachers provide. Resources such as educational software and the Internet expose students to a vast range of experiences and promote interactive learning. Through the Internet, students can communicate with other students anywhere in the world, allowing them to share experiences and viewpoints. Students also use the Internet for individual research projects and to gather information. Computers play a role 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 play an important role in fostering the intellectual and social development of children.

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 include multicultural programming in their lesson plans, to address the needs of all students, regardless of their cultural background.

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 becoming involved in making decisions regarding the budget, personnel, textbooks, curriculum design, and teaching methods.

Work environment. 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, heavy workloads, or old schools that are run down and lack modern amenities. Accountability standards also may increase stress levels, with teachers expected to produce students who are able to exhibit a satisfactory performance on standardized tests in core subjects. Many teachers, particularly in public schools, also are frustrated by the lack of control they have over what they are required to teach.

Teachers in private schools generally enjoy smaller class sizes and more control over establishing the curriculum and setting standards for performance and discipline. Their students also tend to be more motivated, since private schools can be selective in their admissions processes.

Teachers are sometimes isolated from their colleagues because they work alone in a classroom of students. However,

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some schools allow teachers to work in teams and with mentors, to enhance their professional development.

Many teachers work more than 40 hours a week, including school duties performed outside the classroom. Part-time schedules are more common among kindergarten teachers. Although most school districts have gone to all-day kindergartens, some 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.

Most States have tenure laws that prevent public school 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.

Training, Other Qualifications, and Advancement

The traditional route to becoming a public school teacher involves completing a bachelor's degree from a teacher education program and then obtaining a license. However, most States now offer alternative routes to licensure for those who have a college degree in other fields. Private school teachers do not have to be licensed but may still need a bachelor's degree.

Education and training. Traditional education programs for kindergarten and elementary school teachers include courses designed specifically for those preparing to teach. Among these courses are 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. Many 4-year colleges require students to wait until their sophomore year before applying for admission to teacher education programs. To maintain their accreditation, teacher education programs are now required to include classes in the use of computers and other technologies. Most programs require students to perform a student-teaching internship. Teacher education programs are accredited by the National Council for Accreditation of Teacher Education and the Teacher Education Accreditation Council. Graduation from an accredited program is not necessary to become a teacher, but it may make fulfilling licensure requirements easier.

Many States now offer professional development schools, which are partnerships between universities and elementary or secondary schools. Professional development schools merge theory with practice and allow the student to experience a year of teaching firsthand, under professional guidance. Students enter these 1-year programs after the completion of their bachelor's degree.

Licensure and certification. All 50 States and the District of Columbia require public school teachers to be licensed. Licensure is not required for teachers in most 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 and require teachers to exhibit proficiency in their subject. Many school systems are moving toward implementing performance-based systems for licensure, which usually require teachers to demonstrate satisfactory teaching performance over an extended period in order to obtain a provisional license, in addition to passing an examination in their subject. Most States require teachers to complete a minimum number of hours of continuing education to renew their license. Many States have reciprocity agreements that make it easier for teachers licensed in one State to become licensed in another.

All States now also offer alternative licensure programs for teachers who have a bachelor's degree in the subject they will teach, but who lack the necessary education courses required for a regular license. Many of these alternative licensure programs are designed to ease shortages of teachers of certain subjects, such as mathematics and science. Other programs provide teachers for urban and rural schools that have difficulty filling positions with teachers from traditional licensure programs. Alternative licensure programs are intended to attract people into teaching who do not fulfill traditional licensing standards, including recent college graduates who did not complete education programs and those changing from another career to teaching. In some programs, individuals begin teaching quickly under provisional licensure under the close supervision of experienced educators while taking education courses outside school hours. If they progress satisfactorily, they receive regular licensure after working for 1 or 2 years. 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. The coursework for alternative certification programs may leads to a master's degree. In extreme circumstances, when schools cannot attract enough qualified teachers to fill positions, States may issue emergency licenses that let individuals who do not meet the requirements for a regular license begin teaching immediately.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Teachers—kindergarten, elementary, middle, and secondary	–	3,476,200	3,944,900	468,600	13
Kindergarten teachers, except special education	25-2012	179,500	206,500	27,000	15
Elementary school teachers, except special education	25-2021	1,549,500	1,793,700	244,200	16
Middle school teachers, except special and vocational education	25-2022	659,500	760,600	101,200	15
Secondary school teachers, except special and vocational education	25-2031	1,087,700	1,184,100	96,300	9

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

Private schools are generally exempt from meeting State licensing standards. For secondary school teacher jobs, they prefer candidates who have a bachelor's degree in the subject they intend to teach, or in childhood education for elementary school teachers. They seek candidates from among recent college graduates, as well as from those who have established careers in other fields.

Other qualifications. In addition to being knowledgeable about the subjects they teach, 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. Private schools associated with religious institutions desire candidates who share the values that are important to the institution.

Certification and advancement. 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. All States recognize national certification, and many States and school districts provide special benefits to teachers who earn 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.

With further preparation, teachers may move into such positions as school librarians, reading specialists, instructional coordinators, and guidance counselors. Teachers may become administrators or supervisors. 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.

Employment

Kindergarten, elementary school, middle school, and secondary school teachers, held about 3.5 million jobs in 2008. Of the teachers in those jobs, about 179,500 were kindergarten teachers, 1.5 million were elementary school teachers, 659,500 were middle school teachers, and 1.1 million were secondary school teachers. Employment of teachers is geographically distributed much the same as the population.

Job Outlook

Employment is projected to grow about as fast as the average for all occupations. Job prospects are best for teachers in high-demand fields, such as mathematics, science, and bilingual education, and in less desirable urban or rural school districts.

Employment change. Employment of kindergarten, elementary, middle, and secondary school teachers is expected to grow by 13 percent between 2008 and 2018, which is about as fast as the average for all occupations.

Through 2018, overall student enrollments in elementary, middle, and secondary schools—a key factor in the demand for teachers—are expected to rise more slowly than in the past as children of the baby-boom generation leave the school system. Projected enrollments will vary by region. Rapidly growing States in the South and West will experience the largest enrollment increases. Enrollments in the Midwest are expected to hold relatively steady, while those in the Northeast are expected to decline. Teachers who are geographically mobile and who obtain licensure in more than one subject are likely to have a distinct advantage in finding a job.

The number of teachers employed is dependent on State and local expenditures for education and on the enactment of legislation to increase the quality and scope of public education. At the Federal level, there has been a large increase in funding for education, particularly for the hiring of qualified teachers in lower income areas.

Job prospects. Job opportunities for teachers will vary with the locality, grade level, and subject taught. Most job openings will result from the need to replace the large number of teachers who are expected to retire over the 2008–18 period. Also, many beginning teachers—especially those employed in poor, urban schools—decide to leave teaching for other careers after a year or two, creating additional job openings for teachers.

Job prospects should be better in inner cities and rural areas than in suburban districts. 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. Currently, many school districts have difficulty hiring qualified teachers in some subject areas—most often mathematics, science (especially chemistry and physics), bilingual education, and foreign languages. Increasing enrollments of minorities, coupled with a shortage

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of minority teachers, should cause efforts to recruit minority teachers to intensify. Also, the number of non-English-speaking students will continue to grow, creating demand for bilingual teachers and for those who teach English as a second language. Specialties that have an adequate number of qualified teachers include general elementary education, physical education, and social studies.

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 addition, more teachers may be drawn from a reserve pool of career changers, substitute teachers, and teachers completing alternative certification programs. In recent years, the total number of bachelor's and master's degrees granted in education has been increasing slowly. But many States have implemented policies that will encourage even more students to become teachers because of a shortage of teachers in certain locations and in anticipation of the loss of a number of teachers to retirement.

Earnings

Median annual wages of kindergarten, elementary, middle, and secondary school teachers ranged from $47,100 to $51,180 in May 2008; the lowest 10 percent earned $30,970 to $34,280; the top 10 percent earned $75,190 to $80,970.

According to the American Federation of Teachers, beginning teachers with a bachelor's degree earned an average of $33,227 in the 2005–2006 school year.

In 2008, of the majority 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 salaries, hours, and other terms and conditions of employment.

Teachers can boost their earnings 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. Although private school teachers generally earn less than public school teachers, they may be given other benefits, such as free or subsidized housing.

Related Occupations

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:

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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 teachers' unions and education-related issues may be obtained from:

➤ American Federation of Teachers, 555 New Jersey Ave. NW., Washington, DC 20001. Internet: **http://www.aft.org**

➤ National Education Association, 1201 16th St. NW., Washington, DC 20036. Internet: **http://www.nea.org**

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**

➤ Teacher Education Accreditation Council, Suite 300, One Dupont Circle, Suite 320 Washington, DC 20036. Internet: **http://www.teac.org**

Information on alternative certification programs can be obtained from:

➤ National Center for Alternative Certification, 4401A Connecticut Ave., NW., Suite 212, Washington, DC 20008. Internet: **http://www.teach-now.org**

Information on National Board Certification can be obtained from:

➤ National Board for Professional Teaching Standards, 1525 Wilson Blvd., Suite 500, Arlington, VA 22209. Internet: **http://www.nbpts.org**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos318.htm**

Teachers—Self-Enrichment Education

Significant Points

- Many self-enrichment teachers are self-employed or work part time.
- Teachers should have knowledge and enthusiasm for their subject, but little formal training is required.
- Employment is projected to grow much faster than the average for all occupations, and job prospects should be favorable; opportunities may vary by subject taught.

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Nature of the Work

Self-enrichment teachers provide instruction on a wide variety of subjects that students take for fun or self-improvement. Some teach classes that provide students with useful life skills, such as cooking, personal finance, and time management. Others provide group instruction intended solely for recreation, such as photography, pottery, and painting. Many others provide one-on-one instruction in a variety of subjects, including singing, or playing a musical instrument. Some teachers conduct courses on academic subjects, such as literature, foreign languages, and history, in a nonacademic setting. The classes taught by self-enrichment teachers seldom lead to a degree and attendance is voluntary. At the same time, these courses can provide students with useful skills, such as knowledge of computers or foreign languages, which make them more attractive to employers.

Among self-enrichment teachers, their styles and methods of instruction can differ greatly. Most self-enrichment classes are relatively informal. Some classes, such as pottery or sewing, may be largely hands-on, with the instructor demonstrating methods or techniques for the class, observing students as they attempt to do it themselves, and pointing out mistakes to students and offering suggestions for improving their techniques. Other classes, such as those involving financial planning or religion and spirituality, might center on lectures or rely more heavily on group discussions. Self-enrichment teachers may also teach classes offered through religious institutions, such as marriage preparation or classes in religion for children.

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 or 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 youth to activities such as piano or drama, and they may be designed to last from 1 week to several months.

Many self-enrichment teachers provide one-on-one lessons to students. The instructor might only work with the student for 1 or 2 hours per week and then provide the student with instructions on what to practice in the interim until the next lesson. Many instructors work with the same students on a weekly basis for years and derive satisfaction from observing them mature and gain expertise.



Self-enrichment teachers provide instruction on a wide variety of subjects that students take for pleasure or self-improvement.

All self-enrichment teachers must prepare lessons beforehand and stay current in their fields. The amount of time required for preparation can vary greatly, depending on the subject being taught and the length of the course. Many self-enrichment teachers are self employed and provide instruction as part of a personal business. As such, they must collect any fees or tuition and keep records of their students' accounts. Although not a requirement for most self-enrichment classes, teachers often use computers and other modern technologies in their instruction or to maintain their business records.

Work environment. Few self-enrichment education teachers are full-time salaried workers. Most either work part time or are self-employed. Some have several part-time teaching assignments, but it is most common for teachers to have a full-time job in another occupation, often related to the subject that they teach. Although jobs in this occupation are primarily part time and pay is relatively low, most teachers enjoy their work because it gives them the opportunity to share with others a subject that they enjoy.

Many classes for adults are held in the evenings and on weekends to accommodate students who have a job or family responsibilities. Similarly, self-enrichment classes for children are usually held after school, on weekends, or during school vacations.

Because students in self-enrichment programs attend classes by choice, they tend to be highly motivated and eager to learn. Students bring their own unique experiences to class, and many teachers find this aspect of the work especially rewarding and satisfying. Self-enrichment teachers must have a great deal of patience, however, particularly when working with young children.

Training, Other Qualifications, and Advancement

The main qualification for self-enrichment teachers is expertise in their subject area, but requirements vary greatly with the type of class taught and the place of employment.

Education and training. In general, there are few educational or training requirements for a job as a self-enrichment teacher beyond being an expert in the subject taught. To demonstrate expertise, however, self enrichment teachers may be required to have formal training in disciplines such as art or music, where specific teacher training programs are available. Prospective dance teachers, for example, may complete programs that prepare them to teach many types of dance—from ballroom to ballet. Other employers may require a portfolio of a teacher's work. For example, to secure a job teaching a photography course, an applicant often needs to show examples of previous work. Some self-enrichment teachers are trained educators or other professionals who teach enrichment classes in their spare time. In many self-enrichment fields, however, instructors are simply experienced in the field, and want to share that experience with others.

Other qualifications. Self-enrichment teachers should have good speaking skills and a talent for making the subject interesting. Patience and the ability to explain and instruct students

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Self-enrichment education teachers	25-3021	253,600	334,900	81,300	32

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

at a basic level are important as well, particularly for teachers who work with children.

Advancement. Opportunities for advancement in this profession are limited. Some part-time teachers are able to move into full-time teaching positions or program administrator positions, such as coordinator or director. Experienced teachers may mentor new instructors.

Employment

Teachers of self-enrichment education held about 253,600 jobs in 2008. The largest numbers of teachers were employed by public and private educational institutions and providers of social assistance.

Job Outlook

Employment of self-enrichment education teachers is expected to grow much faster than the average for all occupations, and job prospects should be favorable. New opportunities arise constantly because many of these kinds of jobs are short term and they are often held as a second job.

Employment change. Employment of self-enrichment education teachers is expected to increase over the 2008–18 period by 32 percent, which is much faster than the average for all occupations. The need for self-enrichment teachers is expected to grow as more people embrace lifelong learning and course offerings expand. Demand for self-enrichment education will also increase, as more people seek to gain or improve skills that will make them more attractive to prospective employers. Some self-enrichment teachers offer instruction in foreign languages, computer programming or applications, public speaking, and many other subjects that help students gain marketable skills. People increasingly take courses to improve their job skills, which creates more demand for self-enrichment teachers.

Job prospects. Job prospects should be generally favorable in the coming decade, as increasing demand and high turnover create many opportunities. These opportunities may vary, however, because some fields have more prospective teachers than others. Opportunities should be best for teachers of subjects that are not easily researched on the Internet and those that benefit from hands-on experiences, such as cooking, crafts, and the arts. Classes on self-improvement, personal finance, and computer and Internet-related subjects are also expected to be popular.

Earnings

Median hourly wages of self-enrichment teachers were $17.17 in May 2008. The middle 50 percent earned between $12.50 and $24.98. The lowest 10 percent earned less than $9.15, and the highest 10 percent earned more than $32.68. Self-enrichment teachers are generally paid by the hour or for each class that they teach. Earnings may also be tied to the number of students enrolled in the class.

Part-time instructors are usually paid for each class that they teach, and receive few benefits. Full-time teachers are generally paid a salary and may receive health insurance and other benefits.

Related Occupations

The work of self-enrichment teachers is closely related to:

	Page
Artists and related workers	301
Athletes, coaches, umpires, and related workers	321
Dancers and choreographers	325
Musicians, singers, and related workers	328
Recreation workers	522
Teachers—preschool, except special education	286
Teachers—kindergarten, elementary, middle, and secondary	288

Sources of Additional Information

For information on employment of self-enrichment teachers, contact local schools, colleges, or companies that offer self-enrichment programs.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos064.htm**

Teachers—Special Education

Significant Points

- Special education teachers must be organized, patient, able to motivate students, understanding of their students' special needs, and accepting of differences in others.
- All States require teachers to be licensed; traditional licensing requires the completion of a special education teacher training program and at least a bachelor's degree, although some States require a master's degree.
- Many States offer alternative licensure programs to attract college graduates who do not have training in education.
- Excellent job prospects are expected due to rising enrollments of special education students and reported shortages of qualified teachers.

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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 severe cognitive, emotional, or physical disabilities, primarily teaching them life skills and basic literacy. However, the majority of special education teachers work with children with mild to moderate disabilities, using or modifying the general education curriculum to meet the child's individual needs and providing required remedial instruction. Most special education teachers instruct students at the preschool, elementary, middle, and secondary school level, although some work with infants and toddlers.

The various types of disabilities that may qualify individuals for special education programs are as follows: 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 identified under one or more of these categories. Early identification of a child with special needs is an important part of a special education teacher's job, because early intervention is essential in educating children with disabilities.

Special education teachers use various techniques to promote learning. Depending on the student, teaching methods can include intensive individualized instruction, problem-solving assignments, and small-group work. When students need special accommodations to learn the general curriculum or to take a test, special education teachers ensure that appropriate accommodations are provided, such as having material read orally or lengthening the time allowed to take the test.

Special education teachers help to develop an Individualized Education Program (IEP) for each student receiving special education. The IEP sets personalized goals for the student and is tailored to that student's individual needs and abilities. When appropriate, the program includes a transition plan outlining specific steps to prepare 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 the student's general education teachers. Teachers work closely with parents to inform them of their children's progress and suggest techniques to promote learning outside of school.

Special education teachers design and teach appropriate curricula, assign work geared toward each student's needs and abilities, and grade papers and homework assignments. They are involved in the student's behavioral, social, and academic development, helping them develop emotionally and interact effectively in social situations. 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 life skills, such as balancing a checkbook.

As schools become more inclusive, special education teachers and general education teachers increasingly work 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 individualized needs of the student within inclusive special education programs. A large part of a special education teacher's job involves communicating and coordinating with others involved in the child's well-being, including 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 including 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.

Some special education teachers work with infants and toddlers in the child's home with his or her parents. Many of these infants have challenges that slow or preclude normal development. Special education teachers help parents learn techniques and activities designed to stimulate the infant and encourage the growth and development of the child's skills. Toddlers usually receive their services at a preschool where special education



Special education teachers work with young people who have a variety of disabilities.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018 Number	Change, 2008-2018 Percent
Special education teachers	25-2040	473,000	554,900	81,900	17
Special education teachers, preschool, kindergarten, and elementary school	25-2041	226,000	270,300	44,300	20
Special education teachers, middle school	25-2042	100,300	118,400	18,100	18
Special education teachers, secondary school	25-2043	146,700	166,200	19,500	13

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

teachers help them develop social, self-help, motor, language, and cognitive skills, often through the use of play.

Technology is becoming increasingly important in special education. Teachers use specialized equipment such as computers with synthesized speech, interactive educational software programs, and audiotapes to assist children.

Work environment. 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 demanding 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 work under the threat of litigation against the school or district by parents if correct procedures are not followed or if the parents feel that their child is not receiving an adequate education. Recently passed legislation, however, is intended to reduce the burden of paperwork and the threat of litigation. 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.

Training, Other Qualifications, and Advancement

All States require special education teachers to be licensed, which typically requires at least a bachelor's degree and the completion of an approved training program in special education teaching. Some States require a master's degree. Most States have alternative methods for entry for bachelor's degree holders who do not have training in education.

Education and training. 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 often undergo longer periods of training than do general education teachers. Most bachelor's degree programs last four years and include general and specialized courses in special education. However, an increasing number of institutions are requiring a fifth year or other graduate-level preparation. Some programs require specialization, while others offer generalized special education degrees. The last year of the program usually is spent student teaching in a classroom supervised by a certified special education teacher.

Licensure. 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 some 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. Many States offer general special education licenses across a variety of disability categories, while others license several different specialties within special education.

For traditional licensing, 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. However, some States also require a master's degree in special education, which involves at least 1 year of additional coursework, including a specialization, beyond the bachelor's degree. Most States require a prospective teacher to pass a professional assessment test as well. Some States have reciprocity agreements allowing special education teachers to transfer their licenses from one State to another, but many others still require that experienced teachers reapply and pass licensing requirements to work in the State.

Most States also offer alternative routes to licensing that are intended to attract people into teaching who do not fulfill traditional licensing standards. Most alternative licensure programs are open to anyone with a bachelor's degree, although some are designed for recent college graduates or professionals in other education occupations. Programs typically require the completion of a period of supervised preparation and instruction through a partnering college or university and passing an assessment test while teaching under supervision for a period of 1 to 2 years.

Other qualifications. Special education teachers must be organized, 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 skills because special education teachers spend a great deal of time interacting with others, including students, parents, and school faculty and administrators.

Advancement. Special education teachers can advance to become supervisors or administrators. They also may 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 teachers.

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Employment

Special education teachers held a total of about 473,000 jobs in 2008. Nearly all worked in public and private educational institutions. A few worked for individual and social assistance agencies or residential facilities, or in homebound or hospital environments.

Job Outlook

Employment is expected to increase faster than the average for all occupations. Job prospects should be excellent because many districts report problems finding adequate numbers of licensed special education teachers.

Employment change. The number of special education teachers is expected to increase by 17 percent from 2008 to 2018, which is faster than the average for all occupations. Although student enrollments in general are expected to grow more slowly than in the past, continued increases in the number of special education students needing services will generate a greater need for special education teachers.

The number of students requiring special education services has grown steadily in recent years because of improvements that have allowed learning disabilities to be diagnosed at earlier ages. In addition, legislation emphasizing training and employment for individuals with disabilities and educational reforms requiring higher standards for graduation have increased demand for special education services. Also, the percentage of foreign-born special education students is expected to grow as teachers become more adept in recognizing disabilities in that population. Finally, more parents are expected to seek special services for children who have difficulty meeting the new, higher standards required of students.

Job prospects. In addition to job openings resulting from growth, a large number of openings will result from the need to replace special education teachers who switch to teaching general education, change careers altogether, or retire. At the same time, many school districts report difficulty finding sufficient numbers of qualified teachers. As a result, special education teachers should have excellent job prospects.

The job outlook does vary by geographic area and specialty. Although most 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 also are expected to increase more rapidly in certain parts of the country, such as the South and West, resulting in increased demand for special education teachers in those regions. In addition, job opportunities may be better in certain specialties—for example, teachers who work with children with multiple disabilities or those who work with children with severe disabilities such as autism—because of large increases in the enrollment of special education students classified into 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.

Earnings

Median annual wages in May 2008 of special education teachers who worked primarily in preschools, kindergartens, and elementary schools were $50,020. The middle 50 percent earned between $40,480 and $63,500. The lowest 10 percent earned less than $33,770, and the highest 10 percent earned more than $78,980

Median annual wages of middle school special education teachers were $50,810. The middle 50 percent earned between $41,720 and $63,480. The lowest 10 percent earned less than $35,180, and the highest 10 percent earned more than $78,200.

Median annual wages of special education teachers who worked primarily in secondary schools were $51,340. The middle 50 percent earned between $41,810 and $65,680. The lowest 10 percent earned less than $35,150, and the highest 10 percent earned more than $82,000.

In 2008, about 64 percent of special education teachers belonged to unions or were covered by union contracts.

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:

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Audiologists	358
Counselors	234
Occupational therapists	369
Psychologists	215
Recreational therapists	389
Social workers	246
Speech-language pathologists	399
Teacher assistants	276
Teachers—kindergarten, elementary, middle, and secondary	288
Teachers—preschool, except special education	286
Teachers—vocational	298

Sources of Additional Information

For information on professions related to early intervention and education for children with disabilities, listings of schools with special education training programs, information on teacher certification, and general information on related personnel issues, contact:

➤ The Council for Exceptional Children, 1110 N. Glebe Rd., Suite 300, Arlington, VA 22201. Internet: **http://www.cec.sped.org**

➤ National Center for Special Education Personnel and Related Service Providers, National Association of State Directors of Special Education, 1800 Diagonal Rd., Suite 320, Alexandria, VA 22314. Internet: **http://www.personnelcenter.org**

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To learn more about the special education teacher certification and licensing requirements in individual States, contact the State's department of education.

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos070.htm**

Teachers—Vocational

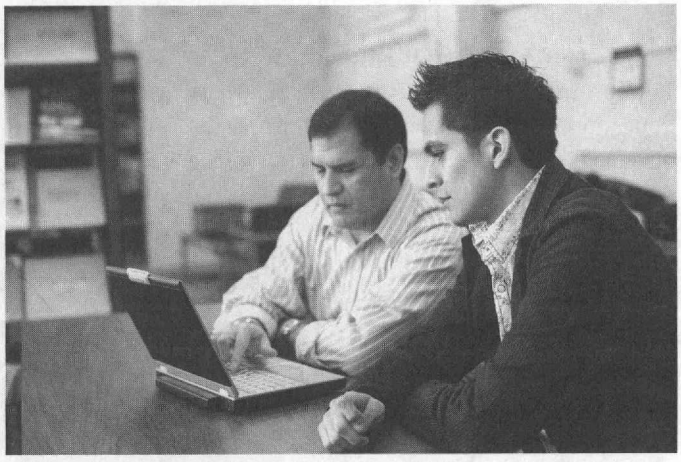
Significant Points

- Traditionally, becoming a vocational education teacher requires a bachelor's degree from a teacher education program and a teacher's license for which requirements vary from State to State.
- Most States now offer alternative routes to licensure for those who have work experience in their field.
- Employment growth is expected to be as fast as the average for all occupations, with favorable job prospects.

Nature of the Work

Vocational education teachers, commonly called career and technical education (CTE) teachers or career-technology teachers, instruct and train students to work in a wide variety of fields. Career and technical education courses train students to enter a particular career and prepare them for the world of work.

Career and technical teachers in middle and secondary schools may be introducing students to a trade or skill for the first time. They often teach courses that are in high demand by area employers, who often provide input into the curriculum and offer internships or apprenticeships to students at the secondary school level. Many vocational teachers play an active role in building and overseeing these partnerships. Additional responsibilities of middle and secondary school teachers may include providing career guidance, helping with job placement, and following up with students after graduation. Secondary CTE teachers are also responsible for coordinating their curriculum offerings with community, technical and 4-year colleges under current Federal law.



Vocational education teachers in middle and secondary schools may introduce students to a trade or skill for the first time.

CTE teachers may teach in traditional comprehensive schools. Within comprehensive secondary schools, CTE teachers may be part of a career academy where they work closely with academic colleagues to create a career-themed, school-within-a-school. They may teach in a regional CTE centers that serve students from many districts who come for half-days. Other CTE teachers may teach in a CTE secondary school where students are in shops and labs for most of the school day.

At the secondary school level, the focus is on preparing students to enter the workforce or to continue on to additional training at the postsecondary level. In addition, CTE teachers aim to reinforce and strengthen material learned by their students in academic classes. To achieve these ends, teachers use a variety of techniques and methods to ensure that students understand the material, such as classroom lectures, hands-on activities done in a laboratory, experiential or work-based learning, and involvement in co-curricular organizations. In the classroom, CTE teachers lecture students on the theories and techniques used in the field. They may discuss the history of the profession or laws and regulations that govern the industry. In addition, teachers may provide demonstrations of tasks, techniques, or tools used in the field. In the lab, teachers assign the students tasks, oversee their progress, and assist students as they encounter problems or need additional instruction or direction. Experiential or work-based learning allows students the opportunity to apply what they have learned in the classroom in real world settings. Students may use class time to work in the field at a business willing to let them learn on the job, and the business provides feedback about the student's performance to the teacher. In some schools, students may run businesses that are owned by the school, such as the school store, to apply their knowledge and skills in a non-classroom setting. Finally, CTE teachers may serve as the advisor for co-curricular student organizations that provide students with additional opportunities to reinforce what they have learned in the classroom.

How teachers use these different settings and techniques varies with their specialized field. These fields include agricultural science, family and consumer science, health occupations, business and marketing, trade and industry, and technology education.

In agricultural science, students learn a wide variety of subjects related to the science and business of agriculture. Classes may cover topics like agricultural production; agricultural-related business; horticulture; agri-science; small animal care; veterinary science; and plant, animal, and food systems. Teachers in this subject may have students plant and care for crops or tend to animals to apply what they have learned in the classroom.

CTE teachers in family and consumer science teach students about culinary arts; sewing; child development; family and consumer services; and food science, dietetics, and nutrition. Students in these settings may run early childhood education classes with teacher supervision, manufacture and market clothing, or create menus and cook for a school function.

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Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Teachers—vocational	–	115,100	125,100	10,100	9
Vocational education teachers, middle school	25-2023	15,600	16,100	500	3
Vocational education teachers, secondary school	25-2032	99,400	109,000	9,600	10

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook.*

In health-related occupations, students learn the skills necessary to work as technicians or assistants in the medical field. This may include learning the skills necessary to become a nurse or dental assistant. Teachers in this field may have students practice their skills by measuring blood pressure or practicing fundamental tasks like administering blood sugar and blood type tests on other staff in the school. Some programs allow students to receive the certifications necessary to enter the field.

Business and marketing students learn the skills necessary to run a business or make sales. They may learn computer programs or how to market a product. They may also learn the basics of financial management for a business. CTE teachers specializing in business and marketing may spend time with students in computer labs to teach them computer skills, or they may guide students as they develop and establish a business. Many programs operate school-based enterprises where students operate real businesses open to the public.

CTE teachers in trade and industry may cover a wide range of topics, such as auto mechanics, cosmetology, heating and air conditioning, electrical wiring, television production, computer networking and computer repair, or auto body repair. These teachers specialize in one of these areas and teach classes in their area of expertise. Many teachers in this field use lab work extensively to allow students to learn with a hands-on approach.

Teachers in technology aim to teach the same subjects that are taught in general education classes, such as math and science, through technology. This may include supervising students as they build a robot to learn about physics, computer science, and math. This type of program is often seen as a precursor to engineering programs.

Work environment. Helping students develop new skills and gain an appreciation of knowledge and learning can be very rewarding. However, teachers may get frustrated when dealing with unmotivated or disrespectful students. Occasionally, teachers must cope with unruly behavior and violence at school. Teachers may experience stress from dealing with large classes, heavy workloads, or schools that are run down and lack many modern amenities.

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. However, CTE teachers often have specific responsibilities that have them in the community during part of the school day working with their business and industry partners.

Including school duties performed outside the classroom, many teachers work more than 40 hours a week. Most middle and secondary school CTE teachers work the traditional ten month school year with a 2-month vacation during the summer. During the vacation break, those on the ten month schedule may teach in summer sessions, take other jobs, travel, or pursue personal interest s. Some enroll in college courses or workshops to continue their education. Teachers in districts with a year-round schedule typically work eight weeks and then have one week of vacation, as well as a five week midwinter break. CTE teachers with active work-based learning programs may be on twelve month contracts to provide time for them to engage in job development for current and future students.

Most States have tenure laws that prevent public school 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 three years. Tenure does not absolutely guarantee a job, but it does provide some security.

Training, Other Qualifications, and Advancement

The traditional route to becoming a career and technical education teacher at the middle or secondary school level requires completing a bachelor's degree from a teacher education program and then obtaining a license. However, most States now offer alternative routes to licensure for those who have work experience in their field.

Education and training. Traditionally, most aspiring CTE teachers obtain a bachelor's degree and often major in the subject they plan to teach while also completing a program of study in teacher preparation. However, with the proper amount of work experience in the chosen teaching field, many states allow CTE teachers to enter the occupation with a bachelor's degree minus the teacher preparation program or with only a high school diploma.

Licensure and certification. All 50 States and the District of Columbia require public school CTE teachers in middle and secondary schools to be licensed. Usually licensure is granted by the State Board of Education or a licensure advisory committee. All States require 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 teachers to obtain a master's degree in education within a specified period after they begin teaching. Almost all States require an applicant for a teacher's license to take a competency test. Most States require teachers to complete a minimum number of hours of continuing education to renew their license. Many States have reciprocity agreements that make it easier for teachers licensed in one State to become licensed in another.

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However, there are alternative routes to licensure which allow those who did not go through traditional teacher preparation program to become licensed CTE teachers. Often this requires work experience in additional to a high school diploma or a bachelors degree without teacher preparation. The educational requirement varies depending on the State and the amount of experience the applicant has.

Other qualifications. In addition to being knowledgeable about the subjects they teach, teachers must be good communicators and inspire trust and confidence. They should motivate students and understand the students' educational and emotional needs. Teachers must 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.

Advancement. Teachers may become administrators or supervisors, although the number of these positions is limited and competition for them 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. CTE teachers may also move to teaching classes at the postsecondary level.

Employment

Vocational education teachers held 115,100 jobs in 2008. Of these jobs, vocational education teachers in middle schools held 15,600 jobs and vocational education teachers in secondary schools held 99,400 jobs. Most were employed in public and private educational institutions.

Job Outlook

Employment of vocational teachers is expected to grow as fast as the average as student enrollments continue to increase.

Employment change. Employment of vocational education teachers is expected to grow by 9 percent from 2008 to 2018, which as fast as the average than all occupations. Employment of middle school vocational education teachers is expected to grow by 3 percent, which is more slowly than the average for all occupations and employment of secondary school vocational education teachers is expected to grow by 10 percent, which about as fast as the average for all occupations. This growth is due in large part to continued growth in school enrollments, which increases demand for these workers. However, growth will be limited by an increased focused on traditional academic subjects.

Through 2018, overall student enrollments in middle, and secondary schools—a key factor in the demand for teachers—are expected to rise more slowly than in the past as children of the baby-boom generation leave the school system. Projected enrollments will vary by region. Rapidly growing States in the South and West will experience the largest enrollment increases. Enrollments in the Midwest are expected to hold relatively steady, while those in the Northeast are expected to decline. Teachers who are geographically mobile and who obtain licensure in more than one subject are likely to have a distinct advantage in finding a job.

Growth in this occupation will be slowed somewhat by an increased focus on traditional academics subjects, like reading and math, and away from career specific training at the middle and secondary school levels. As a result, growth in the employment of vocational education teachers may be limited.

Job prospects. Opportunities in this occupation are expected to be favorable as workers currently employed in this occupation leave the field to retire or for other opportunities.

Earnings

Median annual wages of vocational education teachers in middle schools in May 2008 were $47,870. The middle 50 percent earned between $39,460 and $59,470. The lowest 10 percent earned less than $34,020, and the highest 10 percent earned more than $72,720.

Median annual wages of vocational education teachers in secondary schools in May 2008 were $51,580. The middle 50 percent earned between $42,110 and $64,120. The lowest 10 percent earned less than $34,980, and the highest 10 percent earned more than $77,950.

Related Occupations

Teaching requires the ability to communicate ideas well, motivate students, and be creative. Workers in other occupations that require these skills are

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Counselors	234
Education administrators	41
Librarians	270
Teachers—kindergarten, elementary, middle, and secondary school	288
Teachers—preschool, except special education	286
Teachers—special education	294

Sources of Additional Information

For information on 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**

The Occupational Information Network (O*NET) provides information on a wide range of occupational characteristics. Links to O*NET appear at the end of the Internet version of this occupational statement, accessible at **http://www.bls.gov/ooh/ocos358.htm**

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