Occupational Projections and Training Data, 1980 Edition

U.S. Department of Labor
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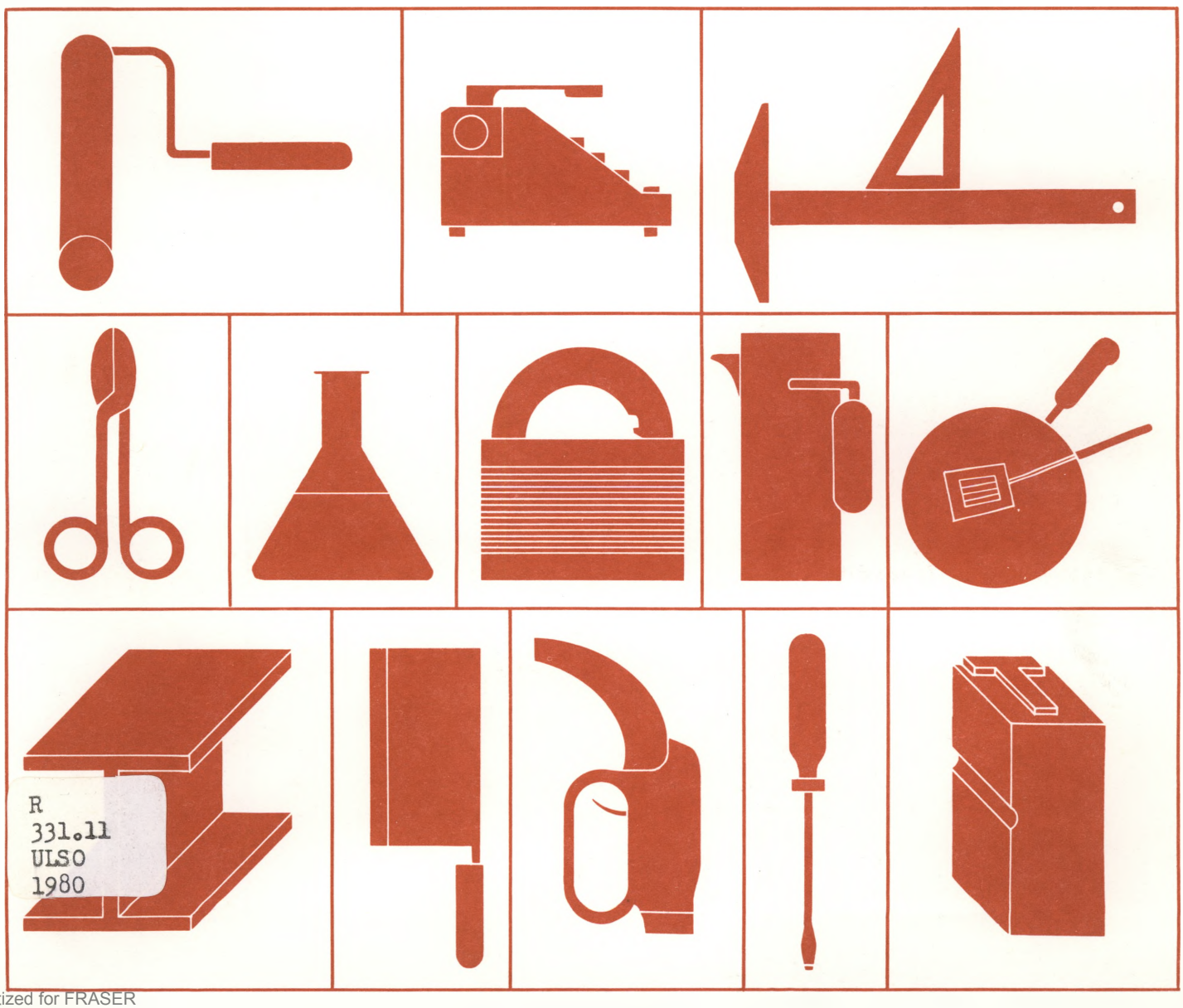

Occupational Projections and Training Data, 1980 Edition

U.S. Department of Labor
Ray Marshall, Secretary

Bureau of Labor Statistics
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Preface

Projections of occupational employment and information on occupational training are needed to plan education and training programs and provide vocational guidance. This bulletin presents general and detailed information on the relationship between occupational requirements and training needs. It is a revision and update of Bulletin 2020 of the same title published in 1979, and was prepared as part of the Bureau of Labor Statistics (BLS) program for developing and disseminating projections of economic and employment data. The BLS revises its projections every 2 years. During the next revision, projections again will be developed for 1990; the base year will be 1980.

This bulletin was prepared in the Division of Occupational Outlook under the general direction of Michael Pilot. Patrick Wash supervised its preparation. The data and information presented were collected, analyzed, and prepared by Charles A. Byrne III, Conley Hall Dillion, Jr., Lawrence C. Drake, Jr., Thomas Nardone, and James V. Petrone. Jon Q. Sargent contributed the discussion of job prospects for college graduates. The employment projections and the information on training required for entry to individual occupations represent the work of economists who prepared the 1980–81 *Occupational Outlook Handbook.*

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Chapter I. Introduction

Each year, millions of people enroll in education and training programs that hopefully will lead to a successful career. At the same time, millions of job openings occur due to business expansion and the need to replace workers because of retirements, deaths, or transfers. However, the number of available jobs in an occupation often does not match the number of people trained in that field. In some occupations, the number of qualified applicants exceeds the number of openings, while in others, a shortage of workers exists. Such imbalances are costly to both the individual and the Nation.

Eliminating such imbalances may be impossible, especially in an economy where individuals are encouraged to make their own educational and career choices. However, the use of occupational demand and supply information in career guidance and education planning can limit the difficulties. The National Commission on Employment and Unemployment Statistics noted this fact in its recent report: "Data on employment conditions and job prospects by occupation are crucial for wise investment of the billions of dollars spent each year on specialized occupational, education and training programs by federal, state and local governments, by employers, and by trainees or their families."[1]

This bulletin presents demand and supply information for nearly 240 occupations. The remainder of this chapter describes some of the uses of this information for career guidance and training evaluation.

Uses In career guidance

Choosing a career is a difficult process. It begins with individuals learning about their interests and abilities. Focusing on occupations that suit those interests and abilities and learning about the prospects for employment in those occupations comes next. Acquiring the necessary training is the last step. This bulletin provides information on employment prospects and training requirements, information that is useful when selecting or preparing for a career. (Other Bureau of Labor Statistics publications also provide information for career guidance. The *Occupational Outlook Handbook* Bulletin 2075, 1980, describes the nature of the work and presents information on training, outlook, and earnings for several hundred occupations. *Exploring Careers*, Bulletin 2001, 1979, helps intermediate grade students bridge the gap between self-exploration and career exploration.)

Prospects for employment are only one factor to consider when choosing an occupation; however, it can be a crucial one. If a person is considering several similar occupations, the best choice may be the one that offers the best prospects for employment. Also, knowing that stiff competition will exist for certain jobs allows individuals to seek training that will give them a competitive advantage. To guage accurately future prospects for employment, individuals need estimates of labor demand and supply.

Information about the future demand for workers is provided in this bulletin in two ways. Chapter 2 discusses the employment outlook for 11 broad groups of occupations and provides an overview of the changes expected in the occupational structure of the economy during the 1980's. It should be particularly useful to individuals or counselors who are not well acquainted with the job market.

Chapter 4 contains detailed statistics of future demand for nearly 240 occupations, including 1978 employment estimates, projected 1990 employment requirements, percent change in employment between 1978 and 1990, and estimates of average annual openings due to employment growth and replacement needs. (The same information is presented in tabular form in appendix B.) These data were developed during the research for the 1980–81 *Occupational Outlook Handbook*. Individuals or counselors can use these data to compare various occupations by size (current and projected), growth rate, and number of job openings and to show the relative level of demand among occupations. For example, the rate of change of employment in all occupation can be compared with the average rate for all occupations. Rates faster than the average generally indicate occupations where demand conditions will be favorable.

Users of these data should be aware that the projections represent the level of employment required to produce an amount of goods and services implied by the Bureau's projections of the economy to 1990. These projections are based on certain assumptions. Some of

[1] *Counting the Labor Force* (National Commission on Employment and Unemployment Statistics, 1979) p. 106.

the assumptions are quantitative, such as the size of the population and the labor force, and the rate of unemployment. Others are qualitative, such as those concerning the institutional framework of the American economy; economic, social, technological, and scientific trends; and the fiscal and monetary policies of the government. (Appendix A presents assumptions and methods used to develop the projections.) Some of the assumptions that have significant effects on the projections, such as how energy needs of the United States will be met in 1990, cannot be made with precision because of the considerable uncertainty about the availability of certain types of energy. The result will depend largely on the policies of future administrations and the actions of foreign governments. Variations between the assumptions used by BLS and actual events, of course, will result in errors in the projections, and users are advised to evaluate these assumptions in any use of these projections.

It should be noted that the estimates of average annual openings do not include occupational transfers. When workers change occupations, they create openings in their old occupation and increase the supply of workers in the new one. Research has shown that occupational transfers are a larger source of job openings than economic growth and replacement needs combined. As a result of the omission of occupational transfers, the estimates of annual openings may understate the demand among the various occupations—particularly in some occupations with a high level of occupational transfers.

Estimates of future occupational demand comprise only half the information needed to evaluate employment prospects. To get the complete picture, individuals must know not only how many jobs will be available, but also how many people will seek those jobs. For each occupation, supply estimates should include (1) the number of persons completing training specifically designed to prepare them for work in that occupation, (2) the number completing related training, (3) the proportion completing training who will seek jobs in the occupation, (5) the number of persons currently not in the labor force who are qualified and who will seek jobs, (6) the number of immigrants who are qualified, and (7) the effect that changes in relative wages may have on each of the above categories.

The reliability of supply estimates varies among occupations. In general, the best data are available for occupations requiring specific training programs. The supply of physicians, for example, can be estimated with a high degree of confidence. Entry is limited to graduates of U.S. medical schools and qualified immigrants. And virtually all graduates and qualified immigrants become physicians. However, for many occupations—even those requiring formal training—data on completions and entry rates are limited, making accurate estimates of supply impossible.

Several types of occupational supply information are presented in this bulletin. Enrollment and completion data from current training programs are given in chapter 3. Chapter 4 presents a comprehensive supply-demand analysis for college graduates as a whole, and for the occupations where supply data are adequate. In addition, for each occupation covered in this publication, chapter 4 gives available data on completions of related training programs. (The data are presented in tabular form in appendix C.)

Qualitative training information

Choosing a course of training is a major step toward a career. Training is available from a wide variety of sources: Colleges and universities, junior and community colleges, apprenticeship and other formal employer training programs, correspondence schools, public and private vocational schools, the Armed Forces, and government employment training programs. Although employers often prefer one form of training and some occupations have rigid training requirements, several types of training are acceptable for most occupations. For example, unions recommend a 4-year apprenticeship for carpenters, but many workers learn the trade informally on the job. Lack of money, time, or geographic mobility can limit the training options available to an individual. Knowing the alternatives, however, enables individuals to balance the training requirements of the job with their own circumstances.

Chapter 3 provides general descriptions of current occupational training programs. In addition, chapter 4 provides a brief discussion of the training required for each occupation covered in this publication, giving both the preferred and the alternate method where applicable.

Uses in planning and evaluating training programs

Education and training officials use occupational supply and demand information in planning and evaluating programs. In fact, Congress has specified in legislation that government training programs and vocational education should be planned on the basis of information on employment prospects. Because the data in this bulletin reflect the national situation, it cannot be the sole basis for State and local area planning. Nevertheless, persons responsible for evaluating training programs cannot ignore national projections in a Nation where workers frequently move from one area to another. Because of this mobility, the National Commission on Employment and Unemployment Statistics questioned the desirability of planning vocational

education solely on the basis of the job prospects in a single community.[2]

To meet the need for local data, the Bureau of Labor Statistics, in cooperation with the Employment and Training Administration and State employment security agencies, conducts the Occupational Employment Statistics program. Under this program, occupational projections are prepared by State agencies, using procedures developed by the BLS. Information on the availability of data for individual States can be obtained from the State agencies listed in appendix D.

Readers who desire more information on occupational training than this summary bulletin can provide may wish to consult the bibliography in appendix E for other sources. The bibliography also lists selected sources of information on earnings and other data related to occupations that may be helpful.

[2]*Counting the Labor Force*, p. 110.

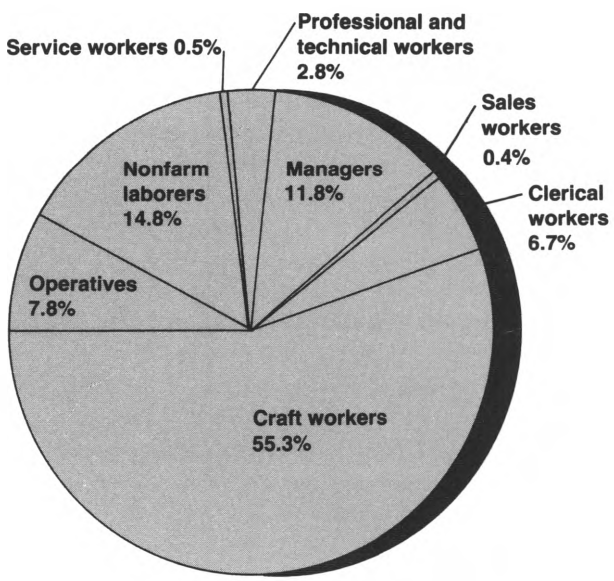
Chapter 2. Occupational Projections

Many factors interact in the economy to change employment levels in occupations. Because total employment in an occupation is determined by the demand from all industries using workers with those particular skills, a key factor is change in the demand for the goods and services produced by these industries. Generally, a rise in the demand for an industry's products will cause a rise in that industry's employment, and a drop in demand, a decline. The precise effects of changes in industry employment upon occupational employment will depend on the occupational structure of the industries and on factors that alter the occupational structure, such as technological and business innovations.

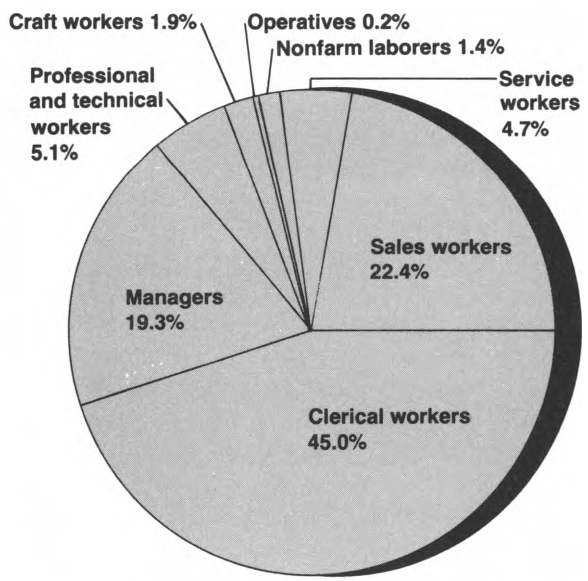
As shown in chart 1, industries differ greatly in the types of workers they employ. In 1978, for example, craft workers constituted about 55 percent of the work force of the construction industry, but only 2 percent in finance, insurance, and real estate. Should the demand for new houses and office buildings rise, the overall demand for workers in the construction industry would rise, and employment of craft workers also would increase. In contrast, even if the demand for banking and insurance services skyrocketed, employment of craft workers would change little.

The introduction of a new technology can alter the mix of workers employed by industries and affect the level of employment in several occupations. The use of

Chart 1. Construction and finance, insurance, and real estate industries differ substantially in the kinds of workers they employ



Construction



Finance, insurance, and real estate

Source: Bureau of Labor Statistics.

automated machinery in a manufacturing industry can decrease the need for machine operators while increasing employment of maintenance mechanics. In many industries, the introduction of the computer gave birth to an entire group of occupations—programmers, systems analysts, and peripheral equipment operators. Yet this change often decreased the need for inventory clerks, bookkeepers, and other workers.

Changes in business organization and operation also can alter the demand for workers. As more stores, restaurants, motels, and other enterprises have become chain operations, the number of salaried managers has grown, while the number of self-employed managers has declined. In another instance, the trend toward self-service has slowed employment growth of retail clerks and gas station attendants.

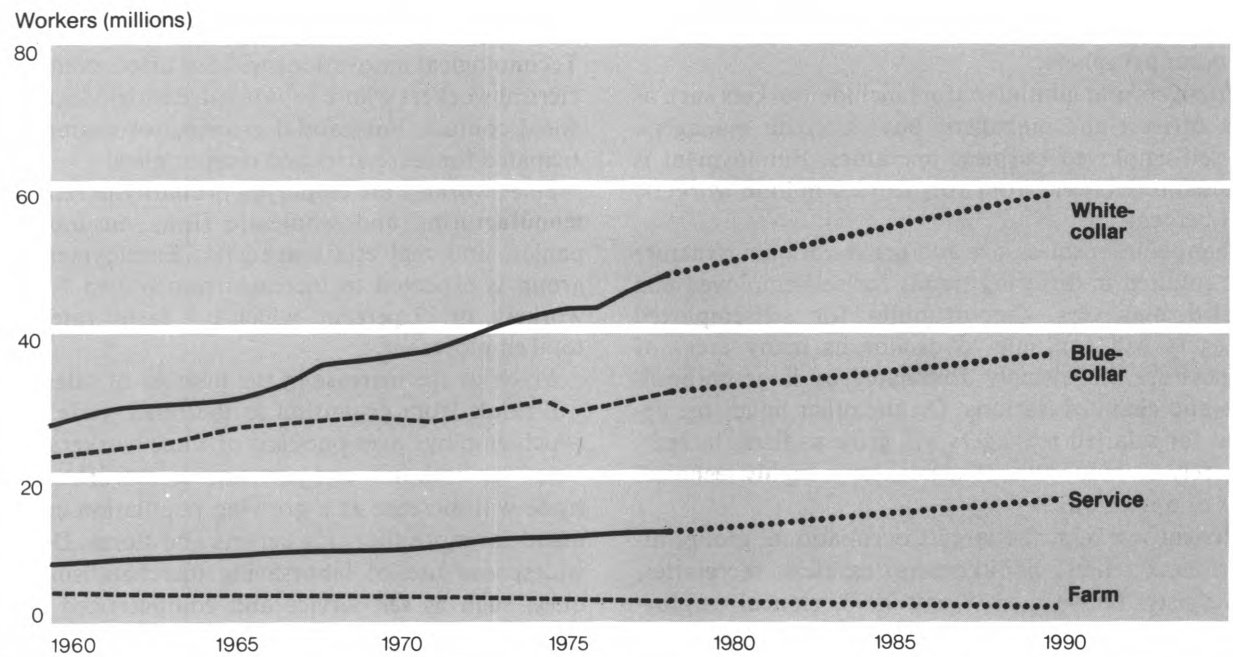
This chapter presents the BLS projections for major occupational groups through the 1980's. Information on the general methodology and assumptions used by the Bureau in developing its employment projections is provided in appendix A. Projections for individual occupations are presented in appendix B. A detailed discussion of the development of projections for the aggregate economy and for employment projections by industry appears in *Employment Projections for the 1980's*, Bulletin 2030.

Occupational profile

Customarily, occupations are divided into four broad categories: (1) White-collar—professional and technical, clerical, sales, and managerial jobs; (2) blue-collar—craft workers, operatives, and laborers; (3) service workers; and (4) farm workers. Changes in employment among these groups have differed markedly, as shown in chart 2. Once a small proportion of the total employed, white-collar workers now represent about one-half of the total. The number of service workers also has risen rapidly, while the number of blue-collar workers has increased at a slower rate, and the number of farm workers has declined. The following sections describe expected changes in employment among the broad occupational groups between 1978 and 1990. (See table 1.)

Professional and technical workers include a wide range of workers, many of whom are highly trained. Among this group are scientists and engineers, medical practitioners, teachers, and accountants. Employment in this group is expected to rise from 14.2 to 16.9 million workers, or about 19 percent, between 1978 and 1990, slightly less than the rate of growth expected for all occupations (20.7 percent).

Chart 2. Through the 1980's, over half of all workers will have white-collar jobs



Source: Bureau of Labor Statistics.

Table 1. Projected change in employment and job openings, by major occupational group, 1978–90

[Numbers in thousands]

Occupational group	1978 employment	Projected 1990 employment	Percent change 1978–90	Openings, 1978–90		
				Total	Growth	Replacement[1]
Total	94,373	114,000	20.8	66,400	19,600	46,800
White-collar workers	47,205	58,400	23.6	36,800	11,200	25,600
Professional and technical workers	14,245	16,900	18.3	8,300	2,600	5,700
Managers and administrators, except farm	10,105	12,200	20.8	7,100	2,100	5,000
Sales workers	5,951	7,600	27.7	4,800	1,700	3,100
Clerical workers	16,904	21,700	28.4	16,600	4,800	11,800
Blue-collar workers	31,531	36,600	16.1	16,200	5,100	11,100
Craft workers	12,386	14,900	20.0	7,000	2,500	4,500
Operatives, except transport	10,875	12,500	15.0	5,600	1,600	4,000
Transport operatives	3,541	4,100	16.2	1,700	1,600	1,100
Nonfarm laborers	4,729	5,100	8.1	2,000	400	1,600
Service workers	12,839	16,700	29.9	12,200	3,800	8,400
Private household workers	1,162	900	−23.2	500	−300	800
Other service workers	11,677	15,800	35.2	11,700	4,100	7,600
Farm workers	2,798	2,400	−15.9	1,300	−400	1,700

[1]Due to deaths, retirements, and other separations from the labor force. Does not include occupational transfers.

NOTE: Detail may not add to totals because of rounding.

Greater efforts in energy production, transportation, and environmental protection will contribute to a growing demand for scientists, engineers, and technicians. The medical professions can be expected to grow as the health service industry expands. The demand for professional workers to develop and utilize computer resources also is projected to grow rapidly.

Some occupations will offer less favorable job prospects, in many cases because the supply of workers exceeds available openings. Teachers will continue to face competition, as will artists, entertainers, airline pilots, and oceanographers.

Managers and administrators include workers such as bank officers and managers, buyers, credit managers, and self-employed business operators. Employment is expected to increase from 10.1 to 12.2 million workers, or 21 percent.

Changes in business size and organizational structure have resulted in differing trends for self-employed and salaried managers. Opportunities for self-employed managers will continue to decline as many areas of business are increasingly dominated by large corporations and chain operations. On the other hand, the demand for salaried managers will grow as firms increasingly rely on management specialists in highly technical areas of operation.

Clerical workers, the largest occupational group, include bank tellers, bookkeepers, cashiers, secretaries, and typists. Between 1978 and 1990, clerical employment is projected to rise from 16.9 to 21.7 million, or about 28 percent.

New developments in information processing equipment will affect employment in various occupations within this group. For example, the more extensive use of computers to store information and for billing, payroll, and other clerical calculations will limit employment opportunities for file clerks and office machine operators. At the same time, however, the need for computer and peripheral equipment operators will increase. Dictation machines, which have sharply reduced the need for stenographers, will continue to affect adversely employment prospects in that occupation. Technological innovations will not affect many types of clerical workers whose jobs involve a high degree of personal contact. Substantial growth, for example, is anticipated for secretaries and receptionists.

Sales workers are employed primarily in retail stores, manufacturing and wholesale firms, insurance companies, and real estate agencies. Employment in this group is expected to increase from 6.0 to 7.6 million workers, or 27 percent, which is a faster rate than for total employment.

Much of the increase in the number of sales workers will result from expansion in the retail trade industry, which employs over one-half of these workers. The demand for both full- and part-time sales workers in retail trade will increase as a growing population creates demand for more shopping centers and stores. Despite the widespread use of laborsaving merchandising techniques, such as self-service and computerized checkout procedures, more stores and longer hours will cause employment to increase.

Craft and kindred workers include a wide variety of highly skilled workers, such as automobile mechanics, carpenters, electricians, machinists, and tool-and-die makers. Employment of craft workers is expected to increase from 12.4 to 14.9 million, or about 20 percent.

Construction occupations and mechanics and repairers, the two largest occupational categories within the craft group, are expected to account for about two-thirds of the group's employment gain, and blue-collar worker supervisors and metalcraft workers for most of the remainder.

Employment in nearly all construction trades is expected to grow, but particularly large increases are anticipated for heavy equipment operators, electricians, plumbers, and pipefitters. Among mechanics and repairers, employment will increase most among workers who repair automobiles, computers and office machines, appliances, and industrial machinery.

In contrast, the long-run employment decline in the railroad industry will lead to the decline of some craft occupations concentrated in that industry, such as railroad and carshop repairers. Similarly, very little growth is expected in printing craft occupations because of advances in printing technology.

Operatives include production workers, such as assemblers, production painters, and welders. Employment of operatives is expected to rise from 10.9 million to 12.5 million workers, or about 15 percent.

Employment of operatives is tied closely to the production of goods, because the majority of these workers are employed in manufacturing industries. The projected slow growth of some manufacturing industries, along with improved production processes, will hold down the demand for many types of operatives. Employment of some textile operatives, for example, is expected to decline due to increasing use of machinery in the textile industry.

Transport equipment operatives include workers who drive buses, trucks, forklifts, and taxicabs. Employment of most transportation operatives will increase slowly along with employment in the transportation industry as a whole. Some occupations such as switch operators are expected to decline. Between 1978 and 1990, the number of transport operatives will rise from 3.5 to 4.1 million, an increase of 17 percent.

Laborers (except farm) include workers such as garbage collectors, construction laborers, freight and stock handlers, and vehicle washers and equipment cleaners. Employment in this group is expected to grow only slowly as machinery increasingly replaces manual labor in construction and manufacturing, the two industries employing most of these workers. For example, power-driven equipment will handle more and more materials in factories, warehouses, and on construction sites, and more companies will install integrated systems to process and convey materials and equipment. Over the 1978 to 1990 period, employment of laborers is expected to rise from 4.7 to 5.1 million, or about 9 percent.

Private household service workers include housekeepers, child care workers, and caretakers. The employment of private household workers will decline about 26 percent from 1.2 million to 890,000 workers. Despite a rising demand for their services, low wages and lack of advancement opportunities make these occupations unattractive to most people.

Service workers include a wide range of workers —firefighters, janitors, cosmetologists, and bartenders are a few examples. Employment of service workers has increased more than any other occupational group in recent years. Some of the factors that are expected to continue this increase are the rising demand for commercial cleaning and protective services, and more frequent use of restaurants, beauty salons, and leisure services as incomes rise. Between 1978 and 1990, employment of service workers is expected to rise 35 percent, from 11.7 million to 15.8 million workers.

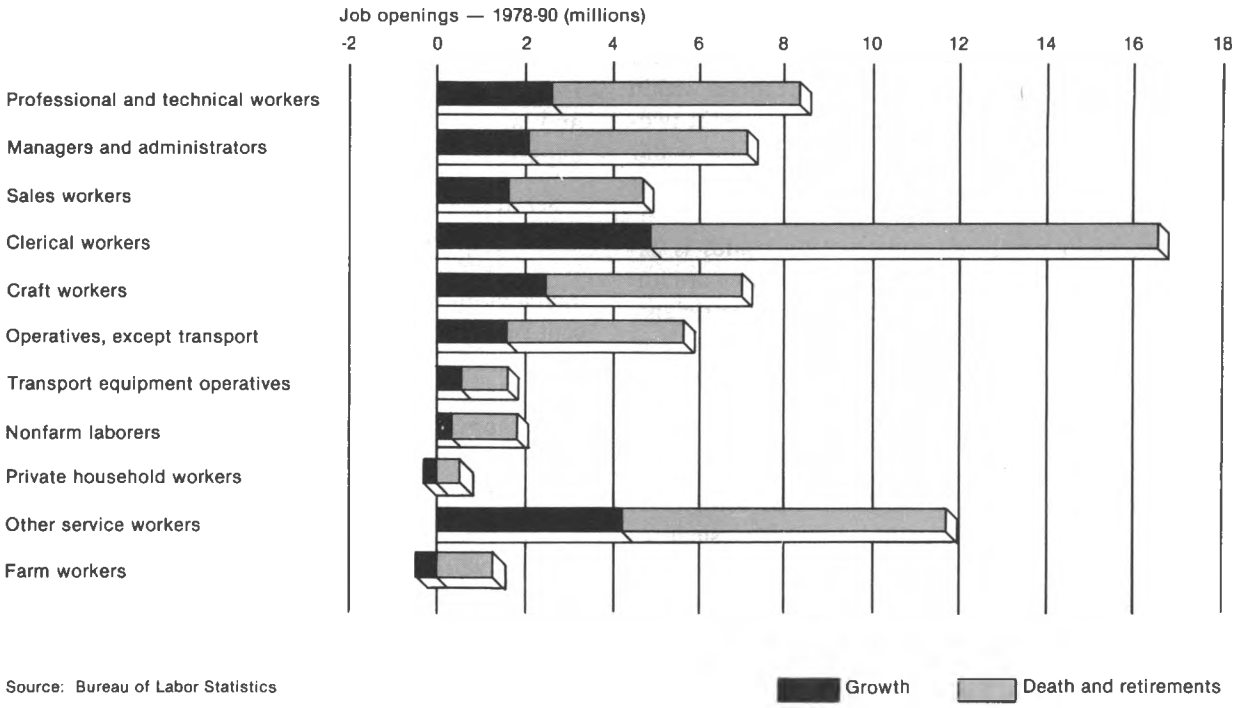
Farm workers include farmers and farm operators, as well as farm laborers. Employment of these workers has declined for decades as farm productivity has increased due to the trend toward fewer but larger farms; the use of more and better machinery; and the development of new feeds, fertilizers, and pesticides. Between 1978 and 1990, the number of farm workers is expected to decline from 2.8 million to 2.4 million workers, a drop of about 14 percent.

Job openings, 1978–90

Changes in employment growth represents only part of the demand for workers in an occupation. The need to replace workers who die, retire, temporarily leave the labor force, or transfer to another occupation creates many job openings. Between 1978 and 1990, replacement needs resulting from deaths and retirements alone are expected to be more than double the number of openings resulting from increases in employment (chart 3). Although data are not available to estimate other replacement needs, research findings indicate that occupational transfers and temporary labor force separations are a larger source of job openings than employment growth, deaths, and retirements combined.

The relationship of occupational transfers and employment is complex and not completely understood. However, research indicates that the number of transfers varies inversely with the amount of training required in an occupation. Workers who have minimal training—salesclerks, machine operators, and laborers, for example—lose little by transferring to another occupation. For workers who have taken extensive training—physicians, engineers, and bank managers—transferring means loss of the time and money spent on their training. It also may mean a cut in pay.

Chart 3. Many job openings are created by replacement needs and employment growth



Source: Bureau of Labor Statistics

Because the transfer of workers among occupations is a major source of both job openings and new entrants, the exclusion of occupational transfers from estimates of job openings is a serious limitation. Research to improve data on occupational transfers is continuing.

Chapter 3. Occupational Training

The potential supply of workers for any occupation consists of persons currently employed in that field, plus individuals from other sources. They may be graduates of programs specifically designed to train workers for the occupation, or graduates of training programs for related fields. They may be persons who possess the necessary qualifications but who are employed in other occupations, unemployed, or not in the labor force. They also may be persons who will immigrate.

To determine supply, one must know not only the number of persons who would fall in each category, but also the proportion who actually will seek jobs in the occupation. In general, far more data are available on the number completing formal training programs than on any other component of supply.[3]

The supply of physicians, for example, can be gauged with some confidence. Entry is limited to graduates of U.S. medical schools and qualified immigrants, and virtually all graduates and qualified immigrants become physicians. Therefore, only projections of medical school graduates plus projections of qualified immigrants are needed to specify supply. Good data are available on medical degrees granted in the past, and M.D. degrees are projected through fairly reliable methods. Good historical data on immigrant physicians also are available on which to base projections.

There are several other occupations for which sufficient data are available to specify future supply, but the estimates must be used cautiously because some of the components of supply are difficult to project. For example, in engineering, the primary source of supply is new graduates of engineering schools and historical data on degrees granted are available on which to base degree projections. Sufficient data also are available to develop estimates of the proportion of new graduates who can be expected to enter engineering. In the past, however, a large number of workers also have entered engineering from other sources, including new college graduates with degrees in related fields such as mathematics and the physical sciences, transfers from other occupations, and immigrants. Prospective supply from these sources can be projected based on past trends, but because the number of entrants depends on the relative wages among related occupations and the availability of jobs in engineering versus related fields, accurately estimating this component of supply is very difficult.

For many other occupations that require formal training, adequate analyses of supply are impossible because only limited data on training completions and entry rates are available. Usually, these occupations can be filled by workers from many different training programs, and a significant portion of training takes place on the job. Among this group are many professional and administrative fields, such as marketing and personnel work, and most skilled craft occupations, such as carpenters and television and radio repairers.

Finally, there are many occupations for which comprehensive supply analyses are meaningless because, in comparison to the number of job openings available, many workers possess entry level skills. Examples of these occupations are receptionist, retail clerk, and assembler.

This chapter presents information on one component of supply—structured training programs. It describes current programs and highlights enrollment and completion data for each. Detailed estimates are presented in appendix C. Training programs discussed are:

Public vocational education
Private vocational education
Employer training
Apprenticeship programs
Federal employment and training programs
Armed Forces training
Home study schools
Community and junior colleges
Colleges and universities

Public vocational education

Vocational education in the public schools originated with the Smith-Hughes Act of 1917. Subsequent legislation included the George-Barden Act (1941), which called for expanded occupational training and increased expenditures for vocational education; the Vocational Education Act of 1963, which provided for research and

[3]A detailed discussion of occupational supply is presented in *Occupational Supply: Concepts and Sources of Data for Manpower Analysis*, BLS Bulletin 1816 (Bureau of Labor Statistics, 1974).

construction for the first time; and the Vocational Education Amendments of 1968, which added new programs and money while changing the philosophical emphasis of vocational education to focus on the needs of individuals rather than on specific occupational areas. The 1963 law and its 1968 amendments not only provided for increased enrollments and expenditures but improved the quality and expanded the scope of vocational programs. Further amendments in 1976 set up improved data collection systems for vocational education.

Vocational education is conducted on three levels—secondary, postsecondary, and adult vocational and technical programs. Secondary vocational education is provided to high school students as part of the curriculum and includes academic as well as vocational courses. Postsecondary vocational education is intended for persons who have completed or left high school and includes those who are enrolled in programs leading to an associate or other degree below the baccalaureate. Adult vocational and technical programs retrain as well as update and improve skills of persons already in the labor force.

Types of training available. Originally, vocational education emphasized agricultural, trade, and industrial education. At present, it also includes areas such as distribution, health, home economics, and office and technical occupations. Other programs that are offered, such as consumer and homemaking training and industrial arts, do not generally lead directly to an occupational skill. Special vocational programs for the disadvantaged and handicapped also are provided.

Curriculums generally prepare trainees for specific occupations. Table 2 records examples of instructional programs related to job titles in the *Dictionary of Occupational Titles*.

Enrollments. Vocational education grew rapidly after the Vocational Education Act of 1963, and further growth took place after passage of the 1968 amendments (table 3). Enrollments in federally aided vocational-technical education programs in 1978 totaled 16.7 million persons, including 1.8 million disadvantaged and nearly 355,000 handicapped. Of the major vocational areas leading to an occupational skill, the largest enrollments were in the office and trades and industry groups, which enrolled 3.3 million and 3.4 million students, respectively. Consumer and homemaking vocational education enrolled 3.7 million students; however, this type of training is unlikely to lead to gainful employment (table 4).

Specific program enrollments varied from several hundred to several hundred thousand with most of the large groups in office occupations. For example, filing, office machine, and clerical programs enrolled 720,000 students; secretarial programs, 700,000; accounting and computing programs, 590,000; and typing programs, 585,000. Within the agricultural sector, agricultural production enrolled nearly 530,000 students. (See appendix table C-7.)

Table 2. Examples of curriculums offering training for specific occupations

Major vocational area	Instructional program	Occupational title
Agriculture	Agricultural mechanics	Farm equipment mechanic
	Soil	Soil conservationists
	Forestry	Forestry aid
Distribution	Floristry	Floral designer
	Distributive services	Purchasing agent
	Recreation and tourism	Recreation director
Health	Dental assistant	Dental assistant
	Medical lab assisting	Medical lab assistant
	Occupational therapy	Occupational therapy aide
Home economics	Care and guidance of children	Child care attendant
	Food management, production, and services	Cook
Office	Peripheral equipment operator	High-speed printer operator
	Secretaries	Legal secretary
	Quality control clerk	Claim examiner
Technical	Commercial pilot training	Commercial airplane pilot
	Electronic technology	Electrical technician
	Scientific data processing	Programmer, engineering and scientific
Trades and industry	Body and fender repair	Automobile body repairer
	Aircraft operation	Flight engineer
	Product design	Industrial designer

SOURCE: *Vocational Education and Occupations*, OE80061 (U.S. Department of Health, Education, and Welfare, Office of Education; and U.S. Department of Labor, Manpower Administration), July 1969.

Table 3. Enrollments in public vocational education, by level, fiscal years 1963–78

Fiscal year	Total[1]	Secondary	Post-secondary	Adult
1963	4,217,198	1,950,016	144,060	2,123,122
1964	4,566,390	2,140,756	170,835	2,254,799
1965	[2]5,430,611	2,819,250	207,201	2,378,522
1966	[2]6,070,059	3,048,248	442,097	2,530,712
1967	[2]7,047,501	3,532,823	499,906	2,941,109
1968	[2]7,533,936	3,842,896	592,970	2,987,070
1969	[2]7,979,366	4,079,395	706,085	3,050,466
1970	8,793,960	5,114,451	1,013,426	2,666,083
1971	10,495,411	6,494,641	1,140,943	2,859,827
1972	11,602,144	7,231,648	1,304,092	3,066,404
1973	12,072,445	7,353,962	1,349,731	3,368,752
1974	13,555,639	8,433,750	1,572,779	3,549,110
1975	15,340,426	9,426,376	1,889,946	4,024,104
1976	15,133,322	8,860,947	2,202,800	4,069,575
1977	16,134,979	9,562,836	2,363,194	4,208,949
1978	16,704,926	10,236,117	2,089,170	4,379,639

[1]Unduplicated total.
[2]Includes enrollments in special needs programs as follows: 1965, 25,638; 1966, 49,002; 1967, 73,663; 1968, 111,000; 1969, 143,420.
SOURCE: *Summary Data, Vocational Education, Fiscal Years 1963-78* (U.S. Department of Education, Bureau of Occupational and Adult Education).

Table 4. Enrollments in public vocational education, by major vocational education area, fiscal year 1978

Vocational education area	Number	Percent distribution
Total enrollment	17,598,619	100.0
Number of students[1]	16,704,926	
Agribusiness	1,006,542	5.7
Distribution	962,009	5.5
Health	758,808	4.3
Home economics	459,590	2.6
Office	3,312,475	18.8
Technical	527,681	3.0
Trades and industry	3,402,722	19.3
Consumer and homemaking	3,659,441	20.8
Special programs[2]	3,509,351	19.9

[1]Unduplicated total.
[2]Includes prevocational, prepostsecondary, remedial, industrial arts, volunteer firefighters, and other programs not elsewhere classified.
NOTE: Detail does not add to totals because of rounding.
SOURCE: U.S. Department of Education, Bureau of Occupational and Adult Education.

Table 5. Number and distribution of private, postsecondary, noncollegiate schools with occupational programs, by type of schools, 1977–78

Type of school	Number of schools	Percent
Total	6,813	100.0
Allied health	241	3.5
Arts/design	246	3.6
Business/office	1,245	18.3
Cosmetology/barber	2,163	31.7
Flight	1,059	15.5
Hospital	770	11.3
Technical institute	92	1.4
Trade	702	10.3
Vocational/technical	102	1.5
Other	193	2.8

NOTE: Detail does not add to totals because of rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics.

Completions and placements. Of the nearly 2,225,000 persons completing programs during 1978, about 1,200,000, or 54 percent, were available for employment. Followup studies of graduates indicate that of those available for employment or placement, 64.8 percent were employed full time in the field in which they trained or in a related field, 25.7 percent obtained other employment, and 9.5 percent were unemployed. Of the remaining 1,020,000 completing programs, about 24 percent were not available for placement (many continued their schooling), and 22 percent did not report or their status was unknown.[4]

Private vocational education

In 1978, the National Center for Education Statistics (NCES) surveyed all private, postsecondary, and noncollegiate vocational schools (6,813) and recorded 1,043,000 enrollments in 175 different programs. Although the distribution of schools varied significantly by program area, cosmetology/barber schools, business/office schools, and flight schools accounted for about two-thirds of all schools (table 5).

Most private vocational schools enroll fewer than 100 students, although some of the largest have considerably more. Large schools typically offer a variety of programs in several vocational areas. Some business schools, for example, offer shorthand, typing, stenography, and fundamentals of accounting and computer operations, while many trade schools offer courses ranging from air-conditioning installation and repair to welding and cutting operations. On the other hand, small schools generally specialize in a single type of program, such as commercial pilot training or radiologic technology. Some programs—flight training, for example—require considerable individual attention and generally have low pupil/teacher ratios, while less technically complex programs, such as real estate, can accomodate large numbers of students. Data showing the relative size of the 12 most popular programs during 1977–78 are shown in table 6.

Enrollments. Enrollments vary not only by program but also by major field. Private vocational education courses are classified into seven areas similar to those used for public vocational education programs: Agribusiness, marketing/distribution, health, home economics, business/office, technical, and trades and industry. In 1977–78, about 37 percent of all students in private vocational education were in trades/industry programs, another 23 percent were in business/office training, and about 17 percent were in marketing/distribution programs (table 7).

Table 6. Total number of private vocational programs and the distribution of programs and students for selected private vocational education areas, 1977–78

Program	Total number of programs offered	Percent distribution of total programs	Percent distribution of students
Total	14,600	100	100
Cosmetology	2,354	16	14
Commercial pilot	2,255	15	7
Secretary	1,957	13	9
Accounting	793	5	3
General office	536	4	2
Data processing	527	4	5
Nursing	423	3	6
X-ray technology	398	3	1
Apparel	317	2	3
Commercial art	268	2	2
Real estate	222	2	14
Autoworker	221	2	3

SOURCE: U.S. Department of Health, Education, and Welfare, National Center for Education Statistics.

[4]*Summary Data, Vocational Education, Fiscal Year 1978* (U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Occupational and Adult Education, Program Year 1978).

Completions. Nearly 285,000 completions were reported from private vocational educational programs during 1977–78. Trades/industry programs had the greatest number of completions while marketing/distribution programs had the highest percent of completions. Business/office programs had the lowest completion rate. (See table 7 and appendix table C-8 for further detail.)

Table 7. Enrollments and completions in private, postsecondary, noncollegiate vocational education programs, by major vocational field, 1978

[Numbers in thousands]

Major field	Enrollments	Completions	Percent completions
All programs	451.1	284.0	63
Agribusiness	.7	.5	76
Marketing/distribution	78.0	63.4	81
Health	70.2	38.5	55
Home economics	1.0	.5	54
Business/office	101.9	48.2	47
Technical	32.1	20.2	63
Trades/industry	167.3	112.6	67

NOTE: Detail may not add to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Employer training

Many companies in private industry have developed educational training programs to meet their various business needs. Generally, these programs serve three purposes: (1) To train new employees, (2) to improve the performance of employees in their present jobs, and (3) to prepare employees for new jobs and responsibilities.

Training varies among occupations. Skilled and semiskilled occupations have three on-the-job training paths—apprenticeship, structured on-the-job instruction, and learning by doing. Structured instruction may range from scheduled training conducted by designated instructors to periodic training from supervisors and fellow employees. Unstructured training often involves simple directions on how to perform a routine task on a machine; further skills then are acquired or developed at the employee's initiative.

White-collar employees also may receive structured training. In larger companies, structured training usually consists of "in-house" programs that offer courses either during or after working hours. These courses normally are designed to meet specific company needs and often are offered by professional associations. In the banking industry, for example, the American Institute of Banking offers programs in 12 areas of banking, such as trusts, commercial lending, and bank marketing.

In addition, companies may allow employees to enroll in college or university courses. For example, under the tuition-aid program, employees may be partially or fully reimbursed for job-related courses taken after working hours. Occasionally, employees are permitted to take outside courses on company time or even to arrange for extended educational leaves of absence.

Limited data indicate that companies use education and training programs quite extensively. In a 1975 survey of firms with 500 or more employees, the Conference Board[5] found that of the 32 million employed, 4.3 million participated in "in-house" company programs, and 1.25 million were in tuition-aid programs. Although firms with fewer than 500 employees often do not have the resources to develop "in-house" programs, tuition-aid programs are not uncommon among these companies.

The lack of data on employer training hinders detailed analysis of occupational training and supply, however. The BLS, with the support of the Employment and Training Administration (ETA), conducted a pilot survey in 1970 to test the feasibility of collecting data on occupational training in selected industries, and to determine the best method of collecting such data.[6] The results encouraged the Bureau, with further support from the ETA, to conduct a nationwide, full-scale mail survey of employer training in nearly 5,000 establishments in 1975 and early 1976. The resulting report, published in 1977, describes the characteristics of occupational training provided by employers in 14 selected occupations in four metalworking industries.[7]

Although narrow in scope, the study presents characteristics of training programs never before documented, along with enrollment and completion data. Some highlights from the BLS/ETA training survey follow:

1. Only 15 percent of all establishments in the four metalworking industries selected provided structured occupational training in the 14 occupations studied.
2. Establishments with 1,000 employees or more accounted for 44 percent of all enrollments in structured training.
3. About 71 percent of all structured training was conducted to qualify employees for work in an occupation whereas 29 percent was to improve current job skills.
4. More than two-thirds of all structured occupational training was provided on the job.

[5]Seymour Lusterman, *Education in Industry*, Report 719 (New York, The Conference Board, Inc., 1977).

[6]"The BLS Pilot Survey of Training in Industry," *Monthly Labor Review*, February 1974, pp. 26-32.

[7]*Occupational Training in Selected Metalworking Industries: A Report on a Survey of Selected Occupations, 1974*, BLS Bulletin 1976/ETA R&D Monograph 53 (U.S. Department of Labor, Bureau of Labor Statistics and Employment and Training Administration, 1977).

5. Establishments provided training primarily because they felt job skills could best be taught in their own training programs and because employees' education or training was inadequate.
6. Employee interest in an occupation was the primary factor used to select employees for training.

Apprenticeship programs

Training authorities generally recommend apprenticeship as the best way to acquire all-round proficiency in a craft. Most apprenticeships range from 1 to 5 years, depending upon the particular trade involved. The programs involve planned on-the-job training and experience, with instruction and required supervision, combined with technical studies in subjects related to the trade. Mastery of a particular trade requires: (1) Learning the skills of the trade, (2) perfecting the use of each specific skill, and (3) bringing each skill up to the speed and accuracy required of the job.

Many apprenticeship programs have committees of employers and local trade unions that interview applicants, review the apprentice's progress, and determine when apprenticeship has been completed satisfactorily. Many programs are registered with Federal and State apprenticeship agencies, but sponsors are not required to register their programs. No estimate is available of the number of apprentices in programs that are not registered.

The Department of Labor's Bureau of Apprenticeship and Training (BAT) registers, but does not finance, apprenticeship programs.[8] BAT provides technical assistance and support to State apprenticeship agencies and to employers and unions in establishing and maintaining apprenticeship programs. In addition, BAT maintains records of new registrations, completions, and cancellations of apprenticeships for each apprenticeable trade by State (table 8).

Of the 50,464 registered apprenticeship completions in 1978, about 60 percent were in construction trades, 12 percent in metalworking, 2 percent in printing, 4 percent in personal services, and the remaining 22 percent in miscellaneous trades. (See appendix tables C-1 and C-4.) Since recording of apprentice data began in 1941, over 1 million apprentices have completed training, and apprenticeship training continues to be an important source of skilled workers.

Although apprenticeship cancellations represent a potential loss of highly trained workers, many dropouts eventually become skilled craft workers through less structured means. In many instances, particularly when jobs are plentiful, apprentices drop their apprenticeship in favor of earning a skilled worker's wage immediately. When the job market is depressed, however, they are more likely to complete their apprenticeships.

[8] *Apprentice Registration Actions, by Region and State* (annual) may be obtained from Division of Reporting Operations, Employment and Training Administration, U.S. Department of Labor, Washington, D.C. 20210. In addition, the annual *Employment and Training Report of the President* contains a tabulation of the training status of registered apprentices.

Table 8. Training status of registered apprentices in all trades, 1960–78

Year	In training at end of year	Apprentice actions during year			In training at beginning of year
		New registrations and reinstatements	Completions	Cancellations[1]	
1960	172,161	54,100	31,727	33,406	161,128
1961	161,128	49,482	28,457	26,414	155,649
1962	155,649	55,590	25,918	26,434	158,887
1963	158,887	57,204	26,029	26,744	163,318
1964	163,318	59,960	25,744	27,001	170,533
1965	170,533	68,507	24,917	30,168	183,955
1966	183,955	85,031	26,511	34,964	207,511
1967	207,511	97,396	37,299	47,957	220,151
1968	[2]207,517	111,012	37,287	43,246	237,996
1969	237,996	123,163	39,646	47,561	273,952
1970	[2]269,626	108,779	45,102	53,610	279,693
1971	[2]278,451	78,535	42,071	43,104	274,024
1972	[2]247,840	103,527	53,059	56,750	264,122
1973	[2]243,956	133,258	43,580	49,860	283,774
1974	[2]280,965	112,830	46,454	56,292	291,049
1975	[2]284,562	83,018	45,765	55,338	266,477
1976	[2]265,647	88,418	49,447	49,650	254,968
1977	253,993	107,897	54,347	44,957	262,586
1978	263,660	131,139	50,464	54,111	290,224

[1] Includes voluntary quits, layoffs, discharges, out-of-State transfers, upgrades within certain trades, and suspensions or interruptions for military service.

[2] Reflects changes or revisions in the reporting system from previous year.

SOURCE: U.S. Department of Labor, Bureau of Apprenticeship and Training.

Federal employment and training programs

The Federal Government has conducted structured employment and training programs since the enactment of the Manpower Development and Training Act (MDTA) of 1962. With the passage of the Comprehensive Employment and Training Act (CETA) of 1973 and the CETA amendments of 1978, programs were decentralized. Although the Federal Government has retained a few programs, such as the Work Incentive (WIN) Program, most Federal employment and training funds now are distributed to State and local governments, along with the responsibility for planning and managing these programs.

Comprehensive Employment and Training Act (CETA). Under CETA, all States, cities, and counties, with populations of 100,000 or more receive Federal grants to run comprehensive employment and training programs in their localities. Some smaller units and rural areas also qualify for Federal allocations. In fiscal year 1978, about 459 eligible units called prime sponsors received funds to provide some of the services or to contract with others. The amount each prime sponsor receives is based upon its current population, unemployment rate, training needs, and number of economically disadvantaged persons.

To receive Federal funds, every eligible sponsor must submit a comprehensive plan describing its area, the services to be provided, and persons to be served. To the maximum extent feasible, employment and training services, including the development of job opportunities and placement in public service jobs, are provided for unemployed, underemployed, and economically disadvantaged persons.

Every State and area that operates a comprehensive employment development program must have a planning council whose members represent clients, labor, business, education, community organizations, the employment services, training agencies, and, where appropriate, agriculture. The councils help governments decide on the services needed and check on program operations. Those prime sponsors operating programs funded under Title VII (Private Sector Initiative Program) must also have a private industry council (PIC).

In fiscal year 1978, CETA served about 2.6 million individuals, not counting nearly a million youth in subsidized summer jobs. About 23 percent received classroom training, 8 percent obtained on-the-job training, 47 percent were in public service employment, and 19 percent were provided work experience. The remaining 3 percent received a variety of services designed to improve their employability.

Of the 1,638,200 persons who left the various programs during the fiscal year, 40 percent entered unsubsidized employment, 22 percent returned to school or entered other training programs, and 38 percent dropped out or were dismissed.

Work Incentive (WIN) Program. The WIN Program helps employable recipients of Aid to Families with Dependent Children (AFDC) get and keep jobs. WIN, created by 1967 amendments to the Social Security Act, was significantly changed by 1971 amendments. The revised program has been referred to as WIN II.

WIN, which is administered jointly by the Department of Labor and the Department of Health and Human Services through State employment services and welfare agencies, provides job development services and referrals and helps to provide employment, subsidizes employment, and provides limited training and supportive services, as needed.

After an interview to determine a person's job potential and needs, an employability plan is started to identify the services and activities needed to get a job. WIN tries to place people in unsubsidized jobs. Of the 1,013,247 persons registered during the 1978 fiscal year, 29 percent were placed in unsubsidized jobs and 19 percent in work and training programs.

Job Corps. The Jop Corps assists youth between 16 and 21 years of age, mostly school dropouts, who have poor educational records and who are "economically disadvantaged," to become more employable and productive. The program provides basic educational and vocational skills as well as social skills and counseling, medical, dental, and other support. The Job Corps differs from other Federal employment programs in that centers provide residential living 24 hours a day, 7 days a week. Centers vary in enrollment from 170 to 2,600 and serve men, women, or both; they may be urban or rural.

At the beginning of the fiscal year ending September 30, 1978, 21,640 persons were enrolled in Job Corps training programs in 66 centers in 32 States and Puerto Rico. In addition, 48,880 new students were enrolled later that fiscal year. Among the fields of training offered were clerical-sales, services, forestry-farming, food service, auto and machine repair, construction, electrical appliance repair, industrial production, transportation, and health occupations. Of the 70,520 students enrolled in fiscal year 1978, approximately 45,000 had left the progam by year's end, of whom about 26,700 were reported as completing the training. During the same period, approximately 19,350 of those completing the training were reported to be available for placement. About 13,900 (72 percent) of those available obtained job placements, with 6,350 being placed in their chosen field. Most of the rest of those completing training received school or military placement. Training completions in specific fields are recorded in appendix table C-1.

Armed Forces training

The Armed Forces are among the Nation's largest sources of training. Of the five categories of military

training programs—recruitment, specialized skill, officer acquisition, professional development, and flight—the most important in numbers and influence is specialized skill training. It provides military personnel with skills for technical jobs, such as radio communication and aircraft engine repair, and for administrative and service-related specialities, such as clerical work and military police duty.

The impact of specialized skill training is clearly reflected by the occupational distribution of the Armed Forces. The number of enlisted personnel in each of the nine major occupational groups on September 30, 1978, was as follows:

Infantry, guncrews, and seamanship specialists	260,087
Electronic equipment repairers	165,408
Communications and intelligence specialists	150,135
Medical and dental specialists	79,837
Other technical and allied specialists	37,234
Functional support and administration	266,511
Electrical/mechanical equipment repairers	356,072
Craft workers	70,677
Service and supply handlers	160,760

This tabulation shows that the skills of enlisted personnel are concentrated in the mechanical and technical areas. Thus, the military services are potentially a major source of trained civilian workers in these fields. (See appendix table C-6 for further detail.)

Although members of the Armed Forces acquire valuable skills during their military service, it is difficult to determine from the Armed Forces listing the transferability of their skills to civilian life. An employer interviewing a Navigation/Bombing Trainer and Flight Simulator Specialist, for example, may never suspect that the skills necessary for this service occupation are closely related to those needed by electronics technicians.

The Army, Navy, and Marine Corps, in concert with the Bureau of Apprenticeship and Training, have established registered apprenticeship programs for uniformed personnel. Only occupations that are comparable or identical to civilian occupations are registered. Individuals participating in a program record their hours of training and work assignments in a logbook that documents their service experience. The logbook thus becomes proof of their progress in the apprenticeship program and can be presented to an employer, labor union, or joint apprenticeship committee when they apply for a job.

Most service personnel, however, are not in an apprenticeship program. To aid in "translating" military job titles, the Department of Defense has compiled a military-civilian job comparability manual. The *Military-Civilian Occupational Source Book* relates military jobs by service branch to their civilian counterparts as identified in the Department of Labor's *Dictionary of Occupational Titles*.[9] Although intended for use by high school guidance counselors, the manual can also serve as a useful tool for employees and vocational counselors involved in job placement for veterans.

Home study schools

Home study (correspondence) schools provide many individuals with an alternative means of education and training. Courses vary in length, skill level, and degree of specialization and emphasize vocational, academic, or simply personal enrichment.

In 1978, about 3 million students were enrolled in home study courses, according to the National Home Study Council (NHSC). Of this number, 1.2 million were enrolled in Federal Government and military programs and another 1.1 million took courses offered by schools accredited by the National Home Study Council. Most of the remaining home study students were enrolled in programs offered by religious organizations, colleges, and universities.

Information on home study is scarce. Few comprehensive studies have been completed that provide a basis for a thorough analysis of past trends in enrollments, completion rates, and the usefulness of these courses in career development. But the limited information indicates that the demand for home study has grown over the past decade and is expected to continue because it is a convenient and relatively low-cost method of obtaining new knowledge or skills.

Community and junior colleges

Since the turn of the century, community and junior colleges have become an integral part of the American educational system. Originally, these schools served primarily as an intermediate step for students between high school and a 4-year college. Over the years, however, providing vocational training for technical and semiprofessional jobs has become equally important.

By offering a wide variety of courses and programs, community and junior colleges enable many students from diverse backgrounds to obtain occupational and educational training beyond high school. For students interested in transferring to a 4-year college, many programs are designed to provide a general educational background in the arts or sciences. Similarly, students specilizing in a particular field may enroll in vocational or occupational curriculums, such as dental hygiene, data processing, or fire science management, which typically last about 2 years and result in an associate degree. According to the American Association of Community and Junior Colleges, the number of schools

[9]Copies of the Source Book can be obtained from the Directorate for Training and Education, Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics), The Pentagon, Washington, D.C. 20301.

in operation grew about 24 percent between 1968 and 1978, and enrollments more than doubled from their 1968 level.

Each year, graduates of community and junior colleges add substantially to the supply of workers entering the labor force. According to recent surveys,[10] the number of associate degrees and other awards granted below the baccalaureate has increased tremendously during the 1970's. About 450,000 awards were granted in the academic year 1977–78, an increase of 42 percent over 1971–72. Awards in occupational curriculums, constituting 62 percent of all awards granted in 1977–78, have risen the most in recent years. (Appendix table C-5 provides occupational curriculum data only.)

Unfortunately, projections of degrees awarded below the baccalaureate are not available. Because community and junior colleges can quickly adjust their programs to meet new employment situations and student interests, radical changes in enrollments in particular curriculums can and do take place in a short period of time. For this reason, reliable degree projections based on past trends and future expectations are difficult to make. Without these projections, a critical component is missing for the development of employment outlook for specific occupations. Some information on future enrollments may be obtained from State and local community and junior college administrators.

[10]The Higher Education General Information Survey (HEGIS) of the National Center for Education Statistics (NCES) provides annual data on associate degrees and other awards below the baccalaureate, including those granted by 4-year colleges. Generally, 2-year colleges have awarded about 85 percent of these degrees. Unfortunately, only some of the data collected by NCES can be used to estimate the number of new graduates entering specific occupations because many categories are too broad to allow for meaningful estimates. For example, to estimate the number of 2-year graduates qualified to become cosmetologists, the personal service technologies category would have to be broken down into its more specific components which presently cannot be done.

Colleges and universities

Colleges and universities serve many purposes, including providing individuals with specific occupational training. A college education provides the necessary background to enter fields such as engineering, law, business, the humanities, and the natural sciences.

The length of a college education depends on the student's interests and career goals. Most students seek employment after obtaining a bachelor's degree, which usually requires 4 years. Those who wish to qualify for positions requiring more specialized knowledge often continue their study. Master's, doctorate, and professional degree programs require several additional years of study after the bachelor's degree. Occasionally, these programs accept students after 2 or 3 years of undergraduate work.

College and university enrollments increased steadily during the 1950's and 1960's, but the rate of increase slowed in the 1970's (table 9). Although no single factor was responsibile for this decline, the tight job market for college graduates and the expectation it would continue surely influenced the decisions of many students.

Earned degrees are closely related to enrollments. The number of degrees conferred by 4-year institutions has

In addition to collecting current data, the NCES annually develops 10-year projections of enrollments and degrees granted by curriculum at the baccalaureate level and above. Projections, along with a discussion of the projection methodology, are published by the NCES in *Projections of Education Statistics to 1986–87* (NCES 78–403). Projections of total degrees over the 1978–90 period are presented in the section of chapter 4 dealing with the outlook for college graduates, and projections by field are presented in the individual occupations discussed in chapter 4.

The Bureau of Health Manpower within the Health Resources Administration, U.S. Public Health Service, U.S. Department of Health and Human Services, has collected training data on health manpower and developed projections of completions of formal training programs for a number of health-related occupations. Several of these projections are included in discussions of individual health occupations in chapter 4.

Table 9. Enrollments in 4-year institutions of higher education, and earned degrees, by level, in the 50 States and the District of Columbia, 1965–66 to 1977–78

Academic year	Total enrollments[1]	Earned degrees			
		Bachelor's	First professional	Master's	Doctor's, except first professional
1965–66	4,747,912	520,923	30,124	140,548	18,237
1966–67	[2]5,064,000	558,852	31,695	157,707	20,617
1967–68	[2]5,398,000	632,758	33,939	176,749	23,089
1968–69	5,720,795	729,071	35,114	193,756	26,188
1969–70	6,028,002	792,656	34,578	208,291	29,866
1970–71	6,357,679	839,730	37,946	230,509	32,107
1971–72	6,462,733	887,273	43,411	251,633	33,363
1972–73	6,549,073	922,362	50,018	263,371	34,777
1973–74	6,590,023	945,776	53,816	277,033	33,816
1974–75	6,819,735	922,933	55,916	292,450	34,083
1975–76	7,214,740	925,746	62,649	311,771	34,064
1976–77	7,128,816	928,228	64,780	318,241	33,244
1977–78	7,242,845	930,201	66,964	312,816	32,156

[1]Fall of academic year.
[2]Estimated.

SOURCE: U.S. Department of Education, National Center for Education Statistics.

increased throughout the 1960's and 1970's. During the 1977–78 academic year in the 50 States and the District of Columbia, 930,000 persons earned bachelor's degrees, 67,000 earned first professional degrees, 313,000 earned master's degrees, and 32,000 earned doctorates.

Entry rates. Projections of degrees by curriculum play a vital part in estimating employment prospects in specific occupations. Because many graduates do not pursue careers in their field of study, however, projections alone do not provide an accurate estimate of future supply. For this reason, entry rates must be developed that indicate the probability that a college graduate who majors in a particular subject area will enter a specific occupation. These entry rates are calculated from followup studies conducted during or after training and generally include data on field of study and intended or current occupation.

Studies have shown that the proportion of graduates of occupationally oriented programs who directly enter related occupations tends to be very high, particularly if training takes a number of years. For example, almost 100 percent of medical school graduates enter medicine and about 85 percent of engineering school graduates enter engineering. However, for many liberal arts graduates, whose training is less occupationally oriented, entry rates into occupations related to a college major are substantially lower. This is especially true at the bachelor's degree level since many graduates enter professional school, teaching, or occupations where a college degree in any one of a number of fields may be adequate preparation.

Comprehensive followup data on college students are available from the American Council on Education (ACE) surveys of college freshmen in 1961 and 1966. The 1961 cohort included over 127,000 freshmen, of whom a sample was resurveyed in 1966 and 1971. The 1966 cohort included 254,000 freshmen surveyed at college entry, of whom a sample of 60,000 was resurveyed in 1971. In 1974, science and engineering students who were freshmen in 1967 and 1968 also were resurveyed. The surveys asked questions on high school and college education, including major of bachelor's and higher degrees received, current employment and occupational status, work activity, and type of employer. These longitudinal data allow analysis of occupational entries and career development over the decade after college entry. Numerous studies based on the ACE surveys have been published, and the BLS has developed entry rates for specific occupations from the survey data.

Additional followup studies of college students and graduates are available from surveys conducted by college placement offices, professional societies, and other organizations. Most of these data are limited to graduates from a single institution or field.

Chapter 4. Relating Training to Occupational Needs

This chapter presents projections of job openings and the training information that the Bureau has gathered or developed as part of its occupational outlook program. Nearly 240 individual occupations are discussed. For each, a description of the ways workers are trained for the job is presented, along with summary statistics on 1990 projected employment, percent growth over the 1978–90 period, and annual openings over this period due to growth and replacement needs. For most occupations, replacement needs include openings due to deaths, retirements, and other labor force separations, but not those arising from transfers to other occupations. Transfers, however, account for a significant number of job openings in many occupations, and therefore estimates of average annual openings generally understate the actual number of jobs available.

Also included are the most recent data on the number of persons completing training; a dash means that statistics on training are not available. Data are for the following time periods:

Public vocational education completions—fiscal year 1978
Private vocational education completions—fiscal year 1978
Apprenticeship completions in programs registered with the Bureau of Apprenticeship and Training —calendar year 1978
Job Corps—fiscal year 1978
Junior college graduates—academic year 1977–78
College graduates—academic year 1977–78 and projected 1978–90 annual average (where available).

For occupations where sufficient data on supply are available, a brief supply-demand analysis is presented. Statistics on occupational requirements and training also are presented in tabular form in appendixes B and C.

A discussion of the overall outlook for college graduates for the 1978–90 period and some of the major implications of this outlook precedes the detailed occupational information.

The Outlook for College Graduates

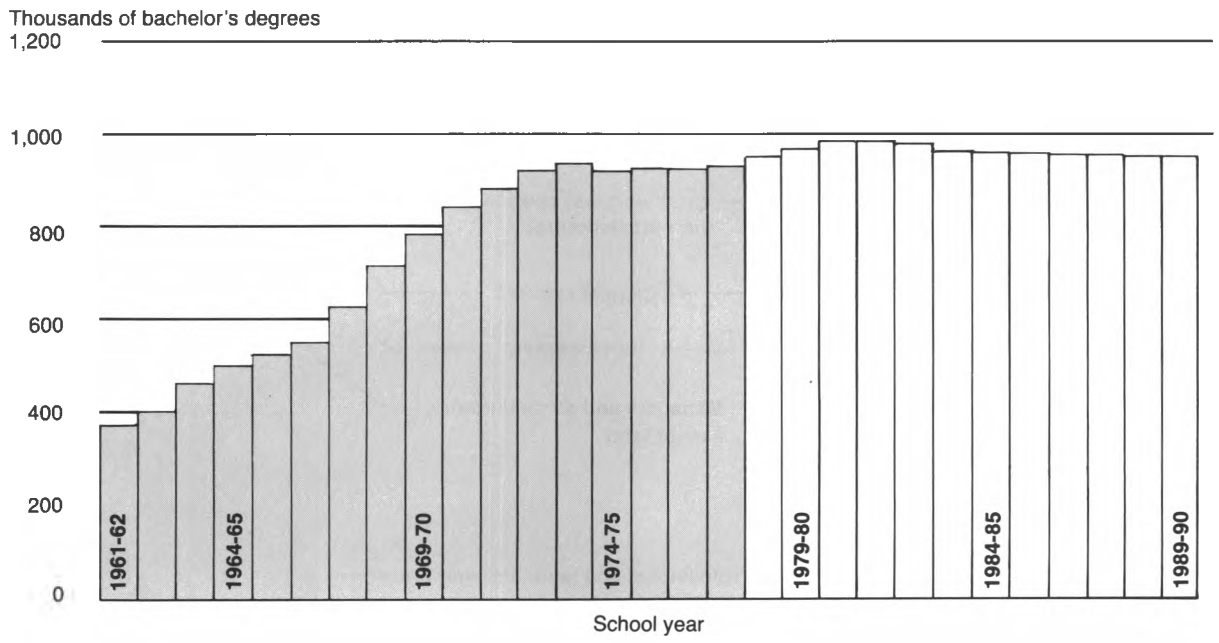
Throughout most of the 1960's, a college degree was considered almost a guarantee of a good job. Overall, there probably were more jobs for which employers sought graduates than there were graduates to fill them. Consequently, graduates generally had their pick of jobs and almost all graduates found the jobs they sought. Beginning about 1969, however, the job market for college graduates changed dramatically. Professional and technical jobs grew more slowly in the 1970's, and a smaller proportion of college graduates entered the desirable jobs that graduates easily found in the 1960's. Less rapid growth during the 1970's in the education field and in many high-technology industries contributed to this turnabout, for they employed many college graduates. However, the principal reasons have been the sharp increase in the number of bachelor's degrees granted (chart 4) and the higher proportion of college students seeking jobs.

Approximately twice as many college graduates entered the labor market annually, on average, between 1969 and 1978 as during the 1962–69 period. Because job openings in the occupations that graduates traditionally sought have not been adequate, more and more graduates have entered nontraditional areas. Chart 5 compares the kinds of jobs graduates entered between 1962 and 1969 and those entered between 1969 and 1978.

Of the roughly 575,000 graduates who entered the labor force annually, on average, between 1962 and 1969, about 73 percent entered professional and technical occupations. This group includes accountants, engineers, doctors, lawyers, teachers, and other occupations for which a college degree usually is required. About 17 percent entered managerial and administrative occupations, another major occupational area generally felt by graduates to be appropriate for their education and abilities. Another 3 percent entered sales jobs, most probably in the better paying sales jobs such as securities sales workers and manuafacturers' sales representatives. Over 6 percent entered clerical, blue-collar, service, and farm occupations.

A different pattern emerged for the 1,150,000 college

Chart 4. Bachelor's degrees earned increased rapidly during the 1960's, leveled off during the 1970's, and will remain on this plateau through 1990



Source: National Center for Education Statistics.

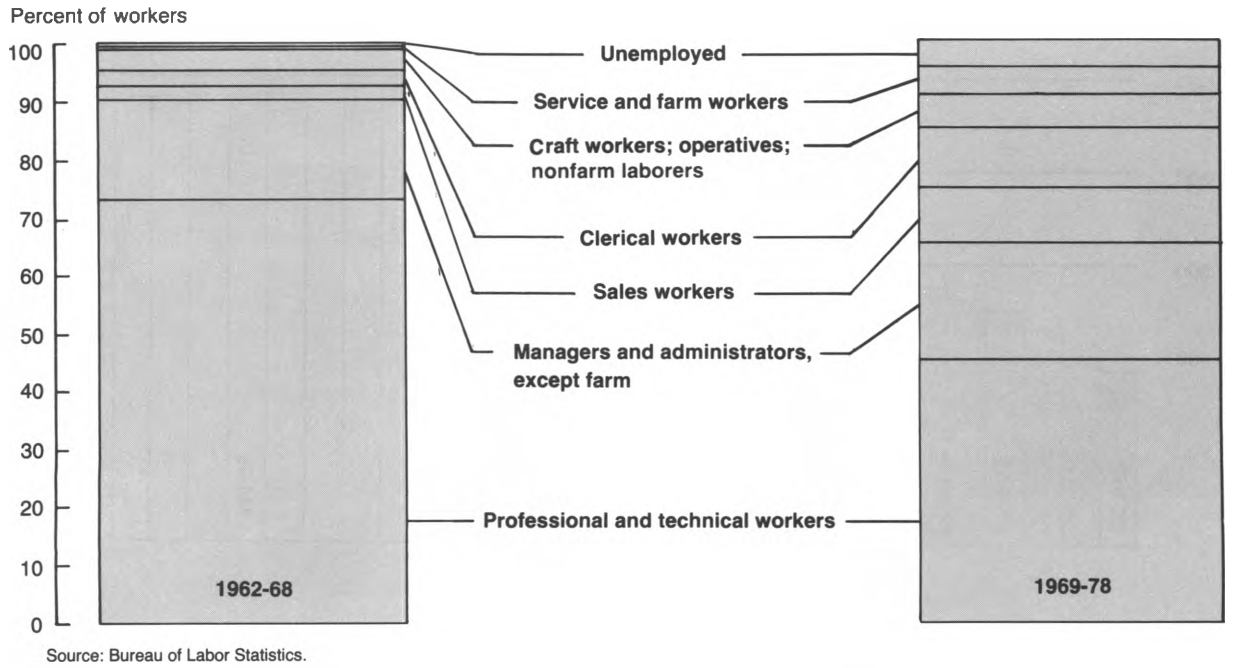
graduates who entered the labor force each year between 1969 and 1978. Although more graduates entered professional and technical occupations than during the 1962–69 period, because many more graduates were competing for available positions, a much smaller percentage—only 46 percent—found professional and technical jobs. About 20 percent entered managerial jobs, and another 9 percent entered sales jobs. It is estimated that about one-fourth of the graduates spilled over into occupations not previously sought or filled by college graduates. Most were clerical, blue-collar, service, and farm occupations, but some were managerial and sales occupations. Most of the increase in the proportion entering managerial and sales jobs probably represents upgrading which occurs as jobs become more complex and, therefore, require people who have more education. The great majority of graduates who took clerical, service, and blue-collar jobs over the 1969–78 period, however, did not enter upgraded positions.

Graduates also have experienced higher rates of unemployment than in the past. From early 1969 to early 1978, the unemployment rate for all graduates increased from less than 1 percent to 2.5 percent, and for graduates 20 to 24 years old, from 2.4 to 6.1 percent. Although some of this increase can be attributed to generally poor economic conditions, the rise in the rate of unemployment of college graduates reflects mostly an increasing supply of graduates. Young graduates still fared much better than young high school graduates, however, who had an unemployment rate of 11.3 percent in 1978. The difference in rates indicates, for the most part, that graduates have been able to outbid nongraduates for jobs.

Overall, about 1 out of 4 graduates who entered the labor force between 1969 and 1978 had to take a job not sought or filled by graduates in better times, or was unemployed.

Increased competition for jobs also has adversely affected earnings. Although average salaries of newly hired graduates have risen since 1969, earnings of nongraduates have risen more rapidly. As a result, on average, the premium paid to college graduates has declined, both because competition in fields traditionally sought by graduates has kept salaries down and because relatively more graduates are in lower paying, nontraditional fields.

Chart 5. Recent college graduates have been entering types of jobs graduates traditionally have not sought



Source: Bureau of Labor Statistics.

The 1980's are expected to be marked by demographic and college enrollment trends that contrast sharply with those of the 1960's and 1970's. As the trailing end of the population bulge representing the post-World War II baby boom leave their teenage years and move into their 20's, the proportion of the population between the ages of 18 and 21 will decline from 7.8 percent in 1978 to 6.0 percent in 1990. This is a reversal of the trend of the last two decades when the proportion of the population in the 18 to 21 age group continually increased and college enrollments grew rapidly.

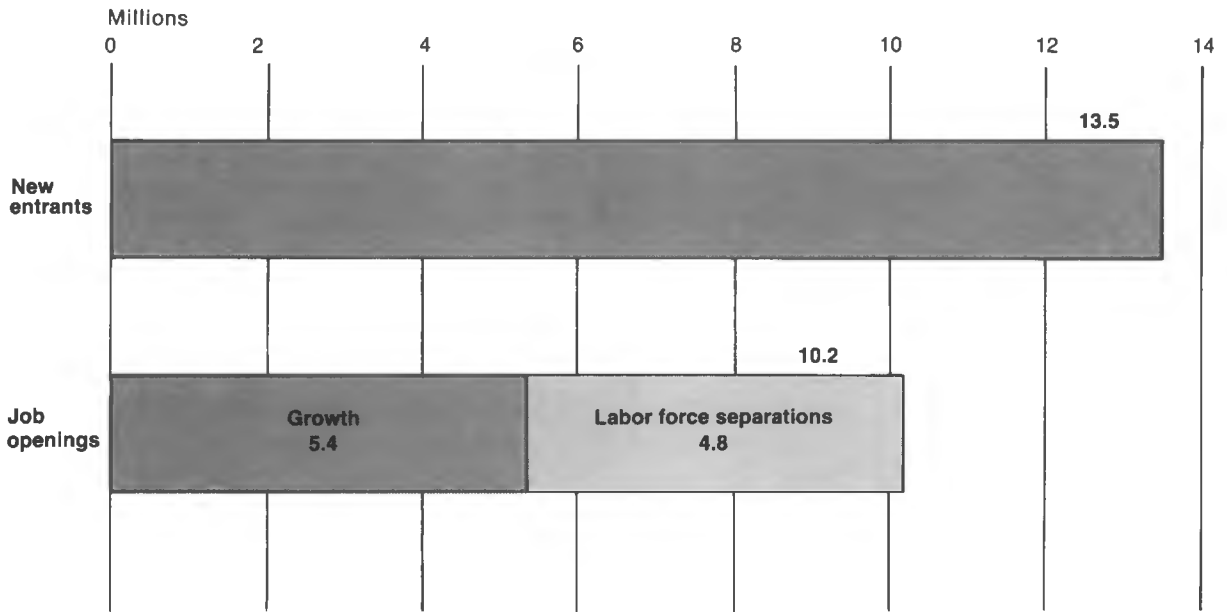
Although the proportion of the population in the typical age range for college attendance is expected to decline during the 1980's, college enrollments are not projected to fall. The drop in the number of students between 18 and 21 is expected to be offset by growth in the number of older students in college. Persons between 25 and 34 will increase from 15.5 percent of the population in 1978 to nearly 17 percent in 1990, and a greater proportion are expected to be students. Thus, the number of bachelor's degrees granted annually during the 1980's is projected to be slightly higher than at present.

College graduates entering the labor force through the 1980's are likely to face job market conditions very similar to those faced by graduates during the 1970's as entrants continue to exceed openings in jobs traditionally sought by graduates. As a result, about 1 graduate in 4 will have to enter a nontraditional occupation or face unemployment.

It is estimated that about 13.5 million college graduates will enter the labor force over the 1978–90 period, but only about 10.2 million job openings are expected to arise in traditional jobs for college graduates (chart 6). About half of these projected openings are expected to result from growth in the kinds of jobs filled by graduates in the past and from upgrading jobs, and half from the need to replace graduates who retire, die, or leave the labor force for other reasons.

Like college graduates in the 1970's, future graduates may be less likely to find jobs in the occupation of their choice than graduates during the 1960's. Many may be unemployed or have to move from job to job to find satisfying employment or compete with nongraduates for the more desirable jobs not previously filled by graduates. As in the past, college graduates will have an

Chart 6. College graduates entering the labor force between 1978 and 1990 are expected to exceed openings in jobs traditionally filled by graduates by 3.3 million.



Source: Bureau of Labor Statistics.

advantage over nongraduates, but, in some fields, they may have to compete with junior and community college graduates who have learned job-related skills. In addition, there are some jobs, such as high-paying sales jobs, where proven sales ability may be valued more highly than a 4-year degree. Graduates who are less well prepared for the job market may be unable to make full use of their skills, and thus may experience job dissatisfaction. As in the 1970's, however, most graduates probably will find a job, and few should face sustained unemployment.

Although the employment outlook for college graduates may not be promising, neither is it bleak. Job satisfaction depends upon a number of factors that are difficult to analyze. College graduates might be satisfied in occupations not traditionally sought by graduates. Persons without a college degree have filled many high-paying responsible jobs in the past, and graduates can be expected to move into these in greater numbers. Graduates who enter clerical, sales, and blue-collar jobs and who prove their abilities on the job are likely to be promoted. Therefore, some graduates who take jobs as clerks should be able to move into administrative positions, and those in craft and service jobs are likely to have an advantage in advancing within their organization or in starting their own business.

Finding a job directly related to one's college major probably is not necessary for job satisfaction. One study found that most liberal arts graduates—those whose college majors were in fields such as English, history, and psychology—generally were happy with jobs in business administration.[11] Business administration, like many other jobs, permits graduates to use their writing, analytical, and interpersonal skills. If graduates feel they are using these skills, they are likely to be satisfied with their jobs.

The study also found that a substantial proportion of graduates in jobs they considered nonprofessional,

[11]Nancy L. Ochsner and Lewis C. Solomon, *College Education and Employment . . . . The Recent Graduates* (Bethlehem, Pa., The CPC Foundation, 1979). The study is a followup of a group of people whose highest degree held was a bachelor's degree: 1961 college freshmen who were working full time between Nov. 1974 and Mar. 1975, and 1970 college freshmen who were working full time between Nov. 1976 and Mar. 1977.

satisfied. Ideas about what constitutes an appropriate job for graduates are changing. More and more graduates views jobs as craft workers, farmers, and self-employed retail store managers, which may in some instances be associated with "alternative life styles," as more desireable than the traditional jobs chosen by graduates. This shift in attitudes eases the problems of underemployment and job dissatisfaction for many college graduates.

It should be pointed out that the number of graduates entering the labor force may be lower than that projected in this bulletin because a higher proportion of high school graduates, aware of the plight of college graduates, may decide not to attend a 4-year college.

Foundry occupations

Patternmakers. A 5-year apprenticeship is considered the best way to learn this trade. Vocational school courses in patternmaking, metalworking, and machining may be credited toward completion of the apprenticeship. Because of the precise skills needed, apprenticeships for wood and metal patternmaking are separate. A high school diploma generally is required, and courses in mechanical drawing, blueprint reading, and shop mathematics are helpful.

Employment, 1978	3,700
Projected employment, 1990	3,900
Percent growth, 1978–90	5.2
Average annual openings, 1978–90	135
Growth	15
Replacement	120
Available training data:	
Apprenticeship completions	66

Molders. Completion of a 4-year apprenticeship is the recommended way to learn skilled hand molding. Workers who have this training also are preferred for some kinds of machine molding. Some people learn molding skills informally on the job, but this way of learning the trade takes longer and is less reliable than apprenticeship. In addition to on-the-job training, apprenticeship programs include instruction in subjects such as shop mathematics, metallurgy, and shop drawing. An eighth grade education usually is the minimum requirement for apprenticeship; however, many employers prefer high school graduates. The less skilled hand molding jobs can be learned by inexperienced workers after 2 to 6 months of on-the-job training.

Employment, 1978	21,000
Projected employment, 1990	22,100
Percent change, 1978–90	5.2
Average annual openings, 1978–90	500
Growth	100
Replacement	400
Available training data:	
Apprenticeship completions[1]	45

[1]Includes some coremakers.

Coremakers. Completion of a 4-year apprenticeship is the recommended way to learn skilled hand coremaking. Workers with this training also are preferred for the more difficult machine coremaking jobs. Apprenticeship programs combine on-the-job training with classroom instruction in subjects such as shop mathematics and the properties of metals. Applicants for apprenticeships must have at least an eighth grade education; however, most employers prefer high school graduates, and some require apprentices to have graduated. For less skilled coremaking jobs, inexperienced workers may be hired and trained on the job.

Employment, 1978	12,000
Projected employment, 1990	12,600
Percent growth, 1978–90	5.2
Average annual openings, 1978–90	350
Growth	50
Replacement	300
Available training data:	
Apprenticeship completions[1]	

[1]See molders.

Machining occupations

All-round machinists. A 4-year apprenticeship is the best way to learn the trade; however, some companies have shorter training programs for machinists who specialize in one type of product or machine. Many machinists learn their skills on the job. Apprenticeship programs combine on-the-job training with classroom instruction in mathematics, physics, and machine shop practices. Taking these courses in high school or vocational school is good preparation. A high school diploma is strongly recommended. Applicants should be mechanically inclined and able to do precise work that requires concentration as well as physical effort.

Employment, 1978	484,000
Projected employment, 1990	584,000
Percent change, 1978–90	20.7
Average annual openings, 1978–90	22,500
Growth	8,000
Replacement	14,500
Available training data:	
Apprenticeship completions	1,182

Instrument makers (mechanical). Many instrument makers learn their trade through 4-year apprenticeships that combine on-the-job training with classroom instruction in mathematics, physics, and machine shop practices. Others advance from the ranks of machinists or skilled machine tool operators and usually require only 1 or 2 years of instrument shop experience to learn the trade. Employers generally prefer high school graduates, especially for apprenticeship programs. Courses in algebra, geometry, trigonometry, science, and machine shop work are useful.

Employment, 1978	6,000
Projected employment, 1990	6,900

Percent change, 1978–90	17.1
Average annual openings, 1978–90	300
Growth	100
Replacement	200
Available training data	—

Machine tool operators. These workers are classified as either semiskilled or skilled operators. Most are trained on the job. Just a few months of experience are required for most semiskilled operators to learn their trade, but 1 to 2 years of experience often are required for a person to become a skilled operator. Some opertors receive training in vocational schools and apprenticeship programs that combine on-the-job experience with classroom instruction. Manufacturers of machine tools also give short courses to operators. A high school diploma is not required, but courses in mathematics and blueprint reading are helpful. Employers look for workers who have physical stamina and mechanical aptitude, or experience working with machinery.

Employment, 1978	542,000
Projected employment, 1990	609,000
Percent growth, 1978–90	12.4
Average annual openings, 1978–90	19,600
Growth	5,600
Replacement	14,000
Available training:	
Public vocational education completions	3,437
Job Corps completions	95

Setup workers (machine tools). Setup workers usually must be qualified as all-round machinists. They have to know how to operate more than one type of machine tool and be able to plan the sequence of a machining operation so that metal parts will be made according to specifications. Being able to communicate clearly is important because setup workers must explain the machining operations that they set up to the semiskilled workers who will perform the work.

Employment, 1978	65,000
Projected employment, 1990	81,000
Percent change, 1978–90	24.6
Average annual openings, 1978–90	3,000
Growth	1,400
Replacement	1,600
Available training data:	
Apprenticeship completions	146

Tool-and-die makers. The best way to learn this trade is through a 4- or 5-year apprenticeship, but many workers learn in vocational school programs or on the job. Several years of experience often are required after completing an apprenticeship for more difficult tool-and-die work. High school graduates are preferred for apprenticeships. Applicants should have a good working knowledge of mathematics and physics, as well as considerable mechanical ability, finger dexterity, and aptitude for precise work.

Employment, 1978	170,000
Projected employment, 1990	210,000
Percent change, 1978–90	23.5
Average annual openings, 1978–90	8,600
Growth	3,300
Replacement	5,300
Available training data:	
Public vocational education completions	2,396
Private vocational education completions	73
Apprenticeship completions	1,236

Printing occupations

Compositors. Some compositors learn their trade through apprenticeships, which generally require 4 years of on-the-job training supplemented by classroom instruction or correspondence courses. Applicants for apprenticeships usually must be high school graduates.

Most compositors, however, learn their trade on the job by working as helpers for several years; others combine trade school and helper experience. Many technical institutes, junior colleges, and colleges offer courses in printing technology which provide a valuable background for people who want to be compositors.

Employment, 1978	181,000
Projected employment, 1990	158,000
Percent change, 1978–90	−12.8
Average annual openings, 1978–90	3,900
Decline	−1,900
Replacement	5,800
Available training data:	
Public vocational education completions[1]	26,920
Apprenticeship completions	108

[1]Includes completions for bookbinders, composing room occupations, lithographic occupations, press operators, and miscellaneous printing occupations.

Lithographers. Although most lithographers learn their trade on the job by helping experienced lithographers, employers recommend a 4- or 5-year apprenticeship program which combines on-the-job training with classroom instruction. Apprenticeship programs may emphasize a specific craft, such as camera operator or platemaker, although an attempt is made to introduce an apprentice to all lithographic operations. Applicants for apprenticeships usually must be high school graduates.

Two-year programs in printing technology, which many technical institutes, junior colleges, and colleges offer, provide a valuable background for people who want to be lithographers. High school and vocational

school courses in printing, photography, mathematics, chemistry, and art also are useful. Useful skills also can be learned in the Armed Forces.

Employment, 1978	28,000
Projected employment, 1990	45,000
Percent change, 1978–90	61.1
Average annual openings, 1978–90	2,300
Growth	1,400
Replacement	900
Available training data:	
Public vocational education completions[1]	—
Armed Forces	1,900
Apprenticeship completions[2]	169

[1]See compositors.
[2]Includes some photoengravers.

Photoengravers. Most photoengravers learn their skills through a 5-year apprenticeship program that combines on-the-job training with classroom instruction. Applicants for apprenticeships usually must be high school or vocational school graduates; courses in printing, chemistry, and physics are useful.

Employment, 1978	8,000
Projected employment, 1990	7,500
Percent change, 1978–90	−6.3
Average annual openings, 1978–90	150
Decline	−50
Replacement	200
Available training data:	
Public vocational education completions[1]	—

[1]See compositors.

Printing press operators and assistants. The recommended way to learn the press operator's trade is through an apprenticeship program that combines on-the-job training with classroom or correspondence school work. The apprenticeship program in commercial printing shops lasts 2 years for press assistants and 4 years for press operators. Applicants for apprenticeships usually must be high school graduates.

Many workers learn their skills on the job by working as helpers or press assistants, or through a combination of work experience and training in vocational or technical schools. High school or vocational school courses in printing, physics, and chemistry are recommended.

Employment, 1978	167,000
Projected employment, 1990	182,000
Percent change, 1978–90	8.9
Average annual openings, 1978–90	5,000
Growth	1,200
Replacement	3,800
Available training data:	
Public vocational education completions[1]	—
Job Corps completions	321
Apprenticeship completions	204

[1]See compositors.

Bookbinders and bindery workers. A 4- or 5-year apprenticeship that combines on-the-job training with related classroom instruction generally is the recommended type of training for skilled bookbinders. Applicants for apprenticeships usually must be high school graduates. Because bindery workers need not be as skilled as bookbinders, they learn their trade through informal on-the-job training that may last from several months to 2 years.

Employment, 1978	69,000
Projected employment, 1990	70,000
Percent change, 1978–90	1.3
Average annual openings, 1978–90	2,600
Growth	100
Replacement	2,500
Available training data:	
Public vocational education completions[1]	—
Job corps completions	1
Apprenticeship completions	48

[1]See compositors.

Other industrial production and related occupations

Assemblers. For most assembly work, inexperienced persons can be trained on the job in a few days or weeks, but for some types of complicated assembly work, training lasts much longer. Employers look for workers who can do routine work at a fast pace. Although a high school diploma usually is not required, vocational school courses, such as machine shop, may be helpful, especially for the more highly skilled jobs.

Employment, 1978	1,164,000
Projected employment, 1990	1,662,000
Percent growth, 1978–90	43.0
Average annual openings, 1978–90	77,000
Growth	42,000
Replacement	35,000
Available training data:	
Jobs Corps completions	308

Automobile painters. Most of these workers start as helpers and acquire their skills informally on the job by working for 3 to 4 years with experienced painters. A small number learn through a 3-year apprenticeship. A high school diploma usually is not required but may be an advantage. Good color sense and the ability to do precise work are helpful personal characteristics.

Employment, 1978	42,000

Projected employment, 1990	54,000
Percent growth, 1978–80	27.2
Average annual openings, 1978–90	2,000
Growth	1,000
Replacement	1,000
Available training data	—

Blacksmiths. Many blacksmiths are trained on the job while working as helpers in blacksmith shops or industrial firms that employ blacksmiths. Some enter through 3- or 4-year apprenticeship programs that combine on-the-job experience with classroom instruction in subjects such as blueprint reading, forging methods, metal properties, and heat-treatment of metal. Vocational school or high school courses in metalworking and blueprint reading also are helpful. A high school diploma is not required.

Blacksmiths who shoe horses are called farriers. Most farriers learn their craft by assisting experienced workers. Others take a 3- or 4-week course in horseshoeing before gaining experience on their own or as a farrier's assistant. Several colleges and private schools offer horseshoeing courses. At least 3 to 5 years of special training or experience are needed to obtain the skills necessary to shoe racehorses. Farriers who work at racetracks must pass a licensing examination during which they demonstrate their knowledge of corrective shoeing techniques and proper choice of shoes for various track conditions.

Employment, 1978	11,000
Projected employment, 1990	7,000
Percent change, 1978–90	–36.4
Average annual openings, 1978–90	300
Decline	–300
Replacement	600
Available training data	—

Blue-collar worker supervisors. Most blue-collar supervisors are high school graduates who have risen through the ranks and learned their skills on the job. Rising through the ranks gives supervisors the advantage of knowing how the work should be done and what problems may arise. Supervisors sometimes are former union representatives who are familiar with grievance procedures and union contracts. To supplement work experience, most employers provide either written materials or classroom training covering subjects such as communication skills, motivation, and management decisionmaking.

Although fewer than one-tenth of all supervisors are college graduates, a growing number of employers are hiring supervisor trainees who have college backgrounds. This is most prevalent in industries with highly technical production processes, such as the chemical, oil, and electronics industries. Employers prefer backgrounds in business administration, industrial relations, mathematics, engineering, or science. In addition, a growing number of workers are improving their skills in public vocational education courses.

Employment, 1978	1,671,000
Projected employment, 1990	1,925,000
Percent change, 1978–90	16.0
Average annual openings, 1978–90	69,000
Growth	21,000
Replacement	48,000
Available training data:	
Public vocational education completions	18,650

Boilermaking occupations. This group includes layout workers, fitters, and boilermakers. Most layout workers and fitters are hired as helpers and learn the craft by working with experienced employees. It generally takes about 2 years or more to become skilled at these jobs. Although many boilermakers also learn their trade on the job, most training authorities recommend a 4-year apprenticeship. For all three occupations, employers prefer high school or vocational school graduates who have had courses in shop, mathematics, blueprint reading, and welding. Due to the strenuous nature of the jobs, most firms require applicants to pass a physical examination.

Employment, 1978	37,000
Projected employment, 1990	56,000
Percent growth, 1978–90	46.2
Average annual openings, 1978–90	3,100
Growth	1,600
Replacement	1,500
Available training data:	
Apprenticeship completions	277

Boiler tenders. Most boiler tenders learn their skills by working as helpers or oilers in boilerrooms. High school graduation usually is not required; however, courses in mathematics, motor mechanics, chemistry, and blueprint reading may be helpful. Stamina and endurance are necessary because boiler tenders are exposed to noise, heat, fumes, and smoke on the job. Some large cities and a few States require tenders to be licensed. Applicants for a license must pass a written test.

Employment, 1978	71,000
Projected employment, 1990	71,000
Percent growth, 1978–90	0.0
Average annual openings, 1978–90	2,800
Growth	0
Replacement	2,800
Available training data	—

Electroplaters. Most electroplaters learn their trade on the job, as helpers to experienced workers. Some learn through a 3- or 4-year apprenticeship program that

combines on-the-job training with classroom instruction. Applicants for apprenticeships usually must be high school graduates. A few people take 1- or 2-year courses in electroplating that are offered by junior colleges, technical institutes, and vocational schools. High school or vocational school courses in chemistry, electricity, physics, mathematics, and blueprint reading are useful.

Employment, 1978	40,000
Projected employment, 1990	40,000
Percent growth, 1978–90	0.0
Average annual openings, 1978–90	800
Growth	0
Replacement	800
Available training data	—

Forge shop occupations. Most workers learn these trades on the job. Generally, they start as helpers or heaters on hammer or press crews and learn by watching and assisting experienced workers. Thus, new workers begin at the bottom of the ladder and advance to more skilled occupations as they gain experience and as openings occur. Some forge shops offer 4-year apprenticeship programs for skilled jobs, such as diesinker and heat treater. These programs combine on-the-job experience with classroom instruction in metal properties, power hammer and furnace operation, blueprint reading, safety, and other machine shop subjects. High school graduation generally is not required but may be preferred for the more skilled occupations. Workers need stamina and endurance to work in the heat and noise of a forge shop, and strength to lift and move heavy forgings and dies.

Employment, 1978	77,000
Projected employment, 1990	80,100
Percent change, 1978–90	3.6
Average annual openings, 1978–90	2,000
Growth	200
Replacement	1,800
Available training data	—

Inspectors (manufacturing). Inspectors generally learn their skills on the job. Depending on the skill required for the particular job, training may last from a few hours to several months. Requirements for the job vary. Some employers hire applicants who do not have a high school diploma, but who have worked as an assembler and are able to follow instructions and concentrate on details. Good eyesight—with or without glasses—is necessary.

Employment, 1978	771,000
Projected employment, 1990	909,000
Percent change, 1978–90	18.0
Average annual openings, 1978–90	35,000
Growth	11,500
Replacement	23,500
Available training data	—

Millwrights. Generally, these workers learn their skills on the job. New employees may start as helpers to skilled workers and rotate from job to job for 6 to 8 years. Millwrights also are trained through 4-year apprenticeship programs that combine on-the-job training with classroom instruction in blueprint reading, mathematics, welding, and safety. On-the-job training covers the use of hoisting equipment and the installation, assembly, and repair of industrial machinery. Good physical condition is required. High school courses in science, mathematics, mechanical drawing, and machine shop are useful.

Employment, 1978	95,000
Projected employment, 1990	118,000
Percent growth, 1978–90	25.0
Average annual openings, 1978–90	4,700
Growth	1,900
Replacement	2,800
Available training data:	
Apprenticeship completions	528

Motion picture projectionists. Most motion picture theaters in urban areas are unionized and projectionists in these theaters must meet union membership requirements. Some union locals accept only persons who have experience running theater projectors. Other locals conduct apprenticeship progams for inexperienced persons. In these programs, apprentices work with a variety of projection equipment under the supervision of experienced projectionists. They also may take courses in basic electronics and mechanics. In a nonunion theater, a trainee may start as an usher or helper and learn the trade by working with an experienced projectionist.

A high school diploma is preferred by employers and may be required by union locals. Experience with projectors gained while serving in the Armed Forces is helpful. Local governments may require projectionists to be licensed.

Employment, 1978	11,000
Projected employment, 1990	10,500
Percent change, 1978–90	−4.5
Average annual openings, 1978–90	750
Decline	−50
Replacement	800
Available training data	—

Ophthalmic laboratory technicians. Most technicians learn their skills on the job, but some learn through 3- to

4-year apprenticeship programs that combine on-the-job training with classroom instruction. Some technicians receive training in the Armed Forces. Others attend community colleges or vocational or technical schools, where they receive certificates, diplomas, or associate degrees in programs varying in length from 9 months to 3 years. Employers prefer high school graduates; applicants for apprenticeships usually must be graduates. High school courses in the basic sciences are useful. Some States require ophthalmic laboratory technicians in retail optical shops to be licensed. Applicants for a license must pass an examination.

Employment, 1978	26,400
Projected employment, 1990	32,200
Percent growth, 1978–90	22.0
Average annual openings, 1978–90	1,400
Growth	500
Replacement	900
Available training data:	
Public vocational education completions	577

Photographic laboratory occupations. Most photographic laboratory workers learn their skills through on-the-job training. High school graduates generally are preferred by employers. Some trainees become specialists in a particular laboratory procedure; training time for one of these specialities ranges from a few weeks to several months. Some trainees become all-round technicians, learning their trade in about 3 years. Completion of postsecondary courses in photographic technology is useful for technicians who wish to become supervisors or managers.

Employment, 1978	57,000
Projected employment, 1990	68,000
Percent growth, 1978–90	20.0
Average annual openings, 1978–90	2,700
Growth	900
Replacement	1,800
Available training data:	
Public vocational education completions[1]	7,960
Junior college graduates	866

[1]May include other photographic occupations.

Power truck operators. Newly hired operators usually are trained on the job. Most workers can learn how to operate a power truck in just a few days, but it may take several weeks to learn the physical layout and operation of a plant and the most efficient way of handling the materials to be moved. Some power truck manufacturers conduct short training courses for operators employed by their customers. A high school diploma is not required.

Employment, 1978	363,000
Projected employment, 1990	458,000
Percent change, 1978–90	24.0
Average annual openings, 1978–90	14,200
Growth	8,000
Replacement	6,000
Available training data	—

Production painters. New workers usually learn by watching and helping experienced painters. Beginners often start out assigned to loading and unloading the conveyor lines that carry the items to be painted. Training may vary from a few days to several months. A high school diploma is not required. Good physical condition is necessary because painters must stand, stoop, and bend in their work, and are exposed to fumes.

Employment, 1978	133,000
Projected employment, 1990	158,000
Percent change, 1978–90	19.0
Average annual openings, 1978–90	5,200
Growth	2,100
Replacement	3,100
Available training data	—

Stationary engineers. Many stationary engineers start as helpers or oilers and acquire their skills informally during many years on the job. This experience can be supplemented by technical or other training in vocational schools or through home study. A good background also can be obtained in the Navy or Merchant Marine. Most training authorities, however, recommend completion of a 4-year apprenticeship as the best way to learn this trade. These programs combine on-the-job training with classroom instruction in practical chemistry, blueprint reading, and other technical subjects.

Employers prefer to hire high school graduates; high school or vocational school courses in mathematics, machine shop, mechanical drawing, chemistry, and physics are an asset. Many States and large cities require stationary engineers to be licensed. Each of the classes of license specify the steam pressure or horsepower of the equipment the engineer may operate. A high school diploma may be required for higher class licenses. Generally, applicants must be at least 18, meet the experience requirements for the class of license, and pass a written examination.

Employment, 1978	179,000
Projected employment, 1990	186,000
Percent growth, 1978–90	4.0
Average annual openings, 1978–90	7,700
Growth	600
Replacement	7,100
Available training data:	
Public vocational education completions	3,639
Apprenticeship completions	315

Welders. There are several levels of skill within this occupation and the training time varies accordingly. Some less-skilled jobs can be learned in a few months on the job, but generally it takes several years of training and experience to become a skilled welder. Many large companies train their own welders, but for entry to skilled jobs, many employers prefer to hire applicants who have high school or vocational school training in welding. Courses in shop mathematics, mechanical drawing, blueprint reading, physics, and chemistry are helpful. Before being assigned to work where the strength of the weld is a highly critical factor, welders may be required to pass a qualifying examination given by an employer or government agency.

Employment, 1978	679,000
Projected employment, 1990	907,000
Percent growth, 1978–90	33.6
Average annual openings, 1978–90	35,000
Growth	19,000
Replacement	16,000
Available training data:	
Public vocational education completions	51,772
Private vocational education completions	4,357
Job Corps completions	1,827

Office Occupations

Clerical occupations

Bookkeeping workers. High school graduates who have taken business arithmetic, bookkeeping, and basic accounting meet the minimum requirements for most bookkeeping jobs. Some employers prefer applicants who have completed business courses at a junior college or business school and have had some work experience. General knowledge of how computers are used to perform bookkeeping transactions is very helpful, as is the ability to type and use various office machines. In a few States, a license is required to work on tax returns. Cooperative work/study programs also can provide high school students with an opportunity to learn bookkeeping skills through on-the-job experience.

Employment, 1978	1,830,000
Projected employment, 1990	2,045,000
Percent growth, 1978–90	11.8
Average annual openings, 1978–90	96,000
Growth	18,000
Replacement	78,000
Available training data:	
Job Corps completions	219

Cashiers. Many cashiers learn their skills on the job under the supervision of an experienced cashier. In large firms, training often includes classroom instruction in the use of electronic or computerized cash registers and other phases of the job. Cashier training also is available in many public school vocational programs. The cashier's job may serve as a stepping stone to a more responsible clerical position or to a supervisory or managerial job.

Employment, 1978	1,400,000
Projected employment, 1990	2,100,000
Percent growth, 1978–90	49.7
Average annual openings, 1978–90	119,000
Growth	58,500
Replacement	60,500
Available training data:	
Job Corps completions	178

Collection workers. Newly hired workers are trained on the job and learn chiefly by observing experienced workers. A high school diploma generally is required. Training also is available through the educational branch of the American Collectors' Association. Business courses are good preparation, and the ability to get along with all kinds of people is very important.

Employment, 1978	78,000
Projected employment, 1990	95,000
Percent growth, 1978–90	21.8
Average annual openings, 1978–90	4,600
Growth	1,400
Replacement	3,200
Available training data	—

File clerks. Newly hired workers usually are given several weeks or months of on-the-job training to learn the employer's filing system and procedures. A high school diploma usually is required for beginning jobs, but employers often consider an eagerness to work hard and learn the job equally important. Most employers seek applicants who can type and have some knowledge of office practices. These and other office skills can be learned in high schools, vocational schools, private business schools, and community and junior colleges. In addition, many States and localities sponsor programs that furnish training in basic clerical skills, particularly to prepare underemployed and low-skilled workers for entry level jobs.

Employment, 1978	273,000
Projected employment, 1990	335,000
Percent change, 1978–90	22.6
Average annual openings, 1978–90	16,500

Growth	5,100
Replacement	11,400
Available training data:	
Jobs Corps completions	209

Hotel front office clerks. High school graduation is the usual requirement for front office jobs. Newly hired workers usually begin as mail, information, or key clerks and are trained on the job. Some clerks may need additional training in data processing or office machine operation. Most hotels fill front office jobs by promotion from within, so that a key or mail clerk may be promoted to room clerk, then to assistant front office manager, and eventually to front office manager. Clerks can improve their opportunities for promotion by taking courses in hotel management offered by colleges, junior colleges, and vocational schools, or by taking home or group study courses, such as those offered by the Educational Institute of the American Hotel and Motel Association. College training is an asset for advancement to managerial jobs.

Employment, 1978	79,000
Projected employment, 1990	98,000
Percent growth, 1978–90	24.9
Average annual openings, 1978–90	5,400
Growth	1,700
Replacement	3,700
Available training data	—

Office machine operators. These workers generally are trained on the job; the amount of training varies with the type of machine being operated. Training can range from a few days for duplicating machine operators to several months of training at a manufacturer's school for bookkeeping and billing machine operators. Employers prefer to hire high school or business school graduates and generally expect applicants to be able to type and know how to operate adding machines and calculators. A knowledge of business arithmetic also is helpful. Many high schools, vocational schools, and State and local training programs teach these skills.

Employment, 1978	160,000
Projected employment, 1990	202,000
Percent change, 1978–90	26.2
Average annual openings, 1978–90	9,700
Growth	3,500
Replacement	6,200
Available training data:	
Job Corps completions[1]	—

[1]Fewer than 25.

Postal clerks. These workers are trained on the job. Applicants must be at least 18 except for high school graduates, who must be at least 16. Applicants must pass an examination that tests clerical accuracy, and the ability to read, do simple arithmetic, and memorize mail sorting systems. Applicants also must pass a physical examination and may have to show that they can handle mail sacks weighing up to 70 pounds.

Employment, 1978	260,000
Projected employment, 1990	210,000
Percent change, 1978–90	−19.0
Average annual openings, 1978–90	2,000
Decline	−4,000
Replacement	6,000
Available training data:	
Job Corps completions	104

Receptionists. Receptionists are trained on the job and usually can learn the proper office procedures in a month. If operating a switchboard is part of the job, this skill may take longer to learn. A high school diploma generally is required and courses in English, typing, elementary bookkeeping, and business practices are helpful. A neat appearance, a pleasant voice, and an even disposition are important. Some employers prefer applicants who have had some college training. College or business school training can help a receptionist advance to secretary or administrative assistant.

Employment, 1978	588,000
Projected employment, 1990	752,000
Percent growth, 1978–90	27.9
Average annual openings, 1978–90	41,000
Growth	14,000
Replacement	27,000
Available training data:	
Job Corps completions	77

Secretaries and stenographers. High school graduation is the minimum educational requirement for practically all secretarial and stenographic positions. Good spelling, punctuation, and grammar are important skills. Many employers prefer to hire applicants who have had additional training at a public or private vocational school or in college. These courses range in length from several months' instruction in shorthand and typing to 1- or 2-year programs that teach specialized skills, such as legal or medical secretarial work. Employers generally test applicants to see that they meet minimum standards of typing and stenographic speed. Persons seeking a job as a shorthand reporter should be able to transcribe 225 words per minute.

Several States require court reporters to be Certified Shorthand Reporters (CSR's). Certification is administered by a board of examiners in each State. The National Shorthand Reporters Association confers the designation Registered Professional Reporter (RPR) upon individuals who pass a two-part examination and participate in continuing education programs. This

designation, which is widely recognized as a mark of excellence in the field, can be substituted for the CSR in some of the States that require it.

The mark of achievement in the secretarial field is the designation Certified Professional Secretary (CPS), which the National Secretaries Association awards to individuals who pass a series of examinations.

Currently, employers report a shortage of well-qualified secretaries. Employment prospects should be very good, particularly for applicants with excellent typing and shorthand skills and experience in office work.

Employment, 1978	3,684,000
Projected employment, 1990	5,357,000
Percent growth, 1978–90	45.4
Average annual openings, 1978–90	305,000
Growth	138,000
Replacement	167,000
Available training data:	
Public vocational education completions	170,167
Private vocational education completions	17,991
Job Corps completions	171
Junior college graduates	23,132
Bachelor's degrees in secretarial studies	1,830

Shipping and receiving clerks. High school graduates are preferred for beginning jobs in shipping and receiving departments. English, typing, business arithmetic, and other high school or vocational school business subjects are helpful. Newly hired workers are trained on the job and often begin by filing, checking addresses, attaching labels, and verifying the contents of shipments. After gaining experience, clerks may be assigned more responsible tasks, such as dealing with damaged merchandise.

Employment, 1978	461,000
Projected employment, 1990	567,000
Percent change, 1978–90	23.0
Average annual openings, 1978–90	22,000
Growth	8,800
Replacement	13,200
Available training data	—

Statistical clerks. A high school diploma or its equivalent is required for most jobs as statistical clerks. Newly hired workers are trained on the job and taught their employers' record systems and procedures. In some instances, individuals are hired as general office clerks before being promoted to statistical clerk. High school courses in mathematics, data processing, bookkeeping, and typing are good preparation.

Employment, 1978	377,000
Projected employment, 1990	475,000
Percent change, 1978–90	26.0
Average annual openings, 1978–90	23,500
Growth	8,200
Replacement	15,300
Available training data	—

Stock clerks. There are no specific educational requirements for beginning stock clerks, although employers prefer to hire high school graduates. The ability to read and write well and a knowledge of arithmetic are necessary; knowing how to type and file is useful. Newly hired workers learn their skills on the job and usually begin by counting and marking stock. Basic duties usually are learned in a few weeks. Stock clerks who handle jewelry, liquor, or drugs must be bonded (which requires good character references).

Employment, 1978	507,000
Projected employment, 1990	600,000
Percent change, 1978–90	18.3
Average annual openings, 1978–90	23,000
Growth	7,800
Replacement	15,200
Available training data:	
Job Corps completions	114

Typists. Employers generally prefer to hire high school graduates who can type at least 50-60 words per minute. Good spelling, punctuation, and grammar are important skills. Most typists learn their skills in high school, or take courses lasting several months at public or private vocational schools. Community and junior colleges also offer the business courses needed for a typist job.

Employment, 1978	1,044,000
Projected employment, 1990	1,246,000
Percent change, 1978–90	19.4
Average annual openings, 1978–90	59,000
Growth	17,000
Replacement	42,000
Available training data:	
Public vocational education completions	144,077
Private vocational education completions	700
Job Corps completions	1,600

Computer and related occupations

Computer operating personnel. High school graduation is the minimum educational requirement for computer operating jobs such as keypunch operator, auxiliary equipment operator, and console operator. Many employers prefer console operators who have some community or junior college education. Beginners usually are trained on the job; the length of training varies. Auxiliary equipment operators can learn their jobs in a few weeks, but console operators require several months of training before they are sufficiently familiar with the equipment to be able to trace the causes of breakdowns.

Formal computer training is desirable because most employers look for applicants who already are skilled in

operating data entry equipment or computer consoles. Many high schools, vocational schools, computer and business schools, and community and junior colleges offer computer training.

Employment, 1978	666,000
Projected employment, 1990	665,000
Percent change, 1978–90	−0.2
Average annual openings, 1978–90	12,500
Decline	−100
Replacement	12,600
Available training data:	
Public vocational education completions	11,519
Private vocational education completions	627
Job Corp completions[1]	278
Junior college graduates[1]	5,652

[1]Includes training for keypunch and other input technologies, computer operators and peripheral equipment operators, and general data processing workers.

Programmers. There are no universal training requirements for programmers because employers' needs vary. Most programmers are college graduates; others have taken courses in programming to supplement their experience. Firms that use computers for scientific or engineering applications usually require programmers to have a bachelor's degree with a major in the physical sciences, mathematics, engineering, or computer science. Some of these jobs require a graduate degree. Although some employers who use computers for business applications do not require college degrees, they prefer applicants who have had courses in data processing, accounting, and business administration.

Public and private vocational schools, high schools, community and junior colleges, and universities teach computer programming. Instruction ranges from introductory courses to advanced courses at the graduate level. High schools in many parts of the country also offer courses in computer programming.

An indication of experience and professional competence at the senior programmer level is the Certificate in Computer Programming (CCP), conferred by the Institute of Certification of Computer Professionals upon candidates who have passed a 5-part examination.

Employment, 1978	247,000
Projected employment, 1990	320,000
Percent growth, 1978–90	29.6
Average annual openings, 1978–90	9,200
Growth	6,100
Replacement	3,100
Available training data:	
Public vocational education completions	11,165
Private vocational education completions	4,776
Junior college graduates	3,368
Degrees in computer and information sciences:	
Bachelor's degrees	7,224
Master's degrees	3,038
Doctor's degrees	196

Systems analysts. No one way of preparing for a job as a systems analyst exists because employers' preferences depend on the type of work done in the firm. Generally, however, a bachelor's degree is the minimum educational requirement. For a job with a bank, insurance company, or business firm, a college degree in accounting, business, or economics is appropriate. For work in a scientific or technical organization, applicants need a degree in the physical sciences, mathematics, engineering, or computer science. In addition to a bachelor's degree in a suitable field, some employers prefer applicants to have related work experience. Others require a graduate degree. A growing number of employers seek applicants who have a degree in computer science, information science, information systems, or data processing. Regardless of college major, most employers look for people who are familiar with programming languages. Courses in computer concepts, systems analysis, and data base management systems offer good preparation for a job in this field.

In addition, most employers prefer applicants who have some experience in computer programming. Because of the importance of programming experience, many who begin as programmers are promoted to analyst trainees. Employers, computer manufacturers, and college and universities offer formal training in systems analysis.

Because technological advances occur so rapidly in the computer field, continuous study is required to keep skills up to date. Usually employers and "software" vendors offer 1- and 2-week courses. Additional training may come from professional development seminars offered by professional computing societies. An indication of experience and professional competence is the Certificate in Data Processing (CDP), conferred by the Institute for Certification of Computer Professionals upon candidates who have completed 5-years' experience and passed a 5-part examination.

Employment, 1978	182,000
Projected employment, 1990	250,000
Percent growth, 1978–90	37.4
Average annual openings, 1978–90	7,900
Growth	5,700
Replacement	2,200
Available training data[1]	—

[1]See programmers.

Banking occupations

Bank clerks. These workers are trained on the job and generally learn their skills in just a few days or weeks. A high school diploma is not absolutely required, but

definitely is preferred. High school or vocational school courses in bookkeeping, typing, business arithmetic, and office machine operation are useful.

Employment, 1978	505,000
Projected employment, 1990	760,000
Percent change, 1978–90	50.5
Average annual openings, 1978–90	45,000
Growth	21,000
Replacement	24,000
Available training data	—

Bank officers and managers. These positions generally are filled by hiring and promoting management trainees, although outstanding bank clerks or tellers may be promoted to trainee jobs and then to management positions. A bachelor's degree is the minimum educational requirement for management trainees. A major in banking and finance is useful, but liberal arts graduates who have had courses in accounting, economics, and statistics also are well qualified. Some banks prefer to hire persons who have graduate degrees for trainee positions; the most desirable degree is the Master of Business Administration. Bank clerks and tellers who are promoted to management trainee positions usually are not college graduates. Often, however, they have taken home study courses in subjects related to banking, such as finance and commercial credit, offered by the American Bankers Association.

In-house training programs for bank officers generally last from 6 months to 1 year. Trainees usually rotate among all the departments in the bank and are encouraged to continue their education through courses offered by local colleges and universities, or through the American Bankers Association.

Employment, 1978	330,000
Projected employment, 1990	510,000
Percent change, 1978–90	54.5
Average annual openings, 1978–90	28,000
Growth	15,000
Replacement	13,000
Available training data:	
Degrees in banking and finance:	
Bachelor's degrees	8,796
Master's degrees	3,298
Doctor's degrees	32

Bank tellers. These workers learn their skills on the job. Generally, banks prefer to hire high school graduates who have some experience in office work. Prior experience is important because employers look for applicants who have the maturity and tact to deal with customers. High school courses in typing, mathematics, and office machine operation are useful. Because tellers handle large amounts of money, applicants must be bonded (which requires good character references).

Employment, 1978	410,000
Projected employment, 1990	455,000
Percent change, 1978–90	11.0
Average annual openings, 1978–90	17,000
Growth	4,000
Replacement	13,000
Available training data	—

Insurance occupations

Actuaries. A bachelor's degree with a major in mathematics or statistics provides a good background for a beginning job in a large life or casualty insurance company; a degree in actuarial science is even better. Some companies hire applicants who have an economics or business administration major, provided they have a thorough foundation in calculus, probability, and statistics. Other useful courses are insurance law, economics, and accounting. Although only 25 colleges and universities offer a degree in actuarial science, several hundred schools offer a degree in mathematics or statistics.

It usually takes from 5 to 10 years after beginning an actuarial career to complete the entire series of examinations required for full professional status. Applicants who pass the first two examinations while still in college usually have an advantage in competing for actuarial jobs upon graduation. The advanced examinations require extensive home study and on-the-job experience.

Employment, 1978	9,000
Projected employment, 1990	12,000
Percent change, 1978–90	32.4
Average annual openings, 1978–90	500
Growth	250
Replacement	250
Available training data:	
Degrees in business statistics:	
Bachelor's degrees	291
Master's degrees	164
Doctor's degrees[1]	—

[1]Fewer than 25.

Claim representatives. A growing number of insurance companies prefer to hire college graduates for positions as claim representatives (examiners and adjusters). Although courses in insurance, economics, or other business subjects are helpful, a major in almost any field is acceptable. An adjuster who has a business or accounting major might specialize in handling claims for losses due to business interruption or damage to merchandise. Someone who has a degree in industrial engineering might adjust industrial claims. College training is not always necessary, however. Persons experienced in automobile repair work might be hired as auto adjusters, and those who have clerical work experience might get jobs as inside adjusters.

Newly hired claim representatives are trained on the job under the supervision of an experienced worker. The Insurance Institute of America offers a six-semester program leading to a diploma in insurance loss and claim adjusting upon successful completion of six examinations. Adjusters can prepare for these examinations through home study or classroom courses.

The Life Office Management Association (LOMA), in cooperation with the International Claim Association, offers a claims education program for life and health examiners. The program is part of the LOMA Institute Insurance Education Program leading to the professional designation, FLMI (Fellow, Life Management Institute) upon successful completion of eight written examinations.

About three-fourths of the States require adjusters to be licensed. State licensing requirements vary, but applicants usually must complete an approved course in insurance or loss adjusting and pass a written examination. They should be bonded (which requires good character references) and be at least 20 years old.

Employment, 1978	169,000
Projected employment, 1990	237,000
Percent change, 1978–90	40.5
Average annual openings, 1978–90	10,250
Growth	5,600
Replacement	4,650
Available training data	—

Underwriters. A bachelor's degree is the minimum educational requirement for beginning underwriting jobs in most insurance companies. Applicants who have degrees in business administration or liberal arts are preferred, but college training in almost any field is acceptable. In some companies, high school graduates who have experience as underwriting clerks are trained as underwriters. Independent study programs, which often are required for advancement in underwriting, are available through the American Institute of Property and Liability Underwriters, the American College of Life Underwriters, the Academy of Life Underwriters, the Health Insurance Association of America, and the Life Office Management Association.

The following estimates represent combined data for insurance agents, brokers, and underwriters:

Employment, 1978	568,000
Projected employment, 1990	682,000
Percent change, 1978–90	20.0
Average annual openings, 1978–90	30,000
Growth	9,500
Replacement	20,500
Available training data	—

Administrative and related occupations

Accountants. Most large firms require applicants to have a bachelor's degree with a major in accounting. Some prefer applicants who have a master's degree in accounting. Training in accounting also is available in junior and community colleges, business schools, and correspondence schools; however, job opportunities for graduates of these 1- and 2-year programs usually are limited to small accounting and business firms. A growing number of employers prefer applicants who are familiar with computers and their applications in accounting and internal auditing.

All States require certified public accountants (CPA's) to be certified by the State board of accountancy. Individuals receive this designation by passing the CPA examination, which is prepared by the American Institute of Certified Public Accountants, and meeting the education and experience requirements of the State. Other designations indicating professional competence include certified internal auditor (CIA) and certified management accountant (CMA).

College graduates will be in greater demand than applicants who lack this training. Experience in an accounting firm while in school helps in job placement after graduation.

Employment, 1978	985,000
Projected employment, 1990	1,275,000
Percent growth, 1978–90	29.4
Average annual openings, 1978–90	61,000
Growth	24,000
Replacement	37,000
Available training data:	
Junior college graduates	12,135

	1977–78	*Projected 1978–90 (annual average)*
Degrees in accounting:		
Bachelor's degrees	40,856	49,615
Master's degrees	3,389	4,493
Doctor's degrees	44	49

Buyers. Although many buyers have worked their way from stockroom and sales positions, a college degree is increasingly important and may be required in the future. Many colleges, junior colleges, and business schools offer 1- or 2-year programs in marketing and purchasing. Generally, however, employers accept graduates in any field and train them on the job.

Many stores have formal training programs for all management trainees, including buyers. These programs last from 6 to 8 months and combine classroom

instruction in merchandising and purchasing with short rotations to various jobs and departments in the store.

Employment, 1978	115,000
Projected employment, 1990	142,000
Percent change, 1978–90	23.5
Average annual openings, 1978–90	7,400
Growth	2,200
Replacement	5,200
Available training data	—

City managers. Although some individuals who have a bachelor's degree in public administration may find employment as a city manager, a master's degree in public or business administration is becoming an essential qualification. Workers in this field usually begin as a management assistant in a position such as administrative assistant, department head assistant, or assistant city manager. As they gain experience and administrative skills, assistants may advance to more responsible positions or to city manager jobs. Professional advancement usually involves relocating to city manager jobs in progressively larger cities.

Employment, 1978	3,300
Projected employment, 1990	5,000
Percent change, 1978–90	52.0
Average annual openings, 1978–90	350
Growth	150
Replacement	200
Available training data	—

Credit managers. A bachelor's degree usually is required for beginning jobs in credit management. Employers generally prefer applicants who have majors in business administration, economics, or accounting, although some employers hire liberal arts graduates as well. Experience may be substituted for the college degree; some employers accept high school graduates who have had experience in credit collection or in processing credit information. Many formal training programs are available through the educational branches of the associations that service the credit and finance fields.

Employment, 1978	49,000
Projected employment, 1990	56,000
Percent growth, 1978–90	14.3
Average annual openings, 1978–90	2,200
Growth	600
Replacement	1,600
Available training data	—

Hotel managers and assistants. Although experience and management ability are the most important considerations in selected hotel managers, employers increasingly prefer college graduates. Formal training in hotel or restaurant management can be helpful, in part because such programs also provide opportunities for part-time or summer job experience and contacts with prospective employers. Many employers prefer applicants who have completed a 4-year college curriculum in hotel and restaurant administration. In 1979, about 50 such programs were offered. Others hire graduates of the hotel training program offered by some junior colleges, technical institutes, and the Educational Institute of the American Hotel and Motel Association. Some large hotels have special management trainee programs in which newly hired workers or persons promoted from within rotate among various departments to acquire a thorough knowledge of the hotel's operation.

Employment, 1978	168,000
Projected employment, 1990	193,000
Percent growth, 1978–90	14.9
Average annual openings, 1978–90	8,900
Growth	2,100
Replacement	6,800
Available training data:	
Public vocational education completions	3,495

	1977–78	*Projected 1978–90 (annual average)*
Degrees in hotel and restaurant management:		
Junior college graduates	2,149	—
Bachelor's degrees	1,696	1,827
Master's degrees	150	70

Lawyers. In all States, admission to the bar is required before an individual can practice law. To qualify for the bar examination, applicants generally must complete 4 years of college followed by 3 years of law school. Four years of study usually are required to complete a night school law curriculum.

Although formal training takes place in law school, the courses one selects as an undergraduate are important because there is no "prelaw major." Students should choose courses that develop and expand their reading, writing, verbal, and analytical skills. College majors in the social sciences, natural sciences, or humanities are particularly suitable. Competition for admission to law school is intense, and as is true for other professional schools, law schools vary widely in quality and reputation. Graduates will find that their standing in the graduating class and the stature of the school they attended are important to prospective employers.

Despite strong employment growth among lawyers, the sizable number of law school graduates entering the job market each year has created keen competition for

salaried positions. While the number of graduates is expected to level off during the 1980's, competition will remain intense. The best prospects for establishing new practices will be in small towns and expanding suburbs, although this will remain a risky and expensive venture. An increasing proportion of law graduates will enter administrative and managerial positions for which legal training is an asset but not normally a requirement. Such jobs are available in banks, insurance firms, real estate companies, government agencies, and other organizations.

Employment, 1978	487,000
Projected employment, 1990	609,000
Percent growth, 1978–90	25.0
Average annual openings, 1978–90	37,000
Growth	10,000
Replacement	27,000

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Law school graduates[1]	34,616	36,632

[1]Includes all schools approved by the American Bar Association (ABA), about 170, but excludes the overwhelming majority of schools not approved by ABA, about 60.

Personnel and labor relations workers. A bachelor's degree is the minimum educational background for a beginning job in personnel work—a field which includes occupations such as recruiter, interviewer, job analyst, position classifier, wage administrator, training specialist, and employee counselor. Some employers look for college graduates who have majored in personnel administration, public administration, business, or economics, while others prefer applicants who have a liberal arts background. Graduate study in industrial relations, economics, business, or law usually is required for labor relations jobs. The combination of a law degree plus a master's in industrial relations is increasingly desirable for people seeking to enter the small and highly competitive labor relations field. Experience is important, too, and some workers gain essential experience in personnel work and then switch to labor relations. While at least 200 colleges and universities offer programs leading to a bachelor's degree in personnel and labor relations, only 30 schools offer the master's degree in labor or industrial relations.

Employment, 1978	405,000
Projected employment, 1990	473,000
Percent growth, 1978–90	16.8
Average annual openings, 1978–90	17,000
Growth	6,000
Replacement	11,000
Available training data	—

Purchasing agents. A college degree is required for a beginning position with a large company. Many companies hire business administration, business management, or liberal arts majors for trainee positions, but firms that manufacture machinery or chemicals generally prefer applicants who have a science or engineering degree. A growing number of large companies look for applicants who have a master's degree in business administration or management. Some small firms select purchasing agents from their own staff and do not require a college degree.

Continuing education is essential for career advancement. Purchasing agents are encouraged to participate in seminars sponsored by professional societies and to take courses in purchasing at local colleges and universities. The recognized mark of experience and professional competence in private industry is the designation Certified Purchasing Manager (CPM), conferred by the National Association of Purchasing Management upon candidates who have passed four examinations and meet educational and experience requirements. In government agencies, the mark of professional competence are the designations Professional Public Buyer (PPB) and Certified Public Purchasing Officer (CPPO), conferred by the National Institute of Governmental Purchasing upon persons who have passed two examinations and meet educational and experience requirements.

Employment, 1978	85,000
Projected employment, 1990	67,000
Percent growth, 1978–90	44.3
Average annual openings, 1978–90	13,400
Growth	6,800
Replacement	6,600
Available training data	—

Urban and regional planners. A master's degree in planning is the usual requirement for jobs at the entry level. There are some beginning jobs, however, for which a bachelor's degree in city planning, architecture, landscape architecture, engineering, or other closely related fields is acceptable. A master's degree is essential for advancement in most jobs.

Although employment of urban and regional planners is expected to grow faster than the average for all occupations through the 1980's, persons seeking jobs as urban or regional planners may face competition. In recent years, qualified applicants have exceeded job openings in planning, and the situation is expected to persist unless fewer degrees are awarded through the 1980's than in recent years.

Employment, 1978	17,000
Projected employment, 1990	22,000
Percent growth, 1978–90	30.0
Average annual openings, 1978–90	800
Growth	450
Replacement	350

Available training data:	
Degrees in city, community, and regional planning:	
Bachelor's degrees	521
Master's degrees	1,192
Doctor's degrees	46

Service Occupations

Cleaning and related occupations

Building custodians. Most building custodians are trained on the job. A high school diploma is not required, as a rule, but workers should know simple arithmetic and read well enough to follow written instructions. High school shop courses are helpful because minor plumbing or carpentry may be part of the job. Training in custodial skills is available through government training programs, labor unions, and public and private voctional education programs.

Employment, 1978	2,251,000
Projected employment, 1990	2,744,000
Percent change, 1978–90	24.8
Average annual openings, 1978–90	180,000
Growth	41,000
Replacement	139,000

Available training data:	
Public vocational education completions	5,406
Private vocational education completions	108
Job Corps completions	1,603

Hotel housekeepers and assistants. Employers prefer to hire applicants who are high school graduates. Experience or training in hotel housekeeping also is helpful in getting a job. Several colleges, junior colleges, and technical institutes have programs in hotel administration that include courses in housekeeping. The Educational Institute of the American Hotel and Motel Association offers courses for either classroom or home study. The National Executive Housekeepers Association certifies those who complete certain education and experience requirements. Persons who have degrees in institutional housekeeping management or who have taken courses in this area may have the best opportunities to advance to executive housekeeper.

Employment, 1978	20,000
Projected employment, 1990	29,000
Percent growth, 1978–90	49.9
Average annual openings, 1978–90	2,000
Growth	800
Replacement	1,200

Available training data	—

Pest controllers. Pest controllers are trained on the job. Many large firms provide several weeks of training that includes formal class work and closely supervised experience. Pest controllers may become certified by passing a State examination on the nature and safe use of pesticides. Most States require pest control firms to have at least one certified pest controller available for consultation to noncertified workers.

Employment, 1978	31,500
Projected employment, 1990	44,500
Percent growth, 1978–90	42.0
Average annual openings, 1978–90	2,500
Growth	1,100
Replacement	1,400

Available training data	—

Food service occupations

Bartenders. Most bartenders learn their trade on the job. A high school diploma is not required. Experience as a bartender's helper, dining room attendant, waiter, or waitress is good training. Some schools offer short courses in bartending. Generally, bartenders must be at least 21 years old; some employers prefer to hire persons who are 25 or older. Some States require bartenders to have health certificates assuring that they are free from contagious diseases. In some instances, bartenders must be bonded.

Employment, 1978	282,000
Projected employment, 1990	369,000
Percent growth, 1978–90	30.9
Average annual openings, 1978–90	21,600
Growth	7,300
Replacement	14,300

Available training data	—

Cooks and chefs. Most cooks acquire their skills on the job while employed as kitchen helpers, although it is becoming common for cooks to have had high school or post-high school vocational training in food preparation. Cooks and chefs may also be trained as apprentices under trade union contracts, professional associations, or employee training programs conducted by

large hotels and restaurants. A high school diploma is not required for most beginning jobs; however, employers usually prefer high school graduates, and applicants for apprenticeship must be graduates. A few private schools have 2- to 3-year training programs for cooks and chefs. The Armed Forces also are a good source of training and experience in food service. Persons who wish to become chefs may find courses in business administration helpful since chefs often are responsible for directing the operation of their kitchens, including purchasing supplies, planning menus, and supervising other kitchen staff. Most States require cooks and chefs to have health certificates showing that they are free from contagious diseases.

Employment, 1978	1,186,000
Projected employment, 1990	1,564,000
Percent growth, 1978–90	31.9
Average annual openings, 1978–90	86,000
Growth	31,000
Replacement	55,000
Available training data:	
Job Corps completions	1,955
Apprenticeship completions	86

Dining room attendants and dishwashers. These occupations can be learned on the job with very little formal training. A high school diploma is not required, and many employers will hire applicants who do not speak English. State laws often require dining room attendants and dishwashers to obtain health certificates showing that they are free of contagious diseases.

Employment, 1978	455,000
Projected employment, 1990	741,000
Percent growth, 1978–90	62.8
Average annual openings, 1978–90	37,000
Growth	24,000
Replacement	13,000
Available training data	—

Food counter workers. Most counter workers learn their skills on the job. For counter jobs that require totaling bills and making change, employers prefer persons who are good in arithmetic and have attended high school. A diploma generally is not necessary. Managers of fast-food restaurants often hire high school students as part-time counter workers. State laws often require counter workers to obtain health certificates showing that they are free of contagious diseases.

Employment, 1978	463,000
Projected employment, 1990	648,000
Percent growth, 1978–90	39.9
Average annual openings, 1978–90	34,000
Growth	15,000
Replacement	19,000
Available training data:	
Job Corps completions	77

Meatcutters. Although many learn their skills informally on the job, most meatcutters complete a 2-year apprenticeship program. A few attend private schools specializing in meatcutting. At the end of the training, apprentices are given a meatcutting test which their employers observe. Employers prefer high school graduates. Some States require meatcutters to have health certificates showing that they are free of contagious diseases.

Employment, 1978	204,000
Projected employment, 1990	187,000
Percent change, 1978–90	−8.3
Average annual openings, 1978–90	5,200
Decline	−1,400
Replacement	6,600
Available training data:	
Job Corps completions	108
Apprenticeship completions	392

Waiters and waitresses. Although most waiters and waitresses start as dining room attendants, carhops, or food counter workers, or learn their skills on the job, some attend training courses offered by public and private vocational schools, restaurant associations, or large restaurant chains. Employers generally prefer applicants who have had at least 2 or 3 years of high school, and are good in arithmetic. Expensive restaurants that take pride in the quality of service they provide often hire only experienced waiters and waitresses. Knowledge of a foreign language is helpful in restaurants specializing in food of a foreign country. State laws often require waiters and waitresses to obtain health certificates showing that they are free of contagious diseases.

Employment, 1978	1,383,000
Projected employment, 1990	1,635,000
Percent growth, 1978–90	18.2
Average annual openings, 1978–90	70,000
Growth	21,000
Replacement	49,000
Available training data:	
Job Corps completions	46

Personal service occupations

Barbers. All States require barbers to be licensed. To obtain a license, applicants must have graduated from a State-approved barber school and be at least 16 years old (in some States 18). States have varying education requirements—some require graduation from high school, while others have no requirement at all. Many States require a beginner to take an examination for an

apprentice license, and then, after 1 or 2 years of work, take a second examination for a license as a registered barber. Many public and private schools and a few vocational schools offer barber training which usually lasts 9 to 12 months. Because some States do not recognize out-of-State training, apprenticeship work, or licenses, persons who wish to become barbers should review the laws of the State in which they wish to work before entering barber school.

Employment, 1978	121,000
Projected employment, 1990	140,000
Percent growth, 1978–90	15.7
Average annual openings, 1978–90	9,700
Growth	1,600
Replacement	8,100
Available training data:	
Public vocational education completions	1,094
Private vocational education completions	5,859
Job Corps completions[1]	—
Apprenticeship completions[2]	229

[1]Fewer than 25.
[2]May include some beauticians.

Bellhops and bell captains. Bellhops are trained on the job. Although a high school diploma is not required, it improves chances for promotion to bell captain or to front office clerk. Opportunities for advancement to bell captain are limited, however.

Employment, 1978	20,000
Projected employment, 1990	19,000
Percent change, 1978–90	−5.0
Average annual openings, 1978–90	600
Decline	−100
Replacement	700
Available training data	—

Cosmetologists. All States require cosmetologists to be licensed. Most States require applicants for a license to be at least 16 years old and pass a physical examination. States have varying education requirements—some have no requirement, while others require graduation from high school. Successful completion of a State-approved cosmetology course is appropriate preparation for taking a State licensing examination. In some States, completion of an apprenticeship program can substitute for graduation from cosmetology school, but few cosmetologists learn their skills this way. Both public and private vocational schools offer training in cosmetology. A daytime course usually takes 6 months to 1 year; an evening course takes longer. An apprenticeship generally lasts 1 or 2 years.

Employment, 1978	542,000
Projected employment, 1990	624,000
Percent growth, 1978–90	15.1
Average annual openings, 1978–90	28,500
Growth	6,900
Replacement	21,600
Available training data:	
Public vocational education completions	27,215
Private vocational education completions	51,177
Job Corps completions	71

Funeral directors and embalmers. All States require embalmers to be licensed. Although licensing standards vary by State, an embalmer generally must be 21, have a high school diploma or its equivalent, graduate from a mortuary science school, serve an internship, and pass a State board examination. About half of the States require a year or more of college in addition to training in mortuary science.

Mortuary science programs are offered by vocational schools, colleges, and junior colleges. Most of these programs are 2 years in length, although a few last 4 years. Internships are 1 to 2 years in length and may be served before, during, or after one attends mortuary school, depending on State regulations.

All but six States also require funeral directors to be licensed. The requirements are similar to those for embalmers, but directors have special internship training and board examinations. Most people obtain both licenses.

Employment, 1978	45,000
Projected employment, 1990	45,000
Percent change, 1978–90	0.0
Average annual openings, 1978–90	2,200
Growth	0
Replacement	2,200
Available training data:	
Public vocational education completions	307
Private vocational education completions	2,060

Private household service occupations

Private household workers. Most jobs require no formal education. Instead, the ability to cook, sew, wash and iron, clean house, and care for children is important. Many necessary skills are learned in the home; more advanced skills can be learned in home economics courses in high schools, junior colleges, vocational schools, and through government and private training programs.

Employment, 1978	1,162,000
Projected employment, 1990	893,000
Percent growth, 1978–90	−23.2
Average annual openings, 1978–90	45,000
Decline	−23,000
Replacement	68,000
Available training data	—

Protective and related occupations

Correction officers. Most State and local governments prefer individuals who are high school graduates and are at least 21 years old. Many require applicants to pass a physical examination and meet standards of height, weight, vision, and hearing. Some State and local governments require applicants to qualify through a written examination that tests general intelligence. Although some correction officers attend training academies, most are trained on the job. Areas covered during their training include institutional policies and regulations, inmate behavior, custody procedures, report writing, and security.

Employment, 1978	110,000
Projected employment, 1990	153,000
Percent change, 1978–90	38.9
Average annual openings, 1978–90	13,000
Growth	3,500
Replacement	9,500
Available training data	—

Firefighters. In most communities, applicants must take a written test, be at least 18 years of age, have a high school education or the equivalent, and meet certain height and weight requirements. They also must pass a physical examination and tests of strength, stamina, and agility. Those who score the highest on these examinations have the best chances for appointment. Experience as a volunteer firefighter or in the Armed Forces may help chances for appointment, too. Beginners in large fire departments generally are trained for several weeks at the city's fire school before assignment to local fire companies. Small communities either train firefighters on the job or hire experienced workers. Additional study can be valuable in preparing for promotion examinations, and many firefighters participate in training programs conducted by fire departments and public vocational schools. Many 2- and 4-year colleges and universities offer courses in fire engineering and fire science.

Employment, 1978	220,000
Projected employment, 1990	270,000
Percent growth, 1978–90	21.0
Average annual openings, 1978–90	7,500
Growth	3,900
Replacement	3,600
Available training data:	
Public vocational education completions	78,542
Junior college graduates	2,827

Guards. Employers prefer high school graduates; applicants who have not completed high school may be tested for their ability to read, write, and follow written and oral instructions. Police experience gained in the Armed Forces or in the State or local police departments is helpful. Most newly hired guards receive on-the-job training combined with formal instruction that covers areas such as the use of firearms, first aid, emergency procedures, and security problems.

Employment, 1978	550,000
Projected employment, 1990	820,000
Percent growth, 1978–90	50.0
Average annual openings, 1978–90	70,000
Growth	20,000
Replacement	50,000
Available training data:	
Job Corps completions[1]	—

[1]Fewer than 25.

Police officers. Most large cities and many smaller communities fill police jobs by competitive examination. Candidates usually must be at least 21 years old, high school graduates, in good health, and must meet height, weight, hearing, and vision requirements. Police departments in some large cities generally require 1 or more years of college, and a growing number of police departments hire students majoring in law enforcement as police interns. Some small cities may consider applicants who have not finished high school.

Small communities often train police officers on the job; large cities have formal training at a police academy for a few weeks or several months. Training usually includes instruction in laws and ordinances, civil rights, investigation techniques, traffic control, self-defense, use of firearms, and first aid.

Police careers are attractive to many people because entrance requirements are minimal, the work is challenging, layoffs are rare, and pay and pensions are relatively good. As a result, keen competition is expected for job openings through the 1980's.

Employment, 1978	450,000
Projected employment, 1990	550,000
Percent growth, 1978–90	22.7
Average annual openings, 1978–90	16,500
Growth	8,500
Replacement	8,000
Available training data:	
Public vocational education completions[1]	21,744
Private vocational education completions	3,331
Job Corps completions[2]	—
Junior college graduates	17,278

[1]May include some State police officers.
[2]Fewer than 25.

State police officers. State civil service regulations govern the appointment of State police officers; a competitive examination generally is required. In most

States, the examination is open to high school graduates, or to persons who have an equivalent combination of education and experience. State police officers must be at least 21, in good health, and must meet height, weight, hearing, and vision standards. Tests of strength and agility often are required. The character and background of candidates usually are investigated. In some States, high school graduates who are under 21 may enter State police work as cadets. They attend classes, are assigned nonenforcement duties, and, if they qualify, may be appointed officrs at age 21.

In all States, recruits must enter a formal training program for several months of classroom instruction in topics such as State laws and jurisdictions, traffic control, and accident investigation. Recruits also learn self-defense, use of firearms, driving techniques, and first aid.

High school and college courses in English, government, psychology, sociology, and physics are useful. Physical education and sports develop stamina and agility. Driver education courses and military police training also are helpful.

Employment, 1978	47,000
Projected employment, 1990	59,000
Percent change, 1978–90	26.0
Average annual openings, 1978–90	1,800
Growth	1,000
Replacement	800
Available training data:	
Public vocational education completions[1]	—
Private vocational education completions[1]	—
Junior college graduates[1]	—

[1]See Police officers.

Construction inspectors (government). These workers receive most of their training on the job. Generally, applicants must have several years of experience as a construction contractor, supervisor, or craft worker. Previous experience as an electrician, plumber, pipefitter, or carpenter is particularly helpful. A high school diploma is required by Federal, State, and most local governments. Many employers prefer inspectors to be graduates of an apprenticeship program or to have had college courses in architecture, engineering, mathematics, or construction technology. Periodic retraining is necessary to keep abreast of changes in technology, building codes, and related areas.

Employment, 1978	20,000
Projected employment, 1990	30,000
Percent change, 1978–90	50.0
Average annual openings, 1978–90	2,200
Growth	800
Replacement	1,400
Available training data	—

Health and regulatory inspectors (government). Because inspectors perform a wide range of duties, qualifications for employment vary. The Federal Government requires a passing score on the Professional and Administrative Career Examination (PACE) for many occupations, including immigration, customs, occupational safety and health, and consumer safety inspectors. To take the examination, a bachelor's degree or 3 years of responsible work experience are required. Other Federal inspectors must pass an examination based on specialized knowledge, in addition to having work experience in a related field. Qualifications for inspectors at the State and local level usually are similar to those for Federal employees. All inspectors are trained in the laws and inspection procedures in their specific field through a combination of classroom and on-the-job training.

Employment, 1978	100,000
Projected employment, 1990	122,000
Percent growth, 1978–90	24.6
Average annual openings, 1978–90	5,800
Growth	2,000
Replacement	3,800
Available training data:	
Junior college graduates	632

Other service occupations

Mail carriers. These workers are trained on the job. Applicants must be at least 18, except for high school graduates, who must be at least 16. They also must pass an examination that tests clerical accuracy and the ability to read, do simple arithmetic, and memorize mail sorting systems. If the job involves driving, an applicant must have a driver's license and pass a road test. Applicants also must pass a physical examination and may be asked to show that they can handle mail sacks weighing up to 70 pounds.

Employment, 1978	245,000
Projected employment, 1990	260,000
Percent change, 1978–90	6.0
Average annual openings, 1978–90	7,000
Growth	1,000
Replacement	6,000
Available training data	—

Telephone operators. New operators are trained on the job. Instruction and practice usually last from 1 to 3 weeks, and then operators are assigned to regular operator jobs and receive further instruction from supervisors. PBX operators may have a somewhat shorter training period than telephone company operators. High school graduation is required, and

courses in speech, office practices, and business arithmetic are helpful.

Employment, 1978	311,000
Projected employment, 1990	290,000
Percent change, 1978–90	−6.8
Average annual openings, 1978–90	9,900
Decline	−1,800
Replacement	11,700
Available training data:	
Job Corps completions	67

Education and Related Occupations

Teaching occupations

Kindergarten and elementary school teachers. All States require public elementary school teachers to be certified, and some States also require certification of elementary teachers in private and parochial schools. To become certified, an individual must have a bachelor's degree from an institution with a State-approved teacher education program; student teaching and basic education courses also are required. In 1978, 23 States required teachers to have graduate degrees. However, this requirement was often coupled with provisions concerning continued education. Thirty States had continuing education requirements for teachers in 1978. Some States demand U.S. citizenship, some an oath of allegiance, and several a health certificate. Local school systems sometimes have additional requirements.

Kindergarten and elementary school teachers may face competition for jobs of their choice through the 1980's. If the pattern continues in line with past trends, the number of persons qualified to teach in elementary schools will approximate the number of openings. The demand for teachers is determined mainly by pupil enrollments, which in turn depend on population growth. Based on projections of the population, the National Center for Education Statistics (NCES) projects that the downward enrollment trend for elementary schools, which has existed since 1967, will halt around 1983. Thereafter, enrollments will increase through the 1980's. Pupil-teacher ratios, which are expected to continue to decline, also will contribute to an increased demand for teachers. The primary source of teacher supply is new degree recipients. NCES projects an average of about 1 million new bachelor's degrees to be awarded annually over the 1978–90 period, although not all graduates will be qualified to teach in elementary schools. On the basis of recent trends, it is anticipated that an average of 103,000 graduates will be prepared to teach each year. Of these 87,000 are expected actively to seek teaching positions.

Teachers who have left the labor force and certified teachers who did not enter the labor force after graduation also are sources of supply. However, the number of prospective entrants from these sources is influenced by factors which cannot be projected with accuracy, such as the availability of teaching jobs relative to other jobs, and salaries of teachers relative to other occupations. Despite the problem of estimating future supply, there is every indication that the potential supply will exceed the average annual openings over the 1978–90 period. As a result, an increasing proportion of new college graduates certified to teach in elementary schools, as well as delayed entrants and reentrants, may have to seek employment in other occupations.

Employment, 1978	1,322,000
Projected employment, 1990	1,652,000
Percent growth, 1978–90	24.9
Average annual openings, 1978–90	86,000
Growth	27,500
Replacement	58,500

Available training data:	1977–78	*Projected 1978–90 (annual average)*
New college graduates prepared to teach in elementary schools[1]	93,622	103,000

[1]National Education Association.

Secondary school teachers. All States require public secondary school teachers to be certified, and some States also require certification of secondary teachers in private and parochial schools. To become certified, an individual must have a bachelor's degree from an institution with a State-approved teacher education program. Student teaching and basic education courses also are required. In 1978, 23 States required graduate degrees for initial certification. However, this requirement was often coupled with provisions concerning continued education. Thirty States required continuing education of teachers in 1978. Some States demand U.S. citizenship, some an oath of allegiance, and several a health certificate. Local school systems sometimes have additional requirements.

The supply of secondary school teachers is expected to exceed greatly the available number of openings

through the 1980's, if past trends of entry into the profession continue. The number of teaching positions projected to decline during this period as enrollment in secondary schools declines. The largest source of secondary teachers is new degree recipients. The National Center for Education Statistics projects an average of about 1 million new bachelor's degrees to be awarded annually over the 1978–90 period, although not all graduates will be qualified to teach in secondary schools. On the basis of recent trends, it is anticipated that about 132,000 graduates will be prepared to teach each year. Of these, 94,000 are expected to seek teaching positions.

Teachers who have left the labor force and certified teachers who did not enter the labor force after graduation also are sources of supply. However, the number of prospective entrants from these sources cannot be projected with accuracy, as it is affected by the availability of teaching jobs relative to other jobs, and salaries of teachers relative to other occupations. Despite the problem of estimating future supply, there is every indication that the potential supply will greatly exceed the expected number of openings. As a result, an increasing proportion of new college graduates certified to teach in secondary schools, as well as delayed entrants and reentrants, may have to seek employment in other occupations.

Employment, 1978	1,087,000
Projected employment, 1990	861,000
Percent change, 1978–90	−20.8
Average annual openings, 1978–90	7,200
Decline	−18,800
Replacement	26,000

Available training data:	1977–78	*Projected 1978–90 (annual average)*
New college graduates prepared to teach in elementary schools[1]	119,432	103,000

[1]Data from National Education Association.

College and university faculty. Beginning instructor positions in community and junior colleges and some 4-year colleges require a master's degree in the subject to be taught. A doctoral degree is required for entry level appointments in some colleges and universities and for tenure, which is increasingly difficult to attain. Advancement to assistant professor, and then to professor, requires additional teaching experience and published books and articles that evidence knowledge and research capability in one's discipline.

The number of doctoral and master's degree holders seeking junior college, college, and university faculty positions is expected to exceed greatly available job openings. Applicants face extremely keen competition, particularly for positions in the largest and most outstanding institutions. It appears, therefore, that an increasing proportion of prospective college teachers will have to seek nonacademic jobs.

Employment, 1978[1]	673,000
Projected employment, 1990[1]	611,000
Percent change, 1978–90	−9.2
Average annual openings, 1978–90	11,000
Decline	−5,000
Replacement	16,000
Available training data	—

[1]Does not include part-time junior instructors.

Teacher aides. Requirements vary widely. Some schools hire high school graduates; some do not require a diploma. Others want aides to have some college training or a bachelor's degree. Teacher aides may be trained on the job or through a formal training program. A growing number of junior and community colleges offer teacher aide programs that culminate in an associate degree. When hiring, schools may give preference to individuals who have experience working with children and have the most education. Some schools have regulations regarding the hiring of aides. Applicants may be required to have a family income below a certain level or to be parents of children in the school district. In addition, health regulations may require teacher aides to pass a physical examination.

Employment, 1978	342,000
Projected employment, 1990	519,000
Percent change, 1978–90	51.8
Average annual openings, 1978–90	26,000
Growth	15,000
Replacement	11,000
Available training data:	
Job Corps completions	35
Junior college graduates	6,187

Library occupations

Librarians. A master's degree in library science generally is required to enter the occupation. A Ph. D. degree is an asset for individuals who plan a teaching career or who aspire to a top administrative post, particularly in a college or university library, or in a large library system. Information scientists and special librarians generally need a master's degree or doctorate in the subject area of the specialized library. Most States require public school librarians to be certified both as teachers and librarians. Some States require certification of public

librarians; the specific education and experience necessary vary.

The employment outlook for librarians is expected to remain very competitive through the 1980's. Although library school enrollments are expected to decline, the number of new graduates and labor force reentrants seeking jobs probably will exceed openings. Most job openings in libraries during the 1980's will result from replacement needs. Opportunities will be best for librarians with scientific and technical backgrounds, particularly in private libraries in the health sciences. The development of new information handling jobs outside the traditional library setting is also expected to offer increased employment opportunities.

Employment, 1978	142,000
Projected employment, 1990	160,000
Percent growth, 1978–90	12.7
Average annual openings, 1978–90	8,000
Growth	1,500
Replacement	6,500

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in library science:		
Bachelor's degrees	693	770
Master's degrees	5,935	7,058
Doctor's degrees	67	80

Library technicians and assistants. These workers may receive training either on the job or in a formal post-high school program. Some libraries require only graduation from high school for library clerks, who, after a few years of training on the job, may advance to technician positions. Other libraries hire only technicians who have formal training.

In 1977, over 180 institutions, mostly 2-year colleges, offered this training. Programs usually consist of a year of liberal arts courses and a year of library-related study and culminate in an associate of arts degree in library technology.

Employment, 1978	172,000
Projected employment, 1990	195,000
Percent change, 1978–90	13.4
Average annual openings, 1978–90	7,700
Growth	1,000
Replacement	6,700
Available training data:	
Junior college graduates	549

Sales Occupations

Automobile parts counter workers. These workers learn on the job, usually beginning as helpers to experienced employees. Generally, 2 years of work experience are needed before a person becomes thoroughly familiar with most types of parts and accessories. Employers usually prefer to hire high school graduates. High school or vocational school courses in auto mechanics, commercial arithmetic, selling, and bookkeeping are helpful. Practical experience in a gasoline station, automobile repair shop, or on vehicles as a hobby also is an asset.

Employment, 1978	97,000
Projected employment, 1990	119,000
Percent growth, 1978–90	22.1
Average annual openings, 1978–90	4,200
Growth	1,800
Replacement	2,400
Available training data:	
Job Corps completions	69

Automobile sales workers. Most beginners are trained on the job, although large dealers sometimes provide formal classroom training. Many employers require beginning sales workers to be at least 21 years old and high school graduates. Courses in public speaking, commercial arithmetic, psychology, business law, and selling are useful. Appropriate personal characteristics, such as a pleasant appearance, an outgoing personality, and the ability to inspire confidence, also are important. Previous sales experience or other work involving contact with the public is desirable.

Employment, 1978	158,000
Projected employment, 1990	200,000
Percent change, 1978–90	26.5
Average annual openings, 1978–90	10,400
Growth	3,500
Replacement	6,900
Available training data	—

Automobile service advisors. These workers are trained on the job. Trainees usually are selected from among personnel already employed in the organization, for example, an experienced mechanic or parts counter worker. Generally, 1 to 2 years of training are needed before a new service advisor can handle all aspects of the job. Some advisors attend training programs conducted by automobile manufacturers. A high school diploma is preferred but not required. Because the job

involves close contact with customers and mechanics in the shop, personal characteristics, such as an ability to deal with customer complaints and communicate clearly, are important.

Employment, 1978	25,000
Projected employment, 1990	30,400
Percent growth, 1978–90	22.1
Average annual openings, 1978–90	1,100
Growth	500
Replacement	600
Available training data	—

Gasoline service station attendants. These workers are trained on the job. A high school diploma usually is not required, and students often are hired for these jobs. Attendants who wish to become station managers need a diploma, however, to participate in service station management programs conducted by oil companies. Applicants for attendant jobs should have a driver's license, a general understanding of how an automobile works, and some sales ability.

Employment, 1978	340,000
Projected employment, 1990	322,000
Percent change, 1978–90	−5.6
Average annual openings, 1978–90	5,200
Decline	−1,600
Replacement	6,800
Available training data:	
Job Corps completions	134

Insurance agents and brokers. Many employers prefer college graduates for insurance sales workers. Degrees in almost any field are acceptable, but applicants who have studied accounting, economics, finance, business law, or insurance are preferred. Because success in selling greatly depends on personal qualities such as aggressiveness and self-confidence, employers look for these traits. Some employers hire experienced individuals who have these characteristics, whether or not they have attended college.

Newly hired workers usually receive some formal training in insurance regulations, selling, policy writing, and techniques for determining the amount of insurance policyholders require. Trainees may attend company-sponsored classes or courses at local colleges and universities. Home study (correspondence) courses also are available.

Many sales workers take courses offered by insurance organizations. The Life Underwriter Training Council (LUTC) awards a diploma in life insurance marketing to agents who successfully complete the council's 2-year life program; there also is a course in health insurance. As agents and brokers gain experience and knowledge, they can qualify for the Chartered Life Underwriter (CLU) designation by passing a series of examinations given by the American College of Bryn Mawr, Pennsylvania. Property-liability agents can qualify for the Chartered Property Casualty Underwriter (CPCU) designation by passing a series of examinations given by the American Institute for Property and Liability Underwriters. The CLU and CPCU designations are recognized marks of achievement in their respective fields.

All agents and most brokers must be licensed in the State where they sell insurance. Most States require candidates for a license to pass a written examination in insurance fundamentals and State insurance laws.

Data for insurance agents and brokers are combined with data on underwriters.

Employment, 1978	568,000
Projected employment, 1990	682,000
Percent change, 1978–90	20.0
Average annual openings, 1978–90	30,000
Growth	9,500
Replacement	20,500
Available training data	—

Manufacturers' sales workers. Employers generally prefer to hire college graduates for these positions. A bachelor's degree in liberal arts or in business administration is good preparation for selling nontechnical products. Industrial manufacturers look for applicants who have degrees in science or engineering, and pharmaceutical companies usually prefer persons who have studied pharmacy.

Newly hired sales workers may receive specialized training before they start on the job. Some companies, especially those that manufacture complex technical products, have formal training programs that last 2 years or longer. Other firms offer classroom instruction followed by additional training under the supervision of field managers.

Employment, 1978	402,000
Projected employment, 1990	499,000
Percent change, 1978–90	24.0
Average annual openings, 1978–90	21,700
Growth	8,000
Replacement	13,700
Available training data	—

Real estate agents and brokers. All States require real estate agents and brokers to be licensed. To obtain a license as an agent, an individual must be a high school graduate, be at least 18 years old, and pass a written test. Many large firms prefer to hire college graduates. However, most employers consider personality traits as important as academic training and seek applicants who have maturity, tact, and sales ability.

Most States require candidates for the general sales license to have completed 30 hours of classroom instruction in the fundamentals and legal aspects of real estate transactions. Courses to prepare candidates for the real estate sales examination are offered in high schools, vocational schools, and colleges and universities. Many real estate firms offer these preparatory courses, and some periodicly offer continuing education courses for their experienced sales workers. In addition, many community and junior colleges and 4-year colleges and universities offer courses and programs leading to associate, bachelor's, or advanced degrees in real estate. Courses in areas such as mortgage financing, real estate appraisal, and real estate management are offered to experienced sales workers through affiliates of the National Assocation of Realtors.

Most States require candidates for the real estate broker's license to have completed 90 hours of classroom instruction in real estate and have 1–3 years of experience selling real estate.

Employment, 1978	555,000
Projected employment, 1990	670,000
Percent change, 1978–90	20.7
Average annual openings, 1978–90	50,000
Growth	10,000
Replacement	40,000
Available training data:	
Public vocational education completions	37,855
Private vocational education completions	41,913

Retail trade sales workers. Most sales workers learn their skills on the job. In large stores, training programs for newly hired workers usually begin with several days of classroom instruction, followed by on-the-job training under the supervision of an experienced worker. In small stores, an experienced worker, or in some cases the proprietor, trains new sales workers. Employers prefer to hire high school graduates, and courses in commercial arithmetic and merchandising provide a good background. Thousands of high schools also offer distributive education programs that allow students to work part time at local stores while taking courses in merchandising, accounting, and other aspects of retailing. Some programs are intended for adults as well and offer training for persons beginning their careers or seeking advancement.

Employment, 1978	2,851,000
Projected employment, 1990	3,785,000
Percent change, 1978–90	32.8
Average annual openings, 1978–90	226,000
Growth	78,000
Replacement	148,000
Available training data:	
Pubic vocational education completions	7,879
Job Corps completions	167

Route drivers. Although some large companies have classes in sales techniques, most route drivers are trained on the job. Employers generally prefer applicants who are high school graduates and have good driving records. Most States require route drivers to have a chauffeur's license.

Employment, 1978	195,000
Projected employment, 1990	190,000
Percent change, 1978–90	−2.9
Average annual openings, 1978–90	3,600
Decline	−500
Replacement	4,100
Available training data	—

Securities sales workers. Employers generally prefer to hire college graduates and consider a degree in business administration, economics, finance, or liberal arts good preparation for the job. Employers look for individuals who are well groomed, able to motivate others, ambitious, and self-starters. Successful sales or managerial experience is particularly helpful. Almost all States require securities sales workers to be licensed; a personal bond is required and applicants must pass a written test. In addition, practically all sales workers must be registered representatives of their firms according to the regulations of the securities exchanges through which they do business, or the National Association of Securities Dealers. Examinations and character investigations are required for registration.

Most employers provide training to help newly hired sales workers meet the requirements for registration. Depending on the size of the firm, this initial training varies from short, informal programs to combined classroom instruction and on-the-job experience lasting 6 months or more.

Employment, 1978	109,000
Projected employment, 1990	120,000
Percent change, 1978–90	10.0
Average annual openings, 1978–90	5,500
Growth	900
Replacement	4,600
Available training data	—

Travel agents. Although no specific educational background is required, some employers prefer to hire college graduates for these jobs. Courses in geography, history, and foreign languages can be helpful. Useful experience may be gained by working as a reservation clerk or receptionist in a travel agency or as an airline reservation or ticket agent. Correspondence and vocational schools offer courses in this area.

Employment, 1978	18,500
Projected employment, 1990	30,000
Percent growth, 1978–90	62.2

Average annual openings, 1978–90	1,900
Growth	950
Replacement	950
Available training data	—

Wholesale trade sales workers. Employers generally require applicants to be high school graduates, although college training is becoming a requirement for an increasing number of these jobs. The background a sales worker needs depends mainly upon the product line and the market. Selling certain products, such as pharmaceuticals, may require a background in chemistry, biology, or pharmacy, for example. High school graduates may begin in a nonselling job and work their way up or may be hired as sales trainees. In either case, beginners usually work in several types of nonselling jobs, such as stock clerk or shipping clerk, before being assigned to sales. Usually, it takes 2 years or longer to prepare trainees for outside sales. College graduates enter the sales force directly out of school. Very large wholesalers offer formal training programs; smaller firms rely on experienced sales workers to instruct trainees.

Employment, 1978	840,000
Projected employment, 1990	958,000
Percent growth, 1978–90	14.0
Average annual openings, 1978–90	40,000
Growth	10,000
Replacement	30,000
Available training data:	
Public vocational education completions	1,692

Construction Occupations

Bricklayers, stonemasons, and marblesetters. Most bricklayers learn their trade on the job, usually in 3 to 5 years. But, some bricklayers and most stonemasons and marblesetters learn their skills through a 3-year apprenticeship program that combines on-the-job training with classroom instruction. A high school diploma or its equivalent is usually required by employers for entry into apprenticeship programs. Others learn skills in public or private vocational schools. Courses in blueprint reading and shop provide a useful background.

Employment, 1978	205,000
Projected employment, 1990	220,000
Percent change, 1978–90	7.3
Average annual openings, 1978–90	6,200
Growth	1,300
Replacement	4,900
Available training data:	
Public vocational education completions[1]	11,891
Private vocational education completions	90
Job Corps completions[1]	816
Apprenticeship completions[1]	583

[1]Also includes tilesetters.

Carpenters. The recommended way to learn this trade is to complete a 4-year apprenticeship. Most workers learn on the job, however, often by beginning as a helper to experienced carpenters and gradually acquiring skills. It takes much longer to become a skilled carpenter in this way than it does through an apprenticeship. Some knowledge of the trade also may be obtained through vocational school courses in carpentry, shop, and mechanical drawing. Employers generally prefer to hire applicants who are high school graduates, but a diploma is not required.

Employment, 1978	1,254,000
Projected employment, 1990	1,390,000
Percent growth, 1978–90	10.9
Average annual openings, 1978–90	58,000
Growth	11,000
Replacement	47,000
Available training data:	
Public vocational education completions	44,625
Private vocational education completions	374
Job Corps completions	1,741
Apprenticeship completions	3,453

Cement masons and terrazzo workers. Most cement masons learn their trade informally on the job in 2 to 3 years. Others complete a 2- or 3-year apprenticeship program that combines on-the-job training with classroom instruction in subjects such as basic mathematics, blueprint reading, and safety. Employers prefer to hire high school graduates, and courses in mathematics and mechanical drawing provide a useful background.

Employment, 1978	83,000
Projected employment, 1990	110,000
Percent change, 1978–90	32.5
Average annual openings, 1978–90	4,400
Growth	2,300
Replacement	2,100
Available training data:	
Job Corps completions	418
Apprenticeship completions	289

Construction laborers. Most laborers are trained on the job as this work does not require specific skills. Generally, applicants must be at least 18 years old and in good physical condition. An experienced construction laborer

can advance to carpenter, bricklayer, cement mason, or other craft occupation.

Employment, 1978	860,000
Projected employment, 1990	970,000
Percent change, 1978–90	12.8
Average annual openings, 1978–90	49,000
Growth	10,000
Replacement	39,000
Available training data:	
Job Corps completions	233

Electricians (construction). Completion of a 4-year apprenticeship that combines on-the-job training with classroom instruction in subjects such as circuits and wiring, fundamentals of electronics, and the National Electrical Code is the recommended way to learn the trade. Many electricians learn their skills on the job, however. Training in some of the skills needed for the occupation also may be acquired through vocational school courses. Employers prefer to hire high school or vocational school graduates who have 1 year of algebra. Courses in electricity, electronics, mechanical drawing, science, and shop provide a good background. Applicants for apprenticeships must be high school graduates. Most cities require electricians to be licensed. To obtain a license, applicants must pass a written test and may have to demonstrate their skill.

Employment, 1978	290,000
Projected employment, 1990	350,000
Percent change, 1978–90	20.7
Average annual openings, 1978–90	12,900
Growth	5,000
Replacement	7,900
Available training data:	
Public vocational education completions	18,373
Private vocational education completions	247
Job Corps[1]	488
Apprenticeship completions	3,678

[1]May include some maintenance electricians.

Floor covering installers. Most of these workers learn their skills on the job, usually beginning as helpers to experienced workers. Others qualify through apprenticeship programs that combine on-the-job training with related classroom instruction. The program for floor covering installers lasts 2 to 4 years. Individuals also may learn the basic skills necessary for the trade as part of an apprenticeship in carpentry, tilesetting, bricklaying, or stone and marble setting. Employers prefer to hire high school or vocational school graduates, and courses in general mathematics and shop may be helpful. Applicants for apprenticeships generally must have a high school diploma.

Employment, 1978	88,000
Projected employment, 1990	110,000
Percent change, 1978–90	25.0
Average annual openings, 1978–90	3,200
Growth	1,800
Replacement	1,400
Available training data:	
Apprenticeship completions	119

Glaziers (construction). The majority of these workers learn their trade through a 3-year apprenticeship that combines on-the-job training with classroom instruction in related subjects such as blueprint reading and safety. Others learn on the job, and a few pick up the skills while working in another industry where glass is installed—automobile manufacturing, for example. Employers generally prefer to hire high school graduates. Courses in mathematics, shop, and mechanical drawing are helpful.

Employment, 1978	19,000
Projected employment, 1990	25,000
Percent employment, 1990	31.6
Average annual openings, 1978–90	1,000
Growth	500
Replacement	500
Available training data:	
Apprenticeship completions	155

Insulation workers. The majority of these workers learn their trade on the job. Others learn through a 4-year "improvership" program that combines on-the-job training with classroom instruction in areas such as safety and insulation application techniques. The "improvership" program is similar to an apprenticeship. A few insulation workers pick up their skills while working in another trade or in a manufacturing plant where applying insulation is part of their job. Employers prefer to hire high school graduates who are licensed to drive. High school or vocational school courses in blueprint reading and shop mathematics are helpful.

Employment, 1978	51,000
Projected employment, 1990	65,000
Percent change, 1978–90	27.5
Average annual openings, 1978–90	2,600
Growth	1,600
Replacement	1,000
Available training data:	
Apprenticeship completions[1]	228

[1]"Improvership" and apprenticeship are interchangeable in reference to insulation workers.

Ironworkers (structural, ornamental, and reinforcing ironworkers; riggers; and machine movers). Most workers learn their skills on the job; however, completion of a 3-year apprenticeship program that supplements on-the-job experience with related classroom

instruction is recommended. Employers generally prefer to hire high school graduates. Courses in blueprint reading, drafting, and mathematics are helpful. The job requires agility, a good sense of balance, and above-average strength.

Employment, 1978	78,000
Projected employment, 1990	104,000
Percent change, 1978–90	33.3
Average annual openings, 1978–90	4,100
Growth	2,200
Replacement	1,900
Available training data:	
Apprenticeship completions	1,155

Operating engineers (construction machinery operators). Completion of a 3-year apprenticeship program including related classroom instruction is recommended. Learning to operate a variety of machines through apprenticeship or, in some instances, private training schools usually results in better job opportunities. Some operating engineers learn their skills on the job, starting as helpers or oilers and then progressing from operating light equipment to highly complex construction machinery. A few individuals learn their skills in the Armed Forces. Most employers prefer high school graduates, and a diploma may be required for entry into apprenticeship programs. Courses in automobile mechanics are helpful.

Employment, 1978	581,000
Projected employment, 1990	820,000
Percent change, 1978–90	41.4
Average annual openings, 1978–90	36,000
Growth	20,000
Replacement	16,000
Available training data:	
Job Corps completions	473
Apprenticeship completions	706

Painters and paperhangers. Although completion of a 3-year apprenticeship combining on-the-job experience and related classroom instruction is recommended, opportunities are very limited. Informal on-the-job training is available through local contractors, however. A high school education is preferred by employers. Manual dexterity and good color sense are important assets.

Employment, 1978	504,000
Projected employment, 1990	572,000
Percent growth, 1978–90	13.5
Average annual openings, 1978–90	27,000
Growth	6,000
Replacement	21,000
Available training data:	
Job Corps completions	730
Apprenticeship completions	488

Plasterers. A 3- to 4-year apprenticeship that combines on-the-job training with classroom instruction in subjects such as blueprint reading, tool care, and safety is the recommended way to learn the trade. Many plasterers learn the trade on the job, however, by working as plasterer's helpers or laborers. Employers generally prefer to hire high school graduates. Courses in mathematics, mechanical drawing, and shop are useful.

Employment, 1978	28,000
Projected employment, 1990	30,000
Percent change, 1978–90	7.1
Average annual openings, 1978–90	1,100
Growth	200
Replacement	900
Available training data:	
Job Corps completions	215
Apprenticeship completions	57

Plumbers and pipefitters. Although many learn their trade informally on the job, completion of a 4- to 5-year apprenticeship is recommended. Employers prefer high school graduates. High school or vocational school courses in mathematics, drafting, physics, and chemistry can provide some useful skills. Some localities require workers to be licensed; applicants must pass a written examination.

Employment, 1978	428,000
Projected employment, 1990	513,000
Percent change, 1978–90	19.9
Average annual openings, 1978–90	20,000
Growth	7,000
Replacement	13,000
Available training data:[1]	
Public vocational education completions	8,312
Private vocational education completions	283
Job Corps completions	136
Apprenticeship completions	3,572

[1]Includes sprinkler fitters and steamfitters.

Roofers. The majority of roofers acquire their skills on the job as helpers to experienced workers. Completion of a 3-year apprenticeship that combines on-the-job training with classroom instruction in cutting and applying various roofing materials, blueprint reading, and safety is recommended, however. Employers prefer to hire high school graduates; courses in mechanical drawing and basic mathematics are helpful.

Employment, 1978	114,000
Projected employment, 1990	140,000
Percent change, 1978–90	22.8
Average annual openings, 1978–90	4,500
Growth	2,200
Replacement	2,300

Available training data:	
Apprenticeship completions	218

Sheet-metal workers. Although many workers learn the trade informally on the job, completion of a 4-year apprenticeship program is the recommended way to enter the occupation. These programs combine on-the-job training with classroom instruction in subjects such as sheet-metal drawing and patternmaking, applied mathematics, and blueprint reading. A high school diploma is preferred by employers and required for entry to apprenticeship programs. Courses in mathematics, mechanical drawing, and shop provide a helpful background for learning the trade.

Employment, 1978	70,000
Projected employment, 1990	90,000
Percent change, 1978–90	28.6
Average annual openings, 1978–90	3,500
Growth	1,700
Replacement	1,800
Available training data:	
Public vocational education completions	6,571
Job Corps completions	86
Apprenticeship completions	1,256

Tilesetters. The best way to learn this trade is through a 3-year apprenticeship program, but many workers acquire their skills on the job, working as helpers. When hiring apprentices or helpers, employers usually prefer high school or vocational school graduates who have had courses in mathematics, mechanical drawing, and shop. Good physical condition, manual dexterity, and a good sense of color harmony also are important.

Employment, 1978	33,000
Projected employment, 1990	45,000
Percent change, 1978–90	36.4
Average annual openings, 1978–90	1,800
Growth	1,000
Replacement	800
Available training data[1]	—

[1]See bricklayers, stonemasons, and marblesetters.

Occupations in Transportation Activities

Air transportation occupations

Air Traffic controllers. Trainees are selected through the competitive Federal Civil Service System. Applicants must be not more than 30 years old, pass a written test, and have either 3 years of work experience that demonstrates their potential, or a college degree. Newly hired controllers receive 16 weeks of formal training as well as on-the-job training during which they learn Federal Aviation Administration regulations, operation of their equipment, and performance characteristics of different aircraft. It usually takes several years of experience to learn the job thoroughly.

Employment, 1978	21,000
Projected employment, 1990	26,000
Percent change, 1978–90	23.9
Average annual openings, 1978–90	700
Growth	400
Replacement	300
Available training data	—

Airplane mechanics. Most mechanics learn their job through 2-year programs offered by trade schools certified by the Federal Aviation Administration (FAA). A few learn on the job. The majority of mechanics who work on civilian aircraft are licensed by the FAA as "airframe mechanics," "powerplant mechanics," or "aircraft inspectors." Airframe mechanics work on the structural parts of the plane; powerplant mechanics work on the engine. Some mechanics and all aircraft inspectors must have both licenses.

At least 18 months of work experience are required for an airframe or powerplant license; for a combined license, at least 30 months of experience working with both engines and airframes are required. To obtain an inspector's license, a mechanic must have held an airframe-and-powerplant license for at least 3 years. Applicants for all licenses must pass written and oral tests and demonstrate their ability to do the work.

Employers prefer to hire high school graduates. Courses in mathematics, physics, chemistry, and mechanical drawing are helpful.

Employment, 1978	132,000
Projected employment, 1990	145,000
Percent change, 1978–90	10.1
Average annual openings, 1978–90	3,500
Growth	1,100
Replacement	2,400
Available training data:	
Private vocational education completions	1,142
Apprenticeship completions[1]	—

[1]Fewer than 25.

Airplane pilots. Pilots who transport passengers or cargo must have at least a commercial pilot's license from the Federal Aviation Administration (FAA). To

obtain a license, applicants must be at least 18, have at least 250 hours of flight experience, and must pass a strict physical examination. Applicants must pass a written test covering the principles of safe flight, navigation techniques, and FAA regulations. They also must demonstrate their flying ability to FAA examiners. Pilots who have to fly in bad weather also must be licensed to fly by instruments. This license requires 40 hours of experience using instruments, passing a written test, and demonstrating the ability to fly by instruments to an FAA examiner.

Most new airline pilots are hired as flight engineers and usually must have fulfilled the added requirements to obtain this license before they are hired. Airline captains must have a transport pilot's license which requires even more flight experience.

Flying can be learned in military or civilian flying schools, but the airlines and many businesses prefer pilots trained in the Armed Forces. Pilots hired by the airlines must be high school graduates; however, most airlines require 2 years of college and prefer to hire college graduates.

Employment, 1978	76,000
Projected employment, 1990	110,000
Percent growth, 1978–90	43.9
Average annual openings, 1978–90	3,800
Growth	2,800
Replacement	1,000
Available training data:	
Public vocational education completions	1,325
Private vocational education completions	11,560

Flight attendants. Most large airlines train their own flight attendants; those that do not operate schools usually send their trainees to another airline's school. Training programs generally last about 5 weeks during which attendants learn flight regulations, how to handle emergencies, and how to deal with passengers. Applicants must be high school graduates and individuals who have 2 years or more of college or experience dealing with the public are preferred.

Employment, 1978	48,000
Projected employment, 1990	76,000
Percent change, 1978–90	56.2
Average annual openings, 1978–90	4,800
Growth	2,300
Replacement	2,500
Available training data	—

Reservation and passenger agents. Most agents receive several weeks of classroom instruction and on-the-job training during which they learn how to use flight schedule information, book reservations, and deal with customers. A pleasant speaking voice is essential and a high school diploma is required.

Employment, 1978	56,000
Projected employment, 1990	64,000
Percent growth, 1978–90	15.0
Average annual openings, 1978–90	2,200
Growth	700
Replacement	1,500
Available training data	—

Merchant marine occupations

Merchant marine officers. Candidates must either have acquired at least 3 years' appropriate sea experience, or have graduated from the U.S. Merchant Marine Academy, from 1 of 6 State merchant marine academies, or from a trade union training program. Candidates also must pass a Coast Guard examination to obtain a license. Usually, applicants who have sea experience but are not graduates of academies must obtain training to pass the examination. A high school diploma is not required.

Employment, 1978	13,500
Projected employment, 1990	13,000
Percent growth, 1978–90	−3.7
Average annual openings, 1978–90	700
Decline	−50
Replacement	750
Available training data	—

Merchant marine sailors. Most sailors learn on the job, although previous sea experience in the Coast Guard or Navy is helpful. Graduation from high school is not required. Applicants must obtain a doctor's certificate stating that they are in excellent health, and, if they do not have previous sea experience, a letter from an employer stating that they will be hired if a job becomes available. In addition, they must acquire special identification papers, "merchant mariner's documents," from the Coast Guard.

Several training programs exist to help experienced sailors upgrade their skills, but only the school operated by the Seafarer's International Union of North America trains inexperienced sailors.

Employment, 1978	24,800
Projected employment, 1990	16,000
Percent change, 1978–90	−36.9
Average annual openings, 1978–90	−250
Decline	−700
Replacement	450
Available training data	—

Railroad occupations

Brake operators. On some railroads, operators receive a few days of training, but most learn their skills on the job. It usually takes a year to learn the job thoroughly.

Employers prefer applicants who have a high school diploma and require applicants to have good eyesight and hearing.

Employment, 1978	66,000
Projected employment, 1990	67,000
Percent change, 1978–90	1.3
Average annual openings, 1978–90	1,600
Growth	100
Replacement	1,500
Available training data	—

Conductors. Conductors are promoted from the ranks of qualified brake operators on the basis of seniority. To qualify, a brake operator must pass examinations covering signals, timetables, operating rules, and related subjects.

Employment, 1978	37,000
Projected employment, 1990	39,000
Percent growth, 1978–90	6.2
Average annual openings, 1978–90	1,700
Growth	200
Replacement	1,500
Available training data	—

Locomotive engineers. Openings in engineer jobs usually are filled by training and promoting engineer helpers according to their seniority. Applicants for helper jobs must be at least 21 years old and have good eyesight, hearing, and color vision. High school graduates are preferred. Helpers are placed in engineer training programs within a year after they are hired. They qualify for promotion to engineer by proving their ability to operate locomotives and by passing a comprehensive examination on subjects such as mechanical and electrical equipment and operating rules and regulations.

Employment, 1978	34,000
Projected employment, 1990	37,000
Percent change, 1978–90	9.6
Average annual openings, 1978–90	2,000
Growth	300
Replacement	1,700
Available training data	—

Shop trades. The major railroad shop trades are car repairer, machinist, electrical worker, sheet metal worker, boilermaker, and blacksmiths. Completing a 3- to 4-year apprenticeship program is the most common way to enter shop trades, although some helpers and laborers are upgraded to these jobs. A high school diploma is preferred but not required. Shop training in high school or vocational school is an advantage. Automobile repair and machining courses are useful for machinists. Courses in electricity and physics will help applicants who want jobs as electrical workers.

Employment, 1978	76,000
Projected employment, 1990	71,000
Percent change, 1978–90	−6.7
Average annual openings, 1978–90	2,100
Decline	−400
Replacement	2,500
Available training data	—

Signal department workers. These workers begin as helpers and are trained on the job. After 60 to 90 days of training, they may advance to assistants; after 2 years' additional training and experience, they may be promoted to signal installers or maintainers. Railroads prefer applicants who are high school or vocational school graduates and have had courses in blueprint reading, electricity, or electronics.

Employment, 1978	12,800
Projected employment, 1990	14,100
Percent change, 1978–90	10.0
Average annual openings, 1978–90	450
Growth	100
Replacement	350
Available training data	—

Station agents. These workers rise from the ranks of other railroad occupations. Experienced telegraphers, telephoners, tower operators, and clerks may advance to jobs as agents in small stations and may be promoted to larger stations as they gain seniority.

Employment, 1978	5,900
Projected employment, 1990	2,400
Percent change, 1978–90	−59.6
Average annual openings, 1978–90	−200
Decline	−300
Replacement	100
Available training data	—

Telegraphers, telephoners, and tower operators. These jobs usually are filled from the ranks of clerical workers according to seniority provisions. Upon promotion, new workers receive on-the-job training that covers operating rules, train orders, and station operations. Before the promotion is final, they must pass examinations on train operating rules and show that they can use all the equipment. A high school diploma generally is preferred and may be required by some railroads.

Employment, 1978	9,700
Projected employment, 1990	6,800
Percent change, 1978–90	−30.2
Average annual openings, 1978–90	50
Decline	−250
Replacement	300
Available training data	—

Track workers. Most workers acquire their skills in about 2 years of on-the-job training. A high school

diploma is not required, but applicants should be able to read and write. The ability to perform heavy work is essential.

Employment, 1978	59,000
Projected employment, 1990	59,000
Percent change, 1978–90	0.0
Average annual openings, 1978–90	1,400
Growth	0
Replacement	1,400
Available training data	—

Driving occupations

Intercity busdrivers. These workers are trained on the job. Most companies conduct 2- to 8-week training programs for new employees that include driving and classroom instruction. Minimum qualifications established by the U.S. Department of Transportation require intercity busdrivers to be at least 21 years old, pass a physical examination, and pass a written test on motor vehicle regulations. Most States require a chauffeur's license. Bus companies generally have even higher requirements. Most prefer applicants who are at least 25 years old; some prefer those who have truck or bus driving experience. A high school diploma is preferred, but not required. High school driver training is useful.

Employment, 1978	23,500
Projected employment, 1990	23,700
Percent change, 1978–90	0.8
Average annual openings, 1978–90	500
Growth	25
Replacement	475
Available training data	—

Local transit busdrivers. New drivers receive several weeks of classroom and driving instruction in which they learn company rules, safety regulations, how to keep records, and how to deal with passengers. Applicants must be at least 21 years old, have a chauffeur's license, and have good eyesight—with or without glasses. Most employers require applicants to pass a physical examination and a written test. A good driving record is essential. A high school diploma is not required, but is preferred by many employers.

Employment, 1978	77,000
Projected employment, 1990	91,000
Percent change, 1978–90	18.9
Average annual openings, 1978–90	3,100
Growth	1,200
Replacement	1,900
Available training data	—

Local truckdrivers. New drivers usually are trained on the job. Many drivers begin by working as freight handlers on a loading dock. In most States, applicants must have a chauffeur's license, and employers prefer to hire individuals who have good driving records. The amount of driving experience required often depends on the size of truck to be driven and value of the cargo. A high school diploma is not required.

Employment, 1978	1,720,000
Projected employment, 1990	2,040,000
Percent growth, 1978–90	18.4
Average annual openings, 1978–90	64,000
Growth	26,000
Replacement	38,000
Available training data:[1]	
Job Corps completions	30

[1]May include some long-distance truckdrivers.

Long-distance truckdrivers. Minimum qualifications set by the U.S. Department of Transportation require drivers to be at least 21 years old, pass a physical examination, and pass a written test on motor carrier safety regulations. Most States require drivers to have a chauffeur's license. Employers may have even higher standards. Many specify height and weight requirements for drivers, and some hire only applicants who have several years' experience driving trucks.

Driver training courses in high school or in a private driving school are good preparation, but they do not assure a job. Most truckdrivers start as freight handlers at a loading dock, advance to local truckdriver, and then to long-distance driver.

Employment, 1978	584,000
Projected employment, 1990	689,000
Percent growth, 1978–90	18.0
Average annual openings, 1978–90	21,000
Growth	8,700
Replacement	12,800
Available training data	—

Parking attendants. These workers are trained on the job. Some employers offer training, ranging from a few hours to a week, that includes a review of proper driving techniques and an outline of company policy on record-keeping procedures and damage claims. Applicants must have a driver's license and be able to drive all types of cars. Completion of a driver's education course is an asset. The ability to keep records of claim tickets, compute parking charges, and make change also is important. Generally, employers prefer high school graduates.

Employment, 1978	44,000
Projected employment, 1990	50,000
Percent growth, 1978–90	13.6
Average annual openings, 1978–90	3,200
Growth	500
Replacement	2,700
Available training data	—

Taxicab drivers. In most cities, taxi drivers must have a chauffeur's license and pass a written test on taxicab and traffic regulations to obtain a special license issued by the local police or safety department or Public Utilities Commission. Some companies teach drivers taxicab regulations and the location of streets. A large number of companies hire only applicants who are at least 21, and some require drivers to be 25 or older.

Employment, 1978	94,000
Projected employment, 1990	94,000
Percent change, 1978–90	0.0
Average annual openings, 1978–90	4,300
Growth	0
Replacement	4,300
Available training data	—

Scientific and Technical Occupations

Conservation occupations

Foresters. A bachelor's degree with a major in forestry generally is required to become a forester. Because of the large supply of forestry graduates, however, many employers prefer applicants who have advanced degrees. Teaching and research generally require advanced degrees.

In recent years, the number of forestry graduates has exceeded available openings, and this situation is expected to continue through the 1990's. Opportunities will be better for individuals who can offer an employeer either an advanced degree or several years of related work experience.

Growth and replacement needs are expected to create about 900 openings annually between 1978 and 1990. The National Center for Education Statistics projects that about 3,000 bachelor's degrees in forestry will be awarded each year during this period. Followup data on forestry graduates indicate that about two-thirds, including those who go on to graduate study, seek entry to the field. If this entry pattern continues, about 2,000 graduates can be expected to seek forester positions each year.

Other sources of supply are immigrants, reentrants to the labor force, and transfers from other occupations. Foresters who enter other occupations also create job openings. Current data on occupational mobility are not adequate to assess the net effect of transfers as a source of supply or openings. Nor are data on immigrants and reentrants to the labor force adequate to allow an assessment of the effect of these sources of supply. Overall, however, it appears that the number of persons seeking jobs as foresters will exceed available openings. As a result, a number of forestry graduates will be forced to seek employment in other fields.

Employment, 1978	31,200
Projected employment, 1990	38,000
Percent change, 1978–90	20.6
Average annual openings, 1978–90	1,400
Growth	500
Replacement	900

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in forestry:		
Bachelor's degrees	2,671	3,000
Master's degrees	488	500
Doctor's degrees	93	65

Forestry technicians. Most persons qualify for beginning jobs as forestry technicians by completing a specialized course of study in a 1- or 2-year post-secondary program, or through work experience on firefighting crews, in tree nurseries, or in other forest work. Most employers require a high school diploma. Post-secondary training can be obtained in technical institutes, junior or community colleges, and some universities. Enthusiasm for outdoor work, physical stamina, and the ability to work with or without direct supervision are essential for success in this field.

Employment, 1978	13,700
Projected employment, 1990	17,300
Percent growth, 1978–90	26.0
Average annual openings, 1978–90	700
Growth	300
Replacement	400
Available training data:	
Public vocational education completions	5,182
Job Corps completions	164
Junior college graduates	1,992

Range managers. A bachelor's degree with a major in range management, range science, or a closely related field usually is required for employment as a range manager. Courses in economics, forestry, computer science, and wildlife and recreation also are useful. Many college students obtain valuable experience through summer jobs with Federal Government agencies, such as the Forest Service in the U.S. Department of Agriculture or the Bureau of Land Management in the U.S. Department of the Interior.

Employment, 1978	3,700
Projected employment, 1990	4,700
Percent growth, 1978–90	27.0
Average annual openings, 1978–90	200
Growth	100
Replacement	100

Available training data:

Degrees in range management:	1977–78
Bachelor's degrees	221
Master's degrees	100
Doctor's degrees	27

Soil conservationists. Most soil conservationists have degrees in agronomy or a closely related field of natural resource science, such as wildlife biology, forestry, or range management. Only a few colleges and universities offer degrees in soil conservation. A background in agricultural engineering and courses in cartography are very useful. The ability to communicate clearly, both orally and in writing, also is important.

Employment, 1978	9,300
Projected employment, 1990	11,400
Percent growth, 1978–90	21.7
Average annual openings, 1978–90	450
Growth	200
Replacement	250

Available training data:

Degrees in agronomy:	1977–78
Bachelor's degrees	1,609
Master's degrees	443
Doctor's degrees	157

Engineers

A bachelor's degree in engineering is required for most entry positions. College graduates who have degrees in one of the natural sciences or mathematics also may qualify for some beginning jobs. Occasionally, experienced technicians are able to advance to some engineering jobs. Graduate training in engineering is being emphasized for a number of jobs, and is essential for teaching and research, and for advancement in many areas.

In all States, engineers must be registered if they offer their services directly to the public, or if they design buildings, dams, or other projects where safety is a factor. Registration requirements include a degree from an accredited engineering school, 4 years of relevant work experience, and passing a State-board written examination. The majority of engineers are not registered.

Employment opportunities for those with engineering degrees are expected to be good through the 1980's. Growth and replacement needs resulting from deaths and retirements are expected to result in an annual average of about 46,500 openings between 1978 and 1990. In addition, many openings will occur each year as employed engineers transfer to other occupations, but the number is difficult to estimate. The major source of supply of engineers is new graduates majoring in engineering. The National Center for Education Statistics projects that about 81,400 bachelor's degrees in engineering will be awarded annually during this period. Followup on college graduates of the 1960's indicate that about 85 percent of the bachelor's degree recipients in engineering, including those who went on to graduate study, actually entered the field. This proportion dropped to 80 percent for graduates during the mid-1970's. Because of the high level of recruiting during this period, this entry rate probably represents fairly accurately the proportion of graduates who seek engineering jobs. If an 80-percent rate continues, an average of about 65,000 are expected to enter the field annually. Other sources of supply are recent graduates in other fields—primarily mathematics and the natural sciences—immigrants, reentrants to the labor force, and transfers from other occupations. The projected large increase in engineering degrees may result in more limited opportunities than in the past for entrants from these sources, however.

Employment, 1978	1,136,000
Projected employment, 1990	1,441,000
Percent growth, 1978–90	26.8
Average annual openings, 1978–90	46,500
Growth	25,500
Replacement[1]	21,000

Available training data:

	1977–78	*Projected 1978–90 (annual average)*
Degrees in engineering:[2]		
Bachelor's degrees	56,009	81,441
Master's degrees	16,409	16,722
Doctor's degrees	2,440	3,158

[1]Does not include openings resulting from transfers.

[2]Includes engineering technology.

Environmental scientists

Geologists. A bachelor's degree in geology or a related field is appropriate training for many entry jobs. An advanced degree is helpful for promotion in most types of work and is required for college teaching and some research positions.

Employment opportunities in geology are expected to be good for geology and earth science graduates. Growth in the employment of geologists and replacement needs are expected to result in about 1,700 openings each year between 1978 and 1990. The major source of supply of geologists is new graduates majoring in geology and earth sciences. The National Center for Education Statistics projects that bachelor's degrees in these majors will average about 5,400 during this

period. Followup data on college graduates of the 1960's indicate that about 30 percent of the bachelor's degree recipients in these majors, including those who went on to graduate study in geology or the earth sciences actually entered geology. The rapid increase in the employment of geologists during the past few years, however, indicates that this proportion may have increased. Assuming an entry rate of 30 percent at a minimum, at least 1,600 geology and earth science graduates can be expected to seek entry to the field annually.

Other sources of supply are graduates from other fields, immigrants, reentrants to the labor force, and transfers from other occupations. Geologists who enter other occupations also create job openings. Current data on occupational mobility are not adequate to assess the net effect of transfers as a source of supply or openings, however. Nor is it possible to determine the effects of immigration and reentrants on supply. Overall, however, it appears that the number of persons likely to seek employment as geologists will roughly equal the number of expected job openings in the field.

Employment, 1978	31,000
Projected employment, 1990	42,000
Percent growth, 1978–90	35.5
Average annual openings, 1978–90	1,700
Growth	900
Replacement	800

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in geology and earth science:		
Bachelor's degrees	4,191	5,392
Master's degrees	1,126	1,332
Doctor's degrees	228	323

Geophysicists. A bachelor's degree in geophysics, or a geophysical specialty, or in a related field of science or engineering with courses in geophysics, physics, geology, mathematics, chemistry, and engineering generally is the minimum requirements for these positions. Graduate training usually is necessary for jobs in research and college and university teaching and for supervisory positions in exploration activities.

Employment, 1978	11,000
Projected employment, 1990	14,600
Percent change, 1978–90	35.5
Average annual openings, 1978–90	600
Growth	300
Replacement	300

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in geophysics and seismology:		
Bachelor's degrees	144	149
Master's degrees	97	145
Doctor's degrees	34	59

Meteorologists. Generally, the minimum requirement is a bachelor's degree in meteorology, a related science, or engineering, with courses in meteorology. An advanced degree is necessary for some positions, particularly in research and in college and university teaching.

Employment, 1978	7,300
Projected employment, 1990	8,800
Percent growth, 1978–90	20.0
Average annual openings, 1978–90	300
Growth	100
Replacement	200

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in atmospheric sciences and meteorology:		
Bachelor's degrees	353	408
Master's degrees	199	275
Doctor's degrees	58	86

Oceanographers. An advanced degree, preferably a Ph. D. degree in oceanography, one of the natural sciences, or engineering generally is required to become an oceanographer. A bachelor's degree is sufficient for beginning jobs as a research or laboratory assistant in oceanography.

Employment, 1978	3,600
Projected employment, 1990	4,400
Percent change, 1978–90	21.6
Average annual openings, 1978–90	150
Growth	75
Replacement	75

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in oceanography:		
Bachelor's degrees	234	273
Master's degrees	177	154
Doctor's degrees	91	117

Life science occupations

Biochemists. Many beginning jobs in biochemistry, especially in research and teaching, require an advanced degree. A Ph. D. degree usually is necessary for high-level biochemical research and for advancement to management and administrative jobs. A bachelor's

degree with a major in biochemistry or chemistry, or with a major in biology and a minor in chemistry, may be sufficient for entry jobs as research assistants or technicians.

Employment, 1978	20,000
Projected employment, 1990	25,000
Percent change, 1978–90	25.5
Average annual openings, 1978–90	900
Growth	450
Replacement	450

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in biochemistry:		
Bachelor's degrees	1,752	2,275
Master's degrees	319	374
Doctor's degrees	429	478

Life scientists. This group includes scientists such as botanists, zoologists, microbiologists, and nutritionists. Although a bachelor's degree is adequate for some jobs in these fields, most positions require graduate training. A Ph. D. degree usually is required to teach in a college or university, or to obtain a senior research or administrative position. A professional health degree, such as an M.D. or D.D.S., is necessary for some jobs in medical research.

Most colleges and universities offer life science curriculums. Liberal arts colleges may emphasize the biological sciences, while many State universities also concentrate on programs in agricultural science. Students seeking careers in the life sciences should obtain as broad a background as possible in the sciences, including biology, chemistry, physics, and mathematics.

Employment prospects for advanced degree holders are expected to be good, but persons who have bachelor's degrees will face competition for jobs. Growth in employment of life scientists and replacement needs are expected to result in about 11,200 openings each year between 1978 and 1990. About 14,000 master's degrees and 4,100 doctorates are projected in the life sciences annually between 1978 and 1990. Followup data indicate that about 50 percent of the master's degree recipients and 90 percent of the doctorate recipients entered the field in the past. If this pattern continues, about 10,500 individuals with advanced degrees can be expected to enter the life sciences annually.

Although this number approximates the estimate of annual openings (11,200), data from the same followup studies indicate that several thousand graduates in other fields also can be expected to seek life scientist positions. Because some positions require a professional medical degree, a number of individuals who have these degrees are expected to enter the field.

Other sources of supply are immigrants, reentrants to the labor force, and transfers from other occupations. Life scientists who enter other occupations also create job openings. Current data on occupational mobility are not adequate to assess the net effect of transfers as a source of supply or openings, however. Nor is it possible to determine the effects of immigration and reentrants on supply. Overall, it appears that the number of persons with advanced degrees who will seek employment as life scientists will roughly equal the number of job openings in the field.

Employment, 1978	215,000
Projected employment, 1990	280,000
Percent growth, 1978–90	28.4
Average annual openings, 1978–90	11,200
Growth	5,100
Replacement	6,100

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in biological sciences and in agriculture and natural resources:		
Bachelor's degrees	74,937	88,268
Master's degrees	10,887	13,972
Doctor's degrees	4,284	4,096

Soil scientists. A bachelor's degree in soil science, agronomy, or a closely related field usually is required. Some employers also require applicants to have had courses in chemistry and cartography. Soil scientists who have trained in both fieldwork and laboratory work may have the edge in obtaining the best jobs. An advanced degree, especially a doctorate, may be necessary for high-level research jobs. A few States require certification of soil scientists who inspect soil conditions before construction starts. To be certified, applicants must have a bachelor's degree and 3 years' experience as a soil scientist or a master's degree and 2 years' experience. Applicants must pass a written examination.

Employment, 1978	3,500
Projected employment, 1990	4,200
Percent change, 1978–90	20.7
Average annual openings, 1978–90	180
Growth	60
Replacement	120

Available training data:

Degrees in soil science:	1977–78
Bachelor's degrees	620
Master's degrees	136
Doctor's degrees	81

Mathematics occupations

Mathematicians. Although a bachelor's degree in mathematics is adequate for some jobs in private industry and government, employers usually require an advanced degree. A Ph. D. degree usually is required to teach in a college or university. For work in applied mathematics, training in the field in which the mathematics will be used is important.

Competition for mathematician jobs is expected to remain keen throughout the 1978–90 period. Individuals who have advanced degrees in applied mathematics should have the best chances for employment. Those mathematics degree holders who are unable to locate mathematician jobs may find openings in other areas requiring a mathematics background, such as actuarial work, statistics, and computer work.

Growth in the employment of mathematicians and replacement needs are expected to create about 1,000 job openings annually between 1978 and 1990. The major source of supply of these workers is new graduates majoring in mathematics. The National Center for Education Statistics projects that about 500 doctorates and 2,700 master's degrees will be awarded each year during this period. Followup data on college graduates of the 1960's indicate that almost one-half of the master's degree recipients and almost all of the doctorate recipients actually entered the field. During the 1970's, the entry rate for master's degree recipients dropped to slightly more than one-fourth, largely due to the growing competition for mathematician jobs and the availability of jobs in the computer field that utilized a mathematics background. However, at least one-third of the master's degree recipients and nearly all the doctorate recipients sought mathematician jobs. If the same proportions hold true in the future, about 1,400 advanced degree holders are expected to seek mathematics positions each year. If past trends continue, several hundred graduates in other fields, primarily the natural sciences, also could look for mathematician jobs.

Other sources of supply are immigrants, reentrants to the labor force, and transfers from other occupations. Mathematicians who enter other occupations also create job openings. Current data on occupational mobility are not adequate to assess the net effect of transfers as a source of supply or openings. Nor are data on immigrants and reentrants to the labor force adequate to evaluate the effect of these sources on supply. Overall, however, it appears that, despite a continued decline in the number of persons receiving advanced degrees in mathematics, many degree holders will have to seek employment in other fields. However, those with doctorates will have better chances of obtaining employment as mathematicians than those with master's degrees because many of the openings will be in academic and other areas that require a Ph. D.

Employment, 1978	33,500
Projected employment, 1990	37,000
Percent growth, 1978–90	9.9
Average annual openings, 1978–90	1,000
Growth	300
Replacement	700

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in mathematics:		
Bachelor's degrees	11,886	11,616
Master's degrees	2,640	2,667
Doctor's degrees	592	508

Statisticians. A bachelor's degree in statistics or mathematics generally is required to become a statistician. For some jobs, however, a bachelor's degree in economics or another applied field and a minor in statistics is preferable. An advanced degree is required for some positions, particularly college teaching. Courses in computer programming, systems analysis, and other computer-related subject areas are highly recommended.

Employment, 1978	23,000
Projected employment, 1990	31,100
Percent change, 1978–90	35.2
Average annual openings, 1978–90	1,500
Growth	700
Replacement	800

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in statistics:		
Bachelor's degrees	273	300
Master's degrees	507	510
Doctor's degrees	153	131

Physical scientists

Astronomers. The usual requirement for a job in astronomy is a Ph. D. degree. Persons who have less education may qualify for some entry level jobs; however, advancement in most areas is open only to those who have a doctorate. In 1978, about 50 colleges and universities had programs leading to the bachelor's degree in astronomy. Students with a bachelor's degree in physics, or in mathematics with a physics minor, usually can qualify for the graduate programs in astronomy.

Almost all doctorate recipients can be expected to seek entry to the field. Unless the number of doctorates granted in the future is substantially lower than the number granted in 1977–78, many doctorate recipients may be forced to enter other occupations.

Employment, 1978	2,000
Projected employment, 1990	2,100
Percent change, 1978–90	5.0
Average annual openings, 1978–90	40
Growth	10
Replacement	30

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in astronomy:		
Bachelor's degrees	110	138
Master's degrees	84	80
Doctor's degrees	80	64

Chemists. A bachelor's degree in chemistry usually is the minimium requirement for entry positions in analysis and testing, quality control, technical service and sales, or jobs as assistants to senior chemists in research and development laboratories. Graduate training is essential for many positions and is helpful for advancement in all types of work. A Ph. D. degree generally is required for teaching in colleges and universities.

Employment opportunities in chemistry are expected to be good for graduates at all degree levels through the 1980's. About three-fourth of the available openings will be in private industry. Little growth in college and university employment is expected, and competition for teaching positions will be keen.

Growth in the employment of chemists and replacement needs are expected to average about 6,100 openings annually between 1978 and 1990. The major source of supply of chemists is new graduates majoring in chemistry. The National Center for Education Statistics project that bachelor's degrees in chemistry will average 12,500 annually during this period. Recent followup data on college graduates indicate that about one-third of those who receive bachelor's degrees in chemistry, including those who went on to graduate study in chemistry, actually enter the field. (Many of those not entering chemistry have gone on to medical, dental, or veterinary schools, or have become secondary school teachers.) Thus, if past entry patterns continue, about 4,000 new graduates are expected to seek jobs as chemists each year. In addition, data from these same followup studies indicate that about 1,400 recent graduates in other fields, primarily biology and other natural sciences, could seek chemist jobs each year.

Other sources of supply are immigrants, reentrants to the labor force, and transfers from other occupations. Chemists who enter other occupations also create job openings. Current data on occupational mobility are not adequate to assess the net effect of transfers as a source of supply or openings, however. Nor is it possible to determine the effects of immigration and reentrants on supply. Overall, however, it appears that the number likely to seek employment as chemists will roughly equal the number of expected jobs openings in the field.

Employment, 1978	143,000
Projected employment, 1990	178,000
Percent growth, 1978–90	24.0
Average annual openings, 1978–90	6,100
Growth	2,900
Replacement	3,200

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in chemistry:		
Bachelor's degrees	11,474	12,523
Master's degrees	1,892	1,483
Doctor's degrees	1,525	1,199

Physicists. Graduate training in physics or in a closely related field is necessary for most jobs. A doctorate usually is required for teaching positions in colleges and universities and for senior research and administrative positions. A bachelor's degree is adequate for some entry level jobs, but graduate training is needed for advancement.

For persons who have graduate degrees in physics, employment opportunities are expected to be favorable through the 1980's. Most openings will be in research and development work. However, competition is expected to be keen for teaching positions in colleges and universities. Persons who have only a bachelor's degree are expected to face very stiff competition for physicist jobs.

Growth in the employment of physicists and replacement needs are expected to result in an annual average of about 1,000 openings between 1978 and 1990. Most of these openings will require graduate training and a substantial number will require doctorates.

College graduates who have majored in physics are the primary source of supply. Since individuals who have only a bachelor's degree in physics rarely find physicist jobs, the number of graduate degrees in physics that are expected to be awarded is of more importance. (Many of those who do not pursue a graduate degree enter high school teaching, computer-related occupations, and engineering.) The National Center for Education Statistics projects that an average of about 1,200 master's and 760 doctor's degrees will be awarded annually between 1978 and 1990. Followup data on college graduates of the mid-1970's indicate that about 20

percent of the master's degree recipients and 90 percent of the doctorate recipients entered the field. If these rates continue, an average of at least 900 new graduate degree recipients are expected to seek physicist jobs each year. Because the proportion entering with master's degrees in the mid-1970's was undoubtedly held down by the lack of job opportunities in physics, 900 probably represents an understatement of the number who will seek jobs in the future.

In addition to new graduates in physics, individuals also enter the field from other sources: Graduates with degrees in related fields, immigrants, reentrants to the labor force, and transfers from other occupations. Physicists who enter other occupations also create openings. Current data on occupational mobility are not adequate to assess the net effect of transfers as a source of supply or openings. Overall, however, it appears that the number of persons likely to seek employment as physicists will roughly equal the number of expected openings in the field.

Employment, 1978	44,000
Projected employment, 1990	48,000
Percent change, 1978–90	8.9
Average annual openings, 1978–90	1,000
Growth	300
Replacement	700

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in physics:		
Bachelor's degrees	3,259	3,290
Master's degrees	1,270	1,204
Doctor's degrees	841	763

Other scientific and technical occupations

Drafters. Specialized training in technical institutes, junior and community colleges, extension divisions of universities, and vocational and technical high schools generally provides the best preparation for beginning drafters. The necessary skills also may be acquired by combining on-the-job training programs with part-time schooling, through 3- or 4-year apprenticeship programs, or in the Armed Forces. A high school diploma usually is required. High school or vocational school courses in mathematics, physical sciences, mechanical drawing, and drafting are useful.

Employment, 1978	296,000
Projected employment, 1990	367,000
Percent change, 1978–90	24.0
Average annual openings, 1978–90	11,000
Growth	5,900
Replacement	5,100

Available training data:	
Public vocational education completions	33,294
Private vocational education completions	1,350
Job Corps completions	110
Apprenticeship completions	85

Engineering and science technicians. Many combinations of education and work experience qualify individuals for these occupations, but most employers prefer applicants who have had some specialized technical training. This specialized training consists of 1 to 4 years of full-time study at a technical institute, junior or community college, extension division of a college or university, or vocational-technical high school. Training also can be acquired on the job, through part-time courses in postsecondary schools, or through correspondence school courses. Experience in technical jobs in the Armed Forces also can be good preparation for these occupations. A high school diploma usually is required.

Employment, 1978	600,000
Projected employment, 1990	760,000
Percent change, 1978–90	25.1
Average annual openings, 1978–90	23,000
Growth	12,500
Replacement	10,500

Available training data:	
Public vocational education completions	44,726
Private vocational education completions	4,679
Apprenticeship completions[1]	116
Junior college graduates[2]	53,364

[1]Electronics technicians.

[2]Includes graduates from all mechanical and engineering technologies, general natural science technologies, marine and oceanographic technologies, and general laboratory technologies.

Food technologists. A bachelor's degree with a major in food technology or in the physical or life sciences, such as chemistry or biology, is the usual minimum requirement for entry jobs. An advanced degree is necessary for many jobs, particularly research and college teaching and for some management level jobs in industry. Over 60 colleges and universities offered programs leading to the bachelor's degree in food technology in 1978. Undergraduates usually take courses in physics, chemistry, mathematics, biology, the social sciences, humanities, and business administration, as well as food technology courses. Food technology courses cover areas such as preservation, processing, sanitation, and marketing of foods.

Employment, 1978	15,000
Projected employment, 1990	17,000
Percent growth, 1978–90	12.0
Average annual openings, 1978–90	500
Growth	150
Replacement	350

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in food science and technology:		
Bacholor's degrees	717	902
Master's degrees	323	328
Doctor's degrees	113	106

Surveyors and surveying technicians. A combination of postsecondary school courses in surveying and extensive on-the-job training is the most common way to enter this occupation. Junior colleges, technical institutes, and vocational schools offer 1-, 2-, and 3-year programs in surveying. Some colleges and universities offer degrees in surveying or a closely related field such a geodesy, photogrammetry, or civil engineering. High school courses in mathematics, drafting, and mechanical drawing provide a good background. Surveyors who are responsible for locating and describing land boundaries must be licensed by the State in which they work. Requiremens for licenses vary, but applicants generally must meet education and experience requirements and must pass a written test.

Employment, 1978	62,000
Projected employment, 1990	74,000
Percent change, 1978–90	20.0
Average annual openings, 1978–90	2,300
Growth	1,000
Replacement	1,300
Available training data:	
Junior college graduates	2,257

Mechanics and Repairers

Telephone craft occupations

Central office craft occupations. Trainee jobs generally are filled by employees already with the company, such as telephone operators or line installers. Occasionally, workers are hired from outside. A high school diploma is not required, but a basic knowledge of electricity or electronics is helpful. Telephone training in the Armed Forces is good preparation for the job. New craft workers receive both classroom instruction and on-the-job training. Some vocational schools, particularly those in rural areas served by small independent telephone companies, also offer training. A few people learn these crafts through apprenticeship programs designed by State employment agencies in conjunction with local telephone companies. Because electrical wires usually are color coded, applicants must not be color blind.

Employment, 1978	135,000
Projected employment, 1990	130,000
Percent change, 1978–90	−3.7
Average annual openings, 1978–90	1,000
Decline	−400
Replacement	1,400
Available training data	—

Central office equipment installers. These workers learn their skills on the job. New employees attend classes the first few weeks to learn basic installation and then begin on-the-job training. Often trainees will be transported to the plant where the equipment is manufactured to receive their training. It usually takes several years to become a skilled installer, and training continues throughout an installer's career to improve skills and teach new installing techniques. A high school diploma generally is preferred, and courses in blueprint reading and electronic theory are helpful. Because electrical wires are color coded, applicants must not be color blind.

Employment, 1978	21,400
Projected employment, 1990	18,000
Percent change, 1978–90	−15.9
Average annual openings, 1978–90	−100
Decline	−300
Replacement	200
Available training data	—

Line installers and cable splicers. These workers usually are trained on the job. Classrooms are equipped with actual telephone apparatus, including poles and other fixtures, to simulate working conditions as much as possible. Trainees learn how to climb poles and are taught safe working practices to avoid falls and contact with power wires. After several weeks, trainees generally are assigned to a crew for on-the-job training under a line supervisor. Some small independent telephone companies, particularly in rural areas, rely on local vocational and technical schools to provide classroom training. A few 4-year apprenticeships also are available in which State employment agencies provide classroom training. A high school diploma is not required. Training in installing telephone systems while in the Armed Forces is helpful. Because the job is strenuous, applicants usually are given physical examinations. Many line installers and cable splicers transfer to other telephone occupations as they advance in age.

Employment, 1978	59,000
Projected employment, 1990	60,000
Percent growth, 1978–90	2.1
Average annual openings, 1978–90	600
Growth	100
Replacement	500
Available training data	—

Telephone and PBX installers and repairers. These workers are trained on the job. Telephone companies provide several weeks of classroom instruction in subjects such as mathematics and electrical and electronic theory, supplemented by on-the-job training. Many small independent telephone companies, particularly in rural areas, rely on local vocational and technical schools to train workers. A few 4-year apprenticeships also are available in which State employment agencies provide classroom training. Because telephone wires are color coded, applicants must not be color blind. Physical examinations are sometimes required, and applicants may have to pass a test to determine their aptitude for the job. Often trainees are chosen from current telephone company employees. A high school diploma is preferred but not required.

Employment, 1978	115,000
Projected employment, 1990	135,000
Percent change, 1978–90	17.5
Average annual openings, 1978–90	3,000
Growth	1,700
Replacement	1,300
Available training data	—

Other mechanics and repairers

Air-conditioning, refrigeration, and heating mechanics. Most workers start as helpers and learn their skills on the job in about 4 years. A few individuals learn the trade through a 4-year apprenticeship program that combines on-the-job training with classroom instruction in related subjects. In addition, many high schools and vocational schools offer courses in air-conditioning, refrigeration, and other subject areas that prepare students for entry jobs. Employers generally prefer to hire high school graduates and a diploma is required for entry into apprenticeship programs. Courses in mathematics, physics, basic mechanics, electricity, and blueprint reading are helpful.

Employment, 1978	210,000
Projected employment, 1990	245,000
Percent growth, 1978–90	16.7
Average annual openings, 1978–90	8,200
Growth	2,900
Replacement	5,300
Available training data:	
Public vocational education completions	18,272
Private vocational education completions	1,662
Jobs Corps completions	171
Apprenticeship completions	203

Appliance repairers. Formal training in appliance repair is available in some vocational and technical schools and community colleges. Graduates of these programs still need on-the-job experience, however, to become familiar with a variety of appliances and repairs. Generally, it takes about 3 years to learn the trade. A high school diploma usually is required and courses in appliance repair, electricity, electronics, shop mathematics, and blueprint reading provide a good background. To keep up with changes in appliance design, experienced repairers may attend training programs conducted by appliance manufacturers.

Employment, 1978	145,000
Projected employment, 1990	180,000
Percent change, 1978–90	24.1
Average annual openings, 1978–90	6,900
Growth	2,900
Replacement	4,000
Available training data:	
Public vocational education completions	5,948
Private vocational education completions[1]	—
Jobs Corps completions	42

[1]Fewer than 25.

Automobile body repairers. Generally 3 to 4 years of on-the-job training are necessary to learn all phases of automobile body repair. Most repairers learn informally on the job, but the recommended way to enter this occupation is through completion of a 3- or 4-year apprenticeship that combines on-the-job training with classroom instruction in safety procedures, shop mathematics, and business. Although high school graduation is not required, most employers consider it an asset. High school or vocational school courses in automobile body repair or automobile mechanics are helpful.

Employment, 1978	185,000
Projected employment, 1990	235,000
Percent growth, 1978–90	28.0
Average annual openings, 1978–90	7,800
Growth	4,300
Replacement	3,500
Available training data:	
Public vocational education completions	29,401
Private vocational education completions	845
Job Corps completions	672
Apprenticeship completions	99

Automobile mechanics. Most automobile mechanics learn their trade through 3 to 4 years of on-the-job experience, but additional time may be needed to learn a difficult specialty such as automatic transmission

repair. Training authorities usually recommend completion of a 3- or 4-year apprenticeship program which combines on-the-job experience with classroom instruction in mathematics, physics, shop safety, and customer relations. Automobile mechanic training in the Armed Forces is good preparation. High school or vocational school courses in science, mathematics, automobile repair, and machine shop also are useful. A high school diploma is preferred but not required.

Employment, 1978	860,000
Projected employment, 1990	1,060,000
Percent change, 1978–90	22.7
Average annual openings, 1978–90	37,000
Growth	16,000
Replacement	21,000
Available training data:	
Public vocational education completions	99,528
Private vocational education completions	6,565
Job Corps completions	1,448
Apprenticeship completions	789

Boat engine mechanics. Most mechanics learn on the job. Generally 2 to 3 years of experience are required to become skilled in repairing both outboard and inboard motors. A high school diploma is preferred by employers but is not required. High school or vocational school courses in small engine repair, auto mechanics, and machine shop are helpful.

Employment, 1978	20,000
Projected employment, 1990	24,000
Percent change, 1978–90	23.9
Average annual openings, 1978–90	1,000
Growth	400
Replacement	600
Available training data:	
Public vocational education completions[1]	13,171

[1]Graduates of small engine repair vocational programs.

Business machine repairers. These workers usually are hired as trainees and taught their skills on the job. Trainees who work in a manufacturer's branch office or for a franchised dealer usually receive several weeks to several months of training at a school sponsored by the manufacturer. Training offered by independent repair shops generally is less formal, with trainees completing a self-study course and receiving on-the-job training from an experienced repairer. Training also is available through apprenticeship programs and in public and private vocational schools.

Applicants must be high school graduates, and some employers require at least 1 year of technical training in basic electricity or electronics. Employers agree that electronics training received in the Armed Forces is excellent preparation. Good eyesight, including color vision, and good hearing are important. High school courses in physics, chemistry, and mathematics are helpful.

Employment prospects will be excellent for those with electronics training.

Employment, 1978	63,000
Projected employment, 1990	98,000
Percent growth, 1978–90	56.0
Average annual openings, 1978–90	4,200
Growth	2,900
Replacement	1,300
Available training data:[1]	
Public vocational education completions	1,217
Private vocational education completions	195
Job Corps completions[2]	—
Apprenticeship completions	94

[1]May include some computer service technicians.
[2]Fewer than 25.

Computer service technicians. Employers usually require applicants to have 1 to 2 years of post-high school training in basic electronics or electrical engineering from a computer school, a technical institute, a junior college, or college. A few technicians are trained through apprenticeship programs. Electronics training in the Armed Forces also is excellent preparation. Generally, 6 months to 2 years of on-the-job experience is required before newly hired technicians are considered competent to work independently on the more complex systems. High school courses in mathematics, chemistry, and physics are considered good preparation. Appearance, disposition, and communication skills also are important.

Employment, 1978	63,000
Projected employment, 1990	121,000
Percent growth, 1978–90	92.5
Average annual openings, 1978–90	5,400
Growth	4,800
Replacement	600
Available training data:	
Junior college completions	319

Electric sign repairers. Most electric sign repairers are trained on the job, although some are trained in apprenticeship programs conducted by local unions and sign manufacturing shops. At least 4 years of training and experience are required to become a fully qualified repairer. Employers prefer to hire high school or vocational school graduates, but many repairers have less education.

All electric sign repairers must be familiar with the National Electric Code. Many cities require repairers to pass an examination in local electric codes, and electric theory and application.

Employment, 1978	15,000

Projected employment, 1990	18,000
Percent growth, 1978–90	20.0
Average annual openings, 1978–90	700
Growth	300
Replacement	400
Available training data	—

Farm equipment mechanics. Most farm equipment mechanics begin as helpers and learn their skills on the job. Employers generally prefer to hire high school graduates who have a farm background. Usually, at least 3 years of on-the-job experience are necessary before a person is able to handle all types of repairs. Some mechanics learn their skills by completing a 3- to 4-year apprenticeship program, while others learn through a vocational program. High school courses in automobile repair, machine shop, science, and mathematics are helpful.

Employment, 1978	62,000
Projected employment, 1990	77,000
Percent change, 1978–90	24.2
Average annual openings, 1978–90	3,500
Growth	1,300
Replacement	2,200
Available training data:	
Job Corps completions	43

Furniture upholsterers. The most common way to learn this trade is to work with experienced upholsterers for about 3 years and acquire skills on the job. Vocational or high school courses in upholstery provide a good background, but experience on the job still is necessary to refine one's skills. A high school diploma is not required.

Employment, 1978	29,000
Projected employment, 1990	29,000
Percent change, 1978–90	0.0
Average annual openings, 1978–90	1,100
Growth	0
Replacement	1,100
Available training data:	
Public vocational education completions[1]	7,198
Private vocational education completions	75
Job Corps completions	102

[1]Includes some upholsterers other than furniture.

Industrial machinery repairers. Most workers learn their skills on the job as helpers to experienced workers by rotating from job to job for several years. Others learn their trade through 4-year apprenticeship programs that combine on-the-job training with classroom instruction in welding, blueprint reading, shop mathematics, and safety. A high school diploma is not required, but high school or vocational school courses in mathmatics and machine shop may be helpful. Good physical condition and agility are necessary because repairers sometimes have to lift heavy equipment or climb to reach large machines.

Employment, 1978	655,000
Projected employment, 1990	1,085,000
Percent change, 1978–90	66.0
Average annual openings, 1978–90	58,000
Growth	36,000
Replacement	22,000
Available training data:	
Job Corps completions	40
Apprenticeship completions	438

Maintenance electricians. Most maintenance electricians work at least 4 years informally on the job to learn their trade. Some workers learn through 4-year apprenticeship programs which combine on-the-job training with classroom instruction in subjects such as electricity, blueprint reading, and safety. A high school diploma usually is required. Vocational education courses in electrical construction are useful, as are high school courses in electricity, physics, mathematics, and science. Many cities and counties require electricians to be licensed. To obtain a license, an applicant must pass a written examination and may have to demonstrate occupational skills.

Employment, 1978	300,000
Projected employment, 1990	385,000
Percent change, 1978–90	28.3
Average annual openings, 1978–90	15,500
Growth	7,000
Replacement	8,500
Available training data:	
Private vocational education completions	600
Job Corps completions	32
Apprenticeship completions	594

Piano and organ tuners and repairers. Most workers learn their trade on the job. Generally, 4 to 5 years of on-the-job training are needed to qualify as a piano or pipe organ technician. Piano tuning alone may be learned in less than 2 years. Electronic organ technicians usually need formal training in electronics available in technical schools, junior colleges, and the Armed Forces. Courses in piano technology are offered by a small number of technical schools and colleges. Home study (correspondence school) courses in piano technology also are available. Employers prefer high school graduates for beginning jobs in these fields. Music courses are helpful in developing an ear for tonal quality, and woodworking courses also are useful because many moving parts in pianos and pipe organs are made of wood.

Employment, 1978	8,000
Projected employment, 1990	8,800
Percent growth, 1978–90	10.0
Average annual openings, 1978–90	700

Growth	100
Replacement	600
Available training data	—

Shoe repairers. These workers generally start as helpers and are trained on the job in shoe repair shops. It takes up to 2 years to learn all aspects of the job. Some repairers learn the trade in vocational schools, but additional training under an experienced shoe repairer generally is helpful. A high school diploma is not required. Business courses are useful because many shoe repairers own their shops. Some high schools and junior colleges offer courses in shoe repair.

Employment, 1978	22,000
Projected employment, 1990	21,000
Percent change, 1978–90	−4.5
Average annual openings, 1978–90	1,600
Decline	−100
Replacement	1,700
Available training data	—

Television and radio service technicians. Employers usually hire persons who have had formal training in electronics while in high school, vocational school, or junior college. Armed Forces electronics training is useful, although employers may require additional training in television electronics. Up to 4 years of on-the-job training are necessary to become skilled in most types of repair work. A high school diploma is required. Some States have licensing requirements.

Employment, 1978	131,000
Projected employment, 1990	166,000
Percent growth, 1978–90	26.7
Average annual openings, 1978–90	6,100
Growth	2,900
Replacement	3,200
Available training data:	
Private vocational education completions	510
Job Corps completions[1]	—
Apprenticeship completions	76

[1]Fewer than 25.

Truck mechanics and bus mechanics. Most mechanics learn their skills on the job in 3 to 4 years, but completion of a 4-year apprenticeship program is the recommended way to learn this trade. These programs combine on-the-job training with classroom instruction in mathematics, physics, and shop safety. A high school diploma is preferred by employers and strongly recommended for applicants for apprenticeships. High school or vocational school courses in automobile repair and mathematics provide good preparation. For some jobs that require driving, mechanics must have a chauffeur's license.

Employment, 1978	165,000
Projected employment, 1990	210,000
Percent change, 1978–90	27.0
Average annual openings, 1978–90	6,800
Growth	3,300
Replacement	3,500
Available training data	—

Health Occupations

Dental occupations

Dentists. All States require dentists to have a license to practice. To be licensed, candidates must graduate from a dental school approved by the American Dental Association and pass a State board examination. Most State licenses permit dentists to engage in both general and specialized practice. However, 14 States require specialists to have 2 or 3 years of graduate education and in some cases, pass a State examination on the specialty. Dental school training generally lasts 4 academic years, although some institutions condense it into 3 calendar years. Applicants to dental school must have 2 to 4 years of college education, including courses in the sciences and humanities. In 1978, about 4 out of 5 students in dental school had a bachelor's or master's degree.

Employment, 1978	120,000
Projected employment, 1990	155,000
Percent change, 1978–90	29.2
Average annual openings, 1978–90	5,500
Growth	3,000
Replacement	2,500

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Dental school graduates	5,238	5,400

Dental assistants. Most dental assistants learn their skills on the job, but an increasing number are trained through post-high school programs offered in junior and community colleges, and in vocational and technical schools. These programs generally take 1 year to complete and lead to a certificate or diploma. Graduates of 2-year programs offered in junior and community colleges earn associate degrees. Training also is available in the Armed Forces. Individuals who have had formal training generally have an advantage

when seeking a job. A high school diploma is required, and courses in biology, chemistry, health, and typing are helpful.

Employment, 1978	150,000
Projected employment, 1990	225,000
Percent growth, 1978–90	50.0
Average annual openings, 1978–90	11,000
Growth	6,300
Replacement	4,700
Available training data:	
Public vocational education completions	8,013
Private vocational education completions	3,521
Job Corps completions	64
Junior college graduates	1,329

Dental hygienists. Completion of an associate degree program usually is sufficient training to practice in a dentist's office. To do research, teach, and work in public or school health programs, at least a bachelor's degree is required. Dental hygienists must be licensed and only graduates of the associate or bachelor's degree programs of accredited dental hygiene schools are eligible for licensing. To obtain a license, applicants must pass both a written and a clinical examination. Dental hygiene training given in the Armed Forces does not fully prepare one to pass the licensing examination, but credit for that training may be granted to persons seeking admission to accredited schools. High school courses in biology, health, chemistry, and mathematics are useful.

Employment, 1978	35,000
Projected employment, 1990	65,000
Percent growth, 1978–90	85.7
Average annual openings, 1978–90	6,000
Growth	2,500
Replacement	3,500
Available training data:	
Public vocational education completions	2,360
Junior college graduates	3,825

	1977–78	Projected 1978–90 (annual average)
Degrees in dental hygiene:		
Bachelor's degrees	1,141	1,695
Master's degrees	30	100
Doctor's degrees	—	—

Dental laboratory technicians. Many dental laboratory technicians learn their skills on the job, usually in 3 to 4 years. A few vocational schools offer courses in dental laboratory work. High school graduates are preferred, and courses in art, crafts, metal shop, metallurgy, and science are helpful. Persons who receive dental laboratory training in the Armed Forces usually qualify for civilian jobs as technicians.

In 1978, 55 junior colleges, colleges, and vocational and technical schools offered training programs accredited by the Commission on Accreditation of Dental and Dental Auxiliary Educational Programs. After completion of these 2-year programs, the trainee may need about 3 years of experience to become a fully qualified technician. Some technicians complete apprenticeship programs. Dental laboratory technicians may become certified dental technicians by passing written and practical examinations given by the National Association of Dental Laboratories. Certification is becoming increasingly important as evidence of a technician's competence.

Employment, 1978	47,000
Projected employment, 1990	70,000
Percent growth, 1978–90	48.9
Average annual openings, 1978–90	2,800
Growth	1,900
Replacement	900
Available training data:	
Public vocational education completions	1,234
Private vocational education completions	793
Apprenticeship completions[1]	26
Junior college graduates	763

[1]Includes some medical technicians.

Medical practitioners

Chiropractors. All States require chiropractors to meet certain educational requirements and pass a State board examination for a license. Although the type of chiropractic procedures permitted and the education required vary, most States require graduation from a 4-year chiropractic course following 2 years of undergraduate college work.

Enrollments in chiropractic colleges have grown dramatically. As more students graduate and the number of practitioners swells, new chiropractors may find it increasingly difficult to establish a practice in those areas where chiropractors already are located.

Employment, 1978	18,000
Projected employment, 1990	21,000
Percent change, 1978–90	17.2
Average annual openings, 1978–90	1,500
Growth	250
Replacement	1,250
Available training data:	1977–78
Chiropractic school graduates	1,661

Optometrists. All States require optometrists to be licensed. Applicants for a license must have a Doctor of Optometry degree from an accredited school of optometry and pass a State board examination. The Doctor of Optometry degree requires a minimum of 6 years of education after high school, consisting of 4 years of

optometry school preceded by at least 2 years of undergraduate college study. In 1979, the American Optometric Association accredited 13 schools.

Employment opportunities are expected to be favorable through the 1980's. About 1,600 new optometrists will be needed annually, although the U.S. Public Health Service projects an average of 1,000 optometry graduates each year.

Employment, 1978	21,000
Projected employment, 1990	26,000
Percent growth, 1978–90	25.2
Average annual openings, 1978–90	1,600
Growth	500
Replacement	1,100

Available training data:	1977–78
Optometry school graduates	1,014

Physicians and osteopathic physicians. All States require a license for the practice of medicine. Applicants for a license must graduate from an approved medical school or school of osteopathy, pass a State board examination, and in almost all cases, serve a 1- or 2-year hospital residency. Most students who enter medical school or a school of osteopathy have earned a bachelor's degree, although many schools accept students who have had just 3 years of college. Although no one college major is best, a major in one of the sciences is good preparation. Most medical schools and schools of osteopathy have 4-year curriculums. Persons who wish to specialize must complete "advanced residency training" usually followed by 2 or more years of practice in the specialty before they may take the specialty board examinations.

The employment outlook for physicians and osteopathic physicians is expected to be favorable. Over the 1978–90 period, about 17,900 students are projected to graduate from U.S. medical schools each year, and about 1,600 foreign medical graduates are expected to enter the country annually, according to the U.S. Public Health Service. The number of physicians and osteopathic physicians from both of these sources (19,500) approximates the estimated total requirements (19,000).

Employment, 1978	405,000
Projected employment, 1990	560,000
Percent growth, 1978–90	38.1
Average annual openings, 1978–90	19,000
Growth	13,000
Replacement	6,000

Available training data:	1977–78	*Projected 1978–90 (annual average)*
M.D. degrees[1]	14,598	16,550
D.O. degrees[1]	964	1,350

[1]U.S. Public Health Service data.

Podiatrists. All States require a license for the practice of podiatry. Applicants for a license must graduate from an accredited 4-year program in a college of podiatric medicine and pass a State board examination. Four States also require a 1-year residency. At least 3 years of college are required for admission to any of the five colleges of podiatric medicine. Most successful applicants to schools of podiatry in 1978 had bachelor's degrees. No one college major is required.

Opportunities for graduates to establish new practices or obtain salaried positions are expected to be favorable. It is anticipated that an average of 600 podiatrists will be needed each year. The U.S. Public Health Service projects that the supply of new graduates should approximate requirements.

Employment, 1978	8,000
Projected employment, 1990	12,500
Percent change, 1978–90	53.7
Average annual openings, 1978–90	600
Growth	350
Replacement	250

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Podiatry school graduates[1]	543	594

[1]U.S. Public Health Service data.

Veterinarians. A license is required to practice veterinary medicine in all States. To be licensed, a candidate must earn the Doctor of Veterinary Medicine (D.V.M.) degree and pass a State board examination.

Four years of study in a college of veterinary medicine preceded by at least 2 years of undergraduate education are required to earn the D.V.M. degree. Applicants for admission to veterinary college must have completed 2 to 3 years of study in a program that emphasizes the physical and biological sciences. Most students, however, have completed 3 to 4 years of college study.

Veterinary employment is expected to grow faster than the average for all occupations through the 1980's. At the same time, however, enrollments and graduations from veterinary schools have swelled, and new graduates may face competition in establishing practices in some areas. Although 1,700 new veterinarians will be needed annually, the U.S. Public Health Service projects an average of 2,100 students will graduate each year.

Employment, 1978	33,500
Projected employment, 1990	45,000
Percent growth, 1978–90	35.6
Average annual openings, 1978–90	1,700
Growth	1,000
Replacement	700

Available training data:	1977–78	*Projected for 1978–90 (annual average)*
Veterinary school graduates[1]	1,635	2,100

[1]U.S. Public Health Service data.

Medical technologist, technician, and assistant occupations

Electroencephalographic (EEG) technologists and technicians. Most EEG technologists and technicians are trained on the job by experienced EEG personnel. Training authorities, however, recommend completion of a formal training program. These programs, which usually last from 1 to 2 years, may be offered in colleges, junior colleges, medical schools, hospitals, and vocational or technical schools. In 1978, there were 27 of these programs, 12 of which were approved by the Committee on Allied Health Education and Accreditation. High school graduation is required, and courses in health, biology, and electronics are helpful.

EEG personnel who have 1 year of training and 1 year of experience and pass a written and oral examination administered by the American Board of Registration of Electroencephalographic Technologists can become "Registered EEG Technologists." Registration is not a requirement for employment but is acknowledgement of a technologist's qualifications and makes it easier to obtain better paying positions.

Employment, 1978	7,000
Projected employment, 1990	10,500
Percent change, 1978–90	49.9
Average annual openings, 1978–90	500
Growth	300
Replacement	200

Available training data:	
Junior college graduates[1]	89

[1]Includes all electrodiagnostic technicians.

Medical laboratory workers. There are three occupations within this group—medical laboratory assistant, medical laboratory technician, and medical technologist. Most *medical laboratory assistants* are trained on the job. In recent years, however, an increasing number have completed 1-year training programs conducted by hospitals, junior colleges, and vocational schools. Applicants to these programs should have a high school diploma with courses in science and mathematics.

Medical laboratory technicians may obtain training through 2-year programs offered by junior colleges, colleges and universities, and vocational and technical schools. Some are trained in the Armed Forces. *Medical technologists* usually must complete 4 years of college, including 12 months of study and extensive laboratory work in medical technology. About 670 hospitals and colleges and universities offered programs accredited by the American Medical Association. A bachelor's degree usually is awarded upon completion, although a few programs require a bachelor's degree for entry.

Employment, 1978	210,000
Projected employment, 1990	265,000
Percent growth, 1978–90	26.2
Average annual openings, 1978–90	14,800
Growth	4,600
Replacement	10,200

Available training data:	
Public vocational education completions	5,223
Private vocational education completions	231
Job Corps completions[1]	—
Junior college graduates	3,819

	1977–78	*Projected 1978–90 (annual average)*
Degrees in medical laboratory technologies:		
Bachelor's degrees	5,288	6,219
Master's degrees	292	350

[1]Fewer than 25.

Medical record technicians and clerks. High school graduates who have basic secretarial skills can enter the medical record field as clerks. About 1 month of on-the-job training is needed to learn routine tasks. Although not required, high school courses in science, health, and mathematics are helpful. The American Medical Record Association (AMRA) offers a correspondence course in medical transcription; the certificate awarded upon successful completion of the course is helpful in applying for a job as a clerk.

Most employers prefer to fill technician positions with graduates of 2-year associate degree programs in medical record technology. In 1978, the American Medical Association and the AMRA had accredited 70 programs. Technicians may take the Accredited Record Technician (ART) examination. Passing the examination indicates competence in the field and can be helpful for promotion.

Employment, 1978	50,000
Projected employment, 1990	65,000
Percent change, 1978–90	30.0

Average annual openings, 1978–90	4,900
Growth	1,300
Replacement	3,600
Available training data:	
Job Corps completions	96
Junior college graduates	1,098

Operating room technicians. Most operating room technicians are trained in vocational and technical schools, hospitals, and community and junior colleges. Generally, these programs last from 9 months to 1 year, but some junior college programs last 2 years and lead to an associate degree. In 1978, there were 68 training programs accredited by the Committee on Allied Health Education and Accreditation. Some technicians are trained on the job. The length of training ranges from 6 weeks to 1 year, depending on the individual's qualifications and the extent and difficulty of the work assigned. Applicants who have worked as nursing aides or practical nurses may be preferred. Some operating room technicians also are trained in the Armed Forces. A high school diploma generally is required, and courses in health and biology are helpful.

The Association of Surgical Technologists awards a certificate to operating room technicians who pass its comprehensive examination. This certification is recognized as a sign of competence and often commands a higher salary.

Employment, 1978	35,000
Projected employment, 1990	53,000
Percent growth, 1978–90	49.9
Average annual openings, 1978–90	2,600
Growth	1,400
Replacement	1,200
Available training data:	
Public vocational education completions	1,381
Junior college graduates	291

Optometric assistants. Most optometric assistants are trained on the job, but training also can be acquired through 1- or 2-year courses in junior colleges. A high school diploma or its equivalent, including knowledge of mathematics and office procedures, is preferred for both on-the-job and formal training.

Employment, 1978	15,000
Projected employment, 1990	21,500
Percent change, 1978–90	42.4
Average annual openings, 1978–90	1,200
Growth	500
Replacement	700
Available training data:	
Junior college graduates	662

Radiologic (X-ray) technologists. Completion of a 2-year training program in radiography is required for entry to the field. These programs are offered in hospitals, medical schools, colleges, junior colleges, vocational schools, and the military services. A few schools conduct 3- or 4-year programs, and some schools award bachelor's and master's degrees in X-ray technology. Generally, there is more potential for advancement for persons who hold bachelor's or master's degrees. High school graduation is required for entry to all training programs, and courses in mathematics, physics, chemistry, and biology are helpful.

Although the demand for radiologic technologists should continue to be strong, the number of graduates of AMA-approved programs in this field is expected to grow rapidly through the 1980's. If present enrollment patterns continue, the number seeking to enter the occupation is likely to exceed the number of openings. As a result, graduates may face competition for positions of their choice.

Employment, 1978	100,000
Projected employment, 1990	140,000
Percent growth, 1978–90	40.0
Average annual openings, 1978–90	9,000
Growth	3,300
Replacement	5,700
Available training data:	
Public vocational education completions	3,090
Private vocational education completions	3,533
Junior college graduates	3,959

	1977–78
Degrees in radiologic technologies:	
Bachelor's degrees	392
Master's degrees	42
Doctor's degrees[1]	—

[1]Fewer than 25.

Respiratory therapy workers. There are three levels of workers-assistants, technicians, and therapists. *Assistants* trained on the job learn their skills in about 6 weeks. A high school diploma is not required but may be preferred by some employers. Formal training beyond high school is required for technicians and therapists. Programs are offered in colleges and universities, junior colleges, and hospitals. Generally, *technician* training programs last 12 months, while *therapist* training programs last 18 to 24 months. Therapists completing the 2-year program at a college earn an associate degree. Some colleges and universities offer 4-year programs for therapists that culminate in a bachelor's degree. High school courses in health, biology, mathematics, physics, and bookkeeping are useful preparation for these occupations.

The National Board of Respiratory Therapy awards the Registered Respiratory Therapist (RRT) and Certified Respiratory Therapy Technician (CRTT) credentials to individuals who meet their requirements. To earn the RRT, therapists must complete an approved training program, have 62 semester hours of college

credit, 1 year of experience, and pass written and clinical examinations. To earn the CRTT, technicians must complete an approved training program, have 1 year of experience, and pass a written test.

Employment, 1978	50,000
Projected employment, 1990	77,500
Percent growth, 1978–90	55.0
Average annual openings, 1978–90	5,000
Growth	2,300
Replacement	2,700
Available training data:	
Public vocational education completions	3,168
Job Corps completions[1]	—
Junior college graduates	2,567

[1]Fewer than 25.

Nursing occupations

Registered nurses. All States require professional nurses to be licensed. Applicants for a license must graduate from a school approved by the State board of nursing and pass the State board examination. All nursing schools require a high school diploma for entry. Programs vary in length from 2 to 5 years. Nurses who complete 2-year courses earn associate degrees; those who complete 3-year courses earn diplomas; and bachelor's degrees are awarded to graduates of 4- and 5-year courses. A master's degree is preferred for research, consultation, teaching, and clinical specialization.

Employment opportunities are expected to be favorable through the 1980's. Between 1978 and 1990, an average of 85,000 new registered nurses will be needed annually. The U.S. Public Health Service projects that the average number of graduates each year will be about 76,000. Traditionally, not all graduates have entered nursing immediately upon graduation, and many have left the labor force early in their careers. Thus, a substantial pool of qualified nurses exists outside the labor force. Many nurses are expected to seek entry or reentry into the field, but the number depends on many factors which are difficult to analyze, such as the availability of jobs in specific localities, general economic conditions, and job opportunities and salaries in other occupations for which nurses are qualified.

Employment, 1978	1,060,000
Projected employment, 1990	1,570,000
Percent growth, 1978–90	49.6
Average annual openings, 1978–90	85,000
Growth	43,000
Replacement	42,000
Available training data:	
Public vocational education completions[1]	24,895
Private vocational education completions	154
Junior college graduates[1]	36,193

	1977–78	*Projected 1978–90 (annual average)*
Degrees in nursing:		
Bachelor's degrees	30,307	30,088
Master's degrees	3,812	4,104
Doctor's degrees	56	20

[1]Some graduates may be counted in both junior college and vocational education programs.

Licensed practical nurses. All States require applicants for licenses as practical nurses to complete a State-approved course in practical nursing and pass an examination. Educational requirements for enrollment in these courses vary by State and range from completion of eighth or ninth grade to high school graduation. Generally, the course lasts 1 year and is given in junior colleges, local hospitals, health agencies, and vocational schools.

Employment, 1978	518,000
Projected employment, 1990	840,000
Percent change, 1978–90	62.2
Average annual openings, 1978–90	60,000
Growth	26,000
Replacement	34,000
Available training data:	
Public vocational education completions	34,399
Private vocational education completions	3,242
Job Corps completions	42
Junior college completions	3,019

Nursing aides, orderlies, and attendants. Although some employers prefer to hire high school graduates, a diploma is not required. Training usually is acquired on the job, often in combination with classroom instruction covering areas such as the correct procedures for changing bed linens, taking temperatures, and giving back rubs. Public and private vocational schools also offer this training.

Employment, 1978	1,037,000
Projected employment, 1990	1,575,000
Percent change, 1978–90	52.0
Average annual openings, 1978–90	94,000
Growth	45,000
Replacement	49,000
Available training data:	
Public vocational education completions	42,325
Private vocational education completions	2,725
Job Corps completions	1,768

Therapy and rehabilitation occupations

Occupational therapists. A bachelor's degree in occupational therapy generally is required to enter this profession. Some schools, however, offer programs leading to

a certificate or a master's degree in occupational therapy for students who have a bachelor's degree in another field. Graduates of approved programs may take the American Occupational Therapy Association examination to become registered occupational therapists (OTR). This designation is recognition of professional competence.

The increasing number of graduates from training programs is expected to be in balance with openings. Employment opportunities, therefore, are expected to be favorable through the 1980's.

Employment, 1978	15,000
Projected employment, 1990	30,000
Percent growth, 1978–90	100.0
Average annual openings, 1978–90	2,500
Growth	1,300
Replacement	1,200

Available training data:

Public vocational education completions	820

	1977–78	Projected 1978–90 (annual average)
Degrees in occupational therapy:		
Bachelor's degrees	1,528	1,920
Master's degrees	222	190

Occupational therapy assistants. Most occupational therapy assistants graduate from 1- or 2-year junior college programs or complete an approved occupational therapy assistant program in the Armed Forces. Some learn their skills in vocational and technical programs. Applicants for training programs must have a high school diploma or its equivalent.

Employment, 1978	10,000
Projected employment, 1990	15,000
Percent growth, 1978–90	50.0
Average annual openings, 1978–90	1,100
Growth	400
Replacement	700

Available training data:

Junior college graduates	661

Physical therapists. All States require physical therapists to be licensed. Applicants for a license must have a bachelor's degree in physical therapy and pass a State board examination. For persons who have bachelor's degrees in other fields, 12- to 16-month certificate programs and master's degree programs are available. A graduate degree combined with clinical experience increases advancement opportunities, especially in teaching, research, and administration.

The rapidly growing number of new graduates is expected to exceed the number of openings that will occur each year in this occupation. As a result, new graduates are expected to face some competition through the 1980's.

Employment, 1978	30,000
Projected employment, 1990	45,000
Percent change, 1978–90	50.0
Average annual openings, 1978–90	2,700
Growth	1,300
Replacement	1,400

Available training data:

	1977–78	Projected 1978–90 (annual average)
Degrees in physical therapy:		
Bachelor's degrees	2,418	3,049
Master's degrees	258	177

Physical therapist assistants and aides. Some States now license physical therapist assistants. To obtain a license, applicants must complete an approved 2-year associate degree program and pass a written examination. A few States, however, license those who learned their skills before the associate degree programs became available. States which do not require licensing allow physical therapist aides to advance to assistants by acquiring the necessary knowledge and skills on the job, but employers often prefer to hire graduates of approved programs for assistant jobs.

Physical therapist aides train on the job. The length and content of these training programs depends on the difficulty of the duties aides are expected to perform and the needs of the patients in the particular program. Employers generally prefer to hire high school graduates who have worked as hospital nursing aides. High school courses in health, biology, psychology, and physical education are useful preparation for both aides and assistants.

Employment, 1978	12,500
Projected employment, 1990	15,000
Percent growth, 1978–90	20.0
Average annual openings, 1978–90	400
Growth	200
Replacement	200

Available training data:

Public vocational education completions	854
Job Corps completions[1]	—
Junior college graduates	975

[1]Fewer than 25.

Speech pathologists and audiologists. Most States prefer and some require applicants for beginning jobs in public schools to have a master's degree. In addition, a teacher's certificate often is required, and some States insist that workers who deal with handicapped children have special training. In 30 States, those offering speech pathology and audiology services outside of schools

must be licensed; licensure requirements vary. Many Federal programs, such as Medicare and Medicaid, require participating speech pathologists and audiologists to have a master's degree.

Competition for jobs in many areas of the country is expected to be keen. Over the 1978–90 period, an average of nearly 4,000 new speech pathologists will be needed each year. Graduates of master's degree programs alone are expected to approach that number, and a number of bachelor's degree holders also will compete for jobs. Some rural and inner-city jobs have been difficult to fill, however, so opportunities for master's degree holders who are willing to work in these areas should be favorable.

Employment, 1978	32,000
Projected employment, 1990	60,000
Percent growth, 1978–90	87.5
Average annual openings, 1978–90	3,900
Growth	2,300
Replacement	1,600

Available training data:

Degrees in speech pathology and audiology:	1977–78
Bachelor's degrees	3,551
Master's degrees	3,190
Doctor's degrees	121

Other health occupations

Dietitians. A bachelor's degree, preferably with a major in foods and nutrition or institution management, is the basic educational requirement. This degree usually is earned through departments of home economics. To qualify for professional recognition, the American Dietetic Association recommends completion of an approved dietetic internship or an approved individual trainee program following graduation. The internship lasts 6 to 12 months and the trainee program, 1 to 2 years. A growing number of coordinated undergraduate programs enable students to complete all requirements in 4 years.

Employment, 1978	35,000
Projected employment, 1990	50,000
Percent change, 1978–90	42.9
Average annual openings, 1978–90	3,300
Growth	1,300
Replacement	2,000

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in foods and nutrition:		
Bachelor's degrees	3,068	1,071
Master's degrees	676	531
Doctor's degrees	33	176

Dispensing opticians. Most dispensing opticians learn their skills on the job. Employers prefer high school graduates, and graduation is required for formal training programs. Some dispensing opticians learn their skills through 2- to 4-year apprenticeship programs that teach optical mathematics, optical physics, and the use of laboratory equipment. Apprentices also are taught to fit patients with eyeglasses and contact lenses. High school courses in physics, geometry, algebra, and mechanical drawing are useful.

In 1978, 21 schools offered 2-year full-time courses in optical fabricating and dispensing work leading to an associate degree. In 1978, 20 States required dispensing opticians to be licensed. Applicants for a license must pass an examination.

Employment, 1978	17,600
Projected employment, 1990	24,300
Percent growth, 1978–90	38.1
Average annual openings, 1978–90	1,200
Growth	600
Replacement	600

Available training data:	
Apprenticeship completions	52
Junior college graduates	662

Health service administrators. Educational requirements for health administrators vary. A bachelor's degree is often the minimum educational preparation. For some jobs, a master's degree in hospital or health care administration or in public health is required. The Ph. D. degree generally is required for teaching and research positions and for administrative jobs in large, prestigious organizations. Some employers hire persons who have other background. A few hospitals and clinics require administrators to be physicians or registered nurses.

Employment, 1978	180,000
Projected employment, 1990	282,000
Percent growth, 1978–90	57.1
Average annual openings, 1978–90	18,000
Growth	8,100
Replacement	9,900

Available training data:

Degrees in hospitals and health care administration:	1977–78
Bachelor's degrees	1,158
Master's degrees	1,565
Doctor's degrees[1]	—

[1]Fewer than 25.

Medical record administrators. Preparation for a career as a medical record administrator is offered in specialized 4-year programs in colleges and universities. Most programs lead to a bachelor's degree in medical record

administration. Some persons transfer into these programs from junior colleges. One-year certificate programs are available for persons who already have a bachelor's degree and the required courses in the liberal arts and biological sciences. High school courses in health, business administration, mathematics, and biology are useful.

Graduates of approved schools in medical record administration may become Registered Record Administrators by passing an examination given by the American Medical Record Association.

Employment, 1978	12,500
Projected employment, 1990	15,000
Percent change, 1978–90	20.0
Average annual openings, 1978–90	900
Growth	200
Replacement	700

Available training data:

Degrees in medical record librarianship:	1977–78
Bachelor's degrees	543
Master's degrees[1]	—

[1]Fewer than 25.

Pharmacists. All States require pharmacists to be licensed. To obtain a license, one must graduate from an accredited pharmacy college, pass a State Board examination, and usually have a specified amount of practical experience or a period of internship under a licensed pharmacist. For entry to a college of pharmacy, at least 1 or 2 years of prepharmacy education in an accredited junior college, college, or university usually is required. At least 5 years of study beyond high school are required to graduate from one of the degree programs accredited by the American Council on Pharmaceutical Education in the 72 colleges of pharmacy. Most graduates receive a Bachelor of Science (B.S.) or Bachelor of Pharmacy (B. Pharm) degree. About one-third of the colleges offer advanced professional degree programs leading to the Doctor of Pharmacy (Pharm. D.) degree; 3 schools offer only the Pharm. D. degree. The Pharm. D. degree, a master's degree, or a Ph. D. degree in pharmacy is required for certain research, administrative, or teaching positions. Some pharmacists enter medical, dental, or law school, or pursue graduate degrees in science or engineering.

If the number of pharmacy college graduates continues to rise as rapidly as it has in recent years, the job market for graduates may become increasingly competitive. Job prospects vary within the profession. Although community pharmacies will continue to be the primary employer of pharmacists, employment of these workers is expected to rise fastest in hospitals and other health facilities. Pharmacists in these settings increasingly provide direct patient care and consultative services to physicians and other professionals.

Employment, 1978	135,000
Projected employment, 1990	185,000
Percent growth, 1978–90	37.0
Average annual openings, 1978–90	7,800
Growth	4,200
Replacement	3,600

Available training data:	1977–78	*Projected 1978–90 (annual average)*
Degrees in pharmacy:		
Bachelor's degrees	7,468	8,079
Master's degrees	320	299
Doctor's degrees	96	61

Social Scientists

The proportion of social scientists employed in colleges and universities varies widely among occupations. (See table below.) Economists and psychologists are much more heavily involved in nonacademic "applied" pursuits than are other social scientists. Little if any employment growth is anticipated in the academic sector through the 1980's, a reflection of declining college enrollments. The number of advanced degrees awarded in the social sciences is expected to exceed job openings, producing a highly competitive job market. As a result, an increasing proportion of advanced degree holders are expected to enter nonacademic positions.

	Estimated percent employed in colleges and universities
Anthropologists	80
Economists	10
Geographers	60
Historians	70
Political Scientists	80
Psychologists	25
Sociologists	80

Anthropologists. A Ph. D. degree in anthropology is necessary for permanent positions in colleges and universities and for many nonacademic jobs. A master's degree is sufficient for teaching jobs in community and junior colleges and some 4-year colleges and for some beginning jobs in business and government, but advancement generally is limited.

The number of qualified anthropologists seeking to enter the field is expected to exceed available positions.

As a result, persons who have a Ph. D. degree may face keen competition, particularly for college and university positions. Master's and bachelor's degree holders are likely to face even greater competition, although some may find research or administrative positions in government and industry, or teaching jobs in junior colleges or high schools.

Employment, 1978	7,000
Projected employment, 1990	8,600
Percent growth, 1978–90	23.1
Average annual openings, 1978–90	350
Growth	150
Replacement	200

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in anthropology:		
Bachelor's degrees	4,300	4,218
Master's degrees	856	1,065
Doctor's degrees	398	353

Economists. A bachelor's degree in economics is sufficient for many beginning jobs in government and industry. A master's degree is sufficient for teaching positions in community and junior colleges and some 4-year colleges and may be required for more responsible nonacademic positions. A Ph. D. degree is required for permanent positions in colleges and universities and is an asset for advancement in all areas.

Persons who have a Ph. D. degree are likely to face competition for academic positions but should find favorable prospects in government, industry, research organizations, and consulting firms. Master's degree holders may face keen competition for academic positions but may find good opportunities for administrative, research, and planning positions in nonacademic areas. Bachelor's degree holders are expected to face very strong competition for jobs as economists, although some may find employment in government, industry, and business as management or sales trainees, or as research or administrative assistants. Economists well trained in quantitative methods should be in particular demand.

Employment, 1978	130,000
Projected employment, 1990	183,000
Percent growth, 1978–90	39.2
Average annual openings, 1978–90	7,800
Growth	4,300
Replacement	3,500

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in economics:		
Bachelor's degrees	15,746	16,923
Master's degrees	1,997	2,254
Doctor's degrees	706	706

Geographers. A bachelor's degree in geography is the minimum requirement for beginning jobs in government and industry. A master's degree is sufficient for teaching jobs in community and junior colleges and some 4-year colleges and may be required for advancement in nonacademic areas. A Ph. D. degree is necessary for permanent positions in colleges and universities and for some senior level research, planning, and administrative positions.

Persons who have a Ph. D. degree are expected to face competition for academic positions but should have favorable prospects for research and administrative jobs in government, industry, research organizations, and environmental and other consulting firms. Master's degree holders may face strong competition for academic positions but may find job opportunities in planning and marketing. Bachelor's degree holders are likely to face competition for jobs as geographers. Some may find employment as management trainees or research or administrative assistants. Others may become secondary school teachers, or earn library science degrees and become map librarians. Geographers trained in applied areas, such as quantitative methods, cartography, or remote sensing data interpretation, should have the best opportunities.

Employment, 1978	10,000
Projected employment, 1990	12,300
Percent growth, 1978–90	22.6
Average annual openings, 1978–90	500
Growth	200
Replacement	300

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in geography:		
Bachelor's degrees	3,732	3,188
Master's degrees	648	755
Doctor's degrees	158	133

Historians. Graduate education usually is necessary for employment as a historian. Although a master's degree is sufficient for teaching jobs in community and junior colleges and some 4-year colleges and for some nonacademic positions, advancement opportunities may be quite limited for persons who do not have a Ph. D. degree. A Ph. D. is required for permanent positions in colleges and universities and for many research and administrative jobs.

The number of qualified persons expected to seek jobs as historians will greatly exceed available positions. Ph. D.'s are expected to face very keen competition, particularly for academic positions. Those with a strong

background in quantitative methods should have the best job prospects. Master's and bachelor's degree holders may face even greater competition, although some may find teaching positions in community colleges or high schools, or management, sales, research, or administrative positions in government and industry.

Employment, 1978	23,000
Projected employment, 1990	23,000
Percent growth, 1978–90	0.0
Average annual openings, 1978–90	700
Growth	0
Replacement	700

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in history:		
Bachelor's degrees	23,145	21,558
Master's degrees	3,040	3,210
Doctor's degrees	813	788

Political scientists. Graduate training generally is required for employment as a political scientists. A Ph. D. degree is necessary for permanent positions in colleges and universities and for some nonacademic jobs as well as for various administrative and research jobs in government, industry, consulting firms, and nonprofit research or civic organizations.

The number of qualified persons seeking to enter this field is expected to exceed greatly the number of available positions. Ph. D.'s may face stiff competition, particularly for academic positions. Master's degree holders are likely to face stiff competition for academic jobs, but may find jobs in government, research organizations, political organizations, and business firms. Advanced degree holders with training in applied areas, such as public administration or public policy, should have the best job prospects. Bachelor's degree holders are expected to find limited opportunities for jobs as political scientists. Some graduates, however, may find jobs as secondary school teachers or as trainees in government, business, and industry.

Employment, 1978	14,000
Projected employment, 1990	16,100
Percent growth, 1978–90	13.8
Average annual openings, 1978–90	500
Growth	150
Replacement	350

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in political science and government:		
Bachelor's degrees	26,245	19,395
Master's degrees	2,070	2,285
Doctor's degrees	636	555

Psychologists. A doctoral degree in psychology generally is the minimum requirement for employment as a psychologist. It is needed for many beginning positions and is increasingly important for advancement, particularly in colleges and universities. Master's degree holders may teach in community and junior colleges and some 4-year colleges, work as school psychologists or counselors, or serve as psychological assistants. Bachelor's degree holders may assist psychologists in a variety of settings.

All States and the District of Columbia have certification or licensing requirements for psychologists who want to enter independent practice. The requirements generally include a doctorate in psychology, 2 years of professional experience, and successful completion of a written examination. Some States certify master's degree holders as psychological assistants or associates.

Persons who have doctoral degrees are expected to face increasing competition, particularly for academic positions. Persons who have doctorates in applied areas, such as clinical, counseling, and industrial or organizational psychology, are expected to have better opportunities than those trained in experimental, physiological, or comparative psychology.

Employment, 1978	130,000
Projected employment, 1990	171,000
Percent growth, 1978–90	32.1
Average annual openings, 1978–90	6,700
Growth	3,500
Replacement	3,200

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in psychology:		
Bachelor's degrees	45,057	40,687
Master's degrees	8,194	10,280
Doctor's degrees	2,597	3,003

Sociologists. A master's degree in sociology generally is the minimum requirement for employment as a sociologist. While a master's degree is sufficient for teaching jobs in community and junior colleges and some 4-year colleges and for some nonacademic positions, advancement opportunities may be limited. A Ph. D. is necessary for permanent positions in colleges and universities and for jobs as directors of major research projects, administrators, or consultants.

The number of qualified persons seeking to enter this field is likely to exceed greatly available job openings. Persons who have Ph. D. degrees face increasing competition, particularly for academic positions. Ph. D.'s with strong backgrounds in quantitative methods

should have the best job prospects. Master's and bachelor's degree holders face even stiffer competition, although some may find teaching jobs in junior colleges and secondary schools or research or administrative jobs in government and industry.

Employment, 1978	19,000
Projected employment, 1990	20,700
Percent growth, 1978–90	8.1
Average annual openings, 1978–90	600
Growth	100
Replacement	500

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in sociology:		
Bachelor's degrees	22,991	17,961
Master's degrees	1,611	1,800
Doctor's degrees	599	700

Social Service Occupations

Counseling occupations

School counselors. Most States require school counselors to have both counseling and teaching certificates, although an increasing number of States no longer require teaching certification. To obtain a teaching certificate, an individual must have a bachelor's degree from an institution with a State-approved teacher education program and complete basic education courses and student teaching. Depending on the State, graduate work and from 1 to 5 years of teaching experience usually are required for a counseling certificate.

Most undergraduate students interested in becoming school counselors take the regular program of teacher education with additional courses in psychology and sociology. In States that do not require teaching experience, students can major in any field. A few States substitute a counseling internship for teaching experience. One to two years of study are necessary to earn a master's degree in counseling.

Employment, 1978	45,000
Projected employment, 1990	50,000
Percent change, 1978–90	11.1
Average annual openings, 1978–90	1,700
Growth	400
Replacement	1,300
Available training data	—

Other social service occupations

Cooperative extension service workers. These workers must have at least a bachelor's degree in the field in which they will conduct their educational program. Although one can specialize in a variety of areas, the most common are agriculture, home economics, youth activities, and community resource development. In addition, training in educational techniques and in a communications field, such as journalism, is helpful. Often workers receive instruction in extenstion work in pre-induction training programs and can improve their skills through regular in-service training programs.

Employment, 1978	16,000
Projected employment, 1990	18,000
Percent change, 1978–90	12.5
Average annual openings, 1978–90	650
Growth	175
Replacement	475
Available training data	—

Homemaker–home health aides. Homemaker–home health aides need to be able to read and write, but high school graduation generally is not required. High school home economics courses, such as meal planning and family living, are helpful, however, particularly for young persons who have little personal experience in homemaking. Some employers hire only experienced nursing aides for jobs as homemaker–home health aides, and require at least a year's experience as a nursing aide in a hospital or nursing home.

As a rule, homemaker–home health aides undergo orientation and training after they are hired; the length and quality of this training vary, however. Agencies that insist on previous experiences as a nursing aide may provide only a few hours of orientation. Most agencies, however, provide 1 or 2 weeks of training, including classroom instruction in topics such as nutrition, meal planning and preparation, personal care of the sick, emotional aspects of illness, and the aging process.

Employment, 1978	110,000
Projected employment, 1990	185,000
Percent change, 1978–90	70.0
Average annual openings, 1978–90	36,000
Growth	7,000
Replacement	29,000
Available training data:	
Public vocational education completions	5,217

Social service aides. Social service aides are trained on the job. These workers have a wide range of educational backgrounds, from elementary school to college. An aide's level of responsibility usually is related to formal educational attainment, so that people who have more schooling do different kinds of work than those who have less. For example, persons who have a grade school education may enter the field in clerical positions, while those who have a college degree may assume some duties normally performed by social workers.

In hiring, employers consider an applicant's desire to help people and his or her ability to communicate with community agencies and clients. An individual's potential for advancement and need for work also may be considered. Most employers emphasize the development of career ladders for these workers based upon on-the-job training, work experience, and further education.

Employment, 1978	134,000
Projected employment, 1990	160,000
Percent change, 1978–90	18.3
Average annual openings, 1978–90	7,500
Growth	2,000
Replacement	5,500
Available training data:	
Junior college graduates	4,238

Social workers. A bachelor's degree in social work generally is the minimum educational requirement for beginning jobs in the field. However, many positions, particularly supervisory, research, or administrative jobs, require a master's degree in social work. A doctorate often is preferred for teaching positions.

In 1976, 22 States had licensing or registration laws concerning social work practice and the use of professional social work titles. Usually, work experience, successful completion of an examination, or both are required. One of these titles is ACSW (Academy of Certified Social Workers) which can be used by members of the National Association of Social Workers who have at least 2 years of post-master's degree work experience and have passed the ACSW examination.

Employment, 1978	385,000
Projected employment, 1990	475,000
Percent change, 1978–90	24.2
Average annual openings, 1978–90	22,000
Growth	8,000
Replacement	14,000

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in social work and helping services:		
Bachelor's degrees	12,672	12,664
Master's degrees	9,886	11,595
Doctor's degrees	138	111

Performing Arts, Design, and Communications Occupations

Performing artists

Actors and actresses. Formal training in acting is increasingly necessary for entrance in the field. Training can be obtained at dramatic arts schools, located chiefly in New York, and in hundreds of college and universities throughout the country. Experience is important; participating in school or community productions is excellent preparation.

Overcrowding has existed in the acting field for many years, and this condition is expected to persist. The number of persons seeking to enter the profession is expected to continue to exceed the number of openings through the 1980's. Even the highly talented are likely to face stiff competition and economic difficulties.

Employment, 1978	13,400
Projected employment, 1990	18,000
Percent change, 1978–90	34.3
Average annual openings, 1978–90	850
Growth	400
Replacement	450
Available training data:	
Degrees in drama:	1977–78
Bachelor's degrees	5,056
Master's degrees	1,295
Doctor's degrees	116

Dancers. Serious training at a dance school or through private lessons should begin by age 12 or earlier, especially for ballet dancers. Training and practice continue throughout a dancer's career. Many colleges and universities offer dance instruction, but a college education is not required for employment as a professional dancer.

Employment, 1978	8,000
Projected employment, 1990	11,000
Percent change, 1978–90	37.5
Average annual openings, 1978–90	550
Growth	250
Replacement	300
Available training data:	
Degrees in dance:	1977–78
Bachelor's degrees	886
Master's degrees	205

Musicians. Studying an instrument, either through school or private lessons, should begin at an early age. More advanced training can be acquired through further study under an accomplished musician, in a college or university which has a strong music program, or in a music conservatory.

Employment, 1978	127,000
Projected employment, 1990	177,000
Percent change, 1978–90	39.4
Average annual openings, 1978–90	8,900
Growth	4,200
Replacement	4,700
Available training data:	
Armed Forces	5,239

	1977–78	Projected 1978–90 (annual average)
Degrees in music:[1]		
Bachelor's degrees	5,243	10,136
Master's degrees	2,668	3,100
Doctor's degrees	266	423

[1]Includes degrees in music performance, composition, and theory.

Singers. As a rule, intensive voice training should not begin until after the individual has matured physically. Voice training can be obtained through private lessons, or in a music conservatory or department of music in a college or university. A background in music theory and history is helpful for persons interested in singing professionally, although formal voice training is not essential for a successful career in popular music.

Employment, 1978	22,000
Projected employment, 1990	31,000
Percent change, 1978–90	40.9
Average annual openings, 1978–90	1,600
Growth	800
Replacement	800
Available training data	—

Design occupations

Architects. All States require architects to be licensed (registered). To obtain a license, applicants must have a bachelor's degree in architecture and have 3 years of experience, or a master's degree and 2 years of experience. They also must pass a written examination. In most States, 12 years of practical experience as an architect may be substituted for the bachelor's degree.

Architects are expected to face competition for jobs through the 1980's as the number of degrees granted in architecture continues to grow. The National Center for Education Statistics (NCES) data presented below are useful in establishing trends, but do not constitute an accurate supply estimate. The NCES projection overstates supply to the extent that it includes degrees in allied fields as well as professional degrees in architecture. Moreover, not all graduates will seek to become registered architects.

Employment, 1978	54,000
Projected employment, 1990	77,000
Percent change, 1978–90	42.6
Average annual openings, 1978–90	4,000
Growth	1,900
Replacement	2,100

Available training data:	1977–78	Projected 1978–90 (annual average)
Degrees in architecture:		
Bachelor's degrees	5,405	5,690
Master's degrees	1,392	1,868
Doctor's degrees	14	25

Display workers. Most display workers learn their trade on the job in 1 to 2 years. A high school diploma is usually required, and some employers prefer applicants who have studied interior decorating, fashion design, or art. Many high schools and vocational schools offer these courses.

Employment, 1978	44,000
Projected employment, 1990	59,000
Percent change, 1978–90	35.3
Average annual openings, 1978–90	3,300
Growth	1,300
Replacement	2,000
Available training data	—

Floral designers. Although there are no minimum educational requirements, most employers prefer high school graduates. Training usually takes place on the job. However, an increasing number of these workers receive training by attending adult education programs, junior colleges, or commercial floral design schools. Manual dexterity and a good sense of color, balance, and proportion are primary qualifications. High school courses in business arithmetic, bookkeeping, selling techniques, and other business subjects are helpful.

Employment, 1978	56,000
Projected employment, 1990	76,000
Percent change, 1978–90	35.2
Average annual openings, 1978–90	4,200
Growth	1,700
Replacement	2,500
Available training data:	
Public vocational education completions	2,267

Industrial designers. The usual way to enter this field is to complete an industrial design curriculum in an art

school, an art department of a university, or a technical college. Persons majoring in engineering, architecture, or fine arts may qualify as industrial designers if their backgrounds match the type of work being done by their employers. Artistic talent is important.

Employment, 1978	13,000
Projected employment, 1990	15,300
Percent growth, 1978–90	17.5
Average annual openings, 1978–90	550
Growth	200
Replacement	350
Available training data	—

Interior designers. Formal training in interior design is increasingly necessary for entrance into the field. Training is available through a 3-year course in a professional school of interior design, or through a 4-year college or university program leading to a degree in interior design and decoration. In most cases, 1 to 5 years of on-the-job training also are necessary before a trainee becomes eligible for advancement to designer.

Employment, 1978	79,000
Projected employment, 1990	95,000
Percent growth, 1978–90	20.9
Average annual openings, 1978–90	3,600
Growth	1,400
Replacement	2,200

Available training data:

	1977–78
Degrees in home decoration and home equipment:	
Bachelor's degrees	836
Master's degrees	39

Landscape architects. A bachelor's degree in landscape architecture through a 4- to 5-year program of study is the usual requirement for employment. To qualify for a license for independent practice, which is required in more than half of the States, applicants must have a degree in landscape architecture from an accredited school, 2- to 4-years' experience, and must pass an examination. Experience sometimes may be substituted for the degree.

Employment, 1978	14,000
Projected employment, 1990	20,500
Percent change, 1978–90	45.8
Average annual openings, 1978–90	1,100
Growth	550
Replacement	550

Available training data:

	1977–78
Degrees in landscape architecture:	
Bachelor's degrees	965
Graduate degrees	211

Photographers. There are several ways to prepare for work as a professional photographer. People interested in commercial photography often start as trainees in a commercial studio and learn the necessary skills through 2 or 3 years of on-the-job training. For work in industrial or scientific photography, post-high school education and training are needed. Requirements for news photographers vary with the size of the newspaper or magazine. Photographic training is available in colleges, universities, community and junior colleges, and art schools.

Employment, 1978	93,000
Projected employment, 1990	107,000
Percent change, 1978–90	15.0
Average annual openings, 1978–90	3,800
Growth	1,100
Replacement	2,700

Available training data:

Armed Forces	5,927
Junior college graduates	866

	1977–78
Degrees in photography:	
Bachelor's degrees	959
Master's degrees	89

Communications occupations

Newspaper reporters. Most newspapers consider only applicants who have a bachelor's degree; either a journalism major or another major combined with journalism classes is preferred. Graduate work is becoming increasingly important. Some jobs are available for talented writers without a college degree on rural, smalltown, and suburban papers, where most reporters begin their career, but even these jobs are largely filled by college graduates who are seeking experience.

Journalism graduates who have specialized in news-editorial studies and completed a newspaper internship should have the best job prospects. Every year, a substantial number of journalism graduates take media jobs in technical publishing, magazine publishing, radio and television broadcasting, advertising, and public relations, while other graduates accept nonmedia positions in sales, management, and other areas.

Employment, 1978	45,000
Projected employment, 1990	53,000
Percent growth, 1978–90	19.6
Average annual openings, 1978–90	2,400
Growth	700
Replacement	1,700

Available training data:

	1977–78	*Projected 1978–90 (annual average)*
Degrees in journalism:		
Bachelor's degrees	8,299	9,018

Master's degrees	797	672
Doctor's degrees	32	20

Public relations workers. A bachelor's degree in journalism, communications, or public relations usually is the preferred educational background for beginning jobs. Some employers seek college graduates who have a degree in a scientific or technical field, plus communications skills. Experience can be very important in getting a job, and many employers prefer applicants who have media or journalism experience.

Some companies that have large public relations staffs have formal training programs for new workers. The Public Relations Society of America accredits those who have passed a comprehensive examination and worked at least 5 years' in the field.

Employment, 1978	131,000
Projected employment, 1990	163,000
Percent change, 1978–90	24.4
Average annual openings, 1978–90	7,500
Growth	2,600
Replacement	4,900
Available training data	—

Radio and television announcers. Formal training in broadcasting in a college or technical school and experience working for a campus or local station are valuable preparation for this occupation. However, station officials pay particular attention to taped auditions. It often is helpful to have a Federal Communications Commission radiotelephone operator license, since the added skill enables announcers to handle a variety of broadcasting duties. Such versatility is particularly important in small stations, where announcers generally get their first jobs. Larger stations often require several years of successful announcing experience.

The great attraction of the broadcasting field will result in keen competition for jobs, particularly on stations in major metropolitan areas.

Employment, 1978	27,000
Projected employment, 1990	33,500
Percent growth, 1978–90	22.2
Average annual openings, 1978–90	850
Growth	500
Replacement	350
Available training data	—

Appendix A. Assumptions and Methods Used to Prepare the Employment Projections

The projections in this bulletin were developed as part of the Bureau's program for conducting research in, and producing information on, future occupational and industrial requirements and resources. The Bureau revises its projections every 2 years; during the next revision, projections again will be prepared for 1990.

The Bureau's projections to 1990 presented here were developed from data on population, industry and occupational employment, productivity, consumer expenditures, and other factors expected to affect employment. The Bureau's research offices provided much of these data, but many other agencies of the Federal Government were important contributors. In addition, experts in industry, unions, professional societies, and trade associations furnished data and supplied information through interviews.

Information compiled from these sources was analyzed in conjunction with the Bureau's model of the economy used in projecting to 1990. Like other models used in economic projections, it encompasses the major facets of the economy and represents a comprehensive view of its projected structure. The Bureau's model is comprised of internally consistent projections of gross national product (GNP) and its components—consumer expenditures, business investment, government expenditures, and net exports; industrial output and productivity; labor force; average weekly hours of work; and employment for detailed industry groups and occupations. The methods used to develop the employment projections used in this bulletin are the same as those used in other Bureau of Labor Statistics studies of the economy. Detailed descriptions of these methods appear in *Employment Projections for the 1980's*, Bulletin 2030 (1979) and the *BLS Handbook of Methods for Surveys and Studies*, Bulletin 1910 (1976).

Assumptions

The Bureau's projections to 1990 are based on the following general assumptions:

- Inflation will decelerate to 5.2 percent annually during 1980–90.
- A stable, long-run unemployment rate close to 4.5 percent will be achieved by the mid-1980's.
- Higher energy prices will not constrain growth in gross national product (GNP). Energy use was assumed to increase at about 3.0 percent a year, considerably slower than pre-1973. Natural gas use was assumed to be constrained by supply limitations. The higher expected relative price of oil was assumed to cause a relative shift to other energy sources.
- The institutional framework of the U.S. economy will not change radically.
- Current social, technological, and scientific trends will continue.
- No major event, such as widespread or long-lasting energy shortages or war, will significantly alter the industrial structure of the economy or alter the rate of economic growth.

Methods

Beginning with population projections by age and sex developed by the Bureau of the Census, a projection of the total labor force is derived using expected labor force participation rates for each population group. In developing participation rates, the Bureau takes into account a variety of factors that affect decisions to enter the labor force, such as school attendance, retirement practices, and family responsibilities.

The labor force projection then is translated into the level of GNP that would be produced by the labor force at the assumed level of unemployment. GNP is derived by subtracting assumed unemployment from the labor force and multiplying the resulting employed labor force by a projection of output per worker. The estimates of future output per worker are based on an analysis of trends in productivity (output per work hour) among industries and changes in average weekly hours of work.

Next, the projection of GNP is divided among its major components: Consumer expenditures, investment, government expenditures—Federal, State, and local—and net exports. Each of these components is broken down by producing industry. Consumer expenditures, for example, are divided among industries producing goods and services such as housing, food, automobiles, medical care, and education.

Once estimates are developed for these products and services, they are translated into detailed projections of industry output, not only for the industries producing the final product—such as an automobile—but also for the industries that provide electric power, transportation, component parts, and other inputs required in the production process. Input-output tables developed by the Department of Commerce and modified and projected to future years by the BLS are used to estimate output.

By using estimates of future output per work hour based on studies of productivity and technological trend for each industry, industry employment projections are derived from the output estimates.

These projections are then compared with employment projections derived using regression analysis. This analysis develops equations that relate employment by industry to combinations of economic variables, such as population and income, that are considered determinants of long-run changes in employment. By comparing projections resulting from input-output analysis and regression analysis, areas may be identified where adjustments are needed. These projections are reconciled after an analysis of underlying factors affecting both projections.

Projections of industry employment are translated into occupational employment projections using an industry-occupation matrix. This matrix, which is divided into 200 industry sectors and 400 occupational categories, describes the current and projected occupational structure of each industry. By applying the projected occupational structure for each industry to the industry employment projection and aggregating the resulting estimates for all industries, employment projections for each of the 400 occupations contained in the matrix are obtained. Thus, the projected employment of an occupation is determined by changes in the proportion of workers in the occupation in each industry, and the growth rate of industries in which an occupation is concentrated. For example, employment in an occupation would be projected to grow: 1) If its proportion of the work force increases, but industry employment remains constant; or 2) if its proportion of the work force remains constant, but industry employment increases.

In some cases, employment is related directly to one of the components of the Bureau's model—for example, the number of cosmetologists is related to consumer expenditures for beauty shop services. In others, employment is related to an independent variable not explicitly projected in the model but believed to be a primary determinant of employment in that occupation. The projection of automobile mechanics, for example, is based on the expected stock of motor vehicles. Projections that are developed independently are compared with those in the matrix and revised, if necessary, to assure consistency.

In addition to a projection of employment for each occupation, a projection is made of the number of workers who will be needed to replace those who die or retire. To estimate these replacement needs, the Bureau has developed tables of working life based on actuarial experience for deaths, and on decennial census data for general patterns of labor force participation. Tables of working life provide death and labor force separation rates for the entire labor force, by age and sex groups. The rate for each age and sex groups then is adjusted to reflect expected changes in labor force behavior. An overall separation rate for an occupation is obtained by weighting each projected rate by employment in the occupation for that age and sex group, and computing the weighted average. Average annual replacement needs are calculated by applying the projected occupational separation rate to projected employment.

The Bureau is continuing research to determine the effect of occupational transfers and temporary labor force separations on job openings. These transfers have not been taken into account in calculating replacement needs.

Supply estimates used in analysis of certain occupations represent the numbers of workers who are likely to seek entry to a particular occupation, if past trends of entry to the occupation continue. These estimates are developed independently of the demand estimates. Thus, supply and demand are not discussed in the usual sense, in which wages play a major role in equating supply and demand.

Appendix B. Detailed Occupational Projections

This appendix presents 1978 employment, projected 1990 employment, and projected average annual job openings in tabular form for 235 occupations. These data were developed as part of the research underlying the 1980–81 *Occupational Outlook Handbook*. The 13 occupational clusters from the *Handbook* have been used: Industrial production and related occupations; office occupations; service occupations; eduation and related occupations; sales occupations; construction occupations; occupations in transportation activities; scientific and technical occupations; mechanics and repairers; health occupations; social scientists; social service occupations; and performing arts, design, and communications occupations.

Applicable program codes for related instructional programs are included, both for vocational and higher education (Vocational Education Codes and Higher Education General Information Survey (HEGIS) Codes). Totals and percentages in table B-1 were calculated from unrounded figures and may not correspond exactly to the rounded data shown.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Industrial production and related occupations:								
Foundry occupations:								
Patternmakers	17.2302 17.3699	.....	3,700	3,900	5.2	135	15	120
Molders	17.2301	.....	21,000	22,100	5.2	500	100	400
Coremakers	17.2301	.....	12,000	12,600	5.2	350	50	300
Matching occupations:								
All-round machinists	17.2302	.....	484,000	584,000	20.7	22,500	8,000	14,500
Instrument makers (mechanical)	17.2302	.....	6,000	6,900	17.1	300	100	200
Machine tool operators	17.2302	.....	542,000	609,000	12.4	19,600	5,600	14,000
Setup workers (machine tools)	17.2302	.....	65,000	81,000	24.6	3,000	1,400	1,600
Tool-and-die makers	17.2307	.....	170,000	210,000	23.5	8,600	3,300	5,300
Printing occupations:	17.1900	5009						
Bookbinders and bindery workers	17.1906	.....	69,000	70,000	1.3	2,600	100	2,500
Compositors	17.1901	.....	181,000	158,000	-12.8	3,900	-1,900	5,800
Electrotypers and stereotypers	17.1903	.....	2,000	[5]	[5]	[5]	[5]	[5]
Lithographers	17.1902	.....	28,000	45,000	61.1	2,300	1,400	900
Photoengravers	17.1904	.....	8,000	7,500	-6.3	150	-50	200
Printing press operators and assistants	17.1902	.....	167,000	182,000	8.9	5,000	1,200	3,800
Other industrial production and related occupations:								
Assemblers	.....	.....	1,164,000	1,662,000	43.0	77,000	42,000	35,000
Automobile painters	17.0301	.....	42,000	54,000	27.2	2,000	1,000	1,000
Blacksmiths	17.2399	.....	11,000	7,000	-36.4	300	-300	600

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Blue-collar worker supervisors	17.1700	.....	1,671,000	1,925,000	16.0	69,000	21,000	48,000
Boilermaking occupations	17.1099	.....	37,000	56,000	46.2	3,100	1,600	1,500
Boiler tenders	17.3200	.....	71,000	71,000	0	2,800	0	2,800
Electroplaters	17.2399	.....	40,000	40,000	0	800	0	800
Forge shop occupations	17.2399	.....	77,000	80,100	3.6	2,000	200	1,800
Inspectors (manufacturing)	17.2400	.....	771,000	909,000	18.0	35,000	11,500	23,500
Millwrights	17.1099	.....	95,000	118,000	25.0	4,700	1,900	2,800
Motion picture projectionists	.....	.....	11,000	10,500	-4.5	750	-50	800
Ophthalmic laboratory technicians	07.0601 17.2101	 5212	26,400	32,200	22.0	1,400	500	900
Photographic laboratory occupations	17.0900	5007	57,000	68,000	20.0	2,700	900	1,800
Power truck operators	17.100302	.....	363,000	458,000	24.0	14,000	8,000	6,000
Production painters	.....	.....	133,000	158,000	19.0	5,200	2,100	3,100
Stationary engineers	17.3200	.....	179,000	186,000	4.0	7,700	600	7,100
Wastewater treatment plant operators (sewage plant operators)	17.3203	.....	112,000	[5]	[5]	[5]	[5]	[5]
Welders	17.2306	5308	679,000	907,000	33.6	35,000	19,000	16,000
Office occupations:	14.0000							
Clerical occupations:								
Bookkeeping workers	14.0102	.....	1,830,000	2,045,000	11.8	96,000	18,000	78,000
Cashiers	14.0103	.....	1,400,000	2,100,000	49.7	119,000	58,500	60,500
Collection workers	04.0800 14.9900	....	78,000	95,000	21.8	4,600	1,400	3,200
File clerks	14.0302	.....	273,000	335,000	22.6	16,500	5,100	11,400
Hotel front office clerks	04.1100	.....	79,000	98,000	24.9	5,400	1,700	3,700
Office machine operators	14.0104	5005	160,000	201,000	26.2	9,700	3,500	6,200
Postal clerks	14.0403	.....	260,000	210,000	-19.0	2,000	-4,000	6,000
Receptionists	14.0406	.....	588,000	752,000	27.9	41,000	14,000	27,000
Secretaries and stenographers	14.0700	5005	3,684,000	5,357,000	45.4	305,000	138,000	167,000
Shipping and receiving clerks	14.0503	.....	461,000	567,000	23.0	22,000	8,800	13,200
Statistical clerks	14.0303	.....	377,000	475,000	26.0	23,500	8,200	15,300
Stock clerks	14.0504	.....	507,000	600,000	18.3	23,000	7,800	15,200
Typists	14.0900	5005	1,044,000	1,246,000	19.4	59,000	17,000	42,000
Computer and related occupations:	14.0200							
Computer operating personnel	14.0201 14.0202 14.020201	5102 5104	666,000	665,000	-.2	12,500	-100	12,600
Programmers	14.0203	0704 0705	247,000	320,000	29.6	9,200	6,100	3,100
Systems analysts	14.0204	0705	182,000	250,000	37.4	7,900	5,700	2,200
Banking occupations:								
Bank clerks	14.0102 14.0104 14.0303 14.0399	....	505,000	760,000	50.5	45,000	21,000	24,000
Bank officers and managers	04.0400	0504 5003	330,000	510,000	54.5	28,000	15,000	13,000
Bank tellers	14.0105	.....	410,000	455,000	11.0	17,000	4,000	13,000
Insurance occupations:	04.1300	0512						
Actuaries	.....	1703	9,000	12,000	32.4	500	250	250
Claim representatives	04.1300	.....	169,000	237,000	40.5	10,250	5,600	4,650

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Insurance agents, brokers, and underwriters	04.1300	.....	568,000	682,000	20.0	30,000	9,500	20,500
Administrative and related occupations:	.....	0502						
Accountants	.....	5002	985,000	1,275,000	29.4	61,000	24,000	37,000
Buyers	04.0800	0509	115,000	142,000	23.5	7,400	2,200	5,200
	.....	5004						
City managers	.....	2102	3,300	5,000	52.0	350	150	200
College student personnel workers	.....	0826	55,000	(5)	(5)	(5)	(5)	(5)
Credit managers	14.0899	0504	49,000	56,000	14.3	2,200	600	1,600
	.....	5003						
Hotel managers and assistants	04.1100	0508	168,000	193,000	14.9	8,900	2,000	6,800
Lawyers	.....	1401	487,000	609,000	25.0	37,000	10,000	27,000
Marketing research workers	04,0100	0509	24,000	(5)	(5)	(5)	(5)	(5)
Personnel and labor relations workers	14,0602	.....	405,000	473,000	16.8	17,000	6,000	11,000
	14.0603	0515						
	14.0699	0516						
Public relations workers	04.0800	0509	185,000	269,000	24.4	7,500	2,600	4,900
Purchasing agents	04.0800	0509	185,000	267,000	44.3	13,400	6,800	6,600
	.....	5004						
Urban and regional planners	.....	0206	17,000	22,000	30.0	800	450	350
Service occupations:								
Cleaning and related occupations:								
Building custodians	17.1100	.....	2,251,000	2,704,000	20.1	176,000	38,000	138,000
Hotel housekeepers and assistants	09.0205	.....	20,000	29,000	49.9	2,000	800	1,200
Pest controllers	.....	.....	31,500	44,500	42.0	2,500	1,100	1,400
Food service occupations:	17.2900							
Bartenders	.....	.....	282,000	369,000	30.9	21,600	7,300	14,300
Cooks and chefs	17.2902	.....	1,186,000	1,564,000	31.9	86,000	31,000	55,000
Dining room attendants and dishwashers	.....	.....	455,000	741,000	62.8	37,000	24,000	13,000
Food counter workers	17.2904	.....	463,000	648,000	39.9	34,000	15,000	19,000
Meatcutters	17.2903	.....	204,000	187,000	-8.3	5,200	-1,400	6,600
Waiters and waitresses	17.2904	.....	1,383,000	1,635,000	18.2	70,000	21,000	49,000
Personal service occupations:								
Barbers	17.2601	5006	121,000	140,000	15.7	9,700	1,600	8,100
Bellhops and bell captains	04.1100	.....	20,000	19,000	-5.0	600	-100	700
Cosmetologists	17.2602	5006	542,000	624,000	15.1	29,000	7,000	22,000
Funeral directors and embalmers	07.0909	.....	45,000	45,000	0.0	2,200	0	2,200
Private household service occupations:								
Private household workers	09.0201	.....	1,162,000	893,000	-23.2	45,000	-23,000	68,000
	09.0202	.....						
	09.0203	.....						
	09.0205							
Protective and related service occupations:								
Correction officers	.....	.....	110,000	153,000	38.9	13,000	3,500	9,500
FBI special agents	.....	.....	8,000	(5)	(5)	(5)	(5)	(5)

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Firefighters	17.2801	5507	220,000	270,000	21.0	7,500	3,900	3,600
Guards	17.2802	.....	550,000	820,000	50.0	70,000	20,000	50,000
Police officers	17.2802	2105	450,000	550,000	22.7	16,500	8,500	8,000
State police officers	17.2802	2105	47,000	59,000	26.0	1,800	1,000	800
	.....	2109						
		5505						
Construction inspectors (government)	17.2899	.....	20,000	30,000	50.0	2,200	800	1,400
Health and regulatory inspectors (government)	17.2899	5408	100,000	122,000	24.6	5,800	2,000	3,800
Occupational safety and health workers	16.0602	.....	80,000	(5)	(5)	(5)	(5)	(5)
	17.2801	.....						
	17.2899							
Other service occupations:								
Mail carriers	14.0403	.....	245,000	260,000	6.0	7,000	1,000	6,000
Telephone operators	14.0401	.....	311,000	290,000	-6.8	9,900	-1,800	11,700
Education and related occupations:								
Teaching occupations:								
Kindergarten and elementary school teachers	.....	0802	1,322,000	1,652,000	24.9	86,000	27,500	58,500
Secondary school teachers	.....	0803	1,087,000	861,000	-20.8	7,200	-18,800	26,000
College and university faculty	.....	0805	673,000	611,000	-9.2	11,000	-5,000	16,000
Teacher aides	.....	.....	342,000	519,000	51.8	26,000	15,000	11,000
Library occupations:								
Librarians	.....	1601	142,000	160,000	12.7	8,000	1,500	6,500
Library technicians and assistants	14.0499	5504	172,000	195,000	13.4	7,700	1,000	6,700
Sales occupations:	04.0000							
Automobile parts counter workers	04.0330	0509	97,000	119,000	22.1	4,200	1,800	2,400
Automobile sales workers	04.0300	0507	158,000	200,000	26.5	10,400	3,500	6,900
	.....	0507						
Automobile service advisors	04.0300	0509	25,000	30,400	22.1	1,100	500	600
	.....	5004						
Gasoline service station attendants	04.1600	.....	340,000	322,000	-5.6	5,200	-1,600	6,800
Manufacturers' sales workers	04.1200	0509	402,000	499,000	24.0	21,700	8,000	13,700
	.....	5004						
Models	.....	.....	60,000	(5)	(5)	(5)	(5)	(5)
Real estate agents and brokers	04.1700	0511	555,000	670,000	20.7	50,000	10,000	40,000
	.....	5004						
Retail trade sales workers	04.0800	0509	2,851,000	3,785,000	32.8	226,000	78,000	148,000
	.....	5004						
Route drivers	.....	.....	195,000	190,000	-2.9	3,600	-500	4,100
Securities sales workers	04.0400	0505	109,000	120,000	10.0	5,500	900	4,600
Travel agents	.....	.....	18,500	30,000	62.2	1,900	950	950
Wholesale trade sales workers	04.0800	0509	840,000	958,000	14.0	40,000	10,000	30,000

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Construction occupations:								
Bricklayers, stonemasons, and marblesetters	17.1004	.....	205,000	220,000	7.3	6,200	1,300	4,900
Carpenters	17.1001	.....	1,253,000	1,390,000	10.9	58,000	11,000	47,000
Cement masons and terrazzo workers	17.1099	.....	83,000	110,000	32.5	4,400	2,300	2,100
Construction laborers	17.1099	.....	860,000	970,000	12.8	49,000	10,000	39,000
Drywall installers and finishers	17.1008	.....	82,000	[5]	[5]	[5]	[5]	[5]
Electricians (construction)	17.1002	.....	290,000	350,000	20.7	12,900	5,000	7,900
Elevator constructors	17.1099	.....	17,000	[5]	[5]	[5]	[5]	[5]
Floor covering installers	17.1099	.....	88,000	110,000	25.0	3,200	1,800	1,400
Glaziers (construction)	17.1099	.....	19,000	25,000	31.6	1,000	500	500
Insulation workers	17.1099	.....	51,000	65,000	27.5	2,600	1,600	1,000
Ironworkers	17.1099	.....	78,000	104,000	33.3	4,100	2,200	1,900
Lathers	17.1006	.....	23,000	[5]	[5]	[5]	[5]	[5]
Operating engineers (construction machinery operators)	17.100302	.....	581,000	820,000	41.4	36,000	20,000	16,000
Painters and paperhangers	17.1005	.....	504,000	572,000	13.5	27,000	6,000	21,000
Painters	.....	.....	484,000	550,000	13.6	26,000	6,000	20,000
Paperhangers	.....	.....	20,000	22,000	10.0	1,500	200	1,300
Plasterers	17.1006	.....	28,000	30,000	7.1	1,100	200	900
Plumbers and pipefilters	17.1007	.....	428,000	513,000	19.9	20,000	7,000	13,000
Roofers	17.1010	.....	114,000	140,000	22.8	4,500	2,200	2,300
Sheet-metal workers	17.2305	.....	70,000	90,000	28.6	3,500	1,700	1,800
Tilesetters	17.1004	.....	33,000	45,000	36.4	1,800	1,000	800
Occupations in transportation activities:								
Air transportation occupations:								
Air traffic controller	17.0400	.....	21,000	26,000	23.9	700	400	300
Airplane mechanics	17.0401	.....	132,000	145,000	10.1	3,500	1,100	2,400
Airplane pilots	16.0601	.....	76,000	110,000	43.9	3,800	2,800	1,000
Flight attendants	04.1900	.....	48,000	76,000	56.2	4,800	2,300	2,500
Reservation and passenger agents	04.1900	.....	56,000	64,000	15.0	2,200	700	1,500
Merchant marine occupations:								
Merchant marine officers	17.0802	.....	13,500	13,000	-3.7	700	-50	750
Merchant marine sailors	17.0801	.....	24,800	16,000	-36.9	-250	-700	450
Railroad occupations:								
Brake operators	.....	.....	66,000	67,000	1.3	1,600	100	1,500
Conductors	.....	.....	37,000	39,000	6.2	1,700	200	1,500
Locomotive engineers	.....	.....	34,000	37,000	9.6	2,000	300	1,700
Shop trades	.....	.....	76,000	71,000	-6.7	2,100	-400	2,500
Signal department workers	17.1402	.....	12,800	14,100	10.0	450	100	350
Station agents	04.1900	.....	5,900	2,400	-59.6	-200	-300	100
	14.0103	.....						
Telegraphers, telephoners, and tower operators	14.0401	.....	9,700	6,800	-30.2	50	-250	300
Track workers	.....	.....	59,000	59,000	0.0	1,400	0	1,400
Driving occupations:								
Intercity busdrivers	04.1900	.....	23,500	23,700	0.8	500	25	475
Local transit busdrivers	04.1900	.....	77,000	91,000	18.9	3,100	1,200	1,900
Local truckdrivers	.....	.....	1,720,000	2,040,000	18.4	64,000	26,000	38,000
Long-distance truckdrivers	.....	.....	584,000	689,000	18.0	21,500	8,700	12,800
Parking attendants	04.0300	.....	44,000	50,000	13.6	3,200	500	2,700
Taxicab drivers	04.1900	.....	94,000	94,000	0	4,300	0	4,300

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Scientific and technical occupations:								
Conservation occupations:								
Foresters	01.0700	0114	31,200	38,000	20.6	1,400	500	900
Forestry technicians	01.0601	5403	13,700	17,300	26.0	700	300	400
Range managers	01.0608	0117	3,700	4,700	27.0	200	100	100
Soil conservationists	.....	.....	9,300	11,400	21.7	450	200	250
Engineers[6]	.....	0900	1,136,000	1,441,000	26.8	46,500	25,500	21,000
Aerospace	.....	0902	60,000	70,000	20.7	1,900	1,000	900
Agricultural	.....	0903	14,000	17,800	26.8	600	300	300
Biomedical	.....	0905	4,000	5,100	26.8	175	100	75
Ceramic	.....	0916	14,000	17,800	26.8	550	300	250
Chemical	.....	0906	53,000	63,000	20.0	1,800	900	900
Civil	.....	0908	155,000	190,000	22.8	7,800	2,900	4,900
Electrical	.....	0909	300,000	364,000	21.5	10,500	5,400	5,100
Industrial	.....	0913	185,000	233,000	26.0	8,000	4,000	4,000
Mechanical	.....	0910	195,000	232,000	19.1	7,500	3,100	4,400
Metallurgical	.....	0914	16,500	21,300	29.0	750	400	350
Mining	.....	0918	6,000	9,500	58.3	600	300	300
Petroleum	.....	0907	17,000	23,400	37.6	900	550	350
Environmental scientists:								
Geologists	.....	1914	31,000	42,000	35.5	1,700	900	800
Geophysicists	.....	1916	11,000	14,600	35.5	600	300	300
Meteorologists	.....	1913	7,300	8,800	20.0	300	100	200
Oceanographers	.....	1919	3,600	4,400	21.6	150	75	75
Life science occupations:								
Biochemists	.....	0414	20,000	25,000	25.5	900	450	450
Life scientists	.....	0400	215,000	280,000	28.4	11,200	5,100	6,100
Soil scientists	.....	.....	3,500	4,200	20.7	180	60	120
Mathematics occupations:								
Mathematicians	.....	1701	33,500	37,000	9.9	1,000	300	700
Statisticians	.....	1702	23,000	31,100	35.2	1,500	700	800
Physical scientists:								
Astronomers	.....	1911	2,000	2,100	5.0	40	10	30
Chemists	.....	1905	143,000	178,000	24.0	6,100	2,900	3,200
Physicists	.....	1902	44,000	48,000	8.9	1,000	300	700
Other scientific and technical occupations:								
Broadcast technicians	16.0108	5008	40,000	(5)	(5)	(5)	(5)	(5)
Drafters	17.1300	5304	296,000	367,000	24.0	11,000	5,900	5,100
Engineering and science technicians	16.0100	5300	600,000	760,000	25.1	23,000	12,500	10,500
	.....	5401						
	.....	5407						
Food technologists	.....	0113	15,000	17,000	12.0	500	150	350
Surveyors and surveying technicians	.....	5409	62,000	74,000	20.0	2,300	1,000	1,300
Mechanics and repairers:								
Telephone craft occupations:								
Central office craft occupations	17.1501	.....	135,000	130,000	-3.7	1,000	-400	1,400
Central office equipment installers	17.1501	.....	21,400	18,000	-15.9	-100	-300	200
Line installers and cable splicers	17.1402	.....	59,000	60,000	2.1	600	100	500
Telephone and PBX installers and repairers	17.1501	.....	115,000	135,000	17.5	3,000	1,700	1,300
Other mechanics and repairers:								
Air-conditioning, refrigeration and heating mechanics	17.0100	5317	210,000	245,000	16.7	8,200	2,900	5,300
Appliance repairers	17.0200	5310	145,000	180,000	24.1	6,900	2,900	4,000

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Automobile body repairers	17.0301	.....	185,000	235,000	28.0	7,800	4,300	3,500
Automobile mechanics	17.0302	5306	860,000	1,060,000	22.7	37,000	16,000	21,000
Boat engine mechanics	17.2200	.....	20,000	24,000	23.9	1,000	400	600
Bowling-pin machine mechanics	17.1401	.....	6,200	(5)	(5)	(5)	(5)	(5)
Business machine repairers	17.0600	5310	63,000	98,000	56.0	4,200	2,950	1,250
Computer service technicians	16.0108	5105	63,000	121,000	92.5	5,400	4,800	600
Electric sign repairers	17.1002	.....	15,000	18,000	20.0	700	300	400
Farm equipment mechanics	01.0301	.....	62,000	77,000	24.2	3,500	1,300	2,200
Furniture upholsterers	17.3500	.....	29,000	29,000	0	1,100	0	1,100
Industrial machinery repairers	17.10031	.....	655,000	1,085,000	66.0	58,000	36,000	22,000
Jewelers	.....	.....	32,000	(5)	(5)	(5)	(5)	(5)
Locksmiths	.....	.....	15,000	(5)	(5)	(5)	(5)	(5)
Maintenance electricians	17.1400	.....	300,000	385,000	28.3	15,500	7,000	8,500
Motorcycle mechanics	17.3100	.....	13,000	(5)	(5)	(5)	(5)	(5)
Piano and organ tuners and repairers	.....	.....	8,000	8,800	10.0	700	100	600
Shoe repairers	17.3402	.....	22,000	21,000	-4.5	1,600	-100	1,700
Television and radio service technicians	17.1503	5310	131,000	166,000	26.7	6,100	2,900	3,200
Truck and bus mechanics	.....	5306	165,000	210,000	27.0	6,800	3,300	3,500
Vending machine mechanics	.....	.....	23,000	(5)	(5)	(5)	(5)	(5)
Watch repairers	17.2102	.....	19,000	(5)	(5)	(5)	(5)	(5)
Health occupations:								
Dental occupations:								
Dentists	.....	1204	120,000	155,000	29.2	5,500	3,000	2,500
Dental assistants	07.0101	5202	150,000	225,000	50.0	11,000	6,300	4,700
Dental hygienists	07.0102	5203	35,000	65,000	85.7	6,000	2,500	3,500
Dental laboratory technicians	07.0103	5204	47,000	70,000	48.9	2,800	1,900	900
Medical practitioners:								
Chiropractors	.....	1221	18,000	21,000	17.2	1,500	250	1,250
Optometrists	.....	1209	21,000	26,000	25.2	1,600	500	1,100
Physicians and osteopathic physicians	.....	1206	405,000	560,000	38.1	19,000	13,000	6,000
	.....	1210						
Podiatrists	.....	1216	8,100	12,500	53.7	600	350	250
Veterinarians	.....	1218	33,500	45,000	35.6	1,700	1,000	700
Medical technologist, technician, and assistant occupations:								
Electrocardiograph technicians	.....	.....	20,000	(5)	(5)	(5)	(5)	(5)
Electroencephalographic technologists and technicians	07.0901	5217	7,000	10,500	49.9	500	300	200
Emergency medical technicians	.....	.....	115,000	(5)	(5)	(5)	(5)	(5)
Medical laboratory workers	07.0200	1223	210,000	265,000	26.2	14,800	4,600	10,200
	07.0203	5205						
	07.0299	.....						
Medical record technicians and clerks	14.0499	5213	50,000	65,000	30.0	4,900	1,300	3,600

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Operating room technicians	07.0305	5211	35,000	53,000	49.9	2,600	1,400	1,200
Optometric assistants	07.0603	5212	15,000	21,500	42.4	1,200	500	700
Radiologic (X-ray) technologists	07.0501	5207	100,000	140,000	40.0	9,000	3,300	5,700
Respiratory therapy workers	07.0903	5215	50,000	77,500	55.0	5,000	2,300	2,700
Nursing occupations:								
Registered nurses	07.0301 16.0305	1203 5208	1,060,000	1,570,000	49.6	85,000	43,000	42,000
Licensed practical nurses	07.0302	5209	518,000	840,000	62.2	60,000	26,000	34,000
Nursing aides, orderlies, and attendants	07.0303	.....	1,037,000	1,575,000	52.0	94,000	45,000	49,000
Therapy and rehabilitation occupations:								
Occupational therapists	.....	1208	15,000	30,000	100.0	2,500	1,300	1,200
Occupational therapy assistants	07.0401	5210	10,000	15,000	50.0	1,100	400	700
Physical therapists	.....	1212	30,000	45,000	50.0	2,700	1,300	1,400
Physical therapist assistants and aides	07.0402	5219	12,500	15,000	20.0	400	200	200
Speech pathologists and audiologists	.....	1220	32,000	60,000	87.5	3,900	2,300	1,600
Other health occupations:								
Dietitians	.....	1306	35,000	50,000	42.9	3,300	1,300	2,000
Dispensing opticians	07.0601 17.2101	5212	17,600	24,300	38.1	1,200	600	600
Health services administrators	.....	1202	180,000	282,000	57.1	18,000	8,100	9,900
Medical record administrators	.....	1202	12,500	15,000	20.0	900	200	700
Pharmacists	.....	1211	135,000	185,000	37.0	7,800	4,200	3,600
Social scientists:								
Anthropologists	....	2202 2203	7,000	8,600	23.1	350	150	200
Economists	.....	2204	130,000	183,000	39.2	7,800	4,300	3,500
Geographers	.....	2206	10,000	12,300	22.6	500	200	300
Historians	.....	2205	23,000	23,000	0.0	700	0	700
Political scientists	.....	2207	14,000	16,100	13.8	500	150	350
Psychologists	.....	2000	130,000	171,000	32.1	6,700	3,500	3,200
Sociologists	.....	2009	19,000	20,700	8.1	600	100	500
Social service occupations:								
Counseling occupations:								
School counselors	.....	0826	45,000	50,000	11.1	1,700	400	1,300
Employment counselors	.....	.....	6,100	(5)	(5)	(5)	(5)	(5)
Rehabilitation counselors	.....	.....	19,000	(5)	(5)	(5)	(5)	(5)
College career planning and placement counselors	14.0602	.....	5,000	(5)	(5)	(5)	(5)	(5)
Other social service occupations:								
Cooperative extension service workers	.....	.....	16,000	18,000	12.5	650	175	475
Homemaker-home health aides	.....	.....	110,000	185,000	70.0	36,000	7,000	29,000
Social service aides	....	5506 5506	134,000	160,000	18.3	7,500	2,000	5,500
Social workers	.....	2104	385,000	475,000	24.2	22,000	8,000	14,000

See footnotes at end of table.

Table B-1. Employment, 1978 and 1990 (projected), and average annual openings, by occupation, 1978–90—Continued

Occupation	Vocational educational code[1]	HEGIS code[2]	Estimated employment, 1978	Projected employment, 1990	Percent change, 1978-90[3]	Annual average openings, 1978–90		
						Total	Employment change	Replacement needs[4]
Performing arts, design, and communications occupations:								
Performing artists:								
Actors and actresses	.....	1007	13,400	18,000	34.3	850	400	450
Dancers	.....	1008	8,000	11,000	37.5	550	250	300
Musicians	.....	1004	127,000	177,000	39.4	8,900	4,200	4,700
	.....	1005						
	.....	1006						
Singers	.....	1007	22,000	31,000	40.9	1,600	800	800
Design occupations:								
Architects	.....	0202	54,000	77,000	42.6	4,000	1,900	2,100
Display workers	04.0100	.....	44,000	59,000	35.3	3,300	1,300	2,000
	17.0702	.....						
Floral designers	04.0500	.....	56,000	76,000	35.2	4,200	1,700	2,500
Industrial designers	17.0703	.....	13,000	15,300	17.5	550	200	350
Interior designers	17.0701	0203	79,000	95,000	20.9	3,600	1,400	2,200
Landscape architects	.....	0204	14,000	20,500	45.8	1,100	550	550
Photographers	.....	1011	93,000	107,000	15.0	3,800	1,100	2,700
Communications occupations:								
Newspaper reporters	.....	0602	45,000	53,000	19.6	2,400	700	1,700
Public relations workers	04.0100	.....	131,000	163,000	24.4	7,500	2,600	4,900
Radio and television announcers	.....	0603	27,000	33,500	22.2	850	500	350
Technical writers	.....	.....	24,000	(5)	(5)	(5)	(5)	(5)

[1] Vocational education codes are from *Vocational Education and Occupations* (U.S. Department of Education and U.S. Department of Labor, 1969).

[2] HEGIS codes are from the Higher Education General Information Survey. See *A Taxonomy of Industrial Programs in Higher Education* (U.S. Department of Education 1970).

[3] Percentages calculated from unrounded numbers.

[4] Replacement needs include openings arising from deaths, retirements, and other separations from labor force. Does not include transfers to other occupations.

[5] Not available.

[6] Totals do not equal the sum of individual estimates because all branches of engineering are not covered separately.

NOTE: Detail may not add to totals because of rounding.

Appendix C. Detailed Training Statistics

This appendix presents detailed statistics on the number of persons completing formal training programs. Table C-1 presents statistics for those occupations listed in appendix B that generally require less than a bachelor's degree for entry. Tables C-2 and C-3 present data on bachelor's, master's, doctor's, and first professional degrees awarded, by field of study.

Tables C-4 and C-5 present limited historical data on junior or community college graduates who are in occupation-related curriculums and on persons who have completed apprenticeship programs, respectively. Table C-6 presents data on enlisted military personnel trained in a particular occupational specialty, and tables C-7 and C-8 give data on vocational education completions.

Because data in these tables are fragmentary and inconsistent, they must be used with caution. In table C-1, data are not strictly comparable because different programs cover different time periods (fiscal years, calendar years, and academic years). Furthermore, many junior and community college completions in table C-5 and vocational education completions in C-7 do not match a specific occupation. Extensive footnotes indicate data limitations.

Table C-1. Available training data for occupations generally requiring less than a bachelor's degree

Occupation	Vocational education code	HEGIS code	Public vocational education completions, Fy 1978	Private vocational education completions, 1977–78	Job Corps completions, Fy 1978	Apprenticeship completions, 1978	Junior college graduates, 1977–78
Industrial production and related occupations:							
Foundry occupations:							
Patternmakers	17.2302	.....	.....	.....	.....	162	.....
Molders	17.2301	.....	.....	.....	.....	95	.....
Coremakers	17.2301	.....	.....	.....	.....		.....
Machining occupations:							
All-round machinists	17.2302	.....	.....	.....	.....	2,859	.....
Machine tool operators	17.2303	.....	3,437	.....	95	.....	.....
Setup workers (machine tools)	17.2302	.....	.....	.....	.....	225	.....
Tool-and-die makers	17.2307	.....	2,396	73	.....	2,311	.....
Printing occupations:[1]	17.1900	5009	26,920	.....	.....	971	719
Compositors	17.1906	.....	.....	.....	.....	159	.....
Lithographers	17.1902	.....	.....	.....	.....	508	.....
Printing press operators and assistants	17.1902	.....	.....	.....	321	204	.....
Bookbinders and bindery workers	17.1906	.....	.....	.....	1	100	.....
Other industrial production and related occupations:							
Assemblers	.....	.....	.....	.....	308	.....	.....
Blue-collar worker supervisors	17.1700	.....	18,650	.....	.....	.....	.....
Boilermaking occupations	17.1099	.....	.....	.....	.....	721	.....
Furniture upholsterers	17.3500	.....	[2]7,198	75	102	.....	.....
Millwrights	17.1099	.....	.....	.....	.....	1,087	.....
Ophthalmic lab technicians	07.0600	.....	577	.....	.....	.....	.....

See footnotes at end of table.

Table C-1. Available training data for occupations generally requiring less than a bachelor's degree—Continued

Occupation	Vocational education code	HEGIS code	Public vocational education completions, Fy 1978	Private vocational education completions, 1977–78	Job Corps completions, Fy 1978	Apprenticeship completions, 1978	Junior college graduates, 1977–78
Photographic laboratory occupations[3]	17.0900	5007	7,960	.....	.....	.....	866
Stationary engineers	17.3200	.....	3,639	.....	.....	480	.....
Welders	17.2306	.....	51,772	4,357	1,827	.....	.....
Office occupations:	14.0000	.....	[4]728,189	.....	.....	.....	.....
Clerical occupations:	.....	.....	.....	.....	[5]3,412	.....	.....
Bookkeeping workers	14.0102	.....	.....	.....	219	.....	.....
Cashiers	14.0103	.....	.....	.....	178	.....	.....
File clerks	14.0302	.....	.....	.....	209	.....	.....
Office machine operators	14.0104	5005	.....	.....	8	.....	.....
Postal clerks	14.0403	.....	.....	.....	104	.....	.....
Receptionists	14.0406	.....	.....	.....	77	.....	.....
Secretaries and stenographers	14.0700	5005	170,167	17,991	171	.....	[6]23,132
Stock clerks	14.0504	.....	.....	.....	114	.....	.....
Typists	14.0900	5005	144,077	700	1,600	.....	.....
Computer and related occupations:	14.0200	.....	.....	.....	.....	.....	.....
Computer operating personnel	14.0201	5101	11,519	627	[7]278	.....	[7]5,095
	14.0202	5102	.....	5,171	.....	.....	.....
Programmers	14.0203	0704	11,165	4,775	.....	.....	.....
Administrative and related occupations:							
Accountants	.....	5002	.....	.....	.....	.....	12,135
Hotel managers and assistants	.....	0508	3,495	.....	.....	.....	.....
	.....	5010	.....	.....	.....	.....	[8]2,149
Service occupations:							
Cleaning and related occupations:							
Building custodians	17.1100	.....	5,406	108[9]	1,603	.....	.....
Food service occupations:	.....	.....	.....		.....	.....	.....
Cooks and chefs	17.2902	.....	.....	.....	[10]1,955	[10]160	.....
Food counter workers	17.2904	.....	.....	.....	77	.....	.....
Meatcutters	17.2903	.....	.....	.....	108	783	.....
Waiters and waitresses	17.2904	.....	.....	.....	46	.....	.....
Personal service occupations:							
Barbers	17.2601	5006	1,094	5,859	2	[11]464	.....
Cosmetologists	17.2602	5006	27,215	51,177	71	.....	.....
Funeral directors and embalmers	07.0909	.....	307	2,060	.....	.....	.....
Private household service occupations:	09.0200	.....	[12]112,680	.....	.....	.....	.....
Private household service workers	09.0201	.....	36,487	.....	.....	.....	.....
	09.0202	.....	17,767	48	.....	.....	.....
	09.0203	.....	41,587	.....	.....	.....	.....
	09.0204	.....	5,243	.....	.....	.....	.....
	09.0205	.....	4,686	.....	.....	.....	.....
Protective and related service occupations:							
Firefighters	17.2801	5507	78,542	.....	.....	.....	2,827
Guards	17.2802	.....	.....	.....	1	.....	.....
Police officers[13]	17.2802	5505	21,744	3,331	3	.....	17,278
Health and regulatory inspectors (government)	17.2899	5408	.....	.....	.....	.....	632
Other service occupations:							
Telephone operators	14.0401	.....	.....	.....	67	.....	.....
Education and related occupations:							
Teaching occupations:							
Teacher aides	.....	5503	.....	.....	35	.....	6,187
Library occupations:							
Library technicians and assistants	14.0499	5504	.....	.....	.....	.....	549

See footnotes at end of table.

Table C-1. Available training data for occupations generally requiring less than a bachelor's degree—Continued

Occupation	Vocational education code	HEGIS code	Public vocational education completions, Fy 1978	Private vocational education completions, 1977–78	Job Corps completions, Fy 1978	Apprenticeship completions, 1978	Junior college graduates, 1977–78
Sales occupations:	04.0000	.....	[14]279,920	[14]63,427	.....	.....	[15]25,293
Automobile parts counter workers	04.0300	0509	.....	.....	69	.....	.....
Gasoline service station attendants	04.1600	5004	.....	.....	134	.....	.....
Real estate agents and brokers	04.1700	5004	37,855	41,913	.....	.....	.....
Retail trade sales workers	04.2000	.....	[16]7,879	.....	167	.....	.....
Wholesale trade sales workers	04.3100	.....	1,692	.....	.....	.....	.....
Construction occupations:							
Bricklayers, stonemasons, and marblesetters	17.1004	.....	11,891	90	816	[17]1,031	.....
Carpenters	17.1001	.....	44,625	374	1,741	5,577	.....
Cement massons and terazzo workers	17,1099	.....	.....	.....	418	402	.....
Construction laborers	17,1099	.....	.....	.....	233	.....	.....
Drywall installers and finishers	17.1008	.....	.....	.....	.....	180	.....
Electricians (construction)[18]	17.1002	.....	18,373	247	488	6,920	.....
Floor covering installers	17.1099	.....	.....	.....	.....	241	.....
Glaziers (construction)	17.1099	.....	.....	.....	.....	250	.....
Insulation workers	17.1099	.....	.....	.....	.....	228	.....
Ironworkers	17.1099	.....	.....	.....	.....	1,841	.....
Lathers	17.1006	.....	.....	.....	.....	172	.....
Operating engineers (construction machinery operators)	17.100302	.....	.....	.....	487	1,433	.....
Painters and paperhangers	17.1005	.....	.....	.....	730	947	.....
Plasterers	17.1006	.....	.....	.....	215	164	.....
Plumbers and pipefitters[19]	17.1007	.....	8,312	283	136	6,801	.....
Roofers	17.1010	.....	.....	.....	.....	428	.....
Sheet-metal workers	17.2305	.....	6,571	.....	86	2,390	.....
Occupations in transportation activities:							
Air transportation occupations:	17.0400	.....	[20]6,459	.....	.....	.....	.....
Airplane mechanics	17.0401	.....	.....	1,142	.....	86	.....
Airplane pilots	16.0601	.....	1,325	11,560	.....	.....	.....
Driving occupations:							
Local truckdrivers	.....	.....	.....	.....	[21]30	.....	.....
Scientific and technical occupations:							
Conservation occupations:							
Forestry technicians	01.0601	5403	5,182	.....	164	.....	2,133
Other scientific and technical occupations:							
Drafters	17.1300	5304	33,294	1,350	110	170	.....
Engineering and science technicians	16.0100	5300 5401 5407	44,726	4,679	.....	[22]479	[23]51,200
Surveyors	.....	5309	.....	.....	.....	.....	2,257
Mechanics and repairers:							
Air-conditioning, refrigeration, and heating mechanics	17.0100	5317	18,272	1,662	171	439	.....
Appliance repairers	17.0200	5310	5,948	8	42	.....	.....
Automobile body repairers	17.0301	.....	29,401	845	672	455	.....
Automobile mechanics	17.0302	5306	99,528	6,565	1,448	1,484	.....
Business machine repairers[24]	17.0600	5310	1,217	195	4	234	.....

See footnotes at end of table.

Table C-1. Available training data for occupations generally requiring less than a bachelor's degree—Continued

Occupation	Vocational education code	HEGIS code	Public vocational education completions, Fy 1978	Private vocational education completions, 1977–78	Job Corps completions, Fy 1978	Apprenticeship completions, 1978	Junior college graduates, 1977–78
Computer service technicians	16.0108	5105	.....	.....	.....	.....	319
Farm equipment mechanics	01.0301	.....	.....	.....	43	.....	.....
Furniture upholsterers	17.3500	.....	[2]7,198	75	102	.....	.....
Industrial machinery repairers	17.10031	.....	.....	.....	40	.....	.....
Maintenance electricians	17.1400	.....	.....	600	32	947	.....
Television and radio service technicians	17.1503	5310	.....	510	9	133	.....
Health occupations:							
Dental occupations:							
Dental assistants	07.0101	5202	8,013	3,521	64	.....	1,329
Dental hygienists	07.0102	5203	2,360	.....	.....	.....	3,825
Dental laboratory technicians	07.0103	5204	1,234	793	.....	73	763
Medical technologists, technicians, and assistant occupations:							
Electrocardiograph technicians	07.0902	5217	.....	.....	16	.....	[2 5]89
Electroencephalographic technologists and technicians	07.0901	5217	.....	.....	.....	.....	[2 5]89
Medical laboratory workers	07.0200	1223	.....	.....	10	.....	.....
	07.0203	5205	3,894	231	.....	.....	3,819
	07.0299	.....	1,329	856	.....	.....	.....
Medical record technicians and clerks	14.0499	5213	.....	.....	96	.....	.....
Operating room technicians	07.0305	5211	1,381	.....	.....	.....	291
Optometric assistants	07.0603	5212	.....	.....	.....	.....	662
Radiologic (X-ray) technologists	07.0501	5207	3,090	3,533	.....	.....	3,959
Respiratory therapy workers	07.0903	5215	3,168	.....	6	.....	2,567
Nursing occupations:							
Registered nurses[2 6]	07.0301	5208	24,895	154	.....	.....	36,193
Licensed practical nurses	07.0302	5209	34,399	3,242	42	.....	3,019
Nursing aides, orderlies, and assistants	07.0303	.....	42,325	2,725	1,768	.....	.....
Therapy and rehabilitation occupations:							
Occupational therapy assistants	07.0401	5210	.....	.....	.....	.....	661
Physical therapist assistants and aides	07.0402	5219	854	.....	16	.....	975
Other health occupations:							
Dispensing opticians	07.0601	5212	.....	.....	.....	83	662
Social service occupations:							
Social service aides	.....	5506	.....	.....	.....	.....	4,238
Performing arts, design, and communications occupations:							
Design occupations:							
Commercial artists	17.0700	1009	10,975	5,860	3	.....	.....
Photographers	.....	1011	.....	.....	.....	.....	866

[1] Includes bookbinders, composing room occupations, lithographic occupations, press operators, and miscellaneous printing occupations.
[2] Includes some upholsterers other than furniture.
[3] May include other photographic occupations.
[4] Includes all persons who completed office occupation programs.
[5] Includes all persons who completed clerical occupation programs.
[6] Includes office machine training.

[7] Includes training for keypunch and other input and peripheral equipment operators, and general data processing workers.

[8] Includes restaurant management.

[9] Includes all persons who completed quantity food preparation programs.

[10] Includes bakers.

[11] Includes beauticians.

[12] Includes all persons who completed private household service occupation programs.

[13] May include some State police officers.

[14] Includes all distribution programs.

[15] Recipients of associate degrees in marketing, distribution, purchasing, business, and industrial management.

[16] Includes training for other occupations in retail trade.

[17] Includes tilesetters.

[18] training data may include some maintenance electricians.

[19] Includes sprinkler fitters and steamfitters.

[20] Includes all persons who completed air transportation occupation programs.

[21] May include some over-the-road drivers.

[22] Electronics technicians.

[23] Includes an unknown number of workers trained for skilled craft occupations and technical occupations, such as industrial drafters.

[24] May include some computer service technicians.

[25] EEG and EKG technicians combined.

[26] Some graduates may be counted in both junior college and vocational education programs.

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1977–78—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph. D., Ed. D., etc.)
All fields	930,201	312,816	32,156
Agriculture and natural resources	22,724	4,036	971
Agriculture, general	1,948	327	10
Agronomy	1,609	443	157
Soil science	620	136	81
Animal science	4,122	480	125
Dairy science	283	57	11
Poultry science	116	31	14
Fish, game, and wildlife management	1,526	364	67
Horticulture	1,844	261	66
Ornamental horticulture	585	26	1
Agricultural and farm management	356	2	—
Agriculture economics	1,697	552	161
Agriculture business	1,078	21	—
Food science and technology	717	323	113
Forestry	2,671	488	93
Natural resources management	2,268	273	33
Agriculture and forestry technologies	162	24	10
Range management	221	100	27
Other	901	128	2
Architecture and environmental design	9,266	3,121	73
Environmental design, general	1,353	67	5
Architecture	5,405	1,392	14
Interior design	864	26	—
Landscape architecture	965	211	1
Urban architecture	7	167	3
City, community, and regional planning	521	1,192	46
Other	151	66	4
Area studies	2,869	925	145
Asian studies, general	193	96	7
East Asian studies	166	86	13
South Asian (India, etc.) studies	12	8	—
Southeast Asian studies	—	5	—
African studies	21	21	7
Islamic studies	—	2	2
Russian and Slavic studies	146	66	4
Latin American studies	293	162	7
Middle Eastern studies	63	52	17
European studies, general	52	8	1
Eastern European studies	7	5	1
Western European studies	45	12	—
American studies	1,488	248	70
Pacific area studies	7	12	—
Other	376	142	16
Biological sciences	52,213	6,851	3,313
Biology, general	38,307	3,118	664
Botony, general	1,021	302	139
Bacteriology	340	85	15
Plant pathology	113	174	93
Plant pharmacology	—	4	—
Plant physiology	88	31	15
Zoology, general	4,478	476	264
Pathology, human and animal	13	90	79
Pharmacology, human and animal	30	112	182
Physiology, human and animal	317	257	219
Microbiology	2,355	532	340
Anatomy	2	88	131
Histology	—	2	—
Biochemistry	1,752	319	429
Biophysics	91	50	73
Molecular biology	241	27	66

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1977–78—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph. D., Ed. D., etc.)
Cell biology	54	24	25
Marine biology	509	112	24
Biometrics and biostatistics	17	109	25
Ecology	841	139	48
Entomology	301	230	142
Genetics	97	136	93
Radio biology	6	27	22
Nutrition, scientific	142	155	54
Neuro sciences	34	7	37
Toxicology	27	19	10
Embryology	–	3	–
Other	1,037	173	124
Business and management	163,274	48,661	867
Business and commerce, general	32,165	9,989	162
Accounting	40,856	3,389	44
Business statistics	291	164	10
Banking and finance	8,796	3,298	32
Investments and securities	114	213	–
Business management and administration	51,595	25,306	457
Operations research	496	489	43
Hotel and restaurant management	1,696	150	1
Marketing and purchasing	17,030	1,618	29
Transportation and public utilities	1,088	158	1
Real estate	659	78	1
Insurance	621	31	6
International business	306	1,043	9
Secretarial studies	1,830	63	1
Personnel management	1,492	1,051	1
Labor and industrial relations	1,343	755	14
Business economics	2,266	318	54
Other	630	548	2
Communications	25,401	3,297	191
Communications, general	9,760	1,830	134
Journalism	8,299	797	32
Radio/television	4,125	247	13
Advertising	1,410	117	–
Communication media	1,527	219	12
Other	280	87	–
Computer and information sciences	7,224	3,038	196
Computer and information sciences, general	5,963	2,713	183
Information sciences and systems	742	224	13
Data processing	395	53	–
Computer programming	24	–	–
Systems analysis	61	30	–
Other	39	8	–
Education	137,742	118,857	7,586
Education, general	3,993	15,749	1,376
Elementary education, general	49,915	19,915	223
Secondary education, general	4,343	6,519	172
Junior high school education	204	66	–
Higher education, general	7	451	304
Junior and community college education	13	201	216
Adult and continuing education	34	919	147
Special education, general	8,604	9,105	255
Administration of special education	–	65	34
Education of the mentally retarded	3,341	920	8
Education of the gifted	11	24	2
Education of the deaf	388	444	2
Education of the culturally disadvantaged	29	102	2
Education of the visually handicapped	112	94	3
Speech correction	2,110	745	4

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1977–78—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph. D., Ed. D., etc.)
Education of the emotionally disturbed	553	540	3
Remedial education	–	108	4
Special learning disabilities	963	1,814	23
Education of the physically handicapped	213	88	1
Education of the multiple handicapped	105	27	–
Social foundations	23	534	193
Educational psychology	320	2,122	577
Pre-elementary education	5,002	1,510	42
Educational statistics and research	2	52	51
Educational testing, evaluation, and measurement	–	101	19
Student personnel	240	15,832	629
Educational administration	187	11,191	1,432
Educational supervision	37	1,407	128
Curriculum and instruction	579	4,205	712
Reading education	234	6,759	106
Art education	3,670	966	40
Music education	7,412	1,355	66
Mathematics education	1,107	600	39
Science education	791	775	65
Physical education	22,823	4,651	210
Driver and safety education	98	279	2
Health education	2,400	1,057	90
Business, commerce, and distributive education	4,801	1,670	63
Industrial arts, vocational and technical education	7,456	2,732	228
Agricultural education	1,115	305	20
Education of exceptional children, not classified above	116	152	1
Home economic education	3,097	580	10
Nursing education	357	333	–
Other	937	1,893	84
Engineering	56,009	16,409	2,440
Engineering, general	3,329	1,593	235
Aerospace, aeronautical, astronautical engineering	1,186	411	115
Agricultural engineering	551	144	37
Architectural engineering	326	18	–
Bioengineering and biomedical engineering	350	191	61
Chemical engineering	4,615	1,237	259
Petroleum engineering	590	98	21
Civil, construction, and transportation engineering	9,265	2,691	277
Electrical, electronics, communications engineering	11,213	3,742	503
Mechanical engineering	8,924	1,943	279
Geological engineering	157	52	–
Geophysical engineering	56	19	1
Industrial and management engineering	2,712	1,722	118
Metallurgical engineering	420	204	75
Materials engineering	234	224	114
Ceramic engineering	152	47	19
Textile engineering	60	9	1
Mining and mineral engineering	509	92	16
Engineering physics	236	106	37
Nuclear engineering	545	474	112
Engineering mechanics	176	152	78
Environmental and sanitary engineering	309	517	36
Naval architecture and marine engineering	567	75	3
Ocean engineering	162	110	20
Engineering technologies	8,787	360	3
Other	578	158	20
Fine and applied arts	41,033	9,036	708
Fine arts, general	4,665	668	76
Art	14,122	2,333	6
Art history and appreciation	1,833	406	109
Music (performing, composition, and theory)	5,243	2,668	266
Music (liberal arts program)	3,599	698	88
Music history and appreciation	169	98	41

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1977–78—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph. D., Ed. D., etc.)
Dramatic arts	5,056	1,295	116
Dance	886	205	–
Applied design	3,526	282	1
Cinematography	651	147	2
Photography	959	89	1
Other	324	147	2
Foreign languages	13,008	2,741	649
Foreign languages, general	1,043	505	180
French	3,736	692	155
German	1,647	357	101
Italian	301	58	19
Spanish	5,082	837	113
Russian	442	50	12
Chinese	116	23	4
Japanese	155	18	1
Latin	117	14	2
Greek, classical	105	10	7
Hebrew	73	38	1
Arabic	8	3	1
Indian (Asiatic)	3	2	1
Scandinavian languages	38	16	1
Slavic languages (other than Russian)	82	69	37
African languages (non-Semitic)	1	5	10
Other	59	44	4
Health professions	60,031	14,483	654
Health professions, general	4,399	757	65
Hospital and health care administration	1,158	1,565	12
Nursing	30,307	3,812	56
Dental specialties	–	352	10
Medical specialties	–	77	27
Occupational therapy	1,528	222	–
Optometry	385	7	7
Pharmacy	7,468	320	96
Physical therapy	2,418	258	1
Dental hygiene	1,141	30	–
Public health	552	2,288	148
Medical record librarianship	546	8	–
Podiatry or podiatric medicine	–	1	–
Biomedical communication	100	49	–
Veterinary medicine specialties	–	150	31
Speech pathology and audiology	3,551	3,190	121
Chiropractic	–	–	–
Clinical social work	270	706	16
Medical laboratory technologies	5,288	292	4
Dental technologies	11	3	–
Radiologic technologies	392	42	2
Other	517	354	58
Home economics	17,737	2,613	203
Home economics, general	6,327	949	71
Home decoration and home equipment	836	39	–
Clothing and textiles	2,819	122	10
Consumer economics and home management	746	91	12
Family relations and child development	3,135	630	71
Foods and nutrition	3,068	676	33
Institutional management and cafeteria management	461	51	–
Other	355	55	6
Law	653	1,786	39
Law, general	645	1,217	39
Other	8	569	–

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1977–78—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph. D., Ed. D., etc.)
Letters	44,733	10,062	2,076
English, general	26,580	5,135	879
Literature, English	2,260	699	199
Comparative literature	531	214	128
Classics	441	132	57
Linguistics	596	522	159
Speech, debate, and forensic science	5,508	1,326	177
Creative writing	257	200	2
Teaching of English as a foreign language	64	456	9
Philosophy	4,035	567	283
Religious studies	3,892	685	161
Other	569	126	22
Library science	693	6,935	67
Library science, general	680	6,837	58
Other	13	98	9
Mathematics	12,701	3,383	805
Mathematics, general	11,886	2,640	592
Statistics, mathematical and theoretical	273	507	153
Applied mathematics	412	195	56
Other	130	41	4
Military sciences	386	45	—
Military science (Army)	11	45	—
Naval science (Navy, Marines)	10	—	—
Aerospace science (Air Force)	34	—	—
Merchant marine	252	—	—
Other	79	—	—
Physical sciences	23,175	5,576	3,137
Physical sciences, general	1,310	204	73
Physics, general	3,259	1,270	841
Molecular physics	19	4	1
Nuclear physics	52	20	31
Chemistry, general	11,408	1,757	1,378
Inorganic chemistry	52	9	23
Organic chemistry	—	23	24
Physical chemistry	2	31	21
Analytical chemistry	1	18	19
Pharmaceutical chemistry	11	54	60
Astronomy	110	84	80
Astrophysics	18	11	9
Atmospheric sciences and meteorology	353	199	58
Geology	4,191	1,126	228
Geochemistry	9	16	6
Geophysics and seismology	144	97	34
Earth sciences, general	1,069	215	55
Paleontology	3	2	5
Oceanography	234	177	91
Metallurgy	29	31	18
Other earth sciences	206	96	39
Other physical sciences	695	132	42
Psychology	45,057	8,194	2,597
Psychology, general	43,501	5,185	1,958
Experimental psychology	38	67	50
Clinical psychology	4	494	348
Psychology for counseling	173	1,719	72
Social psychology	549	241	84
Psychometrics	9	49	2
Statistics in psychology	3	—	1
Industrial psychology	36	106	4
Developmental psychology	439	217	39

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1977–78—Continued

Major field of study	Bachelor's degrees requiring 4 or 5 years	Second-level (master's) degrees	Doctor's degrees (Ph. D., Ed. D., etc.)
Physiological psychology	33	6	15
Other	272	110	24
Public affairs and services	37,685	20,191	395
Community services, general	1,707	425	56
Public administration	2,047	6,921	153
Parks and recreation management	5,623	574	10
Social work and helping services	12,672	9,886	138
Law enforcement and correction	14,923	1,902	17
International public service	125	140	11
Other	588	343	10
Social sciences	114,184	14,660	3,583
Social sciences, general	11,552	2,259	110
Anthropology	4,300	856	398
Archaeology	72	25	16
Economics	15,746	1,997	706
History	23,145	3,040	813
Geography	3,732	648	158
Political science and government	26,245	2,070	636
Sociology	22,991	1,611	599
Criminology	2,350	284	12
International relations	1,435	872	54
Afro-American (black culture) studies	281	44	—
American Indian cultural studies	19	—	—
Mexican-American cultural studies	102	12	—
Urban studies	1,342	745	9
Demography	82	39	7
Other	790	158	65
Theology	6,344	3,329	1,160
Theological professions, general	4,052	1,847	1,079
Religious music	294	142	5
Biblical languages	38	36	9
Religious education	1,665	1,094	37
Other	295	210	30
Interdisciplinary studies	36,059	4,487	301
General liberal arts and sciences	19,707	1,387	55
Biological and physical sciences	3,898	376	56
Humanities and social sciences	3,911	872	84
Engineering and other	189	966	5
Other	8,354	886	101

NOTE: Dash indicates data are not available.
SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table C-3. First professional degrees[1] conferred by institutions of higher education, 1977–78

Field of study	First professional degrees	Field of study	First professional degrees
Total, all institutions	66,964		
Chiropractic (D.C.)	1,661	Podiatry (Pod. D. or D.P) or Podiatry Medicine (D.P.M.)	543
Dentistry (D.D.S. or D.M.D.)	5,238	Veterinary Medicine (D.V.M.)	1,635
Medicine (M.D.)	14,399	Law (LL.B. or J.D.)	34,616
Optometry (O.D.)	1,014	Theology (B.D., M. Div., or Rabbi)	6,367
Osteopathy (D.O.)	944	Other	–
Pharmacy (Pharm. D.)	547		

[1] Includes degrees that require at least 6 years of college work for completion (including at least 2 years of preprofessional training).

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table C-4. Apprentice completions in selected trades, 1964–78

Trade	1964	1965	1966	1967[1]	1968[2]	1969[3]	1970	1971	1972	1973	1974	1975	1976	1977	1978
Construction trades:[4]															
Bricklayers, stone and tile setters	1,369	1,342	1,346	1,602	1,206	1,651	1,801	1,431	1,998	1,400	1,184	1,418	1,407	1,138	1,031
Carpenters	2,882	3,272	3,340	4,249	3,423	3,698	3,083	3,639	5,054	5,719	5,211	5,669	6,211	6,614	5,577
Cement masons	222	297	293	372	386	300	273	384	825	460	526	664	566	399	402
Electricians	3,887	3,327	3,654	6,075	4,742	5,091	5,224	4,364	5,991	5,730	6,138	6,003	6,563	6,849	6,920
Floor coverers	—	—	—	—	—	—	—	316	256	294	300	324	283	173	241
Glaziers	266	222	239	223	244	217	228	248	335	296	297	337	266	236	250
Insulation workers	—	—	—	—	—	—	—	312	282	365	295	354	264	260	228
Lathers	240	268	198	466	290	145	202	188	276	214	278	236	206	183	172
Line erectors, light and power	201	219	236	552	412	617	943	621	586	669	1,159	1,117	1,151	800	831
Operating engineers	—	—	—	—	—	—	—	439	1,035	848	829	932	945	1,299	1,433
Ornamental iron workers	—	—	—	—	—	—	—	—	—	87	112	115	50	95	67
Painters	770	969	807	1,019	868	829	832	992	983	909	1,057	1,148	1,139	981	947
Plasterers	267	181	215	264	201	228	161	161	245	176	183	230	153	148	164
Plumbers–pipefitters[5]	3,101	3,050	2,736	3,601	3,788	4,888	4,266	5,080	5,663	4,843	6,190	6,009	6,061	7,770	6,801
Roofers	282	272	241	379	226	290	278	257	383	426	391	447	482	564	428
Sheet-metal workers	1,742	1,477	1,568	2,184	2,401	2,544	2,309	2,401	2,768	2,775	2,548	2,302	2,351	2,542	2,390
Structural steel workers	732	870	1,075	1,387	1,209	2,006	1,536	1,381	2,098	1,801	1,513	1,952	2,223	2,129	1,774
Tapers, dry-wall installers	—	—	—	—	—	—	—	—	—	446	404	390	195	99	180
Not classified above	526	654	640	230	1,279	1,063	1,221	451	552	—	—	—	—	—	517
Metalworking trades:															
Boilermakers	52	111	91	199	135	180	364	405	504	353	367	340	508	630	721
Machine set-up and operators	—	—	—	—	—	—	—	—	—	112	141	144	212	251	225
Machinists	1,309	1,339	1,616	2,367	2,108	3,527	3,822	3,234	3,695	2,357	2,047	1,905	2,526	2,967	2,859
Patternmakers	131	160	150	326	350	395	444	290	275	166	181	158	129	163	162
Toolmakers, diemakers	1,489	1,293	1,704	3,596	2,502	4,125	4,748	3,482	3,825	2,716	2,051	1,849	1,901	2,387	2,311
Not classified above	164	240	446	1,040	690	541	1,673	446	531	—	—	—	—	—	—
Graphic art trades:															
Bookbinders, bindery workers	235	182	160	116	170	315	223	142	231	81	151	159	122	143	100
Compositors	666	675	559	807	810	837	774	623	844	377	442	475	264	230	159
Lithographers, photo-engravers	640	329	444	469	325	839	987	320	518	183	587	212	292	186	508
Press operators	551	304	423	517	721	826	637	354	635	507	684	635	466	364	204
Not classified above	175	75	106	164	98	160	279	285	478	387	647	326	230	217	128
Personal services trades:															
Barbers, beuticians	—	—	—	—	—	—	—	—	—	176	316	315	347	467	464
Butchers, meatcutters	369	448	531	631	756	362	727	817	997	794	919	661	853	1,431	783
Cooks, bakers	34	40	29	22	47	80	91	261	229	105	226	135	548	251	160
Medical and dental technicians	18	32	13	30	59	65	92	78	145	88	117	106	138	96	73
Office machine servicers	—	—	—	—	—	—	—	—	—	199	387	479	567	388	234
Optical workers	18	24	—	—	—	—	—	—	—	67	153	142	140	131	83
Radio and TV repairers	—	—	—	—	—	—	—	—	—	156	248	222	108	122	113
Miscellaneous trades:[4]															
Air-conditioning and refrigeration mechanics	—	—	—	—	—	—	—	—	—	153	293	212	360	352	439
Aircraft mechanics	—	—	—	—	—	—	—	149	65	53	36	26	48	60	86
Auto and related body repairers	135	133	151	218	214	211	595	307	308	238	310	275	266	198	455
Auto and related mechanics	517	334	529	525	705	1,017	641	774	1,269	1,231	1,341	1,297	1,343	1,425	1,484
Cabinetmakers, wood machinists	213	207	235	177	164	120	186	212	278	241	268	285	294	293	257
Car repairers	13	24	9	77	140	82	101	138	128	174	185	298	290	860	659
Drafters	128	126	182	243	311	447	538	528	453	273	338	220	246	188	170
Electrical workers	251	277	382	583	591	319	446	1,074	1,691	833	835	778	1,106	1,398	167
Electronic technicians	—	—	—	—	—	—	—	377	400	163	217	125	354	275	479

See footnotes at end of table.

Table C-4. Apprentice completions in selected trades, 1964–78—Continued

Trade	1964	1965	1966	1967[1]	1968[2]	1969[3]	1970	1971	1972	1973	1974	1975	1976	1977	1978
Maintenance mechanics . . .	322	354	442	718	1,072	1,293	1,682	1,253	1,846	774	731	662	920	1,303	947
Millwrights	251	165	270	780	331	615	763	695	1,080	786	624	794	933	1,167	1,087
Molders, coremakers	126	110	112	199	212	281	200	–	–	67	87	123	147	149	95
Stationary engineers	98	161	125	141	75	119	80	–	–	130	168	179	288	308	480
Not classified above	–	–	–	–	–	–	1,447	2,146	3,304	2,182	2,742	2,581	2,985	3,668	4,227

[1] Figures are understated because detailed data for Florida and Louisiana were not reported.

[2] Figures are understated because detailed data for Florida were not reported.

[3] Figures are understated because detailed data for California and Florida were not reported.

[4] It was not possible to provide a historical series for several trades because they were either recently listed as a separate trade (i.e., moved from a not elsewhere classified category), or were consolidated with one or more related occupations.

[5] Includes also sprinklerfitters and steamfitters.

NOTE: Dash indicates data not available.

SOURCE: U.S. Department of Labor, Bureau of Apprenticeship and Training.

Table C-5. Associate degrees and other formal awards below the baccalaureate granted in occupational curriculums, 1971–72 to 1977–78[1]—Continued

HEGIS code[2]	Curriculum	Academic year						
		1971–72	1972–73	1973–74	1974–75	1975–76	1976–77	1977–78
	All curriculums	190,039	174,101	201,538	217,949	243,101	265,324	278,969
5000	Business and commerce technologies	61,077	55,311	65,326	68,036	79,179	87,783	96,930
5001	Business and commerce technologies, general	12,781	11,402	12,379	14,325	17,392	23,022	21,670
5002	Accounting technologies	6,583	6,331	7,880	8,208	9,374	11,041	12,135
5003	Banking and finance technologies	349	460	1,605	642	890	860	1,110
5004	Marketing distribution, purchasing, business and industrial management	10,155	9,989	13,559	14,065	19,926	19,064	25,293
5005	Secretarial technologies (includes office machines training)	20,355	15,526	18,650	19,229	19,704	21,011	23,132
5006	Personal service technologies (flight attendant, cosmetologist, etc.)	1,297	552	468	580	632	869	815
5007	Photography technologies	619	661	645	734	810	747	866
5008	Communications and broadcasting technologies (radio/television, newspapers)	986	1,032	1,292	1,525	1,850	1,814	1,735
5009	Printing and lithography technologies	600	450	535	584	587	808	719
5010	Hotel and restaurant management technologies	1,258	1,451	1,852	2,037	1,865	1,702	2,149
5011	Transportation and public utilities technologies	409	467	462	521	627	734	909
5012	Applied arts, graphic arts, and fine arts technologies (includes advertising design)	3,873	4,107	4,594	4,161	4,814	5,294	5,460
5099	Other	1,832	2,883	1,405	1,425	708	817	937
5100	Data processing technologies	8,971	7,640	6,998	6,821	7,176	7,993	9,339
5101	Data processing technologies, general	5,669	4,584	4,360	3,912	3,989	4,671	5,095
5102	Keypunch operator and other input preparation technologies	402	327	133	237	202	131	264
5103	Computer programmer technologies	2,198	2,118	2,018	2,199	2,547	2,618	3,368
5104	Computer operator and peripheral equipment operation technologies	431	249	205	240	229	304	263
5105	Data processing equipment maintenance technologies	104	103	226	179	188	241	319
5199	Other	167	259	56	54	21	28	30
5200	Health services and paramedical technologies	45,412	42,910	51,207	57,943	61,918	66,560	68,447
5201	Health services assistant	202	121	771	1,683	2,367	2,863	2,465
5202	Dental assistant technologies	2,779	1,255	1,197	1,341	1,425	1,699	1,329
5203	Dental hygiene technologies	3,113	3,465	3,738	3,717	3,538	3,872	3,825
5204	Dental laboratory technologies	374	414	594	643	622	676	763
5205	Medical or biological laboratory assistant technologies	1,826	1,902	2,617	3,238	3,313	3,796	3,819
5206	Animal laboratory assistant technologies	162	202	387	502	728	903	1,263
5207	Radiologic technologies (X-ray, etc.)	1,727	2,157	2,758	3,035	3,323	3,465	3,959
5208	Nursing, R.N. (less than 4-year program)	18,211	23,252	28,158	31,994	34,187	35,670	36,193
5209	Nursing, practical (L.P.N. or L.V.N.—less than 4-year program)	9,939	2,637	2,447	2,486	2,794	2,981	3,019
5210	Occupational therapy technologies	287	435	491	485	560	546	661
5211	Surgical technologies	423	110	183	207	252	241	291
5212	Optical technologies (includes ocular care, ophthalmic, optometric technologies)	146	215	395	438	519	595	662
5213	Medical record technologies	447	581	627	753	919	1,055	1,098
5214	Medical assistant and medical office assistant technologies	1,828	1,340	1,623	1,845	2,046	2,278	2,352
5215	Inhalation therapy technologies	982	1,542	1,824	2,103	2,080	2,239	2,567
5216	Psychiatric technologies (includes mental health aide programs)	842	1,138	1,785	1,862	1,730	1,874	2,009
5217	Electrodiagnostic technologies (includes EKG, EEG, etc.)	55	29	24	55	66	81	89
5218	Institutional management technologies (rest home, etc.)	225	22	64	89	81	94	144
5219	Physical therapy technologies	355	469	717	839	749	781	975
5299	Other	1,489	1,624	807	628	619	831	964

See footnotes at end of table.

Table C-5. Associate degrees and other formal awards below the baccalaureate granted in occupational curriculums, 1971–72 to 1977–78[1]

HEGIS code[2]	Curriculum	Academic year						
		1971–72	1972–73	1973–74	1974–75	1975–76	1976–77	1977–78
5300	Mechanical and engineering technologies	44,145	34,781	37,631	40,775	45,169	49,249	51,200
5301	Mechanical and engineering technologies, general	2,925	2,455	3,295	2,436	3,506	5,046	4,746
5302	Aeronautical and aviation technologies	2,656	2,378	2,060	2,208	1,983	2,422	2,679
5303	Engineering graphics (tool and machine drafting and design)	2,907	2,122	2,385	2,477	2,587	2,746	2,818
5304	Architectural drafting technologies	2,369	1,897	2,249	2,583	2,445	2,489	2,764
5305	Chemical technologies (includes plastics)	529	576	555	590	632	656	748
5306	Automotive technologies	5,109	3,676	4,300	4,507	4,714	5,389	5,697
5307	Diesel technologies	835	603	785	926	943	1,197	1,462
5308	Welding technologies	1,548	652	579	842	1,063	1,317	1,300
5309	Civil technologies (surveying, photogrammetry, etc.)	2,095	2,290	2,203	2,219	2,331	2,316	2,257
5310	Electronics and machine technologies (television, appliance, office machine repair, etc.)	9,129	6,397	7,470	8,638	11,145	10,772	12,297
5311	Electromechanical technologies	1,530	1,179	1,670	2,333	2,549	2,551	2,185
5312	Industrial technologies	2,313	1,315	1,928	2,011	2,051	2,282	2,096
5313	Textile technologies	244	245	223	242	329	301	308
5314	Instrumentation technologies	189	276	259	340	360	367	641
5315	Mechanical technologies	2,678	1,954	2,496	2,193	2,451	2,629	2,473
5316	Nuclear technologies	79	88	77	98	169	138	118
5317	Construction and building technologies (carpentry, electric work, plumbing, sheet-metal, air conditioning, heating, etc.)	4,927	3,648	4,652	5,632	5,285	5,806	5,789
5399	Other	2,083	3,030	508	500	626	825	830
5400	Natural science technologies	9,418	9,242	11,496	12,966	13,316	15,534	15,980
5401	Natural science technologies, general	795	648	768	785	1,004	1,231	1,341
5402	Agriculture technologies (includes horticulture)	3,321	3,440	4,470	4,823	5,238	6,150	6,457
5403	Forestry and wildlife technologies (includes fisheries)	1,523	1,671	1,980	2,203	2,133	2,219	1,992
5404	Food services technologies	886	704	1,581	2,046	2,138	2,640	2,703
5405	Home economics technologies	1,210	1,042	1,542	1,770	1,406	1,427	1,652
5406	Marine and oceanographic technologies	334	378	414	544	413	578	525
5407	Laboratory technologies, general	162	189	211	261	246	317	298
5408	Sanitation and public health inspection technologies (environmental health technologies)	632	346	464	437	460	550	632
5499	Other	555	874	66	97	278	422	380
5500	Public-service-related technologies	21,016	24,167	28,880	31,408	36,343	38,225	37,073
5501	Public service technologies, general	504	509	834	914	2,003	2,460	2,596
5502	Bible study or religion-related occupations	929	612	558	1,071	1,011	1,444	1,363
5503	Education technologies (teacher aide and 2-year teacher training programs)	5,170	4,839	5,840	6,189	5,840	5,879	6,187
5504	Library assistant technologies	571	586	506	607	594	657	549
5505	Police, law enforcement, correction technologies	9,204	11,658	14,915	15,639	18,698	18,572	17,278
5506	Recreation and social work and related technologies	1,965	2,269	3,731	3,712	3,009	3,949	4,238
5507	Fire control technology	1,205	1,448	2,013	2,188	3,234	3,142	2,827
5508	Public administration and management technologies	186	240	354	491	741	896	840
5599	Other	1,282	2,008	129	597	1,213	1,226	1,195

[1] These data do not include associate degrees and other formal awards below the baccalaureate granted in arts and sciences curriculums.

[2] HEGIS codes are from the Higher Education General Information Survey. See *A Taxonomy of Instructional Programs in Higher Education* (U.S. Department of Education, 1970).

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table C-6. Enlisted strength in Department of Defense (DOD) occupational groups, September 30, 1978

DOD code	Group title and description of coverage	Enlisted strength
0	INFANTRY, GUN CREWS, AND SEAMANSHIP SPECIALISTS	260,087
01	*Infantry* — includes weapon specialists, ground reconnaisance specialists and crew-served artillery specialists, armor and amphibious crews, and specialists in combat engineering and seamanship	116,386
02	*Armor and Amphibious*	24,298
03	*Combat Engineering* — includes specialists in hasty and temporary construction of airfields, roads, and bridges and in demolition, field illumination, and chemical warfare	22,105
04	*Artillery/Gunnery, Rockets, and Missiles* — includes conventional field, anti-air and shipboard guns and artillery, and rocket and missile specialists	53,383
05	*Air Crew* — includes pilots and navigators, flight engineers, and other air crew	6,006
06	*Seamanship* — includes boatswains, navigators, and other seamanship specialists	14,440
07	*Installation Security* — includes specialists who guard weapon systems, defend installations, and protect personnel, equipment, and facilities	23,469
1	ELECTRONIC EQUIPMENT REPAIRERS	165,408
10	*Radio/Radar* — includes fixed and mobile radio, air traffic and tracking radar, communication, navigation, and electronic countermeasure gear	78,089
11	*Fire Control Electronic System (Non-Missile)*	9,187
12	*Missile Guidance, Control and Checkout* — includes specialists in guidance, control, and checkout equipment for guided and ballistic missiles	23,207
13	*Sonar Equipment* — includes specialists in underwater detection and fire control systems, oceanographic equipment, and related antisubmarine gear	7,462
14	*Nuclear Weapons Equipment*	1,670
15	*ADP Computers*	7,353
16	*Teletype and Cryptographic Equipment*	14,475
19	*Other Electronic Equipment* — includes training devices, inertial navigation systems, and electronics instruments specialists	23,965
2	COMMUNICATIONS AND INTELLIGENCE SPECIALISTS	150,135
20	*Radio and Radio Code* — includes operators of radio, radio teletype, and visual communications equipment	44,424
21	*Sonar*	4,185
22	*Radar and Air Traffic Control*	26,677
23	*Signal Intelligence/Electronic Warfare* — includes the intercept, translation, and analysis of foreign communications, and the operation of electronic countermeasures equipment	22,236
24	*Intelligence* — includes the gathering, receipt, and analysis of nonsignal intelligence data, the interrogation of prisoners, other language translators and interpreters, image interpretation, and specialists in counterintelligence and investigational activities	10,157
25	*Combat Operations Control* — includes specialists in forward area tactical operations and intelligence and in command post control activities	19,945
26	*Communications Center Operations* — includes the receipt and distribution of messages, the operation of communications center equipment, and the operation of major field communications systems	22,511
3	MEDICAL AND DENTAL SPECIALISTS	79,837
30	*Medical Care*	54,687
31	*Technical Medical Services* — includes laboratory, pharmaceutical, and X-ray services	11,259
32	*Related Medical Services* — includes specialists in sanitation, health preservation, and veterinary services and preventive medical services	4,931
33	*Dental Care* — includes specialists in dental care and treatment and in related technical and laboratory services	8,960
4	OTHER TECHNICAL AND ALLIED SPECIALISTS	37,234
40	*Photography* — includes still, motion, and television camera operators, precision photographic processing, editing, and broadcasting	5,927
41	*Mapping, Surveying, Drafting, and Illustrating*	7,593
42	*Weather* — includes specialists in the collection of weather and sea condition data and in weather forecasting	5,573
43	*Ordnance Disposal and Diving* — includes the excavation and rendering safe of explosive ordnance and of chemical and nuclear agents, and underwater demolition and other types of diving	1,476

Table C-6. Enlisted strength in Department of Defense (DOD) occupational groups, September 30, 1978—Continued

DOD code	Group title and description of coverage	Enlisted strength
45	*Musicians*	5,239
49	*Technical Specialists, N.E.C.* — includes physical science laboratory analysts, specialists in memorial activities, safety, NBC warfare, and firefighting and damage control, and other technical specialists and aids such as scientific engineering assistants	11,426
5	FUNCTIONAL SUPPORT AND ADMINISTRATION	266,511
50	*Personnel* — includes specialists in personnel administration, personnel and manpower management, and recruiting and counseling	42,997
51	*Administration* — includes clerks, typists, and stenographers and legal and medical administrative specialists	71,949
52	*Clerical/Personnel* — includes combined personnel and administrative specialists and senior enlisted personnel whose primary responsibilities are non-technical	7,673
53	*Data Processing* — includes computer operators, analysts, and programmers and electric accounting machine operators	13,080
54	*Accounting, Finance, and Disbursing*	14,500
55	*Other Functional Support* — includes specialists who provide support in the functional areas of supply accounting and procurement, transportation, flight operations, and related areas	105,244
56	*Religious, Morale, and Welfare* — includes chaplains' assistants and specialists in theater, arts, sports, and related activities	5,021
57	*Information and Education* — includes specialists in public affairs, radio/TV, and other types of information and education	6,047
6	ELECTRICAL/MECHANICAL EQUIPMENT REPAIRERS	356,072
60	*Aircraft and Related* — includes aircraft engines, electrical systems, structural components and surfaces, and launch equipment	158,985
61	*Automotive* — includes construction equipment and other wheel and track vehicles	57,739
62	*Wire Communications* — includes specialists in the installation and maintenance of telephones, switchboards, and central office and related interior communications equipment	29,699
63	*Missile, Mechanical and Electrical* — includes missiles and missile systems and related components	5,092
64	*Armament and Munitions* — includes small arms, artillery, mines, bombs and associated mountings, nuclear weapons, and ammunition renovation	35,837
65	*Shipboard Propulsion* — includes marine main engines, boilers, and auxiliary equipment	36,242
66	*Power Generating Equipment* — includes nuclear power reactors and primary electric generating plants	27,174
67	*Precision Equipment* — includes optical and other precision instruments and office machines	3,691
69	*Other Mechanical and Electrical Equipment* — includes specialists in the maintenance and repair of mechanical and electrical equipment which is not readily classifiable in another group	1,613
7	CRAFT WORKERS	70,677
70	*Metalworking* — includes specialists in the machining, shaping, and forming of metal and in the fabrication of metal parts	14,095
71	*Construction* — includes specialists in construction trades and construction equipment operation	23,695
72	*Utilities* — includes plumbers, heating and cooling specialists, and electricians	18,456
74	*Lithography*	1,900
75	*Industrial Gas and Fuel Production* — includes specialists in the production of liquid oxygen, hydrogen, nitrogen, and carbon dioxide	926
76	*Fabric, Leather, and Rubber*	2,783
79	*Other Craft Workers, N.E.C.* — includes specialists in trades such as molding, camouflage, and plastic work, which are not readily classifiable elsewhere in this section	8,822
8	SERVICE AND SUPPLY HANDLERS	160,760
80	*Food Service*	50,063
81	*Motor Transport* — includes the operation of wheel and track vehicles (except construction equipment) and railway equipment	32,803
82	*Material Receipt, Storage, and Issue* — includes specialists in the receipt, storage, issue, and shipment of general and specialized classes of supplies, excluding ammunition	31,422
83	*Law Enforcement* — includes military police, protective and corrections specialists, and criminal and noncriminal inspectors and investigators	38,705

Table C-6. Enlisted strength in Department of Defense (DOD) occupational groups, September 30, 1978—Continued

DOD code	Group title and description of coverage	Enlisted strength
84	*Personal Service* — includes laundry, dry cleaning, and related services	2,142
85	*Auxiliary Labor* — includes unskilled laborers and their supervisors	0
86	*Forward Area Equipment* — includes specialists in parachute packing and repair, in aerial delivery operations, and in flight equipment fitting and maintenance	5,625
87	*Other Services, N.E.C.* — includes service specialists who are not readily classifiable in one of the other groups in this section	0

NOTE: Definitions are provided for most occupational groups. The lack of explanatory material for a few occupational groups indicates that the title of the grouping is considered a sufficient definition.

SOURCE: U.S. Department of Defense, Defense Manpower Data Center—Enlisted Master File.

Table C-7. Enrollments and completions in public vocational education by Office of Education (OE) instructional program, fiscal year 1978

OE instructional code and title		Enrollments	Completions
	Total (unduplicated)		
01.	Agriculture[1]	1,006,542	181,014
01.0100	Agricultural production	528,946	80,459
01.0200	Agricultural supplies/services	33,022	9,383
01.0300	Agricultural mechanics	133,576	34,457
01.0400	Agricultural products	12,680	3,481
01.0500	Ornamental horticulture	130,836	32,765
01.0600	Agricultural resources	24,517	6,923
01.0700	Forestry	22,382	4,639
01.990	Other	120,583	8,907
04.	Distribution[1]	962,009	279,720
04.0100	Advertising services	17,760	4,243
04.0200	Apparel and accessories	32,012	11,821
04.0300	Automotive	9,050	3,923
04.0400	Finance and credit	48,745	10,419
04.0500	Floristry	7,767	2,267
04.0600	Food distribution	37.117	18,990
04.0700	Food services	57,277	21,661
04.0800	General merchandise	284,230	108,484
04.0900	Hardware, building materials	4,837	2,527
04.1000	Home furnishings	4,435	1,724
04.1100	Hotel and lodging	19,276	3,495
04.1200	Industrial marketing	22,012	3,769
04.1300	Insurance	16,773	2,875
04.1400	International trade	1,096	337
04.1500	Personal services	19,314	5,421
04.1600	Petroleum	4,318	2,117
04.1700	Real estate	194,365	37,855
04.1800	Recreation and tourism	26,860	6,418
04.1900	Transportation	17,069	4,164
04.2000	Retail trade, other	23,524	7,879
04.3100	Wholesale trade, other	4,500	1,692
04.9900	Other	109.672	17,639
07.	Health[1]	758,808	202,061
07.0101	Dental assistant	21,724	8,013
07.0102	Dental hygiene (associate)	7,465	2,360
07.0103	Dental laboratory technology	4,185	1,234
07.0199	Other dental	1,251	516
07.0203	Medical laboratory assisting	17,988	3,894
07.0299	Other medical laboratory technology	5,464	1,329
07.0301	Nursing, associate degree	115,940	24,895
07.0302	Practical (vocational) nursing	94,874	34,399
07.0303	Nursing assistant (aide)	117,495	42,325
07.0305	Surgical technician	3,895	1,381
07.0399	Other nursing	49,386	7,003
07.0401	Occupational therapy	2,531	820
07.0402	Physical therapy	3,310	854
07.0499	Other rehabilitation	2,819	421
07.0501	Radiologic technology	10,983	3,090
07.0503	Nuclear medical technology	343	88
07.0599	Other radiologic	317	51
07.0600	Ophthalmic	2,758	577
07.0700	Environmental health	4,049	230
07.0800	Mental health technology	14,837	2,807
07.0903	Inhalation therapy technology	14,008	3,168
07.0904	Medical assisting	31,973	10,288
07.0906	Health aide	15,699	5,217
07.0907	Medical emergency technician	88,092	23,748
07.0909	Mortuary science	1,513	307
07.9900	Other	125,909	23,046
09.01	Consumer and homemaking[1]	3,659,441	0
09.0101	Comprehensive homemaking	1,434,941	0
09.0102	Child development	260,252	0
09.0103	Clothing and textiles	356,456	0
09.0104	Consumer education	185,805	0
09.0106	Family relations	264,117	0
09.0107	Food and nutrition	427,769	0
09.0108	Home management	52,682	0
09.1019	Housing and home furnishings	161,567	0
09.1099	Other	506,852	0
09.02	Occupational preparation[1]	459,590	112,680
09.0201	Care and guidance of children	153,478	36,487
09.0202	Clothing management, production, and services	70,807	17,767
09.0203	Food management, production, and services	151,134	41,578
09.0204	Home furnishing, equipment, and services	29,222	5,243
09.0205	Institutional and home management and services	17,751	4,686
09.0299	Other	37,198	6,919
14.	Office occupations[1]	3,312,475	728,189
14.0100	Accounting and computing occupations	588,971	119,569
14.0201	Computer and console operators	50,666	11,519
14.0203	Programmers	83,479	11,165
14.0299	Other business data processing	84,015	22,915
14.0300	Filing, office machines, clerical occupations	719,267	174,592
14.0400	Information, communication occupations	45,400	11,144
14,0500	Materials support, transportation, etc.	4,198	991
14.0600	Personnel, training, and related occupations	58,717	14,858
14.0700	Stenography, secretarial, and related occupations	700,586	170,167
14.0800	Supervisory and administrative management occupations	212,792	29,078
14.0900	Typing and related occupations	584,247	144,077
14.9900	Other	180,137	18,114
16.	Technical[1]	527,681	94,305
16.0101	Aeronautical technology	5,591	1,041
16.0103	Architectural technology	30,660	4,910
16.0104	Automotive technology	14,041	2,354
16.0105	Chemical technology	5,492	896
16.0106	Civil technology	30,100	3,701
16.0107	Electrical technology	25,032	2,607
16.0108	Electronic technology	90,306	17,216
16.0109	Electromechanical technology	4,298	971
16.0110	Environmental control technology	8,612	1,639
16.0111	Industrial technology	18,056	2,183
16.0112	Instrumentation technology	3,681	645

See footnotes at end of table.

Table C-7. Enrollments and completions in public vocational education by Office of Education (OE) instructional program, fiscal year 1978—Continued

OE instructional code and title		Enrollments	Completions
16.0113	Mechanical technology	30,168	5,173
16.0114	Metallurgical technology	1,529	524
16.0117	Scientific data technology	15,887	4,848
16.0601	Commercial pilot training	8,874	1,325
16.0602	Fire and safety technology	29,147	3,615
16.0603	Forestry technology	3,292	543
16.0604	Oceanographic technology	2,709	362
16.0605	Police science	105,457	18,511
16.9901	Air pollution technology	183	9
16.9902	Water and wastewater technology	7.254	557
16.9900	Other	87,312	20,675
17.	Trade and industrial[1]	3,402,722	856,388
17.0100	Air-conditioning	79,357	18,272
17.0200	Appliance repair	19,758	5,948
17.0301	Body and fender repair	93,339	29,401
17.0302	Auto mechanic	340,686	99,528
17.0399	Other automotive	108,980	44,233
17.0400	Aviation occupations	36,814	6,459
17.0500	Blueprint reading	16,856	2,892
17.0600	Business machine maintenance	3,962	1,217
17.0700	Commercial art occupations	52,966	10,975
17.0800	Commercial fishery occupations	7,108	1,135
17.0900	Commercial photographic occupations	40,185	7,960
17.1001	Carpentry, construction	162,313	44,625
17.1002	Electricity, construction	95,382	18,373
17.1004	Masonry	44,723	11,891
17.1007	Plumbing and pipefitting	43,995	8,312
17.1099	Other construction and maintenance trades	130,991	32,133
17.1100	Custodial services	19,895	5,406
17.1200	Diesel mechanic	25,859	7,303
17.1300	Drafting occupations	152,327	33,294
17.1400	Electrical occupations	118,022	24,349
17.1500	Electronic occupations	146,294	35,217
17.1600	Fabric maintenance services	2,865	701
17.1700	Supervisor and management development	76,014	18,650
17.1900	Graphic arts occupations	108,584	26,920
17.2000	Industrial atomic energy occupations	582	114
17.2100	Instrument maintenance and repair occupations	4,547	913
17.2200	Maritime occupations	9,096	1,103
17.2302	Machine shop occupations	117,069	32,588
17.2303	Machine tool operation	14,232	3,437
17.2305	Sheet metal	45,694	6,571
17.2306	Welding and cutting	205,486	51,772
17.2307	Tool and die making	8,475	2,396
17.2399	Other metalworking occupations	58,709	17,548
17.2400	Metallurgy occupations	4,213	400
17.2601	Barbering	4,184	1,094
17.2602	Cosmetology	97,947	27,215
17.2699	Other personnel services	6,114	2,118
17.2700	Plastics occupations	7,608	1,943
17.2801	Firefighter training	186,472	78,542
17.2802	Law enforcement training	104,194	21,744
17.2899	Other public services	66,991	7,346
17.2900	Quantity food occupations	54,468	14,389
17.3000	Refrigeration	8,973	2,260
17.3100	Small engine repair	52,524	13,171
17.3200	Stationary energy sources occupations	14,021	3,639
17.3300	Textile production and fabrication	45,642	12,755
17.3400	Leather working	1,930	677
17.3500	Upholstering	22,136	7,198
17.3600	Woodworking occupations	89,620	17,653
17.9900	Other	243,520	50,059
99.	Special programs[1]	3,509,351	0
99.0100	Group guidance (prevocational)	1,508,189	0
99.0200	Prepostsecondary	—	—
99.0300	Remedial	101,904	0
99.0400	Industrial arts	1,492,790	0
99.0500	Volunteer firefighter		
99.0600	Other not elsewhere classified	406,468	0

[1] Unduplicated total.

SOURCE: Summary Data, Vocational Education—fiscal years 1977 and 1978 (U.S. Department of Education, Bureau of occupational and Adult Education).

Table C-8. Total enrollments and total completing programs in private postsecondary schools with occupational programs, by program: [U.S. total] 1977–78

(Thousands)

OE instructional code and title		Enrollments	Completed program
	Total, private schools	451,131	283,984
01.	Agribusiness	684	517
01.01	Agricultural Production	284	255
01.99	Agricultural, Miscellaneous	67	45
01.0299	Veterinarian assistant	333	217
04.	Marketing and distribution	78,018	63,427
04.01	Advertising service	41	40
04.02	Apparel and accessories	11,400	9,376
04.03	Automotive	—	—
04.04	Finance and credit	2,522	2,143
04.05	Floristry	1,298	1,240
04.06	Food distribution	6	6
04.07	Food services	47	37
04.08	General merchandise	288	264
04.10	Home furnishing	—	—
04.11	Hotel and lodging	637	177
04.12	Industrial marketing	—	—
04.13	Insurance	10	6
04.14	International trade	—	—
04.16	Petroleum	—	—
04.17	Real estate	50,366	41,913
04.18	Recreation and tourism	4,223	3,796
04.19	Transportation	922	481
04.20	Retail trade, other	2,806	554
04.99	Distributive education, other	3,452	3,394
07.	Health occupations	70,211	38,513
07.0101	Dental assisting	4,449	3,521
07.0103	Dental laboratory technology	1,244	793
07.0199	Dental, other	660	434
07.0202	Histology	3	3
07.0203	Medical laboratory assisting	360	231
07.0204	Hemotology	2	2
07.0299	Medical laboratory technology, other	1,226	856
07.0301	Nursing (associate degree)	418	154
07.0302	Practical (vocational) nursing	4,181	3,242
07.0303	Nursing assistant (aide)	3,367	2,725
07.0304	Psychiatric aide	122	71
07.0305	Surgical technician	140	58
07.0399	Nursing, other	35,401	12,929
07.0401	Occupational therapy	60	60
07.0402	Physical therapy	—	—
07.0499	Rehabilitation services, other	—	—
07.0501	Radiologic technology	5,664	3,533
07.0503	Nuclear medical technology	369	309
07.06	Ophthalmic technology	—	—
07.08	Mental health technology	29	12
07.0902	Electrocardiograph technology	—	—
07.0903	Inhalation therapy	512	448
07.0904	Medical assisting (office)	9,211	6,607
07.0906	Community health aide	—	—
07.0907	Medical emergency technician	309	260
07.0909	Mortuary science	2,228	2,060
07.0915	Medical records technician	45	40
07.0920	Physician's assistant	140	97
07.99	Health occupations, other	15	12
09.	Home economics	964	520
09.0201	Child care	25	10
09.0202	Clothing management, production, and services	58	48
09.0203	Food management, production, and services	881	462
14.	Business and office	101,805	48,240
14.01	Accounting and computing occupations	14,336	5,968
14.0201	Computer operator	785	627
14.0202	Keypunch operator	7,674	5,171
14.0203	Computer programmer	6,913	4,776
14.0299	Business data processing, NEC.	3,365	1,614
14.03	Filing, office machines, clerical occupations	7,620	4,398
14.04	Information communication occupations	188	168
14.05	Materials support occupations	—	—
14.07	Stenographic, secretarial, and related occupations	40,190	17,991
14.08	Supervisory and administrative management occupations	15,752	4,449
14.09	Typing and related occupations	807	700
14.99	Office occupations, other	4,075	2,284
16.	Technical occupations	32,145	20,249
16.0101	Aeronautical technology	107	45
16.0102	Agricultural technology	16	8
16.0103	Architectural technology	320	213
16.0104	Automotive technology	634	335
16.0105	Chemical technology	—	—
16.0106	Civil technology	93	22
16.0107	Electrical technology	111	19
16.0108	Electronic technology	7,917	3,365
16.0109	Electromechanical technology	71	46
16.0110	Environmental control technology	174	111
16.0111	Industrial technology	—	—
16.0112	Instrumentation technology	30	22
16.0113	Mechanical technology	115	57
16.0114	Metallurgical technology	—	—
16.0115	Nuclear technology	—	—
16.0117	Scientific data processing	1,113	675
16.0203	Legal assistant	180	102
16.0601	Commercial pilot training	15,483	11,560
16.0602	Fire and fire safety technology	—	—
16.0605	Police science technology	60	18
16.0606	Teacher's assistant	—	—
16.0607	Library assistant	—	—
16.0608	Communications technology	4,619	3,257
16.0695	Performing artists	925	355
16.9901	Air pollution technology	—	—
16.9902	Water and waste water treatment	—	—
17.	Trade and industrial	167,304	112,518

See footnotes at end of table.

Table C-8. Total enrollments and total completing programs in private postsecondary schools with occupational programs, by program: [U.S. total] 1977–78—Continued

(Thousands)

OE instructional code and title		Enrollments	Completed program
17.01	Air conditioning installation and repair	2,635	1,662
17.02	Appliance repair	8	8
17.0301	Body and fender repair	1,495	845
17.0302	Auto mechanic	11,680	6,565
17.0303	Auto specialization, repair	528	443
17.0399	Automotive services, other	1,255	612
17.0401	Aircraft maintenance	1,550	1,142
17.0402	Aircraft operations	–	–
17.0403	Ground operations	–	–
17.05	Blueprint reading	8	8
17.06	Business machine maintenance	241	195
17.07	Commercial art occupations	8,916	5,860
17.08	Commercial fishery occupations	–	–
17.09	Commercial photography occupations	1,040	732
17.1001	Carpentry, construction	719	374
17.1002	Electricity, construction	438	247
17.1003	Heavy equipment maintenance operations	496	443
17.1004	Masonry	173	90
17,1005	Painting and decorating	–	–
17.1007	Plumbing and pipefitting	490	283
17.1008	Drywall installation	–	–
17.1099	Construction and maintenance trades, other	217	122
17.11	Custodial services	192	108
17.12	Diesel mechanic	3,053	2,067
17.13	Drafting occupations	2,583	1,350
17.14	Electrical occupations	1,101	600
17.1503	Radio and TV repair	946	510
17.1599	Electronics occupations, other	4,830	2,332
17.16	Fabric maintenance services	–	–
17.17	Supervisor and management development	–	–
17.19	Graphic arts occupations	1,421	707
17.20	Industrial atomic energy occupations	–	–
17.21	Instrument maintenance and repair occupations	2,628	1,949
17.22	Maritime occupations	3,304	2,649
17.2302	Machine shop occupations	370	149
17.2303	Machine tool operations	505	206
17.2306	Welding and cutting	6,650	4,357
17.2307	Tool and diemaking	318	73
17.2399	Metalworking, other	1,294	938
17.24	Metallurgy occupations	19	8
17.2601	Barbering	7,764	5,859
17.2602	Cosmetology	76,688	51,177
17.2699	Personal services, other	3,018	2,665
17.27	Plastics occupations	20	10
17.2801	Firefighter training	–	–
17.2802	Law enforcement training	3,513	3,331
17.2899	Public service occupations, other	–	–
17.29	Quantity food occupations	3,757	3,171
17.30	Refrigeration	100	48
17.31	Small engine repair, internal combustion	114	74
17.33	Textile production and fabrication	354	204
17.34	Leatherworking	–	–
17,35	Upholstering	83	75
17.36	Woodworking occupations	456	411
17.40	Truck driving	8,212	6,339
17.9900	Trade and industrial occupations, other	565	494

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Appendix D. State Employment Security Agencies

State employment security agencies develop occupational projections and related employment statistics in cooperation with the Bureau of Labor Statistics of the U.S. Department of Labor. The following list gives the addresses of the employment security agencies.

Alabama	Chief, Research and Statistics Department of Industrial Relations Industrial Relations Building 649 Monroe Street Montgomery 36130
Alaska	Chief, Research and Analysis Employment Security Division Department of Labor P.O. Box 3-7000 Juneau 99802
Arizona	Chief, Labor Market Information Research and Analysis Department of Economic Security P.O. Box 6123 Phoenix 85005
Arkansas	Chief, Research and Statistics Employment Security Division P.O. Box 2981 Little Rock 72203
California	Chief, Employment Data and Research Division Employment Development Department P.O. Box 1679 Sacramento 95808
Colorado	Chief, Research and Analysis Division of Employment Department of Labor and Employment 1210 Sherman Street Denver 80203
Connecticut	Director, Research and Information Connecticut Employment Security Division 200 Folly Brook Boulevard Weatherfield 06109
Delaware	Chief, Office of Research, Planning, and Evaluation Department of Labor Building D Chapman Road and Route 273 Newark 19713
District of Columbia	Chief, Branch of Labor Market Information and Analaysis D.C. Department of Labor 605 "G" Street, N.W. Room 1000 Washington, D.C. 20001
Florida	Chief, Research and Statistics Division of Employment Security Florida Department of Commerce Caldwell Building Tallahassee 32304

Georgia	Director, Information Systems Employment Security Agency Department of Labor 254 Washington St., S.W. Atlanta 30334
Hawaii	Chief, Research and Statistics Department of Labor and Industrial Relations P.O. Box 3680 Honolulu 96811
Idaho	Chief, Research and Analysis Department of Employment P.O. Box 35 Boise 83707
Illinois	Manager, Research and Analysis Division Bureau of Employment Security Department of Labor 910 South Michigan Avenue Chicago 60605
Indiana	Chief of Research Employment Security Division 10 North Senate Avenue Indianapolis 46204
Iowa	Chief, Research and Statistics Department of Job Service 1000 East Grand Avenue Des Moines 50319
Kansas	Chief, Research and Analysis Department of Human Resources 401 Topeka Avenue Topeka 66603
Kentucky	Chief, Research and Special Projects Department of Human Resources 275 E. Main Street Frankfort 40601
Louisiana	Chief, Research and Statistics Department of Employment Security P.O. Box 44094 Baton Rouge 70804
Maine	Director, Manpower Research Division Employment Security Commission 20 Union Street Augusta 04330
Maryland	Director, Research and Analysis Department of Human Resources 1100 North Eutaw Street Baltimore 21201
Massachusetts	Director, Information and Research Division of Employment Security Hurley Building Government Center Boston 02114
Michigan	Director, Research and Statistics Division Employment Security Commission Department of Labor Building 7310 Woodward Avenue Detroit 48202
Minnesota	Acting Director, Research and Statistical Services Department of Economic Security Services 390 North Robert Street St. Paul 55101
Mississippi	Chief, Research and Statistics Employment Security Commission P.O. Box 1699 Jackson 39205
Missouri	Chief, Research and Statistics Division of Employment Security Department of Labor and Industrial Relations P.O. Box 59 Jefferson City 65101
Montana	Chief, Reports and Analysis Employment Security Division P.O. Box 1728 Helena 59601
Nebraska	Chief, Research and Statistics Division of Employment Department of Labor P.O. Box 94600 Lincoln 68509
Nevada	Chief, Employment Security Research Employment Security Department 500 East Third Street Carson City 89713

New Hampshire	Director, Economic Analysis and Reports Department of Employment Security 32 South Main Street Concord 03301
New Jersey	Director, Division of Planning and Research Department of Labor and Industry P.O. Box 2765 Trenton 08625
New Mexico	Chief, Research and Statistics Employment Security Commission P.O. Box 1928 Albuquerque 87103
New York	Director, Division of Research and Statistics Department of Labor State Campus Building 12 Albany 12240
North Carolina	Director, Bureau of Employment Security Research Employment Security Commission P.O. Box 25903 Raleigh 27611
North Dakota	Chief, Research and Statistics Employment Security Bureau P.O. Box 1537 Bismarck 58501
Ohio	Director, Division of Research and Statistics Bureau of Employment Services 145 South Front Street Columbus 43216
Oklahoma	Chief, Research and Planning Division Employment Security Commission 310 Will Rogers Memorial Office Building Oklahoma City 73105
Oregon	Assistant Administrator Research and Statistics Employment Division 875 Union Street, N.E. Salem 97311
Pennsylvania	Director, Research and Statistics Bureau of Employment Security Department of Labor and Industry 7th and Forster Streets Harrisburg 17121
Puerto Rico	Chief of Research and Statistics Bureau of Employment Security 427 Barbosa Avenida Hato Rey 00917
Rhode Island	Supervisor, Employment Security Research Department of Employment Security 24 Mason Street Providence 02903
South Carolina	Director, Manpower Research and Analysis Employment Security Commission P.O. Box 995 Columbia 29202
South Dakota	Chief, Research and Statistics Employment Security Department 607 North Fourth Street P.O. Box 730 Aberdeen 57401
Tennessee	Chief, Research and Statistics Department of Employment Security Cordell Hull Building Room 519 Nashville 37219
Texas	Chief, Economic Research and Analysis Employment Commission TEC Building 15th and Congress Avenue Austin 78778
Utah	Director, Research and Analysis Department of Employment Security P.O. Box 11249 Salt Lake City 84147
Vermont	Chief, Research and Statistics Department of Employment Security P.O. Box 488 Montpelier 05602
Virginia	Commissioner, Virginia Employment Commission P.O. Box 1358 Richmond 23211

Washington	Chief, Research and Statistics Employment Security Department 1007 South Washington St. Olympia 98501
West Virginia	Chief, Labor and Economic Research Department of Employment Security 112 California Avenue Charleston 25305
Wisconsin	Director, Research and Statistics Department of Industry Labor and Human Relations P.O. Box 7944 Madison 53701
Wyoming	Chief, Research and Analysis Employment Security Commission P.O. Box 2760 Casper 82601

Appendix E. Bibliography

This appendix includes additional sources of occupational information. The publications listed under each subject heading are intended to provide a representative sample of the wealth of information available.

General information

U.S. Department of Commerce, Bureau of the Census. *Census of Population: 1970 Subject Reports*, Final Report PC(2)-7A, Occupational Characteristics, 1973.

Employment and unemployment data for detailed occupations by color, sex, class of worker, earnings, and a variety of other characteristics. Data for earlier censuses are available in publications of the same title for the appropriate census years.

U.S. Department of Labor, Bureau of Labor Statistics. *Handbook of Labor Statistics*, Bulletin 2000, 1979.

Compilation of major statistical series on employment, unemployment, wages, and other subjects produced by the Bureau of Labor Statistics. Also includes related series from other governmental agencies and foreign countries. Contains 160 tables which generally begin with 1967 data and run through 1977. Annual.

U.S. Department of Labor, Bureau of Labor Statistics. *BLS Handbook of Methods for Surveys and Studies*, Bulletin 1910, 1976.

Describes each BLS statistical program, noting the origin of data, defining terms, and outlining concepts. Tables, survey forms, and mathematical formulations are presented for clarification. Sources of additional information also are included.

U.S. Department of Labor, Bureau of Labor Statistics. *Occupational Outlook Handbook*. Biennial.

A comprehensive publication on occupations and industries. Describes nature of work, training, outlook, and earnings for hundreds of occupations.

U.S. Department of Labor, Bureau of Labor Statistics, *U.S. Working Women: A Databook*, Bulletin 1977, 1977.

Statistical report on the changing role of women in the labor force. Brief text gives highlights of tables and charts on labor force participation of women, employment and unemployment, marital status, income, education, job tenure, work life expectancy and other social and demographic characteristics.

U.S. Department of Labor and U.S. Department of Education. *Employment and Training Report of the President*, 1978. Annual from 1963 through 1975 under *Manpower Report of the President*.

Includes the Department of Labor's annual report on employment and training requirements, resources and utilization, and employment and training programs. Statistical appendix presents data on the labor force, employment, and education as well as projections relevant to these areas.

U.S. Department of Labor, Employment and Training Administration. *Research and Development Projects*. Annual.

Lists completed research and development projects funded by the Employment and Training Administrations, with annotations.

Education and training information

Lusterman, Seymour, *Education in Industry*, Report 719. New York, The Conference Board, Inc., 1977.

A study of the aims, scope, and character of employee education and training activities among corporations with 500 or more employees. Sections are included on corporate employee education and training activities, industry's use of outside resources for employee development, internal programs conducted during working hours, and case illustrations of individual company programs.

Neary, H. James. "The BLS Pilot Survey of Training In Industry," *Monthly Labor Review*, February 1974, pp. 26-32.

Describes the results of the BLS pilot survey of training in metalworking industries, including methods of data collection and the survey design. The pilot survey was conducted to determine whether reliable data could be collected on training enrollments and completions in industry.

U.S. Department of Labor, Employment and Training Administration. *Training Opportunities in Job Corps: A Directory of Job Corps Centers and Courses*. Annual.

Renetzky, Alvin, and Schlachter, Gail A., editors. *Directory of Internships, Work Experience Programs, and On-the-Job Training Opportunities.* Thousand Oaks, California, Reddy Reference Press, 1976.

A guide to internship, work experience, and on-the-job training opportunities sponsored by governmental agencies, business and industry, professional associations, foundations, and various social and community organizations.

U.S. Department of Education, National Institute of Education. *Home-Based Education: Needs and Technological Opportunities*, 1976.

Reviews literature on correspondence education and a Stanford University research project on computer-assisted instruction at home. A cross-referenced annotated bibliography covering the home-based instructional uses of computers, television, and other media also is included.

U.S. Department of Education, National Center for Education Statistics. *The Condition of Education.* Annual since 1975.

A statistical report that examines differences in educational opportunities, participation, and outcomes among groups of individuals according to sex, ethnic origin, family income, and other characteristics.

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Contains data on enrollments, degrees, and other items. Compiled from various sources indicated in table footnotes.

U.S. Department of Education, National Center for Education Statistics. *Directory of Postsecondary Schools with Occupational Programs, 1971.* NCES Publications No. 78-352 and No. 78-352A (supplement).

A comprehensive list of all schools offering postsecondary occupational training, including private vocational schools as well as 2- and 4-year colleges.

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A comprehensive list of public and private colleges and universities.

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Contains enrollments by detailed occupational program for fiscal years.

U.S. Department of Education, National Center for Education Statistics. *Projections of Educational Statistics.* Annual since 1964.

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U.S. Department of Labor, Bureau of Labor Statistics and Employment and Training Administration. *Occupational Training in Selected Metalworking Industries: A Report on a Survey of Selected Occupations, 1974,* BLS Bulletin 1976/ETA R&D Monograph 53, 1977.

The results of a nationwide survey of employer training in nearly 5,000 establishments conducted in 1975 and early 1976. Describes the characteristics of occupational training provided by employers for 14 selected occupations in four metalworking industries.

U.S. Department of Labor, Bureau of Labor Statistics. *Tomorrow's Manpower Needs.* Bulletin 1606, Supplement 3 (Revised), 1975.

Contains conversion tables for matching occupational classifications of BLS projections to vocational education program codes. Based on 1970 census.

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Provides guidelines on the screening and admissions process and procedures to be followed when recommending and processing youth for enrollment in the Job Corps programs under CETA.

Wasserman, Paul. *Training and Development Organizations Directory.* Detroit, Mi., Gale Research Co., 1978.

Describes firms, institutes, and other agencies offering training programs.

Wenrich, Ralph C., and Wenrich, J. William. *Leadership in Administration of Vocational and Technical Education.* Columbus, Ohio, Merrill Publishing Co., 1974.

Analyzes changes in vocational education and suggests ways in which a program administrator might use this information in planning programs designed to prepare youth and adults for employment.

Followup data

Astin, Alexander. *The College Drop Out: A National Profile.* Washington, D.C., American Council on Education, 1972.

Examines what happens to college dropouts, their entry into the labor force, transfer rates, and likelihood of return to college.

Astin, Helen, and Bisconti, Ann S. *Career Plans of College Graduates of 1965 and 1970*. Bethlehem, Pa., College Placement Council, Inc., 1972.

Reports on entry to employment by type of employer, undergraduate major, occupation, and other items. Based on data from the American Council on Education.

Astin, Helen, and Bisconti, Ann S. *Undergraduate and Graduate Study in Scientific Fields*. Washington, D.C., American Council on Education, ACE Research Reports, Vol. 8, No. 3, August 1973.

Examines the flow of a national cohort of college freshmen of 1961 over a decade, focusing on patterns of undergraduate study, attrition, degree attainment, advanced study, and employment. Findings on the progress and goals of 1966 freshmen are included as a means of comparison with the 1961 cohort. Contains 78 separate cross-tabulations.

Astin, Helen; El-Khawas, Elaine; and Bisconti, Ann S. *Beyond the College Years*. Washington, D.C., American Council on Education, 1974.

Report prepared for the National Science Foundation and the National Institutes of Health. Uses correlation and regression analysis to examine factors associated with career outcomes and presents data on career flows.

Bayer, Alan; Royer, Jeannie; and Webb, Richard. *Four Years After College Entry*. Washington, D.C., American Council on Education, ACE Research Reports, Vol. 8, No. 1, 1973.

Followup of a sample of the freshman class of 1967.

College Placement Council, Inc. *The College Graduate: Turnover and Mobility*, Report No. 3, Bethlehem, Pa., 1970.

Using National Opinion Research Center data for 33,000 graduates of the class of 1961, the report studies labor force mobility and job changing during 5 years after graduation. Detail includes degree field, type of employer, and sex. Earlier reports in the series dealt with graduates' attitudes toward business, and job satisfaction.

College Placement Council, Inc. *College Graduates and Their Employers—A National Study of Career Plans and Their Outcomes*, Report No. 4, 1975.

Actual occupations of college graduates compared with college-year plans. Analyses flow directly from *Career Plans of College Graduates of 1965 and 1970* (see above), but provide greater detail in classification of majors and careers.

College Placement Council, Inc. *The Hard-to-Place Majority—A National Study of the Career Outcomes of Liberal Arts Graduates*, Report No. 5, 1975.

Actual occupations of college graduates compared with field of study. Analyses flow directly from *Career Plans of College Graduates of 1965 and 1970* (see above), with emphasis on liberal arts graduates.

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Followup study of people who were freshmen in 1961, whose highest degree held was a bachelor's degree, and who were working full time.

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Descriptive report including 1971 data on college freshmen of 1961 and 1966.

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Survey of 2-year associate degrees granted for completion of engineering and technology curriculums.

Engineering Manpower Commission. *Placement of Engineering Graduates*. New York, Engineers Joint Council. Annual.

Data from a survey of over 200 engineering schools provide information on the placement status of 24,000 technical and 14,500 nontechnical graduates who received bachelor's degrees. Numbers and percentages of graduates entering employment, graduate school, and military service are given.

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By studying the careers of 10,000 holders of third-level research degrees, systematically selected from the graduating classes of 1935, 1940, 1950, 1955, and 1960, this report focuses on the factors associated with choice of employment in academic or other settings, with particular emphasis on the circumstances surrounding a change in employer category.

Project Talent — A 5-year Follow-up Information on High School Graduates of 1960. Pittsburgh, University of Pittsburgh, School of Education, July 1969.

A continuing follow-up of the high school graduates, their activities during the 5 years after graduation, examining employment and continuing education.

Sharp, Laure M., and Biderman, Albert D. *Employment of Retired Military Personnel.* BSSR 361. *Washington,* D.C., Bureau of Social Science Research, 1966.

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Sharp, Laure M., et. al. *Five Years After the College Degree.* Washington, D.C., Bureau of Social Science Research, 5 volumes:

Part I:	*Graduate and Professional Education.* 1965.
Part II:	*Occupational Outcome* (text tables; appendix tables). 1965.
Part III:	*Methodological Note.* 1966.
Part IV:	*Military Service.* 1967.
Part V:	*Geographic Mobility.* 1967.

Based on a survey in 1963 of 1958 bachelor's degree recipients including a subsample of individuals surveyed in the National Science Foundation study, *Two Years After the College Degree,* who obtained further graduate and professional education during 1958–63. Describes occupational entry and other characteristics by type of training.

Somers, Gerald G. *The Effectiveness of Vocational and Technical Programs: A National Follow-up Study.* Madison, University of Wisconsin, Center for Studies in Vocational and Technical Education, 1971.

Based on a 1969 survey of a national sample of 1966 vocational and technical program graduates, reports labor force and employment status by type of program, major occupational classification, and personal characteristics.

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A continuing followup study of a sample of 20,000 high school seniors of 1972 to examine their postsecondary and occupational status, and its relation to high school training experience.

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Byrne, James J. "Occupational Mobility of Workers." *Monthly Labor Review,* February 1975, pp. 53-59.

Discusses occupational mobility of workers between January 1972 and January 1973 by age, sex, and race, and compares results of postcensal survey to those of a similar survey in 1965.

Eck, Alan. *Measuring Labor Force Movements: A New Approach,* Report No. 581. Bureau of Labor Statistics, 1979.

Uses newly developed data to describe workers' movements into and out of the labor force. Discusses limitations to the data and compares them with other sources of information.

Parnes, Herbert S. "Longitudinal Surveys: Prospects and Problems." *Monthly Labor Review,* February 1972, pp. 11-15.

Discusses the surveys and lists additional articles and reports based on survey data.

Sharp, Laure M., et. al. *Five Years After the College Degree.* Washington, D.C., Bureau of Social Science Research, 5 volumes: Part V: *Geographic Mobility,* 1967.

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Provides data on occupational mobility revealed by the 1970 Census of Population. It discusses the uses of mobility information, the patterns of separation and entry, and the limitations on the data.

U.S. Department of Commerce, Bureau of the Census, Census of Population: 1970, Subject Reports, Final Report PC(2)-7E, *Occupation and Residence in 1965,* 1973.

Geographic mobility data for major occupational groups, comparable 1960 data are in Final Report PC(2)-2B, *Mobility for States and State Economic Areas.*

U.S. Department of Labor, Bureau of Labor Statistics. *Occupational Mobility of Workers,* Special Labor Force Report 176, 1975.

Discusses patterns of mobility, demographic characteristics, flows among occupations, and job and industrial mobility.

Immigration

National Science Foundation. *Immigrant Scientists and Engineers in the United States. A Study of Characteristics and Attitudes.* NSF 73-302, 1973.

Reports on a survey conducted by NSF in mid-1970 of a sample of those admitted between February 1964 and January 1969 and who filed address reports with the Immigration and Naturalization Service in 1969.

U.S. Department of Health and Human Resources, National Institutes of Health. *The Foreign Medical Graduate: A Bibliography*, DHEW Publication No. (NIH) 73-440, November 1972.

Citations of information about foreign medical graduates in the United States, including their education abroad, flow into the United States, and their training and employment in the United States. Includes only publications before September 1972.

U.S. Department of Labor, Employment and Training Administration. *Immigrants and the American Labor Market*, Manpower Research Monograph 31, 1974.

Discusses the behavior of immigrants in the labor market, the skills they bring with them, skills being used, and their adjustment to the labor market.

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American Nurses Association. *The Nation's Nurses: Inventory of Registered Professional Nurses*. 1965.

Data on work activity and labor force mobility characteristics of R.N.'s.

National Education Association. *Status of the American Public School Teacher, 1970–71*. Research Report 1972-R3, 1972.

Data on reentrants.

Ornstein, Michael. *Entry into the American Labor Force*. New York, Academic Press, Inc., 1976.

A detailed examination of the way in which a sample of American men entered the labor force. Discusses trends and social mobility after entry.

U.S. Department of Commerce, Bureau of the Census. Census of Population: 1970, Subject Reports, Final Report PC(2)-6C, *Persons Not Employed*, 1973.

Data on occupational characteristics of persons not in the labor force or unemployed. Comparable 1960 data in Final Report PC(2)-6C, *Labor Reserve*.

Separations from the labor force

Fullerton, Howard N. "A New Type of Working Life Table for Men." *Monthly Labor Review*, July 1972, pp. 20-27.

Uses a "generation" life table in which the life spans of cohorts are followed through time, instead of a "period" life table based on mortality rates applicable to each age observed at one point in time. Includes tables, data sources, and technical appendix.

U.S. Department of Labor, Bureau of Labor Statistics, *Length of Working Life for Men and Women, 1970*, Special Labor Force Report 187, 1976.

Discusses worklife expectancies for men and women. The working life table and its uses are explained in the technical appendix.

U.S. Department of Labor, Bureau of Labor Statistics. *Tomorrow's Manpower Needs*, Bulletin 1606, Vol. 1, February 1969, and Supplement 4, *Estimating Occupational Separations from the Labor Force for States*, 1974.

Vol. 1 discusses the development of death and separation rates, and shows 1960 rates for individual occupations by sex in appendix A. Supplement 4 contains estimates of occupational separations for States and shows 1970 and 1985 rates for individual occupations by sex in appendix B.

Trends

Bednarzik, Robert W., and Klein, Deborah P. *Labor Force Trends: A Synthesis and an Analysis and a Bibliography*. Special Labor Force Report 208, U.S. Department of Labor, Bureau of Labor Statistics, 1978.

Syntheizes studies of the labor force behavior of men, women, and teenagers. Discusses trends and possible changes.

Taeuber, Karl E. *Demograhpic Trends Affecting the Future Labor Force*. Madison, Wis., Institute for Research on Poverty, 1976.

Reviews population and manpower projections along with their relation to demographic shifts and minority participation.

Earnings

American Society for Personnel Administration. *Trends in Employment of College and University Graduates in Business and Industry*. Annual since 1946.

Survey of beginning monthly salaries in 185 companies representing large- and medium-sized firms in 22 States and 20 industries. Salaries are for bachelor's and master's degree holders in engineering, accounting, sales, business administration, liberal arts, production management, physics, chemistry, mathematics, economics, and other fields.

College Placement Council, Inc., *College Placement Council Salary Survey*. Issued three times each year.

Reports beginning salary data based on offers made to graduating students at all degree levels in selected curricula and graduate programs.

Endicott, Frank S. Trends in Employment of College *and University Graduates in Business and Industry*.

Placement Center of Northwestern University. Annual since 1946.

Survey of beginning monthly salaries in 185 companies representing large- and medium-sized firms in 22 States and 20 industries. Salaries are for bachelor's and master's degree holders in engineering, accounting, sales, business administration, liberal arts, production management, physics, chemistry, mathematics, economics, and other fields.

Professional and business associations. The following associations or periodicals conduct salary surveys for occupations of special interest to them:

Advertising Age (magazine)
American Anthropology Association
American Association of Colleges of Pharmacy
American Chemical Society
American Collectors Association, Inc.
American Dental Assistants Association
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American Dental Hygienists Association
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American Institute of Physics
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American Mathematical Society
American Petroleum Institute
American Political Science Association
American Psychological Association
American Sociey of Interior Designers
American Society of Landscape Architects
American Society of Radiologic Technologists
Child Welfare League of America
Engineers Joint Council
Industrial Designers Society of America
Institute of Food Technologists
International City Management Association
International Personnel Management Association
International Taxicab Association
Medical Economics (magazine)
National Academy of Sciences
National Association of Realtors
National Executive Housekeepers Association
National Farm and Power Equipment Dealers Association
PR *Reporter* (public relations newsletter)
Society of American Foresters
University of Texas Medical Branch (Galveston)

U.S. Department of Labor, Bureau of Labor Statistics. *Area Wage Surveys: Metropolitan Areas, United States and Regional Summaries*. Annual.

Provides national and regional estimates of occupational earnings, supplementary wage benefits, and establishment practices for workers in the Nation's Standard Metropolitan Statistical Areas. Six industry divisions are covered: Manufacturing; transportation, communication, and other public utilities; wholesale trade; retail trade; finance, insurance, and real estate; and selected services.

U.S. Department of Labor, Bureau of Labor Statistics. *Directory of Occupational Wage Surveys, January 1970–December 1977*, Report 537, 1979.

Lists publications resulting from the Bureau of Labor Statistics' occupational wage programs between 1970 and 1976.

U.S. Department of Labor, Bureau of Labor Statistics. *Employment and Earnings, State and Areas, 1939–75*, Bulletin 1370–12, 1977.

This bulletin is a comprehensive historical reference volume of State and area employment and earnings statistics released by the Bureau of Labor Statistics.

U.S. Department of Labor, Bureau of Labor Statistics. *Employment and Earnings, United States, 1909–78*, Bulletin 1312–16, 1979.

Presents historical national earnings data released by the Bureau of Labor Statistics for individual nonagricultural industries.

U.S. Department of Labor, Bureau of Labor Statistics. *National Survey of Professional, Administrative, Technical, and Clerical Pay*. Annual since Winter 1959–60, various bulletins.

Summarizes the results of the Bureau of Labor Statistics' annual salary survey of selected professional, administrative, technical, and clerical occupations in private industry. Averages are shown for annual, monthly, and weekly rates, excluding overtime pay.

Periodicals

U.S. Department of Labor, Bureau of Labor Statistics. *Employment and Earnings*, monthly.

Presents charts and detailed tables on the labor force, employment, unemployment, hours, earnings, and labor turnover. Compiled from data based on household interviews, nonagricultural establishment records, and administrative records of unemployment insurance systems. March issue contains annual averages for previous year for all national industry series.

U.S. Department of Labor, Bureau of Labor Statistics. *Monthly Labor Review*.

Presents articles on employment, labor force, wages, prices, productivity, unit labor costs, collective bargaining, workers' satisfaction, social indicators, and labor developments abroad. Regular features include a review of developments in industrial relations, significant court decisions in labor cases, book reviews, and current labor statistics.

U.S. Department of Labor, Bureau of Labor Statistics. *Occupational Outlook Quarterly*.

Presents current information on employment trends and outlook, supplementing and updating information in the *Occupational Outlook Handbook*.

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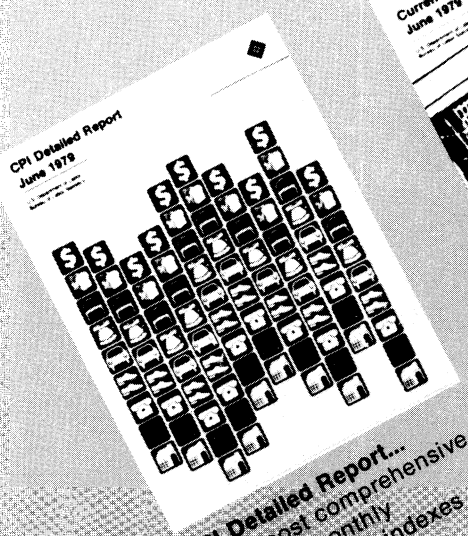

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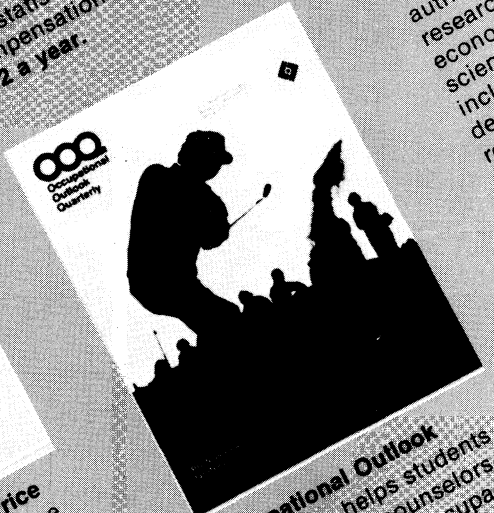

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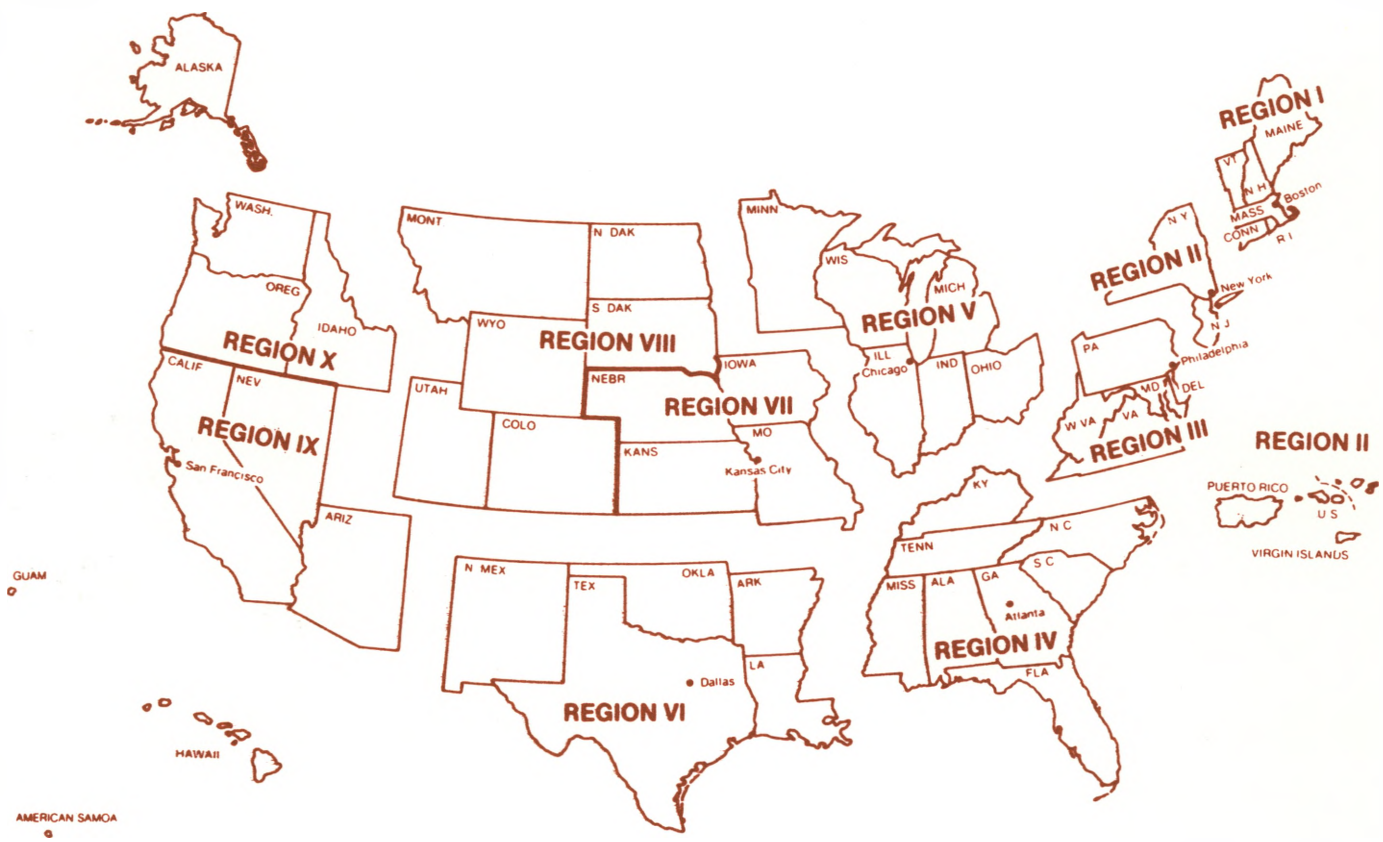

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