

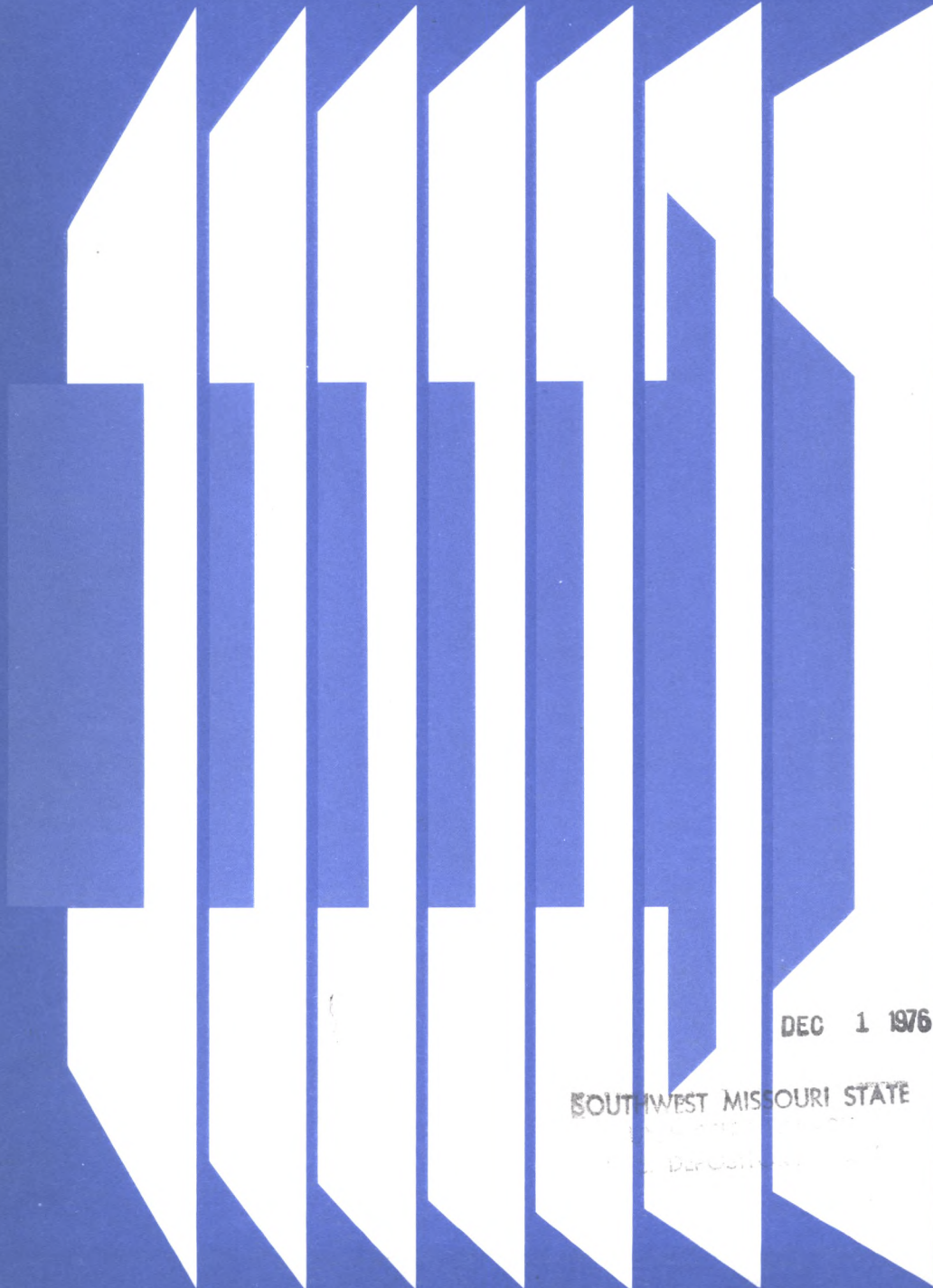
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Occupational Projections and Training Data



U. S. Department of Labor
Bureau of Labor Statistics
1976

Bulletin 1918



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Bulletin 1918



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Preface

This bulletin presents both general and detailed information on the relationship between occupational requirements and training needs. It is a revision and updating of BLS Bulletin 1824, *Occupational Manpower and Training Needs*. This bulletin was prepared as part of the Bureau of Labor Statistics program for preparing and disseminating projections of economic and occupational and industrial employment data.

Information needed to plan education and training programs and for vocational guidance includes projections of occupational requirements and information on occupational training. Chapter 1 of this bulletin discusses how occupational projections and training data can be used in planning and counseling. Chapter 2 presents an overview of occupational projections, and Chapter 3 provides information from a variety of sources on the status of occupational training. Chapter 4 gives detailed information on how workers in specific occupations obtain training, along with projections of employment requirements for each of these occupations, and statistics on training programs to the extent that they are available.

This bulletin was prepared in the Division of Occupational Outlook of the Bureau of Labor Statistics under the general direction of Neal H. Rosenthal. Daniel E. Hecker supervised the preparation of the bulletin. Harold Blitz, Chester Levine, Max Carey, Anne Kahl, and H. James Neary contributed to the collection, preparation, and analysis of the data.

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Contents

Chapters:	<i>Page</i>
1. Using occupational data for planning and counseling	1
Data on projections.....	1
Data on supply.....	2
Uses of data in planning	3
2. Occupational projections.....	4
Factors affecting occupational employment	4
Changing occupational structure	4
Growth trends in major groups	4
Net occupational openings	9
3. The status of occupational training	11
Vocational education.....	11
Private vocational schools.....	12
Apprenticeship programs	13
Employer training.....	13
Armed Forces training.....	14
Federal employment and training programs	15
Home study courses	16
Community and junior colleges	16
Colleges and universities.....	16
4. Relating training to occupational needs.....	19
The outlook for college graduates.....	19
Industrial production and related occupations.....	22
Foundry occupations.....	22
Machining occupations	22
Printing occupations.....	23
Other industrial production and related occupations	24
Office occupations	26
Clerical occupations.....	26
Computer and related occupations.....	28
Banking occupations	29
Insurance occupations	30
Administrative and related occupations	31
Service occupations	33
Cleaning and related occupations	33
Food service occupations.....	33
Personal service occupations	34
Private household service occupations	35
Protective and related service occupations	35
Other service occupations.....	36
Education and related occupations	36
Teaching occupations	36
Library occupations	38

Contents—Continued

Chapter 4—Continued	<i>Page</i>
Sales occupations	38
Construction occupations	40
Occupations in transportation activities	43
Air transportation occupations	43
Merchant marine occupations	44
Railroad occupations	44
Driving occupations	45
Scientific and technical occupations	46
Conservation occupations	46
Engineers	46
Environmental scientists	47
Life science occupations	48
Mathematics occupations	49
Physical scientists	49
Other scientific and technical occupations	50
Mechanics and repairers	51
Telephone craft occupations	51
Other mechanics and repairers	51
Health occupations	55
Dental occupations	55
Medical practitioners	55
Medical technician, technologist, and assistant occupations	57
Nursing occupations	58
Therapy and rehabilitation occupations	59
Other health occupations	59
Social scientists	60
Social service occupations	62
Counseling occupations	62
Other social service occupations	63
Art, design, and communications-related occupations	63
Design occupations	63
Communications-related occupations	65

Charts:

1. Through the mid-1980's employment growth will vary widely among occupations	5
2. Employment is expected to continue to shift toward white-collar and service occupations	6

Tables:

1. Employment in 1974 and projected requirements in 1985 by major occupational group	7
2. Projected requirements and job openings by major occupational group, 1974-85	9
3. Examples of curriculums offering training for specific occupations	12
4. Enrollments in vocational education, by level, fiscal years 1964-74	12
5. Enrollments in vocational education, by major vocational education area, fiscal year 1974	12
6. Number of private noncollegiate postsecondary schools with occupational programs and full and part-time enrollments, by type of school, 1973-74	13

Contents—Continued

	<i>Page</i>
7. Enrollments in private noncollegiate postsecondary schools with occupational programs, by program 1973–74	13
8. Training status of registered apprentices in all trades, 1962–74	14
9. Total degree-credit enrollment in 4-year institutions of higher education, and earned degrees, by level, 1963–64 to 1973–74 academic years	17
10. College degrees awarded, 1963–74 and projected 1974–85	19
11. Projected supply of college graduates, 1974–85	20
12. Projected job openings for college graduates, 1974–85	20
13. Projected openings and new supply for Ph. D's, 1974–85	21
Appendixes:	
A. Methods and assumptions for projections of manpower requirements	66
B. Detailed occupational projections	68
C. Detailed training statistics	77
D. State employment security agencies	98
E. Bibliography	101

Chapter 1. Using Occupational Data for Planning and Counseling

Occupational demand and supply information are key elements in vocational counseling and planning education and training programs. Although many individuals make career decisions based on substantial occupational information, others use little or no such data in planning their working life. Some are successful, but others are not because of misinformation or lack of information. Similarly, planners of education and training programs often do not have adequate occupational information to make wise decisions. As a result, vocationally oriented programs may prepare students for jobs in overcrowded fields while a shortage may exist in other fields.

Occupational demand and supply information serves many other purposes. Such data may be used to alert government and other interested parties to potential occupational supply-demand imbalances; to help choose between program or policy alternatives; to provide information necessary for developing other types of projections; and to encourage an informed and responsible public concern for occupational supply-demand problems.

Information in this bulletin serves all of these purposes. Other Bureau publications, however, focus on some uses more sharply. The *Occupational Outlook Handbook*, for example, which draws on the same research, provides information for use in vocational guidance.

Data in this bulletin reflect the national situation. Most vocational counseling and education and training planning, however, are done at the State or local level. To meet the needs for local data, the Bureau of Labor Statistics (BLS), in cooperation with the Employment and Training Administration and the individual State employment security agencies, has established the Occupational Employment Statistics Program. This program has the following three elements:

1. The Occupational Employment Statistics Survey—collects wage and salary employment data by occupation and industry from nonfarm establishments by mail.
2. The National/State Industry-Occupation Matrix System—shows total employment in 241 occupational categories, cross-classified by 201 industrial sectors for each State and the District of Columbia. These tables are used to project occupational requirements for States and sub-State areas.
3. The State and Area Occupational Projections Program—assists State employment security agencies in

projecting occupational requirements for States and areas. The program encompasses the training of analysts in projection techniques, research on methods of developing projections, the development of computer systems, and the publication of national data for use by States.

Under the Occupational Employment Statistics Program, projections of 1985 occupational requirements are expected to be available in the fall of 1976 for all States and Standard Metropolitan Statistical Areas (SMSA's) of 50,000 population or more that are consistent with the national occupational projections presented in this report. Information on the availability of data for individual States can be obtained from the State agencies listed in appendix D of this bulletin.

Data on projections

This bulletin presents information on future requirements for 241 occupations analyzed during preparation of the 1976-77 edition of the *Occupational Outlook Handbook*. These occupations are projected to include about 70 million workers or approximately two-thirds of all workers in 1985. Most of these occupations require considerable training. For example, projections account for about 90 percent or more of professional, sales, and craft workers, and 80 percent of clerical workers.

The data are part of the continuing BLS program to develop economic and employment projections. Appendix A gives underlying assumptions as well as methods used. Some assumptions are quantitative, such as the unemployment rate, average weekly hours, and level of the Armed Forces. Others are qualitative such as those concerning the international political climate; the institutional framework of the American economy, economic; social, technological, and scientific trends; and fiscal and monetary policies of the government.

Some assumptions that have significant effects on the projections, such as how energy needs of the United States will be met in 1985, cannot be made with precision. The outcome will depend largely on the policies of future administrations and of the oil-producing countries, as well as other uncertainties. Users, therefore, should be aware that these projections represent the level of employment required to produce the amount of

goods and services implied in the Bureau's model of the 1985 economy.

The key item in this bulletin on demand is the projected number of openings by occupation. These estimates reflect projected growth and estimated separations from the labor force for all causes, including death, retirement, sickness, and family responsibilities. Openings created because of shifts from one occupation to another are not included in the estimates of job openings, because of a lack of information.

Data on supply

Estimates of future occupational openings comprise only part of the information needed to evaluate career prospects and the adequacy of education and training programs. Information also is needed on the prospective supply of workers by occupation. The key item in the data on supply is projected new entrants. For each occupation such data 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 of persons completing specific training or related programs who can be expected to seek entry to the occupation, (4) the number of workers who can be expected to transfer from other occupations, (5) the number of qualified persons not currently in the labor force who can be expected to seek employment in the occupation, (6) unemployed persons who are qualified to work in the occupation, and (7) the number of qualified immigrants.¹

The ability to determine supply varies among occupations, depending on the availability of current data on entrants from each of these sources and the reliability of projections. In general, much better data are available on entrants from specific training programs than from other sources. The supply of physicians, for example, can be analyzed 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, projections of medical school graduates, plus projections of qualified immigrants are all that 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 are also available on which to base projections. Other components such as occupational transfers and labor force reentrants are negligible in this occupation, and the lack of such data are, therefore, not crucial to the analysis.

¹ A detailed discussion of occupational supply is presented in *Occupational Supply: Concepts and Sources of Data for Manpower Analysis*, Bulletin 1816 (Bureau of Labor Statistics, 1974).

For several other occupations, sufficient data are available to specify future supply, but the results must be used with caution because some of the sources of supply are difficult to project. For example, in engineering, the primary source of supply is new graduates of engineering schools, and data are available on degrees granted in the past on which to base degree projections. Also, data are sufficient to develop estimates of the proportion who can be expected to seek work as engineers. In the past, 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. These data, however, must be used cautiously because relative wages among related occupations and the availability of jobs in engineering versus related fields, which can vary greatly over time, influence the number of prospective entrants.

For occupations which are predominantly female, for example, nurses, a significant proportion of entrants come from the pool of qualified workers not in the labor force. Very little data are available on past patterns of entry and reentry from this source and the number who seek to enter depends on a variety of factors that are difficult to analyze, including relative wage rates, and the choice between work and other activities by women whose husbands provide adequate income.

Many other occupations requiring formal training have limited data on training completions and entry rates, making adequate analyses of supply impossible. In general, these occupations can be filled by workers from a number of different training programs and a significant portion of training can be provided on the job. These occupations include many in professional and administrative fields, such as marketing and personnel workers, but many are in the skilled craft occupations such as T.V. repairers, electroplaters, and carpenters.

For many occupations, comprehensive supply analyses are not meaningful because, compared to the number of job openings, large numbers of workers possess entry level skills. For example, the number of workers qualified to become receptionists is much greater than the number of positions available, but the number of persons seeking such jobs depends on relative wages, the availability of comparable jobs, and other market forces.

Chapter 4 presents supply analyses for a limited number of occupations; for other occupations, available current training data are presented. Chapter 3 assesses data availability from all types of training sources including junior colleges, the Job Corps, and other Government-sponsored programs, vocational education, registered apprenticeships, and colleges and universities. Appendix C summarizes in tabular form

all available data for those occupations discussed in chapter 4.

Uses of data in planning

Occupational projections and training data are used in a variety of ways to plan education and training programs. Previous issues of this publication² have indicated several uses, including statistical analyses in which data can be arranged by size of annual openings, growth rates, or employment size, and analyses in which comparisons can be made of current training and projected annual openings. In addition, examples of how national and State job prospects can be compared have been shown.

Illustrations of uses were also presented for analyzing specific occupations, including (1) occupations for which 4 years of specialized college training are required or preferred, but in which entrants come from a variety of other sources, (2) occupations for which formal vocational training (apprenticeship) is recommended, but in which many workers nevertheless enter by casual on-the-job training methods, and (3) occupations for which formal occupational training generally is not required.

Individuals engaged in vocational guidance and planning education and training programs should understand the limitations of data on occupational projections and training. For example, data on annual openings exclude those arising from occupational transfers. Some occupations may have many more openings than this bulletin indicates because large numbers of workers transfer to other occupations each year. This may occur because the occupation (1) is an "entry" occupation and the normal career ladder follows an established pattern, or (2) the occupation has low wages and/or poor working conditions which result in high turnover.

Transfers may also add significantly to supply in oc-

cupations that are subject to large numbers of entrants from other occupations due to factors such as established career ladder patterns or high relative wages. Therefore, this bulletin may significantly understate the number of workers expected to seek jobs in the occupation. Furthermore, when employers desire experienced workers, care must be used by planners in expanding training programs for the occupation.

In addition, this bulletin does not include training programs sponsored under CETA or employer training programs other than registered apprenticeships. Statistics on supply also do not include workers who qualify for occupations through Armed Forces training, correspondence school training, private vocational school training, or partial completion of a formal training program.

To use the data in this bulletin, therefore, the demand and supply structure of the occupation must be understood. On the supply side, the discussion of occupational training requirements in chapter 4 should be considered along with all available statistical data. Consideration must be given to questions such as: Is the number of reentrants to the labor force generally large in this occupation? Does Armed Forces training play a significant role in training workers for this occupation? Do established career patterns and career ladders indicate that large numbers of workers will desire to transfer into the occupation from related fields? Do employer training programs (other than registered apprenticeships for which data are available) provide large numbers of workers in these occupations? On the demand side, questions should concern the significance of openings caused by workers transferring to other occupations. Many questions can be answered with some assurance and will cause few problems in the analysis. The answers to others are in doubt, and decisions based only on available statistics must be considered carefully. Some further information, however, can be developed from the studies referred to in the bibliography in appendix E. The BLS also is developing information, to be available in late 1976, on occupational mobility, employer training in selected craft occupations in selected industries, and working patterns of college graduates.

² *Occupational Manpower and Training Needs*, Bulletin 1701, 1971, and *Occupational Manpower and Training Needs*, Bulletin 1824, 1974.

Chapter 2. Occupational Projections

This chapter presents projections of occupational requirements through the mid-1980's based on the Bureau's extensive studies of economic growth, technological change, and industrial and occupational trends. Appendix A furnishes information on the assumptions underlying these projections. Appendix B presents projections of specific occupations. More detail on the economic and industry projections underlying the occupational projections is presented in the March 1976 issue of the *Monthly Labor Review*.

Factors affecting occupational employment

Many factors will change employment levels of major occupational groups and specific occupations: (1) Growth rates of industries. Rapid growth in an industry likely would cause rapid growth of occupations heavily concentrated in that industry. Similarly, slow growth of an industry likely would cause slow growth for occupations heavily concentrated in it. (2) Changing occupational structure within an industry. Such changes can result from a variety of causes. Technological innovations in machines or production processes can cause employment in occupations to expand or contract and create a need for new occupations. For example, the computer resulted in the emergence and rapid growth of employment of programmers, systems analysts, and computer operators, but contributed to the decline in relative importance of file clerks and other clerical occupations. Changes in business operations, such as a shift to self-service in stores, also alter the occupational structure of industries. In addition, supply-demand conditions in one occupation may affect the demand for another. For example, in hospitals, nurses aides have been substituted for registered nurses during periods when registered nurses have been in short supply.

Changing occupational structure

Various factors will interact to change the occupational mix of the U.S. economy between 1974 and 1985, but most long-term trends among major categories of workers—white-collar, blue-collar, service, and farm workers—are projected to continue.

From assumptions discussed in appendix A, total employment is expected to increase about 20 percent,

from 85.9 to 103.4 million.³ Employment in both white-collar and service jobs is expected to grow faster than total employment, but employment in blue-collar jobs is expected to grow more slowly. Farm workers are expected to decline.

White-collar workers, the largest major occupational category, are projected to rise by almost 28 percent between 1974 and 1985, from 41.7 to 53.2 million (chart 1). Service workers also are expected to rise by about 28 percent, from 11.4 to 14.6 million. Blue-collar workers, the second largest major occupational category, are expected to increase by only 13 percent, from 29.8 million in 1974 to 33.7 million in 1985. The number of farm workers will decline 39 percent from 3 million in 1974 to 1.8 million in 1985.

By 1985, white-collar workers are expected to make up 51.5 percent of the economy's total employment, up from 48.6 percent in 1974 (chart 2). The share of the total attributed to service workers also is expected to increase, from 13.2 to 14.1 percent. The blue-collar share of total employment, on the other hand, is expected to decline from 34.6 percent in 1974 to 32.6 percent in 1985, despite the projected increase in the number of these workers. Farm workers are expected to make up only 1.8 percent of total employment in 1985, down from 3.5 percent in 1974.

Growth trends in major groups

Professional and technical workers. Professional and technical employment, which includes such highly trained personnel as physicians, lawyers, engineers, and scientists, is expected to rise from 12.3 million in

³ Statistics on employment in this report are based on the concept used by the Current Population Survey that each individual is counted once in his major occupation. The data for total employment here, therefore, differ from a count of jobs as presented in the articles by Ronald E. Kutscher, and Charles T. Bowman and Terry H. Morlan, in the March 1976 issue of the *Monthly Labor Review*. Since one worker may hold more than one job, the job count in these articles is greater than that presented here. Additional differences between the totals occur because the job count is based primarily on data from a survey of establishments collected by State agencies in a cooperative program with the Bureau of Labor Statistics, and the count of individuals is based on a survey of households conducted by the Bureau of the Census for the BLS. The reasons that cause the employment count to differ between these two surveys are indicated in "Comparing Employment Estimates from Household and Payroll Series," *Monthly Labor Review*, December 1969, pp. 9-20.

Chart 1

Through the mid-1980's employment growth will vary widely among occupations

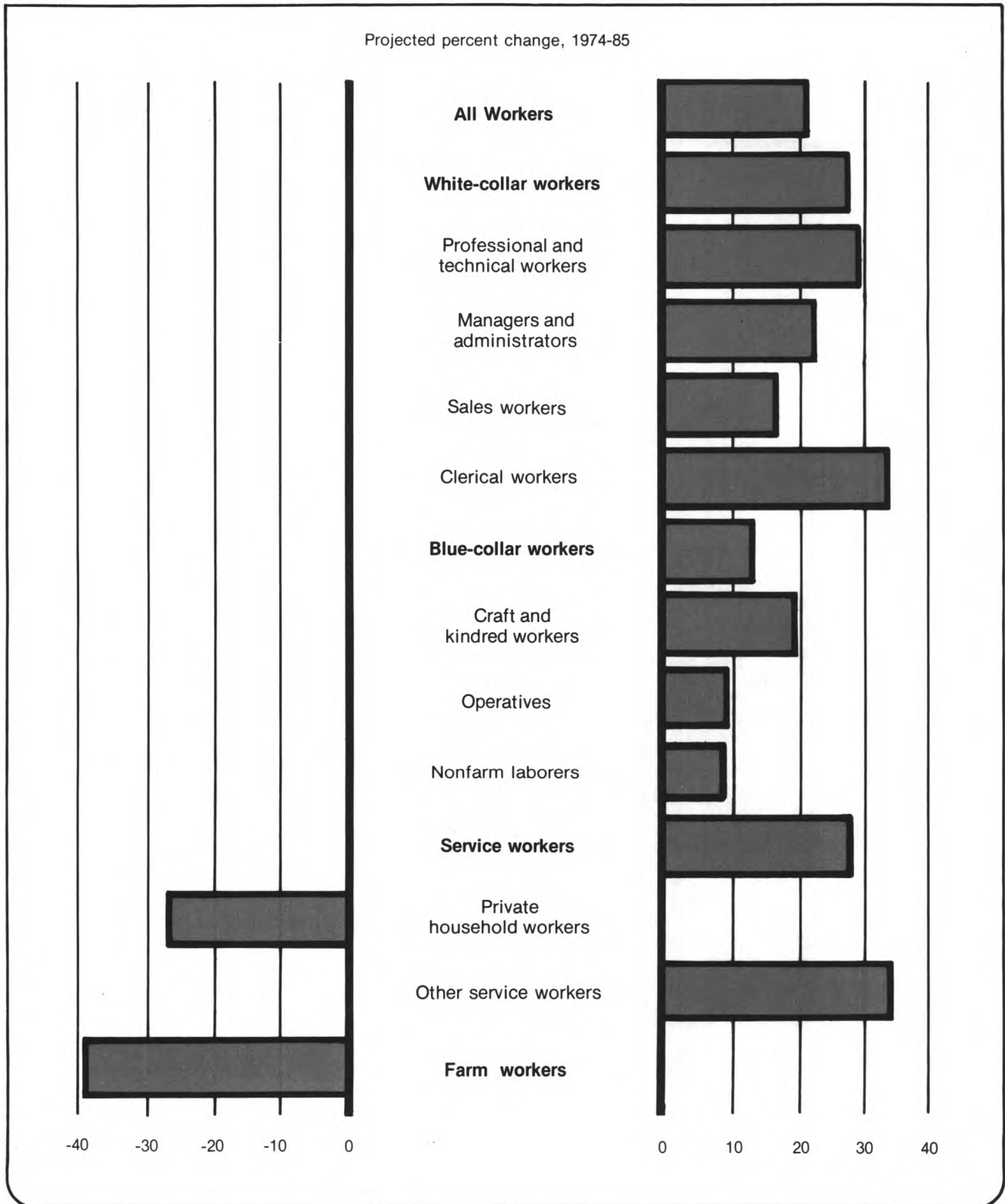
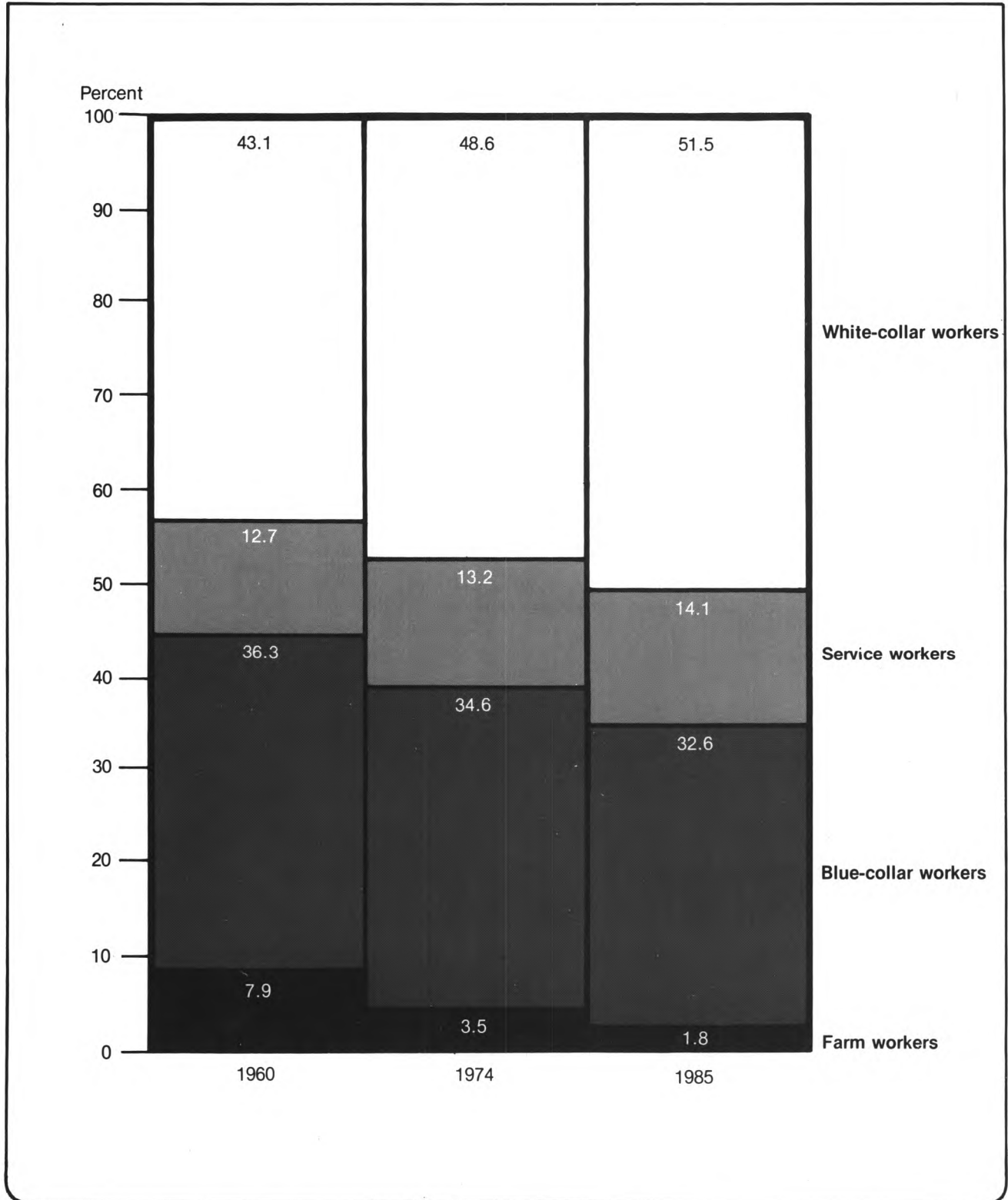


Chart 2

Employment is expected to continue to shift toward white-collar and service occupations



1974 to 16 million in 1985 or one and one-third times the rate of increase projected for total employment. As a result, the share of total employment attributed to professional and technical workers is expected to grow from 14.4 to 15.5 percent over the 1974–85 period (table 1).

Employment in this area is expected to expand as a rising population requires more goods and services and as the Nation makes greater efforts in energy exploration and production, mass transportation, urban renewal, and environmental protection. The quest for scientific and technical knowledge is bound to grow and raise the demand for scientific and technical workers. During the late 1970's and early 1980's, emphasis will continue on social sciences and medical services. The demand for professional workers to develop and use computer resources also is projected to grow rapidly.

Although professional and technical workers as a group are expected to increase rapidly, growth rates will differ among individual fields. Noteworthy is the difference between two of the largest occupations in the group—registered nurses and teachers. Employment of nurses is projected at 1.2 million in 1985, about one-half more than the number employed in 1974, as the population grows and as a larger percentage of the population becomes older. The number of people covered by hospitalization and medical insurance, including medicare and medicaid, also will increase and stimulate demand for nurses. At the same time the older population is growing, the teen-age population will decline due to the low birth rates of the 1960's. Consequently, the demand for secondary school teachers is expected to decline slightly, from about 1.2 million in 1974 to about 1.1 million in 1985. A more rapid decline in employment would be projected if it were not for an anticipated decrease in the ratio of students to teachers.

Managers and administrators. Employment of managers and administrators is projected to reach 10.9 million in 1985, up from 8.9 million in 1974, or a slightly faster rate than that anticipated for total employment. The share of total employment attributed to managers and administrators is expected to increase by a small amount, from 10.4 to 10.5 percent in 1985.

Changes in business size and organization have resulted in differing trends for self-employed and salaried managers. The number of self-employed managers (proprietors) is projected to continue to decline as the trend toward larger business establishments continues to restrict growth in the total number of business establishments. The expansion of some kinds of small businesses, such as quick-service grocery stores and restaurants, however, should slow the rate of decline. Requirements for salaried managers, on the other hand, are expected to continue to grow rapidly as firms increasingly depend on trained management specialists. Technological developments will contribute further to

Table 1. Employment in 1974 and projected requirements in 1985 by major occupational group

[Numbers in thousands]

Occupational group	1974 employment		Projected 1985 requirements	
	Number	Percent	Number	Percent
Total.....	85,936	100.0	103,400	100.0
White-collar workers.....	41,739	48.6	53,200	51.5
Professional and technical workers.....	12,338	14.4	16,000	15.5
Managers and administrators.....	8,941	10.4	10,900	10.5
Salesworkers.....	5,417	6.3	6,300	6.1
Clerical workers.....	15,043	17.5	20,100	19.5
Blue-collar workers.....	29,776	34.6	33,700	32.6
Craft and kindred workers.....	11,477	13.4	13,800	13.3
Operatives.....	13,919	16.2	15,200	14.7
Nonfarm laborers.....	4,380	5.1	4,800	4.6
Service workers.....	11,373	13.2	14,600	14.1
Private household workers.....	1,228	1.4	900	.9
Other service workers.....	10,145	11.8	13,700	13.2
Farm workers.....	3,048	3.5	1,900	1.8

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

employment growth. For example, more technically trained managers will be needed to administer research and development programs and make decisions on the installation and use of automated machinery and computers.

Manager employment in various industries is expected to increase at different rates. For example, in the relatively slow growing manufacturing sector, employment of managers between 1974 and 1985 is projected to increase about 10 percent contrasted with a 40-percent growth in service industries.

Salesworkers. Employment in sales occupations is projected to rise from 5.4 million in 1974 to 6.3 million in 1985, but the rate of increase is slower than that anticipated for total employment. As a result, the proportion of total employment attributed to sales workers is expected to decrease from 6.3 to 6.1 percent.

Much of the growth in salesworkers is expected to stem from expansion of the retail trade industry, which employs about one-half of these workers. The demand for both full- and part-time salesworkers in retail trade is expected to increase as population grows and stores remain open longer and expand into suburban areas. However, the more widespread use of laborsaving merchandising techniques, such as self-service and checkout counters, should moderate employment growth. Consequently, the rate of growth for salesworkers in retail trade is expected to be somewhat slower than that for salesworkers in wholesale trade, insurance, real estate, and manufacturing.

Clerical workers. With 15 million workers in 1974, the clerical group was the largest of all occupational groups. Clerical employment is expected to rise to 20.1 million in 1985, an increase of about one-third, or more than any other group but service workers, excluding private household. The clerical share of total employment is projected to rise from 17.5 to 19.5 percent during the 1974-85 period. Developments in computers, office equipment, and communications devices will retard employment growth in some clerical occupations and increase it in others. Growth in the employment of file clerks and office machine operators, for example, will be limited as computers are used more extensively to arrange, store, and transmit information. At the same time, employment of computer and peripheral equipment operators is expected to increase substantially. Advances in mail processing equipment should have an adverse impact on the growth of postal clerks. Dictation machines have reduced severely the need for stenographers, and further reductions are anticipated, although the need for stenographers who are trained as court reporters is expected to increase.

Technological developments are unlikely to affect many types of clerical workers, including secretaries, typists, and receptionists, whose jobs involve a high degree of personal contact. Employment in these three occupations is projected to grow about 2.1 million between 1974 and 1985, or more than two-fifths of the total growth in the clerical group. Secretaries alone are expected to grow nearly 1.6 million. The rapid growth anticipated for secretaries, typists, and receptionists is due partly to the high concentrations of these workers in rapidly expanding industries such as medical and other health services and miscellaneous business services.

Craft and kindred workers. Employment in this highly skilled blue-collar group is projected to increase at about the same rate as total employment, rising from 11.5 million in 1974 to 13.8 million in 1985. The craft share of total employment will continue to be slightly more than 13 percent.

Construction trade workers and mechanics, the two largest occupational categories in the craft group, are expected to make up about two-thirds of the group's employment gain, and blue-collar supervisors and metal craftworkers, most of the remainder. Because of advances in printing technology, very little growth is anticipated in printing crafts.

The number of workers in construction trades is projected to increase from 3.5 to 4.4 million during the 1974-85 period, primarily as a result of growth in the construction industry. Population growth and the relatively low levels of housing erected in the mid-1970's should create a strong pressure for new housing in the years ahead. The industry also will be stimulated as more commercial and industrial structures are re-

quired, and as alteration and maintenance needs for existing structures increase. Nearly all construction trades are expected to grow and particularly rapid increases are anticipated for heavy equipment operators, plumbers, structural metal workers, roofers, cement finishers, and electricians.

As our society becomes increasingly mechanized, the number of mechanics needed to repair industrial and consumer machinery is projected to rise from 3 million in 1974 to 3.6 million in 1985. A large part of this increase is attributed to the demand for mechanics who work on equipment powered by internal combustion engines, such as motor vehicles and much of the heavy construction equipment.

Mechanics who repair computers, office machines, air conditioners, and radios and television sets are expected to grow most rapidly.

Operatives. The growth of operative occupations, which employ more workers than any other blue-collar group, is tied closely to the output of manufacturing industries. As consumer demand continues to shift from goods- to service-producing industries and as more sophisticated technological advances increase productivity, employment of operatives is expected to slow to half the rate of increase anticipated for total employment—from 13.9 million in 1974 to 15.2 million in 1985. Consequently, the operative share of total employment is expected to decline from 16.2 percent in 1974 to 14.7 percent in 1985. About 3 of every 5 operatives in 1974 worked in manufacturing industries. Large numbers were machine operators, assemblers, and inspectors. Outside of manufacturing, operatives were concentrated in trade and transportation industries. Many were transport equipment operatives, such as truckdrivers and route workers.

Employment requirements for individual operative occupations reflect different rates of growth and differing technological innovations of the employing industries. For example, the projected decline in the employment of spinners and weavers reflects not only the anticipated relatively small increase in the output of the fabric and yarn industry where these workers are concentrated, but also the increased mechanization of spinning and weaving processes.

Nonfarm laborers. Like operatives, laborers are expected to increase less than one-half as fast as the average for all occupations. Employment in this small blue-collar group is projected to rise from 4.4 to 4.8 million between 1974 and 1985. Laborers' share of total employment is expected to decline from 5.1 to 4.6 percent.

Increases in demand for laborers are expected to be offset partially by rising output per worker resulting from the continuing substitution of machinery for manual labor. For example, power-driven equipment such

as forklift trucks, derricks, cranes, hoists, and conveyor belts will take over more of the handling of materials in factories, at freight terminals, and in warehouses. Power-driven machines also will be doing more excavating, ditch digging, and similar work. In addition, an increasing number of plants will install integrated systems to process and handle materials and equipment.

Service workers, excluding private household. Numbering 10.1 million in 1974, these service workers are projected to increase to 13.7 million in 1985, a faster rate of increase than that anticipated for any other occupational group. As a result, their share of the total is expected to rise from 11.8 to 13.2 percent. Employment growth in this heterogeneous occupational group, which includes such jobs as police officer, cook, hairdresser, and janitor, will stem mainly from growth in population, business activity, and personal income. Technological change affects service workers less than it does many other categories; hence, productivity advances do not restrain their employment growth very much.

Private household workers. In contrast to the rapid employment gain anticipated for other service workers, the number of private household workers is projected to decline from 1.2 million to 900,000 between 1974 and 1985. A continued decline for these workers is expected despite a rise in demand for them. As personal incomes rise and more women work outside the home, the demand for maids and other household workers should increase. However, fewer persons are expected to seek household jobs because of the poor earnings and low social status associated with these jobs.

Farm workers. Despite rapid growth in the demand for

agricultural products both at home and for export, farm workers are expected to decline from 3 to 1.9 million between 1974 and 1985 as productivity rises on farms. Improved machinery, fertilizer, seeds, and feed will lead to greater output with fewer workers. New hybrid plants are expected to produce sturdier fruits and vegetables which can be harvested mechanically. Developments in packing, inspection, and sorting systems for fruits, vegetables, and other products also will reduce employment.

Net occupational openings

Occupational growth provides only part of the estimate of future requirements. More than twice as many openings will result from deaths and retirements as from growth over the 1974–85 period. Openings from growth and replacement are expected to be about 57.6 million or average 5.2 million jobs each year. Of this number, replacement needs are expected to total 40.2 million compared with 17.4 million for growth.

Replacement needs will be more significant than job growth in each of the major occupational groups, particularly in occupations which employ many women and older workers. However, in some occupations, growth requirements are likely to exceed those for replacement.

Occupational shifts also will create many job openings. For example, when a technician is upgraded to an engineer, a technician job opening is created. This shift also adds to the supply of engineers. Except for some professions specifically noted for which data are available, estimates for job openings in this bulletin exclude transfers. However, data are being developed on occupational mobility from the 1970 Decennial Census.

Table 2. Projected requirements and job openings by major occupational group, 1974–85

[Numbers in thousands]

Occupational group	1974 employment	Projected 1985 requirements	Percent change	Openings, 1974–85		
				Total	Growth	Replacements
TOTAL	85,936	103,400	20.3	57,600	17,400	40,200
White-collar workers.....	41,739	53,200	27.5	34,300	11,500	22,800
Professional and technical workers.....	12,338	16,000	29.4	9,400	3,600	5,700
Managers and administrators.....	8,941	10,900	21.6	5,200	1,900	3,200
Salesworkers.....	5,417	6,300	15.7	3,400	900	2,600
Clerical workers.....	15,043	20,100	33.8	16,300	5,100	11,300
Blue-collar workers.....	29,776	33,700	13.2	12,500	3,900	8,600
Craft and kindred workers.....	11,477	13,800	19.9	5,100	2,300	2,800
Operatives.....	13,919	15,200	9.0	6,000	1,300	4,800
Nonfarm laborers.....	4,380	4,800	8.8	1,400	400	1,100
Service workers.....	11,373	14,600	28.0	11,000	3,200	7,800
Private household workers.....	1,228	900	-26.7	600	-300	900
Other service workers.....	10,145	13,700	34.7	10,400	3,500	6,900
Farm workers.....	3,048	1,900	-39.0	-100	-1,200	1,000

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

For ease of comparison with training data, this bulletin lists job openings of individual occupations in terms of average annual openings rather than for the whole

1974–85 period. Average openings data were developed by dividing projected openings for the entire 1974–85 period by 11.

Chapter 3. The Status of Occupational Training

Each year occupational training is needed by millions of young people and the disadvantaged to qualify for entry level jobs and by experienced workers who need further training for advancement.

As shown in the preceding chapter, the Nation increasingly is shifting from blue- to white-collar and service jobs, which often require high levels of education and skill acquired through formal training. Although blue-collar jobs are projected to grow more slowly than the average, an increasingly large proportion of blue-collar workers are expected to be craftworkers, who require more training than other blue-collar workers. In addition, the proportion of formally educated workers within occupations has been increasing. As these trends continue, more jobs than ever before will require specialized training. Furthermore, occupational training is being broadened to prepare workers for the changing nature of jobs and for changing labor market conditions.

This chapter covers available training for occupations through:

- Vocational education
- Private vocational schools
- Apprenticeship programs
- Employer training
- Armed Forces training
- Federal employment and training programs
- Home study courses
- Junior colleges and community colleges
- Colleges and universities

The discussions of occupational training cover the nature of training programs, available data on training, uses of data for supply-demand analysis, and problems associated with using data. Chapter 4 discusses specific training needed to enter each of 241 occupations. Appendix C presents statistics on training for each detailed occupation.

Data on occupational training are most useful when accompanied by entry rate information, because not all graduates of training programs for particular occupations enter those occupations. Entry rates, applied to current or projected training completions, indicate the number of people with specific training expected to seek entry into an occupation. This chapter covers

sources of entry rates and chapter 4 incorporates available data in occupational analyses.

A recent BLS study⁴ provides an in-depth discussion of ways to analyze training statistics and other data on occupational supply for vocational guidance and education planning and presents a detailed bibliography of data sources.

Vocational education

Vocational education includes secondary, post-secondary, and adult vocational and technical programs funded under the Vocational Education Act of 1963, as amended by the Vocation Educational Amendments of 1968. The legislation provides that vocational-technical education include within its scope all occupations which are not generally considered professional and do not require a baccalaureate or higher degree.

Vocational education is conducted on three levels. Secondary vocational education is provided to high school students as part of the high school curriculum and includes academic as well as vocational courses. Post-secondary vocational education is for persons who have completed or left high school and are available for full-time study in preparation for entering the labor market. Adult education retrains as well as updates and upgrades skills of persons already in the labor force.

Types of training available. Originally, vocational education emphasized agricultural and trade and industrial education. It now includes other areas such as distributive occupations, health, home economics, and office occupations. Consumer and homemaking skills are another area, but the relation between training and an occupation is not so direct in this field as in the other fields. Special programs for the disadvantaged and handicapped also are included. Curriculums are designed to prepare workers for specific occupations.

⁴ *Occupational Supply: Concepts and Sources of Data for Manpower Analysis.*

Table 3 shows examples of instructional programs related to job titles in the *Dictionary of Occupational Titles*.

Enrollments. Vocational education grew rapidly after the passage of the Vocational Education Act of 1963, and further growth was spurred by the 1968 amendments (table 4). Enrolled in federally aided vocational-technical education programs in 1974 were 13.6 million persons, including 1.6 million disadvantaged and more than 230,000 handicapped. Programs are grouped into eight major vocational areas. The consumer and homemaking area, which had the largest enrollment—3.2 million—was followed by the office and the trades and industry areas which had about 2.8 million each (table 5). Programs with the largest enrollments in 1974 were: typing and related skills (661,730); agricultural production (552,441); stenography, secretarial, and related skills (656,522); filing and office machines (508,915); and accounting and computing (429,708).

Completion and placements. Of the 1,921,000 persons who had completed vocational education programs in

Table 3. Examples of curriculums offering training for specific occupations

Major vocational area	Instructional program	Occupational title
Agriculture	Agricultural mechanics	Farm equipment mechanic
	Soil Forestry	Soil conservationist Forest aid
	Floristry	Floral designer
Distribution	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*, (U.S. Department of Health, Education, and Welfare, Office of Education; and U.S. Department of Labor, Manpower Administration) OE80061, July 1969.

Table 4. Enrollments in vocational education, by level, fiscal years 1964-74

Fiscal year	Total ¹	Secondary	Post-secondary	Adult
1964	4,566,390	2,140,756	170,835	2,254,799
1965	5,430,611	2,819,250	207,201	2,378,522
1966	6,070,059	3,048,248	442,097	2,530,712
1967	7,047,501	3,532,823	449,906	2,941,109
1968	7,533,936	3,842,896	592,970	2,987,070
1969	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

¹ Unduplicated total.

SOURCE: *Annual Reports, Vocational and Technical Education, 1964-1974*, U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Occupational and Adult Education.

fiscal year 1974,⁵ approximately 60 percent were available for placement. (Of this 60 percent, about 68 percent obtained employment in the field for which they were trained, or in a related field; 23 percent were employed in other fields; and 9 percent were unemployed). Twenty-five percent were not available for placement, and 15 percent did not report or their status was unknown.⁶

Private vocational schools.

In the 1973-74 academic year there were 7,824 private vocational schools, including 2,401 cosmetology/barber schools, 1,477 flight schools, 1,241 business/office schools, and 1,077 hospital schools, according to the NCES. Enrollments were greatest in business/office schools (319,700); trade schools (126,342); cosmetology/barber schools; (113,643); and vocational-technical schools (112,605) (table 6).

Private vocational schools vary greatly in size, with enrollments from under 24 to over 5,000 students. Most have small enrollments, however; 90 percent have fewer than 250 students. About 170 different course areas were offered by the 7,824 private vocational schools. Some business schools offer courses in short-hand, typing, stenography, and fundamentals of accounting, while others offer only one course. Trade schools offer courses in many fields, such as auto mechanics, barbering, locksmithing, radio-TV broadcasting, and truckdriving. The programs in other schools cover a broad spectrum of fields including commercial art, health-related occupations and fashion design.

The courses offered by private vocational education

⁵ See appendix C. Excludes Consumer and homemaking completions.

⁶ *Summary Data, Vocational Education, Fiscal Year 1974*, U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Occupational and Adult Education.

Table 5. Enrollments in vocational education, by major vocational education area, fiscal year 1974

Vocational education area	Number	Percent distribution
Total	113,555,629	100.0
Agriculture	976,319	7.2
Distribution	832,905	6.1
Health	504,913	3.7
Occupational home economics	496,117	3.7
Office	2,757,464	20.3
Technical	392,887	2.9
Trades and industry	2,824,317	20.8
Consumer and homemaking	3,206,567	23.7
Other programs ²	1,803,023	13.3

¹ Unduplicated.

² Includes prevocational, prepostsecondary, remedial, and other not elsewhere classified. Some overlapping with other programs.

SOURCE: U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Occupational and Adult Education.

school are classified, for analytic purposes, into the same seven areas used for public vocational education programs: agriculture, distributive, health, home economics, office, technical, and trades and industry.

In 1973-74, about 40 percent of all students in private vocational education schools were enrolled in the trades and industry programs; almost 23 percent in the office programs; and approximately 16 percent in the distributive programs (table 7).

Further detail on enrollments and data on completions are not available.

Apprenticeship programs

Training authorities recommend formal apprenticeship training as the best way to acquire all-round proficiency in a skilled craft. It provides a thorough knowledge of the trade and enables the apprentice to perform most tasks completely.

Most apprenticeship programs have committees of employers and local trade unions which interview applicants, review the trainee's progress, and determine when an apprenticeship has been completed satisfactorily. Most programs are registered with Federal or State

Table 6. Number of private noncollegiate post-secondary schools with occupational programs, and full- and part-time enrollments, by type of school, 1973-74

Type of school	Number of schools	Enrollments		
		Total	Full-time	Part-time
Total	7,824	887,365	583,866	303,499
Vocational-technical	588	112,605	83,794	28,811
Trade	678	126,342	94,200	32,142
Technical Institute	163	49,260	38,947	10,313
Business/Office	1,241	319,700	180,156	139,544
Cosmetology/Barber	2,401	113,643	91,841	21,802
Flight	1,477	74,963	23,806	51,157
Hospital	1,077	62,693	62,298	395
Other	199	28,159	8,824	19,335

Table 7. Enrollments in private noncollegiate post-secondary schools with occupational programs, by program, 1973-74

[In thousands]

Program	Number	Percent distribution
Total	887.4	100.0
Agriculture	2.1	.2
Distributive	140.5	15.8
Health	109.2	12.3
Home Economics .....	.2	—
Office	202.0	22.8
Technical	80.2	9.0
Trades and Industry	353.2	39.8

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

NOTE: Detail may not add to total due to rounding.

apprenticeship agencies. 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. 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 apprenticeship for each apprenticeable trade by State.⁷ Of the 44,768 registered apprenticeship completions in 1974, 58.9 percent were in construction trades, 10.1 percent in metalworking, 5.1 percent in printing, and the remaining 25.9 percent in a miscellaneous trades category. Since the mid-1960's, apprenticeship registrations have increased significantly.⁸ (table 8). Training craftworkers to meet future manpower requirements has become a common goal for employers, unions, and government manpower officials. Apprenticeship cancellations which represent a potential loss of highly trained workers may not be so serious as they appear, however, since many dropouts eventually become skilled journeymen through less formal means. Many apprentices, particularly when jobs are plentiful, drop their apprenticeship because of the opportunity to work at the journeyman level.

Employer training

In employer training, workers learn occupations either formally or informally, usually on the job. Both

⁷ See appendix C.

⁸ Annual copies of *Apprentice Registration Actions, by Region and State*, 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* (formerly the *Manpower Report of the President*), U.S. Department of Labor, contains a tabulation on the training status of registered apprentices.

Table 8. Training status of registered apprentices in all trades, 1962-74

Year	In training at beginning of year	Apprentice actions during year			In training at the end of year
		New registrations and reinstatements	Completions	Cancellations ¹	
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	97,896	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	² 278,431	78,535	42,071	40,891	274,004
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	² 269,214	109,706	44,768	55,285	278,867

¹ Includes voluntary quits, layoffs, discharges, out-of-State transfers, upgrading 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.

skilled and semiskilled occupations have at least three on-the-job training paths—*apprenticeship, formal on-the-job instruction, and learning by doing*. Apprenticeship programs, discussed in the preceding section, represent formal employer training with skills acquired on the job in conjunction with related classroom instruction. Formal on-the-job instruction may range from structured training by designated instructors to periodic instruction from supervisors and other employees.

In most instances, employer training takes place informally within the work environment. Most workers, according to a study on occupational training conducted in 1963 by the Department of Labor, had “just picked up” their current skills informally on the job⁹ by observing fellow workers, practicing during lunch hours and coffee breaks, and by asking questions of experienced workers.

The lack of data on employer training hinders proper manpower analysis. The BLS, with the support of the Employment and Training Administration, conducted a pilot survey in 1971 and 1972 to test the feasibility of collecting data on enrollments and completions of occupational training in selected industries, and to determine the best method of collecting such data.¹⁰ The results were generally positive. With further Education and Training Administration support, the Bureau has in progress a nationwide, full-scale survey of occupational training for 13 occupations in selected metalworking industries. Results of this survey should be available by fall 1976.

⁹ *Formal Occupational Training of Adult Workers*. Manpower/Automation Research Report No. 2 (U.S. Department of Labor, December 1964).

¹⁰ See “The BLS Pilot Survey of Training in Industry,” *Monthly Labor Review*, February 1974, pp. 26-32.

Armed Forces training

The Armed Forces is one of the Nation’s largest sources of trained manpower. Military training programs are classified in five categories: recruit training, specialized skill training, officer acquisition training, professional development training, and flight training. Of these, specialized skill training is the most important in numbers and influence. Specialized training provides military personnel with skills for technical jobs such as radio communication and aircraft engine repair, and for administrative and service-related specialties such as clerical work and military police duty.

The impact of specialized training is clearly reflected by the occupational distribution of the Armed Forces.¹¹ The number of enlisted personnel in each of the nine major occupational groups on June 30, 1975, is as follows:

Infantry, gun crews, and seamanship specialists	223,558
Electronic equipment repairers	179,077
Communications and intelligence specialists.....	122,538
Medical and dental specialists	83,803
Other technical and allied specialists	33,872
Administrative specialists and clerks	323,253
Electrical and mechanical equipment repairers	360,006
Craftworkers	86,574
Service and supply handlers.....	192,611
Total	1,605,292

This tabulation shows that the skills of enlisted personnel are concentrated in the mechanical and technical areas. Thus, the military is potentially a major source of trained civilian workers in these fields.

¹¹ Appendix table C-6 presents detailed statistics on the 67 occupational subgroups.

It is difficult to determine from the Armed Forces listing the transferability of military skills to civilian skills. For example, the Air Force occupation Navigation/Bombing Trainer and Flight Simulator Specialist appears to have no relation to a civilian occupation. However, studies indicate that the skills necessary for this service occupation are highly related to those needed by electronics technicians. To "translate" military job titles, the Department of Defense, Office of the Assistant Secretary of Defense for Manpower and Reserve Affairs, has compiled a two-section Military-Civilian Job Comparability Manual. The first section relates military job specialties by service branch either "highly" or "substantially" to civilian occupations. A second section, essentially the inverse of the first, relates civilian job categories to military specialties. Although intended as a guide for employers and vocational counselors in job placement for the veteran, the manual can serve as a useful tool for manpower analysis.

Federal employment and training programs

The Federal Government has sponsored employment and training programs on a formal basis 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, this nationally directed program was replaced by a decentralized system of Federal, State, and local employment and training activities. Although a few programs, such as WIN, have been retained under direct Federal control, most Federal employment and training funds are now distributed to State and local governments, and along with them, the responsibility for planning and managing programs. The Federal Government, however, has retained oversight and technical assistance functions.

In fiscal year 1975, there were 431 eligible units of government, called prime sponsors, receiving funds. The comprehensive employment and training programs of these prime sponsors can include—but are not limited to—

- Outreach to make needy persons aware of available employment and training services.
- Assessment of individual needs, interests, and potential; referral to appropriate jobs or training; and followup to help new workers stay on the job.
- Orientation, counseling, education, and classroom skill training to help people prepare for jobs or qualify for better jobs.
- Subsidized on-the-job training.
- Allowances to support trainees and their families and needed services, such as child care and medical aid.
- Labor market information and job redesign to open up positions for employment and training program graduates.
- Transitional public service jobs.
- Special programs for groups such as Indians, migrants, persons with limited English, exoffenders, and youth.

The act also provides that, to the maximum extent feasible, employment and training services, including the development of job opportunities, be provided to the unemployed, underemployed, and economically disadvantaged. 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 service, training agencies, and where appropriate, agriculture. The councils help governments decide on the employment and training services needed in their areas.

In fiscal year 1975, its first year of operation, CETA served over 1,510,000 individuals. About 21 percent received classroom training; 5 percent, on the job training; 25 percent, public service employment; and 43 percent, work experience. The remaining 6 percent received many services designed to improve their employability. Unfortunately, under this decentralized system, data on training are not available on a national basis. However, State and local area data may be available from prime sponsors.

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

WIN II is administered jointly by the Department of Labor and the Department of Health, Education, and Welfare through State employment services (or other employment and training agencies) and welfare agencies across the country. To serve WIN participants better, staffs of the two agencies have been brought together in the same office at national and regional levels and to a great extent at State and local levels as well. WIN II may provide participants with job development services and referrals, preparation for finding employment, subsidized employment, limited training, and supportive services such as child care. Upon registration, people receive labor market information and voluntary referrals to jobs. During fiscal year 1975, there were 586,060 participants, and 170,641 or about 30 percent were helped to move into unsubsidized jobs.

Job Corps. The Job Corps assists youth between 16 and 21 years of age, mostly school drop-outs, who have low educational records and who are "economically disadvantaged," become more responsive, 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 manpower programs in that centers provide residential living 24 hours a day, 7 days

a week. Centers vary in enrollment from 150 to 2,200; may be urban or rural; and serve men, women or both.

For the fiscal year ending June 30, 1974, training was provided 63,300 corpsmembers in 61 centers in 31 States and Puerto Rico. Among the fields of training were clerical-sales, service, forestry-farming, food service, auto and machine repair, construction trades, electrical appliance repair, industrial production, transportation, and health occupations. School and military placements constitute a significant proportion of all placements, but job placements predominate. In fiscal year 1974 approximately 15,250 Job Corps trainees were placed in jobs, about 7,000 of whom were placed in the field for which they were trained.

Home study courses

In 1973, more than 4.3 million persons were enrolled in home study (correspondence) courses which were accredited by the National Home Study Council. These courses vary in length, skill level, and degree of specialization, and include academic instruction, vocational training, and personal enrichment programs. Courses are useful primarily for persons already employed, in the Armed Forces, living in rural areas, or for people who cannot leave home for institutional training.

In 1973, over 1.8 million students were enrolled in home study private schools; over 1.5 million through the Federal Government and the military services; over 300,000 in religious schools; and almost 14,000 in business and industrial training. However, information is lacking about the number of entrants, completions, and follow-up of persons trained in specific occupations.

Community and junior colleges

Community colleges serve many functions. For some students, they provide the first 2 years of academic training leading to a bachelor's degree. For others, they offer educational programs which prepare students for specific occupations upon graduation.

Although the typical program lasts 2 years or more, a number of courses can be completed within 1 year. Types of career education include business and commerce technologies; data processing technologies, including computer maintenance as well as operation and programming; health services and paramedical technologies; mechanical and engineering technologies; natural science technologies; and public-service-related technologies such as law enforcement.

According to the American Association of Community and Junior Colleges, the number of schools in operation grew about 77 percent between 1960 and 1974, and enrollments reached over 4 times the 1960 level.

Through the Higher Education General Information Survey (HEGIS), the National Center for Education

Statistics (NCES) compiles data each year on associate degrees and other awards below the baccalaureate.¹² These data represent all awards granted, including 2- and 3-year degree programs offered by 4-year colleges. Two-year colleges generally have awarded over 80 percent of all degrees.

Between July 1, 1973 and June 30, 1974, the time frame of the most recent survey for which data are available, about 370,000 associate degrees and other awards below the baccalaureate were granted in the United States. More than half were in curriculums designed to provide occupational competence at the technician or semiprofessional level.

The data provided by the NCES are in some cases classified by relatively broad curriculum areas. For example, according to the latest survey, 4,360 awards were granted in "General data processing technologies." In the absence of detailed descriptions of the curriculum content leading to these awards, their treatment as potential supply in more narrowly defined occupations such as computer operator, peripheral equipment operator, or programmer has some weaknesses. However, meaningful estimates of the availability of graduates in many occupations can be made by grouping the more narrow specialties. Data on junior college degrees related to specific occupations are presented in appendix C.

Projections of degrees awarded below the baccalaureate are not available and are a critical missing element in the supply analysis of specific occupational fields. Statistics also are unavailable on the projected composition of State and local junior college enrollments by curriculum and full-or part-time status. However, several State administrators of junior college systems have compiled data on these and other topics. For example, past experience in Illinois suggests that future junior college enrollments in that State may include a higher proportion of students in career-oriented curriculums as well as increases in part-time enrollment and adult education. Local manpower planners can contact State junior college administrators for information to assess State educational needs.

Colleges and universities

College training covers a wide range of subjects—including engineering, natural sciences, humanities, arts, business, law, and medicine. Most bachelor's degree programs require 4 years, and professional training generally requires several additional years.

The NCES collects data on numbers of institutions, enrollments, and earned degrees. In 1974, there were

¹² For a manual describing the taxonomy, consult *a Taxonomy of Instructional Programs in Higher Education*. OE-500064-70 (U. S. Department of Health, Education, and Welfare, Office of Education, 1970).

1,887 4-year institutions of higher education, 552 public and 1,335 private. Since 1970, the number of 4-year institutions has increased by 220, or over 13 percent.

Enrollments in colleges and universities have increased steadily since the late 1940's; however, the rate of increase in recent years has been declining (table 9). In the fall of 1974, 6,825,000 persons were enrolled in degree-credit programs in 4-year institutions.

The number of earned degrees also has increased steadily. In 1974, 954,000 persons earned bachelor's degrees, 278,000 earned master's degrees, 33,800 earned doctorates, and 54,300 earned first professional degrees. Earned degree statistics by curriculum and degree level are presented in discussions of individual occupations in chapter 4 and in appendix tables C-2 and C-3.

Projections. The NCES, in addition to collecting current data on earned degrees, annually develops 10-year projections of degrees granted by curriculum at the baccalaureate level and above. Historical trends and projections, along with a discussion of the projection methodology, are published in *Projections of Education Statistics to 1984-85* (NCES 76-210). Projections of total degrees over the 1974-85 period are presented in the outlook for college graduates and projections by field are presented in discussions of individual occupations in chapter 4.

The Bureau of Health Manpower within the Health Resources Administration, U.S. Public Health Service, U.S. Department of Health, Education, and Welfare has collected training data on health manpower and developed projections of completions of formal training for a number of health-related occupations. These projections and a discussion of the methodology are published in *The Supply of Health Manpower, 1970 Profiles and Projections to 1990*, DHEW publication No.

(LTRA) 75-38. A number of these projections are included in discussions of individual occupations in chapter 4.

Entry rates. The proportions of graduates of occupationally oriented programs directly entering related occupations tend to be very high, particularly if training takes a number of years. For example, almost 100 percent of the medical school graduates enter medicine and about 85 percent of engineering school graduates enter engineering. For many liberal arts graduates however, particularly at the bachelor's degree level, entry rates into occupations directly related to a college major are substantially lower. Liberal arts training tends to be less occupationally oriented. While it may prepare graduates for immediate entry into directly related occupations, it also provides necessary preparation for entry into professional schools, teaching, or occupations where a college degree in any one of a number of fields may be adequate preparation.

Entry rates are calculated from followup studies of persons during or after their training. Generally, these include data on field of study and intended or current occupation.

Comprehensive followup data on college students are available from American Council on Education (ACE) surveys of college freshmen of 1961 and 1966. The 1961 cohort originally included over 127,000 freshmen, of whom a sample were resurveyed in 1966 and 1971. The 1966 cohort included 254,000 freshmen surveyed at college entry, of whom a sample of 60,000 were resurveyed in 1971. 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

Table 9. Total degree-credit enrollment in 4-year institutions of higher education, and earned degrees, by level, 1963-64 to 1974-75 academic years

Academic year	Total degree - credit enrollment ¹	Earned degrees			
		Bachelor's	First professional	Master's	Doctor's except first professional
1963-64	3,869,837	466,486	27,667	105,551	14,490
64-65	4,239,305	501,248	28,755	117,152	16,462
65-66	4,684,888	520,248	30,799	140,548	18,237
66-67	² 4,984,000	558,075	32,472	157,707	20,617
67-68	²⁵ 5,325,000	631,923	34,787	176,749	23,089
68-69	5,638,616	728,167	36,018	193,756	26,188
69-70	5,955,644	791,510	35,724	208,291	29,866
70-71	6,290,167	839,730	37,946	230,509	32,107
71-72	6,390,782	887,273	43,411	251,633	33,363
72-73	6,473,203	930,272	50,435	264,525	34,790
73-74	6,598,259	954,376	54,278	278,259	33,826
74-75	³ 6,825,152	-	-	-	-

¹ Fall of academic year.

² Estimated.

³ Earned degree data not yet available.

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

occupational entries and career development over the decade after college entry. Numerous studies based on the ACE surveys have been published, and the BLS currently is developing entry rates to 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 information on ways workers qualify for jobs in each of 241 occupations. Each discussion of occupational training requirements is followed by statistics on 1974 employment, projected 1985 requirements, percent growth from 1974 to 1985, and projected average annual openings due to growth and replacement over the 1974—85 period. For most occupations, replacements include openings due to deaths, retirements, and other labor force separations, but not 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. The few occupations which have data on the number of openings from transfers are indicated in a footnote.

Also included are the most recent data on the number

of persons completing training for the following time periods:

- Junior college graduates—academic year 1973–74
- Job Corps—fiscal year 1974
- Vocational education completions—fiscal year 1974
- Apprenticeship completions—calendar year 1974
- College graduates—academic year 1973–74 and projected 1974–85 annual average (where available)

A dash means that statistics on training are not available.

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

A discussion of the overall outlook for college graduates for the 1974–85 period and some of the major implications of this outlook precede the detailed occupational information.

The Outlook for College Graduates

During the past two decades, the advance in the educational level of the labor force was paralleled by the rise in the educational requirements of jobs, as reflected in the faster growth of occupations requiring the most education. From the late 1950's to the mid-1960's, major shortages appeared among scientists, engineers, teachers, and doctors. During the early 1970's however, the supply of graduates in some fields caught up with or exceeded requirements. The question arises as to whether the increase in the number of jobs offering satisfactory employment for those with the most education will be sufficient to absorb the anticipated increasing numbers of college graduates. An analysis of existing supply and demand trends for graduates may throw some light on the question.

U.S. colleges and universities — principal suppliers of the country's most highly trained manpower — are projected by the NCES to continue turning out record numbers of graduates through the mid-1980's. Between 1974 and 1985, about 16.1 million college degrees are expected to be awarded (table 10), or 50 percent more than during the previous 11 years. Although these graduates represent potential additions to the supply of workers at each degree level, not all can be considered

part of the effective new supply of college educated workers. Most advanced degree recipients already work, and therefore are part of the supply of college graduates in the labor force. Many others, especially those holding bachelor's degrees, delay entry into the civilian labor force to continue their education, enter the Armed Forces, or become full-time homemakers.

About 13.1 million graduates are expected to enter the civilian labor force from 1974 to 1985 (table 11). On the basis of past patterns of entry, 8 out of ten will come directly from college, including 9.1 million bachelor's degree recipients, more than 1.2 million master's de-

Table 10. College degrees awarded, 1963–74 and projected 1974–85

[In millions]

Degree	1963–74 Degrees awarded	1974–85 Degrees awarded
Total	10.6	16.1
Bachelor's	7.8	11.4
Master's	2.1	3.6
Doctor's .....	.3	.4
First professional, including law, medicine, dentistry, etc. ....	.4	.7

Table II. Projected supply of college graduates, 1974–85
[In thousands]

Source	Number
Total	13,108
New college graduates	10,884
Bachelor's degree recipients	9,066
Master's degree recipients	1,262
Doctor's degree recipients	15
First professional degree recipients	541
Military separations	217
Other	2,008

NOTE: Detail may not add to totals due to rounding.

gree recipients, 15,000 doctor's degree recipients, and 540,000 holders of first professional degrees. In addition, 2.25 million college graduates are expected to enter or reenter the civilian labor force from sources other than the Nation's colleges and universities. They include reentrants to the labor force, persons separating from the Armed Forces, and immigrants and persons returning to the United States after living in a foreign country.

Between 1974 and 1985, more than one-fifth of all openings are expected to require persons who have completed 4 years or more of college. These graduates are expected to fill one-third of the openings for white-collar jobs, three-fourths of the openings in professional and technical occupations, and nearly one-half of the openings in managerial and administrative occupations. The increasing requirements for college graduates reflect a continuing trend. The proportion of all employed persons who were college graduates grew from 10 percent in 1959 to 15.5 percent in 1974; the expectation is that this proportion will keep increasing, and reach almost 19 percent by the mid-1980's.

Over the 1974 to 1985 period, job openings for college graduates, which are expected to total 12.1 million (table 12), will stem from three sources: employment growth, replacement needs, and educational upgrading. Growth of employment in jobs traditionally held by college graduates is expected to require 3.5 million graduates, or 29 percent of total requirements. Between 1974 and 1985, more than 50 percent of the openings for graduates are expected to be for replacement of graduates who die, retire, or otherwise leave the labor force; and about 18 percent will be for replacement of workers whose jobs did not previously require a degree. This "educational upgrading" of jobs is due to the increasingly complex skills required. For example, as computers and other technological innova-

Table 12. Projected job openings for college graduates, 1974–85

[In thousands]

Type	Number
Total	12,100
Growth	3,500
Replacement	6,500
Upgrading	2,100

tions continue to affect an ever-broadening range of jobs, college-educated workers increasingly will be needed. For other jobs, an understanding of complex legal and regulatory constraints imposed on business and industry is becoming essential.

Educational upgrading is anticipated in a wide range of managerial and administrative jobs as well as professional and technical jobs. For example, as business and government increasingly rely on salaried management specialists, as self-employed managers decline in number, and as sales jobs require more technical knowledge, these occupations will be upgraded and filled by college graduates.

Educational upgrading, however, may partly reflect employers' response to the greater availability of college graduates. Many employers have wanted to hire college graduates but were unable to do so in the 1960's because supply-demand conditions favored college graduates. As a surplus of graduates began to appear in the early 1970's, college graduates began to fill an increasing number of positions traditionally not requiring a college degree.

The projection of 12.1 million openings for college graduates, already discussed, is based on the assumption that the percent of graduates in clerical and blue-collar occupations through 1985 will remain at 1974 levels. Proportions for other groups are expected to increase as in the past.

Although the projected 13.1 million college graduates entering the labor force over the 1974–85 period is about 950,000 above projected openings, graduates are not expected to experience high levels of unemployment. College graduates are expected to continue to have a competitive advantage over those with less education. Their problems likely will center on underemployment and job dissatisfaction as many individuals take jobs for which a college degree is not required — jobs in which their training is not fully used.

A "spillover" of graduates into nontraditional fields already has become apparent. For example, between 1970 and 1974, the proportion of workers having four or more years of college education has increased by more than 60 percent in clerical, service, and blue-collar occupations — areas which have traditionally had very small proportions of college graduates. The estimated number of college graduates currently employed in these occupations is about 750,000 higher than would have been expected had trends of the 1960's continued.

Some spillover may also have occurred in major groups which have traditionally employed large proportions of graduates. Since 1970, the proportions of college graduates in the professional-technical, managerial, and sales groups have grown faster than through the 1960's, as some occupations in these groups have helped to absorb a surplus of college graduates.

The "spillover" has been caused — at least in part — by generally poor economic conditions during the

1970–75 period. Aerospace cutbacks and the recession of 1970–71, followed by an oil embargo in 1973–74 and recession in 1974–75, have dramatically slowed the economy's growth during the first half of this decade. As a result, employers have hired fewer workers. However, since 1970 the number of college graduates entering or reentering the labor force has nearly doubled.

Over the next decade, the prospective oversupply of college graduates also is likely to limit the advancement of those with less education in professional fields such as engineering and accounting, as well as in higher level managerial, sales, and service jobs. Thus, while college graduates are expected to face competition for jobs, those without a college education are likely to encounter great competition for better jobs.

On the other hand, graduates of 4-year colleges are likely to face competition in some occupations from community and junior college graduates. Community colleges and other post-secondary institutions have shown that they can train students for many occupations in 2 years or even less, and the number of students completing career education programs in these institutions is increasing rapidly.

As the plight of new graduates who are unable to enter the field of their choice becomes known, however, some high school students may change their aspirations for a college education. Consequently, the number of graduates may be lower than projected and the oversupply reduced.

The outlook for workers holding a Ph.D. has the same general prospective as college graduates as a whole. During the late 1960's and early 1970's, the proportion of Ph.D.'s in most occupations increased significantly. Since most new Ph.D.'s found employment in the field of their choice, it appears that this increased proportion of Ph.D.'s reflects actual demand rather than a spillover into non-traditional areas. If demand is projected by

assuming a continued increase in the proportion of Ph.D.'s in each occupation, openings from growth and labor force separations will total about 200,000 for the 1974–85 period. The most recent projections for Ph.D. degrees to be awarded over the same period developed by the NCES, which are based on 10-year trends in enrollments for advanced degrees, indicate that 420,000 new Ph.D.'s would be available for employment in the United States.¹³

Ph.D.'s in some fields will feel the effects of this prospective oversupply more strongly than others. For example, job openings and the supply of new Ph.D.'s in engineering are projected to balance, whereas the number of new Ph.D.'s in education is expected to far exceed openings. (table 13).

Despite the significantly large difference between projected openings and new supply, Ph.D.'s will probably not experience high levels of unemployment. Instead underemployment—employment in a job requiring less skill than the worker has acquired—with its inherent job dissatisfaction—may be widespread. In addition, adjustments also are likely to take place on the supply side, as relatively fewer young people pursue a Ph.D. The excess supply of Ph.D.'s that was developing in the early 1970's already has affected advanced degree enrollments in many fields. As a result, the current NCES degree projections, which are used in this analysis, are significantly lower than the NCES projections which were used in an earlier Bureau analysis.¹⁴

¹³ Ph.D.'s awarded to individuals expected to emigrate or return to their home country are excluded and workers expected to receive Ph.D.'s in another country who are expected to immigrate to the United States are included.

¹⁴ See *Ph.D. Manpower: Employment, Demand, and Supply, 1972–85*. BLS Bulletin 1860 for a more complete discussion of the Bureau methodology used to analyze supply and demand.

Table 13. Projected openings and new supply for Ph.D.'s, 1974–85

Field	Estimated 1974 employment	Projected 1985 requirements	Openings—1974–85			Projected new supply 1974–85	Difference between new supply and openings
			Total	Growth	Labor force separations		
All fields	378,400	488,600	201,900	110,100	91,800	422,900	221,000
Engineering and natural science	177,500	237,500	104,000	60,000	44,000	139,400	35,400
Engineering	35,000	55,700	30,300	20,700	9,600	29,100	-1,200
Physical science	68,500	86,300	34,200	17,800	16,400	38,300	4,200
Chemistry	37,700	43,300	14,200	5,600	8,600	18,000	3,800
Physics	24,700	25,900	6,600	1,200	5,400	12,100	5,500
Life science	60,000	78,900	33,600	18,900	14,700	59,500	25,900
Mathematics	14,000	16,600	5,900	2,600	3,200	12,400	6,500
Social science and psychology	71,600	101,600	48,400	30,000	18,300	88,800	40,400
Psychology	26,300	46,200	27,500	19,900	7,700	38,100	10,600
Arts and humanities	46,600	45,900	9,100	-600	9,800	52,600	43,400
Education	68,700	87,400	35,200	18,700	16,500	115,400	80,200
Business and commerce	6,500	6,800	1,600	200	1,400	13,300	11,700
Other fields	7,500	9,300	3,600	1,800	1,800	13,300	9,700

NOTE: Details may not add to totals due to rounding.

Industrial Production and Related Occupations

Foundry occupations

Patternmakers. A 5-year apprenticeship is the best way to learn the patternmaking trade. Trade school courses in patternmaking may be credited toward completion of the apprenticeship. A high school education generally is required.

Employment, 1974	20,500
Projected 1985 requirements.....	21,200
Percent growth, 1974-85.....	3.4
Average annual openings, 1974-85	500
Growth.....	50
Replacements	450

Available training data:

Apprenticeship completions	167
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Molders. A 4-year apprenticeship is the recommended training for hand molders. Some less skilled hand molders acquire skills on the job. Apprenticeship training is also preferred for some kinds of machine molding. An eighth grade education is required for apprentices, but many employers require additional training.

Employment, 1974	60,000
Projected 1985 requirements	62,000
Percent growth, 1974-85	3.3
Average annual openings, 1974-85	1,300
Growth	200
Replacements	1,100

Available training data:

Apprenticeship completions	178
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¹ Includes coremakers.

Coremakers. A 4-year apprenticeship is the recommended training for coremakers. Apprentices must have at least an eighth grade education, but some employers require graduation from high school. For less skilled coremaking jobs, inexperienced workers may be hired and trained on the job or other foundry workers may be upgraded.

Employment, 1974	24,500
Projected 1985 requirements	25,300
Percent growth, 1974-85	3.3
Average annual openings, 1974-85	550
Growth	50
Replacements	500

Available training data:

Apprenticeship completions	(¹)
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¹ See molders.

Machining occupations

All-round machinists. A 4-year apprenticeship program is the best way to learn the trade. However, some companies have training programs for single-purpose

machinists that require less than 4 years, and many machinists learn on the job. A typical 4-year apprenticeship includes 8,000 hours of shop training and 570 hours of classroom training. A high school or vocational school education that includes courses in mathematics, physics, and machine shop is desirable.

Employment, 1974	335,000
Projected 1985 requirements	414,000
Percent growth, 1974-85	23.6
Average annual openings, 1974-85	14,500
Growth.....	7,200
Replacements	7,300

Available training data:

Apprenticeship completions	1,879
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Instrument makers (mechanical). Most instrument makers learn their trade through apprenticeships. Others advance from the ranks of machinists or skilled machine tool operators. A typical 4-year apprenticeship consists of about 8,000 hours of shop training and 576 hours of classroom instruction.

Employers generally prefer that apprentices have a high school education, including courses in algebra, geometry, trigonometry, science, and machine shop work.

Employment, 1974.....	5,500
Projected 1985 requirements	6,000
Percent growth, 1974-85	5.2
Average annual openings, 1974-85	150
Growth	50
Replacements	100

Available training data

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Machine tool operators. A few months on the job are required for most semiskilled operators to learn their trade, but 1 to 2 years' experience is often required for an operator to become skilled. Although there are no special educational requirements, courses in mathematics and blueprint reading are helpful.

Employment, 1974	600,000
Projected 1985 requirements	650,000
Percent growth, 1974-85	8.3
Average annual openings, 1974-85	18,000
Growth	4,500
Replacements	13,500

Available training data:

Job Corps completions	76
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Setup workers (machine tools). Setup workers usually must qualify as all-round machinists. They must be able to operate one or more kinds of machine tools and select the sequence of operations so that metal parts will be made according to specifications.

Employment, 1974	50,000
Projected 1985 requirements	55,000

Percent growth, 1974-85	5.2
Average annual openings, 1974-85	1,350
Growth	250
Replacements	1,100

Available training data:

Apprenticeship completions	138
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Tool and die makers. Skill can be acquired through a 4- or 5-year apprenticeship or on the job. Several years of experience after apprenticeship often are required for the more difficult tool and die work. Most employers prefer apprentices who have a high school or trade school education.

Employment, 1974	170,000
Projected 1985 requirements	200,000
Percent growth, 1974-85	19.9
Average annual openings, 1974-85	6,600
Growth	3,000
Replacements	3,600

Available training data:

Apprenticeship completions	1,971
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Printing occupations

Bookbinders and related workers. A 4- or 5-year apprenticeship that combines on-the-job training with related classroom instruction generally is the recommended training for skilled bookbinders. Apprenticeship applicants usually must have a high school education.

The less skilled bindery workers learn the trade through informal on-the-job training that may last from several months to 2 years.

Employment, 1974	35,000
Projected 1985 requirements	38,000
Percent growth, 1974-85	9.1
Average annual openings, 1974-85	1,900
Growth	300
Replacements	1,600

Available training data:

Job Corps completions	27
Vocational education completions	¹ 17,658
Apprenticeship completions	² 150

¹ Vocational education data include completions for bookbinders, composing room occupations, lithographic occupations, press operators, and miscellaneous occupations.

² There were also 2,302 apprenticeship completions for occupations listed in footnote 1. The number being trained for each occupation under these two programs cannot be determined from available data.

Composing room occupations. Many compositors learn their trade through apprenticeships that generally require 6 years of progressively advanced training supplemented by classroom instruction or correspondence courses. Some learn on the job by working as helpers for several years; others combine trade school and helper experience. Applicants for apprenticeships usu-

ally must be high school graduates. Many technical institutes, junior colleges, and colleges offer courses in printing technology, which provide a valuable background for people who are interested in becoming compositors.

Employment, 1974	165,000
Projected 1985 requirements	158,000
Percent growth, 1974-85	-4.6
Average annual openings, 1974-85	3,900
Growth	-700
Replacements	4,600

Available training data:

Apprenticeship completions	430
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Electrotypers and stereotypers. These workers usually learn their trades through 5-to-6 year apprenticeships that include training on the job and classes in related technical subjects. Apprenticeship applicants usually must have a high school education.

Employment, 1974	4,000
Projected 1985 requirements	3,200
Percent growth, 1974-85	-20.9
Average annual openings, 1974-85	20
Growth	80
Replacements	100

Available training data

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Lithographic occupations. Many lithographic craft workers learn their trades through 4- or 5-year apprenticeship programs. These programs may emphasize a specific craft, such as platemaker or press operator, although an attempt is made to make the apprentice familiar with all lithographic operations. Apprenticeship applicants generally 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 are interested in learning lithographic crafts.

Employment, 1974	85,000
Projected 1985 requirements	108,000
Percent growth, 1974-85	30.3
Average annual openings, 1974-85	4,300
Growth	2,300
Replacements	2,000

Available training data:

Apprenticeship completions	¹ 574
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¹ Includes photoengravers.

Photoengravers. Most photoengravers learn their skills through a 5-year apprenticeship that includes at least 800 hours of classroom instruction. Apprenticeship applicants usually must have a high school education, preferably with courses in printing, chemistry, and physics.

Employment, 1974	17,000
Projected 1985 requirements	16,000
Percent growth, 1974-85	-5.9

Average annual openings, 1974-85	250
Growth	-100
Replacements	350

Available training data:

Apprenticeship completions	(1)
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¹ See lithographic occupations.

Printing press operators and assistants. The recommended way of learning the press operator's trade is through apprenticeship that combines on-the-job training and related classroom or correspondence school work. The apprenticeship period in commercial printing shops is 2 years for press assistants and 4 to 5 years for operators. Some 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 education generally is required; courses in printing, physics, and chemistry are recommended.

Employment, 1974	140,000
Projected 1985 requirements	170,000
Percent growth, 1974-85	22.3
Average annual openings, 1974-85	5,600
Growth	2,800
Replacements	2,800

Available training data:

Job Corps completions	288
Apprenticeship completions	581

Other industrial production and related occupations

Assemblers. Training varies according to the level of skill required. Most inexperienced people can be trained in a few days or weeks, but some training lasts much longer. 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, 1974	1,140,000
Projected 1985 requirements	1,350,000
Percent growth, 1974-85	18.5
Average annual openings, 1974-85	63,000
Growth	19,000
Replacements	44,000

Available training data:

Job Corps completions	441
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Automobile painters. Most automobile painters start as helpers and acquire their skills informally by working for 3 to 4 years with experienced painters. A small number learn through a 3-year apprenticeship. A high school education is generally not required.

Employment, 1974	25,000
Projected 1985 requirements	32,000
Percent growth, 1974-85	21.1
Average annual openings, 1974-85	900

Growth	500
Replacements	400

Available training data

Blacksmiths. Most beginners train on the job as helpers in blacksmith shops. Others enter through formal apprenticeship programs which generally last 3 or 4 years.

Employment, 1974	9,000
Projected 1985 requirements	6,100
Percent growth, 1974-85	-30.8
Average annual openings, 1974-85	50
Growth	-250
Replacements	300

Available training data

Blue-collar worker supervisors. Most workers who are promoted to blue-collar supervisor jobs are high school graduates who have learned their skills on the job. Although fewer than one-tenth of all supervisors are college graduates, a growing number of employers are hiring supervisor trainees with college backgrounds.

Employment, 1974	1,460,000
Projected 1985 requirements	1,770,000
Percent growth, 1974-85	21.0
Average annual openings, 1974-85	61,000
Growth	28,000
Replacements	33,000

Available training data:

Vocational education completions	8,506
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Boilermaker occupations. Most boilermakers acquire skills on the job, but most training authorities agree that a 4-year apprenticeship is the best way to learn this trade. Layout men and fitup men generally learn their trades on the job by working as helpers for 2 or more years. Employers prefer high school graduates.

Employment, 1974	45,000
Projected 1985 requirements	62,000
Percent growth, 1974-85	40.9
Average annual openings, 1974-85	2,700
Growth	1,600
Replacements	1,100

Available training data:

Apprenticeship completions	352
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Boiler tenders. Most learn their skills by working as helpers in boiler rooms. Some large cities and a few States require boiler tenders to be licensed.

Employment, 1974	90,000
Projected 1985 requirements	86,000
Percent growth, 1974-85	-4.4
Average annual openings, 1974-85	2,100
Growth	-400
Replacements	2,500

Available training data:

Vocational education completions	1,031
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Electroplaters. Most electroplaters learn the trade on the job. A small percentage of electroplaters train through a 3- or 4-year apprenticeship program. High school courses in chemistry, electricity, physics, mathematics, and blueprint reading provide a helpful background for people who are interested in becoming electroplaters.

Employment, 1974	34,000
Projected 1985 requirements	41,000
Percent growth, 1974-85	18.8
Average annual openings, 1974-85	1,250
Growth	600
Replacements	650
Available training data	-

Forge shop occupations. Most workers learn their trades on the job. Some forge shops offer apprentice training programs for skilled jobs, such as die sinker and heat treater. High school graduates are preferred, especially for the more skilled jobs.

Employment, 1974	65,000
Projected 1985 requirements	73,000
Percent growth, 1974-85	8.9
Average annual openings, 1974-85	1,750
Growth	550
Replacements	1,200
Available training data	-

Furniture upholsterers. The most common way to learn this trade is to complete on-the-job training in an upholstery shop. Other ways of acquiring training are by working for furniture manufacturers in jobs closely related to upholstering, or through vocational or high school courses. A few people acquire the necessary skills through apprenticeship programs that last from 3 to 4 years.

Employment, 1974	34,000
Projected 1985 requirements	35,500
Percent growth, 1974-85	7.6
Average annual openings, 1974-85	1,200
Growth	200
Replacements	1,000

Available training data:

Job Corps completions	139
Vocational education completions	16,258

¹ May include some upholsterers other than furniture.

Inspectors. Inspectors generally are trained on the job. Training may last from a few hours to several months depending on the skill level. Requirements for the job vary. Some employers hire applicants who do not have a high school diploma but who have qualifying aptitudes or related experience. Other employers prefer experienced production workers.

Employment, 1974	790,000
Projected 1985 requirements	1,000,000
Percent growth, 1974-85	26.5

Average annual openings, 1974-85	51,000
Growth	19,000
Replacements	32,000
Available training data	-

Millwrights. These workers generally acquire their skills on the job or through 4-year apprenticeship programs that combine shop training with classroom instruction. Many companies prefer that apprentice applicants be high school graduates.

High school courses in science, mathematics, mechanical drawing, and machine shop are useful to the prospective millwright.

Employment, 1974	95,000
Projected 1985 requirements	115,000
Percent growth, 1974-85	21.0
Average annual openings, 1974-85	3,800
Growth	1,800
Replacements	2,000

Available training data:

Apprenticeship completions	561
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Motion picture projectionists. Most motion picture theaters in urban areas are unionized and young people who aspire to work as projectionists in these theaters must complete a union apprenticeship program. In a nonunion theater, a trainee may start as a usher or helper and learn the trade by working with an experienced projectionist. A high school education is preferred by employers.

Employment, 1974	18,000
Projected 1985 requirements	19,500
Percent growth, 1974-85	8.5
Average annual openings, 1974-85	1,000
Growth	150
Replacements	800

Available training data

Ophthalmic laboratory technicians. Most learn their skills on the job. Others learn through 3- to 4-year apprenticeships. Employers prefer high school graduates who have had courses in the basic sciences. Some States require licenses for ophthalmic laboratory technicians in retail optical shops.

Employment, 1974	22,000
Projected 1985 requirements	35,000
Percent growth, 1974-85	59.1
Average annual openings, 1974-85	2,100
Growth	1,300
Replacements	800

Available training data

Photographic laboratory workers. Most darkroom technicians learn their trade by 3 to 4 years of on-the-job training; some helpers become specialists in a particular activity, which usually requires less training time. A high school education is preferred and college courses are helpful for those interested in supervisory or mana-

gerial jobs. On-the-job training for workers in semi-skilled photographic laboratory occupations may range from a few weeks to several months.

Employment, 1974	50,000
Projected 1985 requirements	61,000
Percent growth, 1974-85	26.5
Average annual openings, 1974-85	3,300
Growth	1,200
Replacements	2,100

Available training data:

Vocational education completions	¹ 4,680
Junior college graduates	¹ 645

¹ May include other photographic occupations.

Power truck operators. Most workers can be trained on the job to operate a power truck in a few days. It may take several weeks, however, to learn the physical layout and operation of a plant and the most efficient way of handling the materials to be moved.

Employment, 1974	347,000
Projected 1985 requirements	400,000
Percent growth, 1974-85	15.3
Average annual openings, 1974-85	9,100
Growth	4,800
Replacements	4,300

Available training data

Production painters. New workers usually learn the job by watching and helping experienced painters. Training may vary from a few days to several months. A high school diploma generally is not required.

Employment, 1974	125,000
Projected 1985 requirements	151,000
Percent growth, 1974-85	19.1
Average annual openings, 1974-85	5,000
Growth	2,200
Replacements	2,800

Available training data

Stationary engineers. Many stationary engineers start as helpers or craftworkers in other trades and acquire their skills informally on the job. Most training authorities, however, recommend a 4-year apprenticeship as the best way to learn this trade. High school or trade school graduates with courses in mathematics, mechanical drawing, machine shop practices, physics, and chemistry are preferred. Some States and cities require stationary engineers to be licensed.

Employment, 1974	193,000
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Projected 1985 requirements	193,000
Percent growth, 1974-85	0.0
Average annual openings, 1974-85	5,000
Growth	0
Replacements	5,000

Available training data:

Vocational education completions	¹ 1,031
Apprenticeship completions	164

¹ Includes stationary firemen.

Wastewater treatment plant operators (sewage plant operators). Trainees usually start as helpers and learn their skills on the job. Some States require, and employers generally prefer, high school graduates. Some positions, especially in larger cities and towns, are covered by civil service regulations and applicants may be required to pass examinations on elementary mathematics, mechanical aptitude, and general intelligence. A 2-year program leading to an associate degree in wastewater technology provides a good general knowledge of the water pollution control field as well as basic preparation for becoming an operator.

Employment, 1974	62,000
Projected 1985 requirements	100,000
Percent growth, 1974-85	61.3
Average annual openings, 1974-85	6,100
Growth	3,450
Replacements	2,650

Available training data:

Vocational education completions	2,620
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Welders. Generally, it takes several years of on-the-job training to become a skilled welder. Some less skilled jobs, however, can be learned in a few months. For entry to skilled jobs, many employers prefer applicants who have high school or vocational school training in welding. 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, 1974	645,000
Projected 1985 requirements	815,000
Percent growth, 1974-85	26.2
Average annual openings, 1974-85	27,000
Growth	15,000
Replacements	11,500

Available training data:

Job Corps completions	1,523
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Office Occupations

Clerical occupations

Bookkeeping workers. High school graduates who have taken business arithmetic, bookkeeping, and account-

ing meet the minimum requirements for most bookkeeping jobs. Some employers prefer applicants who have completed business courses at a junior college or business school. Work/study programs provide high

school students with an opportunity to learn bookkeeping skills through on-the-job experience.

Employment, 1974.....	1,700,000
Projected 1985 requirements.....	1,875,000
Percent growth, 1974-85.....	10.9
Average annual openings, 1974-85	121,000
Growth.....	17,000
Replacements	104,000

Available training data:

Job Corps completions.....	21
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File clerks. Employers prefer high school graduates for beginning file clerk jobs. Many seek applicants who can type and have some knowledge of office practices. High schools, private business schools, and community and junior colleges teach these and other office skills. Many States and localities sponsor programs which furnish training in basic clerical skills.

Newly hired workers usually begin with several weeks of on-the-job training to learn the employer's filing system and procedures.

Employment, 1974	275,000
Projected 1985 requirements.....	320,000
Percent growth, 1974-85.....	15.9
Average annual openings, 1974-85	25,000
Growth.....	4,000
Replacements	21,000

Available training data:

Job Corps completions.....	393
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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 employers prefer college graduates with advancement potential for front office jobs. Opportunities for promotion are good in most hotels, 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 opportunities for promotion by taking courses in hotel management, offered by junior and community colleges, public and private vocational schools, and correspondence schools.

Employment, 1974.....	54,000
Projected 1985 requirements.....	63,000
Percent growth, 1974-85.....	17.3
Average annual openings, 1974-85	4,250
Growth.....	850
Replacements	3,400

Available training data

Collection workers. A high school diploma is the minimum educational requirement for most beginning jobs in collection work. Newly hired workers learn their skills on the job, chiefly by observing experienced workers.

Employment, 1974.....	63,000
Projected 1985 requirements.....	81,500
Percent growth, 1974-85.....	29.4
Average annual openings, 1974-85	4,500
Growth.....	1,700
Replacements	2,800

Available training data

Cashiers. Employers prefer high school graduates for cashier jobs. Courses in business arithmetic, bookkeeping, typing, and other business subjects are good preparation. Most cashiers are trained on the job. In large firms, training often includes classroom instruction in the use of cash registers and other equipment. Cashier training also is available in many public school vocational programs.

Employment, 1974.....	1,111,000
Projected 1985 requirements.....	1,340,000
Percent growth, 1974-85.....	20.6
Average annual openings, 1974-85	97,000
Growth.....	21,000
Replacements	76,000

Available training data:

Job Corps completions.....	161
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Office machine operators. High school graduation is the minimum educational requirement for most office machine operator jobs. Newly hired workers usually are expected to be able to type and operate adding machines and calculators. Many high schools, private business schools, and State and local government training programs teach these skills. The amount of on-the-job training beginners receive depends on the type of machines they operate. Generally, it lasts a few weeks.

Employment, 1974.....	170,000
Projected 1985 requirements.....	190,000
Percent growth, 1974-85.....	13.1
Average annual openings, 1974-85	12,800
Growth.....	2,100
Replacements	10,700

Available training data:

Job Corps completions.....	274
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Postal clerks. These workers must be at least 18, pass an examination that tests clerical accuracy, and have the ability to read, do simple arithmetic, and memorize mail distribution systems. Applicants also must pass a physical examination and may have to show that they can lift and handle mail sacks weighing up to 70 pounds. New clerks are trained on the job.

Employment, 1974.....	293,000
Projected 1985 requirements.....	302,000
Percent growth, 1974-85.....	3.1
Average annual openings, 1974-85	9,700
Growth.....	800
Replacements	8,900

Available training data:

Job Corps completions.....	42
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Receptionists. High school graduation generally is the minimum requirement for work as a receptionist. Business courses such as typing and elementary bookkeeping are helpful. Some employers prefer applicants with college training. College or business school training can help, too, in advancing from a receptionist to a secretary or administrative assistant.

Employment, 1974.....	460,000
Projected 1985 requirements.....	635,000
Percent growth, 1974-85.....	38.3
Average annual openings, 1974-85	57,500
Growth.....	16,000
Replacements	41,500

Available training data:

Job Corps completions.....	38
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Secretaries and stenographers. High school graduation is the minimum educational requirement for practically all secretarial and stenographic positions. Many employers prefer applicants who have had additional training at a college or private business school. Courses range from several months' instruction in shorthand and typing to 1- or 2-year programs teaching specialized skills such as legal or medical secretarial work. Applicants generally must meet minimum standards of typing and stenographic speed.

Employment, 1974.....	3,300,000
Projected 1985 requirements.....	4,860,000
Percent growth, 1974-85.....	47.8
Average annual openings, 1974-85	439,000
Growth.....	142,500
Replacements	296,500

Available training data:

Job Corps completions.....	157
Vocational education completions	166,926
Bachelor's degrees in secretarial studies.....	1,896
Junior college graduates	18,650

Shipping and receiving clerks. High school graduates are preferred for beginning jobs in shipping and receiving departments. Newly hired workers are trained on the job, and often begin by filing, checking addresses, attaching labels, and verifying the contents of shipments.

Employment, 1974.....	465,000
Projected 1985 requirements.....	560,000
Percent growth, 1974-85.....	20.4
Average annual openings, 1974-85	20,500
Growth.....	8,700
Replacements	11,800

Available training data

Statistical clerks. High school graduation is the minimum educational requirement for most jobs as statistical clerks. Courses in business arithmetic, bookkeeping, and typing are good preparation, and the abil-

ity to operate calculators, tabulating machines, and other office equipment can be helpful. Newly hired workers are trained on the job, and learn the employer's record system and procedures.

Employment, 1974.....	325,000
Projected 1985 requirements.....	375,000
Percent growth, 1974-85.....	15.8
Average annual openings, 1974-85	23,000
Growth.....	4,500
Replacements	18,500

Available training data:

Job Corps completions.....	20
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Stock clerks. High school graduates are preferred. Newly hired workers learn their skills on the job, and usually begin by counting and marking stock. Basic duties usually are learned within a few weeks. Stock clerks who handle jewelry, liquor, or drugs must meet bonding standards.

Employment, 1974.....	490,000
Projected 1985 requirements.....	610,000
Percent growth, 1974-85.....	25.0
Average annual openings, 1974-85	26,000
Growth.....	11,000
Replacements	15,000

Available training data:

Job Corps completions.....	174
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Typists. Typists generally need to be high school graduates, and must be able to type at least 40-50 words per minute. Good spelling, punctuation, and grammar are important skills. Most typists learn their skills in high school, or take courses at public or private vocational schools. Community and junior colleges also offer the business courses needed for a typist's job.

Employment, 1974.....	1,000,000
Projected 1985 requirements.....	1,400,000
Percent growth, 1974-85.....	34.9
Average annual openings, 1974-85	125,000
Growth.....	33,000
Replacements	92,000

Available training data:

Job Corps completions.....	889
Vocational education completions	119,477

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 to have some college education. Formal computer training is desirable, for most employers look for applicants already skilled in operating data-entry equipment or computer consoles. Computer training is offered in many high schools, public and private vocational schools including computer

schools and business schools, and in community and junior colleges.

Employment, 1974.....	500,000
Projected 1985 requirements.....	545,000
Percent growth, 1974-85.....	10.1
Average annual openings, 1974-85	27,500
Growth.....	4,500
Replacements	23,000

Available training data:

Job Corps completions.....	353
Vocational education completions	141,666
Junior college graduates	24,754

¹ Includes training for programmers and system analysts

² 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. Some require college graduates; others do not. 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. In firms that use computers for business applications, experience in inventory control, payroll, or accounting often is more important than a college degree. Nonetheless, these firms usually prefer applicants who have had courses in data processing or programming.

Computer programming is taught at public and private vocational schools, community and junior colleges, and colleges and universities. Instruction ranges from introductory courses to advanced courses at the graduate level. High schools also offer courses in computer programming.

Employment, 1974.....	200,000
Projected 1985 requirements.....	285,000
Percent growth, 1974-85.....	42.5
Average annual openings, 1974-85	13,000
Growth.....	7,800
Replacements	5,200

Available training data:

Degrees in computer and information sciences:	
Bachelor's degrees	4,757
Master's degrees	2,276
Doctor's degrees	198
Junior college graduates	2,018

Systems analysts. There is no single way of preparing for a job as a systems analyst 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 the bachelor's degree in a suitable field, some employers prefer applicants with work experience in that field. Others require a graduate degree. Further, most employers prefer applicants with 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 colleges and universities offer formal training in systems analysis.

Employment, 1974	115,000
Projected 1985 requirements	190,000
Percent growth, 1974-85.....	65.2
Average annual openings, 1974-85	9,100
Growth.....	7,000
Replacements	2,100

Available training data:

Degrees in systems analysis:

Bachelor's degrees	54
Master's degrees	124
Doctor's degrees	-

Banking occupations

Bank clerks. High school graduation is adequate preparation for most beginning clerical jobs in banks. Courses in bookkeeping, typing, business arithmetic, and office machine operation are useful.

Employment, 1974.....	517,000
Projected 1985 requirements.....	718,000
Percent growth, 1974-85.....	38.9
Average annual openings, 1974-85	54,000
Growth.....	18,000
Replacements	36,000

Available training data: -

Bank officers. These positions are filled by management trainees or by promoting outstanding bank clerks or tellers. A bachelor's degree is the minimum educational requirement for management trainees. A major in banking and finance is useful, but liberal arts graduates with course work in accounting, economics, and statistics also are well qualified. Bank employees who are promoted to management trainee positions usually are not college graduates. Often, however, they have taken home study courses offered by the American Institute of Banking.

In-house training programs for bank officers generally last from 6 months to a year. Trainees usually rotate among all the departments in the bank, and are encouraged to take courses offered by local colleges and universities, or through the American Institute of Banking.

Employment, 1974.....	240,000
Projected 1985 requirements.....	333,000
Percent growth, 1974-85.....	38.9
Averages annual openings, 1974-85	16,000
Growth.....	8,500
Replacements	7,500

Available training data:

Degrees in banking and finance:

Bachelor's degrees	6,518
Master's degrees	2,252
Ph.D.'s	34

Bank tellers. Tellers learn their skills on the job. Banks generally prefer high school graduates with some experience in office work. Prior experience is important because employers are looking for applicants with the maturity and tact to deal with customers. Because tellers handle large amounts of money, applicants must meet bonding standards.

Employment, 1974.....	270,000
Projected 1985 requirements.....	377,000
Percent growth, 1974-85.....	38.9
Average annual openings, 1974-85	30,000
Growth.....	10,000
Replacements	20,000
Available training data	-

Insurance occupations

Actuaries. A bachelor's degree with a major in mathematics or statistics is the minimum educational requirement for beginning actuarial jobs in large insurance companies. Some companies hire applicants with 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. Fewer than 20 colleges and universities offer training programs specifically designed for actuarial careers. Several hundred schools offer some of the necessary courses, however.

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, 1974.....	10,700
Projected 1985 requirements.....	14,400
Percent growth, 1974-85.....	34.1
Average annual openings, 1974-85	700
Growth.....	350
Replacements	350
Available training data	-

Claim representatives. A growing number of insurance companies prefer college graduates for 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 with a business or accounting major might specialize in loss from business interruption or damage

to merchandise. Someone with a degree in 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 with 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 6-semester study 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 a great deal, but applicants usually must complete an approved course in insurance or loss adjusting, and pass a written examination. They should be bonded and at least 20 years of age.

Employment, 1974.....	125,000
Projected 1985 requirements.....	152,000
Percent growth, 1974-85.....	21.8
Average annual openings, 1974-85	6,600
Growth.....	2,500
Replacements	4,100
Available training data	-

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

The following figures are the combined data for insurance agents, brokers, and underwriters:

Employment, 1974.....	470,000
Projected 1985 requirements.....	536,000
Percent growth, 1974-85.....	15.0
Average annual openings, 1974-85	19,400
Growth.....	6,400
Replacements	13,000
Available training data	-

Administrative and related occupations

Accountants. Most large firms require the bachelor's degree with a major in accounting, or in a closely related field such as business administration or economics. Some prefer applicants with a master's degree in accounting. In addition to programs at the college level, training in accounting is available in junior and community colleges, business schools, and correspondence schools. Job opportunities for graduates of these 1- and 2-year programs usually are limited to small accounting and business firms.

All States require "certified public accountants" to be certified by the State board of accountancy. This is done by passing the CPA examination administered by the American Institute of Certified Public Accountants and meeting State requirements as to education and experience. Three-fourths of the States require CPA candidates to be college graduates, and nearly all of them insist on 2 years or more of public accounting experience.

Employment, 1974.....	805,000
Projected 1985 requirements.....	995,000
Percent growth, 1974-85.....	23.9
Average annual openings, 1974-85	45,500
Growth.....	17,500
Replacements	28,000

Available training data:

<i>Degrees in accounting</i>	<i>1973-74</i>	<i>Projected 1974-85 (annual average)</i>
Bachelor's degrees ..	29,770	38,945
Master's degrees	1,806	2,719
Doctor's degrees	70	84
Junior college graduates ..	7,880	

Buyers. Most retail stores prefer college or junior college graduates for buying jobs. Courses in merchandising or marketing may help, but employers generally 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 in the store.

Employment, 1974.....	110,000
Projected 1985 requirements.....	150,000
Percent growth, 1974-85.....	37.6
Average annual openings, 1974-85	9,000
Growth.....	4,000
Replacements	5,000

Available training data

City managers. A bachelor's degree, preferably with a major in public administration or a related field, is the minimum educational background needed to become a

city manager. A master's degree in public or municipal administration is preferred.

Employment, 1974.....	2,900
Projected 1985 requirements.....	4,200
Percent growth, 1974-85.....	47.4
Average annual openings, 1974-85	150
Growth.....	100
Replacements	50

Available training data

Credit managers. A bachelor's degree usually is required for beginning jobs in credit management. Newly hired employees work as management trainees under experienced credit personnel.

Employers generally prefer applicants who have majored in business administration, economics, or accounting. Some employers hire liberal arts majors. Experience sometimes can be substituted for the college degree. Some employers accept high school graduates who have had experience in credit collection or in processing credit information.

Employment, 1974.....	66,000
Projected 1985 requirements.....	90,000
Percent growth, 1974-85.....	36.4
Average annual openings, 1974-85	4,500
Growth.....	2,200
Replacements	2,300

Available training data

Hotel managers and assistants. Although experience and management ability are the most important considerations in selecting hotel managers, employers increasingly prefer college graduates. Formal training in hotel or restaurant management can be helpful, in part because such programs 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. Others hire graduates of the hotel training programs offered by some junior and community colleges, public and private vocational schools, and home study (correspondence) schools. These programs generally take from 3 months to 2 years. Some large hotels have special management trainee programs for college graduates and persons promoted from within.

Employment, 1974	120,000
Projected 1985 requirements	150,000
Percent growth, 1974-85	22.8
Average annual openings, 1974-85	6,500
Growth	2,500
Replacements	4,000

Available training data:

<i>Degrees in hotel and restaurant management:</i>	
Bachelor's	1,188
Master's	64
Junior college graduates	1,852
Vocational education completions	3,430

Lawyers. Admission to the bar is a prerequisite for the practice of law in all States. To qualify for the bar examination, most States require 4 years of college followed by 3 years of law school. Four years of part-time study usually are required to complete a night school law curriculum.

It is anticipated that about 26,000 entrants will be needed annually over the 1974–85 period to meet projected requirements. NCES projections indicate an average of about 31,700 law school graduates annually over this period. Not all law school graduates, however, pass the bar examination and seek to practice law. In the past, law school graduates, either by choice or because of economic circumstances, have entered politics, public administration, business, and other fields. Nevertheless, unless a significant change occurs in enrollment trends, an oversupply of law school graduates can be expected for careers in law, and many graduates may have to find employment in these other fields.

Employment, 1974	342,000
Projected 1985 requirements	490,000
Percent growth, 1974–85	43.3
Average annual openings, 1974–85	26,400
Growth	13,500
Replacements	12,900

Available training data:

	1973–74	Projected 1974–85 (annual average)
L.L.B. or J.D. degrees ..	29,652	31,700

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 with a liberal arts background and evident management potential.

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 area. Experience is important, too, and some workers gain essential experience in personnel work and then switch to labor relations.

Employment, 1974	320,000
Projected 1985 requirements	450,000
Percent growth, 1974–85	40.2
Average annual openings, 1974–85	23,000
Growth	12,000
Replacements	11,000

Available training data

Public relations workers. A bachelor's degree in journalism, English, or public relations usually is preferred for a beginning job. Some employers have special needs, however, and seek college graduates with a degree in a scientific or technical field, plus appropriate communications skills. Experience can be very important in getting a job, and many employers prefer applicants with media or journalism experience.

Employment, 1974	100,000
Projected 1985 requirements	134,000
Percent growth, 1974–85	28.8
Average annual openings, 1974–85	6,500
Growth	2,500
Replacements	4,000

Available training data

Purchasing agents. For a beginning position with a large company, a college degree is required. Many companies hire business administration or liberal arts majors for trainee positions. Firms that manufacture machinery or chemicals, however, generally prefer applicants with a degree in science or engineering. A growing number of large companies look for applicants with a master's degree in purchasing management or in a related field. Some small firms select purchasing agents from their own staff, whether or not the worker has a college degree.

Employment, 1974	189,000
Projected 1985 requirements	258,000
Percent growth, 1974–85	36.5
Average annual openings, 1974–85	11,700
Growth	6,300
Replacements	5,400

Available training data

Urban planners. The master's degree in planning is the usual requirement for jobs at the entry level. For some jobs, however, a bachelor's degree in city planning, architecture, landscape architecture, engineering, or other closely related field is acceptable.

The number of persons enrolled in graduate planning programs has risen rapidly in recent years. If this trend continues, the number of applicants may outstrip available openings and lead to increased competition for jobs in this small field.

Employment, 1974	13,000
Projected 1985 requirements	18,000
Percent growth 1974–85	38.5
Average annual openings, 1974–85	700
Growth	450
Replacements	250

Available training data:

Degrees in city, community, and regional planning:

Bachelor's degrees	410
Master's degrees	1,380
Doctor's degrees	51

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 and labor unions.

Employment, 1974	1,900,000
Projected 1985 requirements	2,400,000
Percent growth, 1974-85	26.6
Average annual openings, 1974-85	146,000
Growth	47,000
Replacements	99,000

Available training data:

Vocational education completions	3,412
Job Corps completions	1,104

Hotel housekeepers and assistants. A high school education usually is preferred, and experience or training in hotel housekeeping is helpful in getting a job. Courses in housekeeping are offered by colleges and universities having programs in hotel administration, public and private vocational schools, and home study (correspondence) schools.

Employment, 1974	18,000
Projected 1985 requirements	21,000
Percent growth 1974-85	15.6
Average annual openings, 1974-85	1,450
Growth	250
Replacements	1,200

Available training data:

Vocational education completions	4,700
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Pest controllers. Most controllers can do routine work after 2 or 3 months of on-the-job training. Employers prefer trainees who are high school graduates. About 30 States require licenses. In most States, the license is only for registration, but a few require applicants to pass a written examination. Beginning in October 1976, the U.S. Environmental Protection Agency will require that pest controllers be certified.

Employment, 1974	27,000
Projected 1985 requirements	36,500
Percent growth, 1974-85	32.1
Average annual openings, 1974-85	2,100
Growth	800
Replacements	1,300

Available training data

Food service occupations

Bartenders. Most bartenders learn their trade on the job. Experience as a bartender's helper, dining room

attendant, waiter, or waitress is good training. Some private schools offer short courses in bartending. Generally, bartenders must be at least 21 years of age, and some employers prefer those who are 25 or older.

Employment, 1974	233,000
Projected 1985 requirements	200,000
Percent growth, 1974-85	28.8
Average annual openings, 1974-85	15,200
Growth	6,100
Replacements	9,100

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 high school or post high school training in food preparation. Less frequently, they are trained as apprentices under trade union contracts or employee training programs conducted by large hotels and restaurants.

Employment, 1974	955,000
Projected 1985 requirements	1,250,000
Percent growth, 1974-85	30.9
Average annual openings, 1974-85	78,600
Growth	26,800
Replacements	51,800

Available training data:

Vocational education completions	¹ 1,803
Apprenticeship completions	² 225

¹ Includes training for bakers, meatcutters, and servers.

² Includes bakers.

Dining room attendants and dishwashers. Little formal training is needed to qualify for these occupations. Many employers will hire applicants who do not speak English, and some mentally retarded persons can be trained as dishwashers.

Employment, 1974	370,000
Projected 1985 requirements	435,000
Percent growth 1974-85	17.6
Average annual openings, 1974-85	17,200
Growth	6,800
Replacements	10,400

Available training data

Food counter workers. In counter jobs that require totaling bills and making change, employers prefer to hire persons who are good in arithmetic and have attended high school, although a diploma generally is not necessary. Counter jobs in cafeterias usually require no specific education.

Employment, 1974	350,000
Projected 1985 requirements	425,000
Percent growth, 1974-85	21.4
Average annual openings, 1974-85	29,200
Growth	6,700
Replacements	22,500

Available training data

Meatcutters. These workers acquire their skills either informally on the job or through apprenticeship programs. Those in apprenticeship programs generally complete 2 to 3 years of supervised on-the-job training which may be supplemented by some classroom work. Employers prefer high school graduates.

Employment, 1974	202,000
Projected 1985 requirements	204,000
Percent growth, 1974-85	0.9
Average annual openings, 1974-85	5,000
Growth	200
Replacements	4,800

Available training data:

Job Corps completions	124
Apprenticeship completions	914

Waiters and waitresses. Although most waiters and waitresses pick up their skills on the job, some attend special training courses offered by some public and private schools and restaurant associations. Most employers prefer applicants who have had at least 2 or 3 years of high school.

Employment, 1974	1,180,000
Projected 1985 requirements	1,440,000
Percent growth, 1974-85	21.8
Average annual openings, 1974-85	105,000
Growth	24,000
Replacements	81,000

Available training data:

Job Corps completions	70
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Personal service occupations

Barbers. All States require barbers to be licensed. To obtain a license, a person must have graduated from a State-approved barber school, have completed the eighth grade, meet certain health requirements, and be at least 16 years old (in some States 18). Nearly all 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. Courses usually last 6 to 12 months. Because most States do not recognize training, apprenticeship work, or licenses obtained in another State, persons who wish to become barbers should review the laws of the State in which they wish to work before entering barber school.

Employment, 1974	130,000
Projected 1985 requirements	135,000
Percent growth, 1974-85	3.6
Average annual openings, 1974-85	5,550
Growth	450
Replacements	5,100

Available training data:

Vocational education completions	940
Apprenticeship completions	316

Bellhops and bell captains. Bellhops are trained on the job. High school graduates are preferred, because they are more likely to have the qualities needed for promotion. Many hotels fill bellhop jobs by promoting elevator operators. Bellhops, in turn, may advance to jobs as front office clerks.

Employment, 1974	17,000
Projected 1985 requirements	19,000
Percent growth, 1974-85	9.6
Average annual openings, 1974-85	600
Growth	150
Replacements	450

Available training data

Cosmetologists. All States require that cosmetologists be licensed. Most States require applicants for licensing to pass a physical examination, be at least 16 years old, and have completed at least the 10th grade. Successful completion of a State-approved cosmetology course is adequate preparation for a State licensing examination. In some States completion of an apprenticeship training program can substitute for graduation from cosmetology school, but few cosmetologists learn their skills this way.

Both public and private vocational schools offer cosmetologist training. A daytime course usually takes 6 months to 1 year; an evening course takes longer. An apprenticeship program generally lasts 1 or 2 years.

Employment, 1974	500,000
Projected 1985 requirements	622,000
Percent growth, 1974-85	24.9
Average annual openings, 1974-85	50,800
Growth	11,300
Replacements	39,500

Available training data:

Vocational education completions	19,270
Job Corps completions	182

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 apprenticeship, and pass a State board examination. One-half of the States require a year or more of college in addition to training in mortuary science.

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

Employment, 1974	45,000
Projected 1985 requirements	45,000
Percent growth, 1974-85	0.0
Average annual openings, 1974-85	1,400
Growth	0
Replacements	1,400

Available training data

Private household service occupations

Private household workers. Most household worker jobs require no formal education. Instead, the ability to cook, sew, wash and iron, clean house, and care for children is important. Many of the necessary skills are learned in the home; more advanced skills can be learned in home economics courses in public and private schools.

Employment, 1974	1,200,000
Projected 1985 requirements	900,000
Percent growth, 1974-85	-26.7
Average annual openings, 1974-85	52,000
Growth	-30,000
Replacements	82,000
Available training data	-

Protective and related service occupations

Firefighters. In most communities, qualifying examinations are open to high school graduates. Those who score the highest on these examinations which test intelligence as well as strength, stamina, and agility have the best chances for appointment. Experience gained as a volunteer firefighter or through training 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 being assigned to local fire companies.

Additional study can be valuable in preparing for promotion examinations. Fire departments frequently conduct training programs, and many colleges and universities offer courses in fire engineering and fire science.

Employment, 1974	220,000
Projected 1985 requirements	270,000
Percent growth, 1974-85	23.3
Average annual openings, 1974-85	7,300
Growth	4,600
Replacements	2,700

Available training data:

Vocational education completions	4,084
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Guards. High school graduates are preferred, and applicants who have not completed high school may be asked to take a test to demonstrate their ability to follow written and oral instructions. Most guards are trained on the job. They learn the use of firearms, first aid, ways to handle emergencies, and other necessary skills.

Employment, 1974	475,000
Projected 1985 requirements	508,000
Percent growth, 1974-85	7.4
Average annual openings, 1974-85	26,000
Growth	3,000
Replacements	23,000

Available training data

Police officers. In many communities, police jobs are filled by competitive examination. Candidates must be high school graduates, as a rule. Police departments in large cities generally require one or more years of college, and a growing number of police departments prefer candidates with college training in sociology, psychology, community relations, and related subjects. Some city police departments hire students in college-level law enforcement programs as police interns.

Police departments in some small cities consider applicants who have not finished high school, but who have had experience in law enforcement.

In small communities police officers often are trained on the job; in large cities formal training ranges from a few weeks to months.

Employment, 1974	480,000
Projected 1985 requirements	650,000
Percent growth, 1974-85	35.5
Average annual openings, 1974-85	22,000
Growth	15,500
Replacements	6,500

Available training data:

Junior college graduates	14,915
Job Corps completions	3
Vocational education	23,511

¹ May include some State police officers.

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 with an equivalent combination of education and experience. In some States, high school graduates may enter State police work as cadets. They attend classes, are assigned nonenforcement duties and, if they qualify, may be appointed State police officers at age 21.

In all States, recruits must enter a formal training program of several months for classroom instruction in State laws and jurisdictions, in procedures for traffic control and accident investigation, and in related topics.

Employment, 1974	45,500
Projected 1985 requirements	76,000
Percent growth, 1974-85	68.3
Average annual openings, 1974-85	3,600
Growth	2,850
Replacements	750

Available training data:

Vocational education completions	(¹)
Junior college graduates	(¹)

¹ See police officers.

Construction inspectors (government). Construction inspectors receive most of their training on the job. Applicants generally must have several years of experi-

ence as a construction contractor, supervisor, or craftworker. Federal, State and most local governments also require a high school diploma. Many employers prefer inspectors to be graduates of an apprenticeship program or have 2 years of college in architecture, engineering, or construction technology.

Employment, 1974	22,000
Projected 1985 requirements	30,000
Percent growth, 1974-85	43.0
Average annual openings, 1974-85	1,700
Growth	750
Replacements	950
Available training data	-

Health and regulatory inspectors (government). Most health and regulatory inspectors are required to have several years of experience in a field related to the area in which they will work. Often a bachelor's degree or several years of college with courses in related subjects may be substituted for some or all of the required years of experience. Specialized knowledge is learned on the job in many inspector jobs. Applicants for Federal jobs often are required to take the Professional and Administrative Career Examination (PACE).

Employment, 1974	110,000
Projected 1985 requirements	160,000
Percent growth, 1974-85	44.0
Average annual openings, 1974-85	7,900
Growth	4,500
Replacements	3,400
Available training data:	
Junior college graduates	464

Occupational safety and health workers. In this field, a bachelor's degree in science or engineering is the minimum requirement for beginning professionals including safety engineer, fire protection engineer, industrial hygienist, and loss control consultant. A degree in safety management, industrial safety, fire protection engineering, environmental health, or other closely related field is an asset; many employers prefer applicants with a master's degree or Ph.D. in occupational safety or health. Employers also attach great importance to

prior work experience in the field and are likely to prefer applicants with first-hand experience in industry, insurance, or in safety.

For jobs at the technician level, completion of a 2-year associate degree in an appropriate curriculum, plus relevant work experience, provides the background many employers seek.

Employment, 1974	25,000
Projected 1985 requirements	32,500
Percent growth, 1974-85	29.0
Average annual openings, 1974-85	1,100
Growth	700
Replacements	400
Available training data	-

Other service occupations

Mail carriers. These workers must be at least 18 and pass a written examination that tests clerical accuracy, and the ability to read, do simple arithmetic, and memorize mail distribution systems. If the job involves driving, the 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 lift and handle 70-pound mail sacks.

Employment, 1974	267,000
Projected 1985 requirements	275,000
Percent growth, 1974-85	3.0
Average annual openings, 1974-85	5,600
Growth	700
Replacements	4,900
Available training data	-

Telephone operators. New operators receive on-the-job training to become familiar with equipment, records, and work activities. After about 1 to 3 weeks of instruction they are assigned to regular operator jobs.

Employment, 1974	390,000
Projected 1985 requirements	385,000
Percent growth, 1974-85	-1.3
Average annual openings, 1974-85	28,000
Growth	-500
Replacements	28,500
Available training data	-

Education and Related Occupations

Teaching occupations

Kindergarten and elementary school teachers. All States require teachers in public elementary schools to be certified. Some States also require teachers in private and parochial schools to be certified. A bachelor's degree which includes student-teaching and education courses is generally the minimum requirement for certification. Some States require a master's degree or equivalent within a certain period after initial certifica-

tion. Local school systems sometimes have additional requirements for employment.

Over the 1974-85 period an average of about 94,000 entrants will be needed annually to meet projected requirements for kindergarten and elementary school teachers. This is the largest number of openings of any professional occupation. Most openings are expected to result from the need to replace teachers who leave the field because of deaths, retirements, and other labor force separations, rather than from growth.

New degree recipients, reentrants, and delayed entrants are the primary sources of elementary school teacher supply. The largest source is new degree recipients. The National Center for Education Statistics (NCES) projects an average of about 1 million new bachelor's degrees to be awarded annually over the 1974-85 period, although not all graduates are expected to qualify for teaching in elementary schools. During the 1960's and early 1970's, more than one out of eight bachelor's degree recipients qualified for certification. If this proportion continues from 1974 to 1985, an annual average of about 130,000 new graduates would be certified to teach in elementary schools over the period.

Teachers who have left the labor force and certified teachers who did not enter the labor force after graduation also are primary sources of supply. However, the number of prospective entrants from these sources is influenced by factors which cannot be projected with great accuracy, such as 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 average annual number of workers seeking jobs as elementary school teachers will significantly exceed the average annual openings over the 1974-85 period. This situation has existed over recent years, resulting in a decline in the rate of entry to the profession of newly certified college graduates. In the 1960's, about 80 percent of new graduates who had elementary school certification obtained positions in elementary schools, but by 1974 the proportion had declined to under 60 percent. In addition, the number of reentrants and delayed entrants has declined significantly. Over the 1974-85 period, therefore, 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, 1974	1,276,000
Projected 1985 requirements	1,439,000
Percent growth, 1974-85	12.8
Average annual openings 1974-85	94,000
Growth	15,000
Replacements	79,000

Available training data:

New college graduates prepared to teach in elementary schools in 1974	¹ 128,800
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¹ Source: National Education Association.

Secondary school teachers. All States require teachers in public secondary schools to be certified. Some States also require teachers in private and parochial schools to be certified. A bachelor's degree is the minimum requirement for certification. Twelve States usually require a fifth year of study, or a master's degree within a specified period after beginning employment. The number and type of education courses, subject specialty courses, and type of student-teaching preferred vary among States and school systems.

An average of 37,000 entrants will be needed annually over the 1974-85 period to meet the projected requirements for secondary school teachers. All openings will result from the need to replace teachers who leave the field because of deaths, retirements, and other labor force separations. In fact, the number of secondary school teaching positions is projected to decline.

The primary sources of secondary school teacher supply are new degree recipients, reentrants, and delayed entrants. The largest source is new degree recipients. The NCES projects an average of about 1 million new bachelor's degrees to be awarded annually over the 1974-85 period, although not all graduates are expected to qualify for teaching in secondary schools. During the 1960's and early 1970's, about one-fifth of bachelor's degree recipients qualified for certification. If this proportion continues from 1974 to 1985, an annual average of about 200,000 new graduates would be certified to teach in secondary schools over the period.

Teachers who have left the labor force and certified teachers who did not enter the labor force after graduation also are primary sources of teacher 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 problems of estimating future supply, there is every indication that the potential average annual number of workers seeking jobs as secondary school teachers will greatly exceed the annual average openings over the 1974-85 period. The situation has existed over recent years, resulting in a decline in the rate of entry to the profession of newly certified college graduates. In the 1960's, about two-thirds of new graduates who had secondary school certification obtained positions in secondary schools, but by 1974, the proportion had declined to under one-half. In addition, the number of reentrants and delayed entrants has declined significantly. Over the 1974-85 period, it is expected that an even greater proportion of new college graduates certified to teach in secondary schools, as well as potential delayed entrants and reentrants, may have to seek employment in other occupations.

Employment, 1974	1,086,000
Projected 1985 requirements	998,000
Percent growth, 1974-85	-8.1
Average annual openings 1974-85	37,500
Growth	-4,000
Replacements	41,500

Available training data:

New college graduates prepared to teach in secondary schools in 1974	¹ 167,839
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¹ Source: National Education Association.

College and university teachers. At least a master's degree in the subject to be taught is required for most beginning instructor positions, although a Ph.D is gen-

erally preferred. Advancement to assistant professor, to associate professor, and then to a full professorship requires increasing amounts of additional teaching and research experience. Currently, more than one-half of the faculty in universities and about 10 percent of the faculty in 2-year colleges have doctorates.

An average of about 14,000 entrants will be needed annually over the 1974-85 period to meet projected requirements.

The NCES projects an average of about 40,000 Ph.D.'s to be awarded annually over this period. In the past, about one-half of all Ph.D. recipients entered college teaching. If this entry rate continues, the supply of Ph.D.'s alone seeking employment as college and university teachers could exceed requirements. It appears, therefore, that a much higher proportion of advanced degree holders in the future than in the past may have to seek employment in fields other than college teaching.

Employment, 1974	1527,000
Projected 1985 growth	1516,000
Percent growth, 1974-85	-2.1
Average annual openings, 1974-85	14,000
Growth	-1,000
Replacements	15,000

Available training data

¹ Does not include part-time junior instructors.

Library occupations

Librarians. For professional librarians in public, academic, and special libraries, completion of a 1-year master's degree program in library science is usually required. For librarians in school libraries, a bachelor's degree in education with specialization in librarianship or audiovisual technology is the basic requirement, although a master's degree may be preferred.

It is anticipated that an average of about 10,500 entrants will be needed annually over the 1974-85 period to meet requirements. NCES projects that 11,400 bachelor's and master's degrees in library science will be awarded annually over this period. In the past, not all graduates have sought entry into the labor force immediately upon graduation; therefore fewer than 11,400

new library science graduates are expected to seek entry into the field annually. However, many qualified librarians outside the labor force who have not worked in the field or who have left the field are expected to seek entry or reentry to the field. In addition, persons with degrees in education with specialization in librarianship or audiovisual technology are expected to seek entry. Although data on entrants from those other sources are limited, it is anticipated that the number of people seeking to enter or reenter the field may exceed openings, and some may have to find employment in other fields.

Employment, 1974	125,000
Projected 1985 requirements	150,000
Percent growth, 1974-85	20.0
Average annual openings, 1974-85	10,700
Growth	2,300
Replacements	8,400

Available training data:

<i>Degrees in library science</i>	<i>Projected</i>	
	<i>1973-74</i>	<i>1974-85</i>
	<i>(annual average)</i>	
Bachelor's degrees ...	1,160	1,374
Master's degrees	8,130	10,004
Doctor's degrees	60	87

Library technicians and assistants. A high school diploma or its equivalent plus on-the-job or formal post-high school training is usually required for library technicians and assistants.

On-the-job programs generally take from 1 to 3 years to complete, depending on the library. Junior and community colleges and technical institutions offer formal 2-year education programs which lead to an associate of arts degree in library technology.

Employment, 1974	135,000
Projected 1985 requirements	175,000
Percent growth, 1974-85	29.3%
Average annual openings, 1974-85	14,100
Growth	3,600
Replacements	10,500

Available training data:

Junior college graduates	506
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Sales Occupations

Automobile parts counter workers. Skills for this occupation are learned on the job and usually 2 years of working experience are necessary before an employee is fully qualified. 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 working experience in a gasoline service station or auto repair shop also is an asset.

Employment, 1974	75,000
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Projected 1985 requirements	96,000
Percent growth, 1974-85	27.5
Average annual openings, 1974-85	3,500
Growth	1,900
Replacements	1,600

Available training data:

Job Corps completions	31
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Automobile salesworkers. Most beginners are trained on the job, although large firms sometimes provide

formal classroom training. Many employers require beginning automobile salesworkers to be at least 21 years old and high school graduates. Courses in public speaking, commercial arithmetic, psychology, business law, and selling are useful. Previous sales experience or work requiring contact with the public also is helpful.

Employment, 1974	130,000
Projected 1985 requirements	160,000
Percent growth, 1974-85	25.5
Average annual openings, 1974-85	5,500
Growth	2,900
Replacements	2,600
Available training data	-

Automobile service advisors. Trainees are usually selected from the employees in the employer's organization. For example, a person may apply for a job as service advisor trainee after gaining experience as mechanic or parts counter worker trainee. Service advisors trained on the job usually become qualified after 1 to 2 years of experience.

Employment, 1974	20,000
Projected 1985 requirements	28,000
Percent growth, 1974-85	21.3
Average annual openings, 1974-85	800
Growth	450
Replacements	350
Available training data	-

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 is associated with personal qualities such as aggressiveness and self-confidence, employers look for these traits. Some employers prefer individuals with appropriate experience and personal characteristics, whether or not they have attended college.

Newly hired workers usually receive some formal training. Trainees may attend company-sponsored classes or courses at local colleges and universities. Home study (correspondence) courses are also available.

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

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

Gasoline service station attendants. Applicants should have a driver's license, a general understanding of how an automobile works, and some sales ability. A high school education usually is not required except for service station management training programs conducted by oil companies. Attendants are trained on the job.

Employment, 1974	450,000
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Projected 1985 requirements	525,000
Percent growth, 1974-85	16.3
Average annual openings, 1974-85	12,700
Growth	6,700
Replacements	6,000

Available training data:

Job Corps completions	174
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Manufacturers' salesworkers. Employers generally prefer college graduates for manufacturers' salesworkers. A bachelor's degree in liberal arts or in business administration is good preparation for selling nontechnical products. Industrial manufacturers look for applicants with degrees in science or engineering, and pharmaceutical companies usually prefer people who have studied pharmacy. Industrial marketing training is available in vocational education programs.

Newly hired workers generally receive formal training before starting on the job. Some companies have 1 to 2 year programs; other firms offer classroom instruction followed by additional training under the supervision of field managers.

Employment, 1974	380,000
Projected 1985 requirements	387,000
Percent growth, 1974-85	2.4
Average annual openings, 1974-85	9,500
Growth	800
Replacements	8,700

Available training data

Real estate salesworkers and brokers. High school graduation is generally the minimum educational requirement for a job as a real estate salesworker. Many large firms prefer college graduates. However, most employers consider personality traits as important as academic training and prefer applicants with maturity, tact, and sales ability.

Many firms offer formal training programs for beginners and experienced workers. 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 also are available through the National Association of Realtors.

All States and the District of Columbia require real estate salesworkers and brokers to pass a written examination and to be licensed. Most States require brokers to have a specific amount of experience selling real estate or the equivalent in related experience or education.

Employment, 1974	400,000
Projected 1985 requirements	480,000
Percent growth, 1974-85	21.8
Average annual openings, 1974-85	28,500
Growth	7,800
Replacements	20,700

Available training data:

Vocational education completions	37,937
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Retail trade salesworkers. Employers prefer high school graduates. High school subjects such as commercial arithmetic and merchandising provide a good background. Some high schools have distributive education programs which teach the principles of retail selling. Most sales workers learn their skills on the job, however. 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.

Employment, 1974	2,800,000
Projected 1985 requirements	3,175,000
Percent growth, 1974-85	15.1
Average annual openings, 1974-85	190,000
Growth	38,000
Replacements	152,000
Available training data:	-
Job corps completions	141
Vocational education completions	169,319

¹ Includes training for other occupations in retail trade.

Route drivers. Most States require a route driver to have a chauffeur's license. Most employers prefer applicants who are high school graduates and over 25 years of age. Some large companies have classes in sales techniques, but training is mostly on the job.

Employment, 1974	190,000
Projected 1985 requirements	200,000
Percent growth, 1974-85	4.1
Average annual openings, 1974-85	3,700
Growth	700
Replacements	3,000
Available training data	-

Securities salesworkers. Employers generally prefer college graduates. A degree in business administration, economics, finance, or liberal arts is good preparation for work selling securities. Successful sales or managerial experience helps in getting a job, because many employers look for specific personality traits and signs of sales ability. Most States require persons who sell

securities to be licensed. Personal bonds and written examinations are required to obtain this license. In addition, practically all salesworkers must be registered representatives of their firm according to the regulations of the securities exchanges through which they do business, or the National Association of Securities Dealers, Inc. Examinations and character investigations are required for registration.

Most employers provide training to help newly hired salesworkers 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, 1974	100,000
Projected 1985 requirements	130,000
Percent growth, 1974-85	31.9
Average annual openings, 1974-85	6,100
Growth	2,900
Replacements	3,200

Available training data

Wholesale trade salesworkers. High school graduation is the usual requirement for a wholesale salesworker, although some sales jobs require college training. An engineering degree generally is needed to sell scientific and technical products. Newly hired workers usually begin as trainees, and are trained in several kinds of nonselling jobs before being assigned to sales. Trainee programs for college graduates usually involve classroom instruction as well as rotations to nonselling jobs. Generally 2 years or longer are required before a trainee is ready for his or her own sales territory.

Employment, 1974	770,000
Projected 1985 requirements	883,000
Percent growth, 1974-85	15.0
Average annual openings, 1974-85	30,000
Growth	10,000
Replacements	20,000

Available training data:

Vocational education completions

Construction Occupations

Asbestos and insulation workers. Asbestos workers learn their trade through either informal on-the-job training or a 4-year "improvership" program. The improvership program is similar to apprenticeship. Employers prefer high school graduates.

Employment, 1974	30,000
Projected 1985 requirements	50,000
Percent growth, 1974-85	66.7
Average annual openings, 1974-85	2,300
Growth	1,800
Replacements	500
Available training data:	
Apprenticeship completions	1277

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

Bricklayers and stonemasons. Completion of a 3-year apprenticeship program is the recommended training for these trades. A high school education or its equivalent is important for entry to apprenticeship programs. Training may also be obtained informally on the job.

During the early 1970's apprenticeship completions numbered slightly more than one-half of openings resulting from growth and deaths and retirements.

Employment, 1974	165,000
Projected 1985 requirements	205,000

Percent growth, 1974-85	24.2
Average annual openings, 1974-85	6,500
Growth	3,600
Replacements	2,900

Available training data:

Vocational education completions	8,908
Job Corps completions	785
Apprenticeship completions	11,162

¹ Includes stonemasons, marble-setters, and tile setters.

Carpenters. A 4-year apprenticeship program, including 144 hours of classroom instruction, is recommended. Training may also be acquired on the job. A high school education or its equivalent is desirable. Some knowledge of the trade may be obtained through vocational school courses in carpentry and shop.

During the early 1970's, apprenticeship completions numbered about 15 percent of openings resulting from growth and deaths and retirements.

Employment, 1974	1,060,000
Projected 1985 requirements	1,300,000
Percent growth, 1974-85	22.5
Average annual openings, 1974-85	49,100
Growth	21,700
Replacements	27,400

Available training data:

Vocational education completions	30,173
Job Corps completions	2,758
Apprenticeship completions	5,153

Cement masons. Cement masons learn their trade either through on-the-job training as helpers or through 2-year or 3-year apprenticeships. High school graduates are preferred.

During the 1970's, apprenticeship completions numbered about 15 percent of openings resulting from growth and deaths and retirements.

Employment, 1974	90,000
Projected 1985 requirements	120,000
Percent growth, 1974-85	33.3
Average annual openings, 1974-85	4,300
Growth	2,700
Replacements	1,600

Available training data:

Job Corps completions	344
Apprenticeship completions	520

Construction laborers. Little formal training is required for work as a building or construction laborer. Generally, applicants must be at least 18 years of age and in good physical condition.

Employment, 1974	865,000
Projected 1985 requirements	1,004,000
Percent growth, 1974-85	16.1
Average annual openings, 1974-85	28,400
Growth	12,600
Replacements	15,800

Available training data:

Job Corps completions	37
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Drywall installers and finishers. These workers usually start as helpers and learn most of their skills on the job. Some employers, in cooperation with unions, offer classroom instruction to supplement on-the-job training. High school graduates are preferred, but applicants with less education frequently are hired.

Employment, 1974	60,000
Projected 1985 requirements	75,000
Percent growth, 1974-85	25.0
Average annual openings, 1974-85	1,900
Growth	1,400
Replacements	500

Available training data

Electricians (construction). A high school education usually is required for electrician jobs. An apprenticeship program lasting 4 years and including 144 hours of classroom instruction each year is recommended. Training also may be acquired on the job. Some trade skills may be acquired through vocational school courses. Most cities require electricians to pass licensing examinations.

During the early 1970's, apprenticeship completions numbered about 60 percent of openings resulting from growth and deaths and retirements in the construction industry, but many individuals who completed electrician training went into other industries.

Employment, 1974	245,000
Projected 1985 requirements	320,000
Percent growth, 1974-85	30.6
Average annual openings, 1974-85	11,700
Growth	6,800
Replacements	4,900

Available training data:

Job Corps completions	595
Vocational education completions	12,776
Apprenticeship completions	15,933

¹ All electricians, including maintenance.

Elevator constructors. A high school education is required. Almost all elevator constructors learn their trade primarily through on-the-job training supplemented by classroom instruction. A trainee usually can become a fully qualified constructor within 4 years.

Employment, 1974	19,000
Projected 1985 requirements	25,000
Percent growth, 1974-85	31.6
Average annual openings, 1974-85	1,050
Growth	550
Replacements	500

Available training data

Floor covering installers. High school graduates are preferred. Courses in general mathematics and shop may provide a helpful background for floor covering work. Most workers acquire their skills on the job. Others qualify through apprenticeship programs.

Employment, 1974	85,000
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Projected 1985 requirements	100,000
Percent growth, 1974-85	17.6
Average annual openings, 1974-85	2,400
Growth	1,400
Replacements	1,000

Available training data:

Apprenticeship completions	295
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Glaziers (construction). These workers learn their trade through a 4-year apprenticeship or through on-the-job training. A high school diploma or its equivalent is required for entry into apprenticeship programs.

During the early 1970's, apprenticeship completions numbered nearly 50 percent of openings resulting from growth and deaths and retirements in the construction industry, but some individuals who completed glazier training went into other industries.

Employment, 1974	9,000
Projected 1985 requirements	13,000
Percent growth, 1974-85	44.4
Average annual openings, 1974-85	500
Growth	350
Replacements	150

Available training data:

Apprenticeship completions	295
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Lathers. Although many lathers acquire their skills informally on the job, apprenticeship is recommended. Depending on the local union, apprenticeship programs last 2, 3, or 4 years. Apprenticeship applicants usually are required to have a high school education or its equivalent.

During the early 1970's, apprenticeship completions numbered slightly more than 35 percent of openings resulting from growth and deaths and retirements.

Employment, 1974	25,000
Projected 1985 requirements	25,000
Percent growth, 1974-85	0.0
Average annual openings, 1974-85	200
Growth	0
Replacements	200

Available training data:

Apprenticeship completions:	277
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Operating engineers (construction machinery operators). A 3-year apprenticeship program is the recommended training. High school graduates are preferred for these programs. Most people, however, are trained informally on the job.

Employment, 1974	400,000
Projected 1985 requirements	610,000
Percent growth, 1974-85	51.4
Average annual openings, 1974-85	27,000
Growth	18,800
Replacements	8,200

Available training data:

Job corps completions	914
Apprenticeship completions	806

Painters and paperhangers. A high school education is preferred but not essential for painter and paperhanger employment. Although a 3-year formal apprenticeship program including related classroom instruction is recommended, training also may be obtained informally on the job. During the early 1970's apprenticeship completions numbered less than 10 percent of openings resulting from growth and deaths and retirements.

Employment, 1974	470,000
Projected 1985 requirements	525,000
Percent growth, 1974-85	10.8
Average annual openings, 1974-85	18,100
Growth	4,700
Replacements	13,400

Available training data:

Job Corps completions	605
Apprenticeship completions	1,037

Plasterers. A 3- to 4-year apprenticeship including classroom instruction is recommended, but many learn the trade on the job by working as plasterers' helpers or laborers. High school graduates are preferred.

Employment, 1974	26,000
Projected 1985 requirements	25,000
Percent growth, 1974-85	-3.8
Average annual openings, 1974-85	450
Growth	-100
Replacements	550

Available training data:

Job Corps completions	187
Apprenticeship completions	182

Plumbers and pipefitters. A 5-year apprenticeship including related classroom instruction is recommended, but many learn the trade informally on the job. Employers prefer high school graduates. Some skills may be acquired through vocational school courses. Some localities require workers to pass a licensing examination.

Employment, 1974	375,000
Projected 1985 requirements	535,000
Percent growth, 1974-85	42.7
Average annual openings	23,500
Growth	14,600
Replacements	8,900

Available training data:

Vocational education completions	7,174
Job Corps completions	127
Apprenticeship completions	15,860

¹ Includes sprinkler-fitters.

Roofers. A 3-year apprenticeship including related classroom instruction is recommended for roofing work. The majority of roofers, however, acquire their skills by working as helpers.

Employment, 1974	90,000
Projected 1985 requirements	130,000

Percent growth, 1974-85	44.4
Average annual openings, 1974-85	5,000
Growth	3,600
Replacements	1,400
Available training data:	
Apprenticeship completions	387

Sheet-metal workers. A 4-year apprenticeship program including classroom instruction is recommended for sheet-metal workers, but many people learn the trade informally on the job. A high school education is required for entry to apprenticeship programs, and courses in mathematics, mechanical drawing, and shop provide a helpful background for learning the trade.

During the early 1970's, the number of apprenticeship completions was greater than openings for sheet-metal workers in the construction industry, but many individuals completing sheet-metal training went into other industries.

Employment, 1974	65,000
Projected 1985 requirements	75,000
Percent growth, 1974-85	15.4
Average annual openings, 1974-85	2,000

Growth	900
Replacements	1,100
Available training data:	
Job Corps completions	129
Apprenticeship completions	2,464

Structural, ornamental, and reinforcing ironworkers, riggers, and machine movers. A 3-year apprenticeship program including related classroom instruction is recommended for these jobs. Applicants for apprenticeship generally must have a high school education.

During the 1960's and early 1970's, apprenticeship completions numbered about 30 percent of openings resulting from growth and deaths and retirements.

Employment, 1974	85,000
Projected 1985 requirements	112,000
Percent growth, 1974-85	31.8
Average annual openings, 1974-85	3,900
Growth	2,500
Replacements	1,400

Available training data:	
Apprenticeship completions	1,615

Occupations in Transportation Activities

Air transportation occupations

Air traffic controllers. Trainees are selected through the competitive Federal Civil Service System. Applicants must have 3 years of progressively responsible work experience that demonstrates their potential and/or a college degree. Successful applicants receive both on-the-job and formal training. It usually takes 2 to 3 years to become a fully qualified controller.

Employment, 1974	22,000
Projected 1985 requirements	27,500
Percent growth, 1974-85	24.8
Average annual openings, 1974-85	750
Growth	500
Replacements	250

Available training data	-
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Airplane mechanics. High school graduates are preferred. Most mechanics learn their job in the Armed Forces or in private trade schools certified by the Federal Aviation Administration (FAA). Others learn through formal apprenticeship programs or on-the-job training. Some large airlines train apprentices in carefully planned 3- or 4-year programs which include both classroom instruction and work experience. Mechanics who work on civilian aircraft usually must be licensed by the FAA.

Employment, 1974	130,000
Projected 1985 requirements	145,000
Percent growth, 1974-85	12.1
Average annual openings, 1974-85	3,200
Growth	1,400

Replacements	1,800
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Available training data:	
Apprenticeship completions	19

Airplane pilots. All commercial pilots must be licensed by the Federal Aviation Administration. Flying can be learned in military or civilian flying schools. Applicants hired by a scheduled airline usually start as flight engineers, although they may begin as copilots.

Employment, 1974	79,000
Projected 1985 requirements	101,000
Percent growth, 1974-85	28.7
Average annual openings, 1974-85	2,800
Growth	2,100
Replacements	700

Available training data:	
Vocational education completions	1,016

Flight attendants. Applicants must be high school graduates, and those who have 2 years of college, nurses' training, or experience in dealing with the public are preferred. Most large airlines train their own flight attendants; those that do not operate schools generally send trainees to the school of another airline.

Employment, 1974	41,000
Projected 1985 requirements	56,000
Percent growth, 1974-85	35.2
Average annual openings, 1974-85	6,400
Growth	1,300
Replacements	5,100

Available training data	-
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Reservation, ticket, and passenger agents. Airlines require a high school education and usually prefer applicants with some college training.

Employment, 1974	56,000
Projected 1985 requirements	76,000
Percent growth, 1974-85	35.8
Average annual openings, 1974-85	4,250
Growth	1,800
Replacements	2,450
Available training data	-

Merchant marine occupations

Merchant marine officers. Candidates must have at least 3 years of appropriate sea experience or be a graduate of an approved training program. Training may be obtained at either the U.S. Merchant Marine Academy, one of five State merchant marine academies, or in a trade union training program. Officer candidates also must pass a Coast Guard examination. Although there are no educational requirements, formal training usually is needed to pass the examination for an officer's license.

Employment, 1974	7,500
Projected 1985 requirements	7,500
Percent growth, 1974-85	0.0
Average annual openings, 1974-85	150
Growth	0
Replacements	150
Available training data	-

Merchant marine sailors. Although not required, previous sea experience in the Coast Guard or Navy is helpful. In addition, applicants must obtain merchant marine papers from the Coast Guard. Most training programs are designed to upgrade experienced workers, but the Seafarers' International Union of North America operates a school that trains inexperienced young people.

Employment, 1974	20,000
Projected 1985 requirements	17,150
Percent growth, 1974-85	-14.2
Average annual openings, 1974-85	50
Growth	250
Replacements	300
Available training data	-

Railroad occupations

Brake operators. Employers prefer applicants with a high school education. Operators learn their skills on the job. It usually takes a year or so to learn the job thoroughly.

Employment, 1974	73,000
Projected 1985 requirements	69,000
Percent growth, 1974-85	-5.8
Average annual openings, 1974-85	700
Growth	-400

Replacements	1,100
Available training data	-

Conductors. Qualified brake operators are promoted to conductors on a seniority basis. To qualify, a person usually must have several years' experience as a brake operator and pass examinations covering signals, timetables, operating rules, and related subjects.

Employment, 1974	39,500
Projected 1985 requirements	41,000
Percent growth, 1974-85	4.6
Average annual openings, 1974-85	1,250
Growth	150
Replacements	1,100
Available training data	-

Locomotive engineers. Openings in engineer jobs are usually filled by training and promoting engineer helpers according to seniority rules. Applicants for helper jobs must be at least 21 years old; high school graduates are preferred. Helpers qualify for promotion by proving their ability to operate locomotives and by passing a comprehensive exam on subjects such as mechanical and electrical equipment and operating rules and regulations.

Employment, 1974	37,000
Projected 1985 requirements	38,500
Percent growth, 1974-85	4.3
Average annual openings, 1974-85	1,350
Growth	150
Replacements	1,200
Available training data	-

Shop trades. Apprenticeship training is the most common way of entering the railroad shop trades, although some workers learn on the job and are upgraded from jobs as helpers and laborers. Applicants who have had shop training in high schools are preferred.

Employment, 1974	75,000
Projected 1985 requirements	57,000
Percent growth, 1974-85	-27.0
Average annual openings, 1974-85	-300
Growth	-1,900
Replacements	1,600
Available training data	-

Signal department workers. New employees are assigned as helpers to experienced workers. After about 60 to 90 days of training, they may advance to assistants; after another 2 to 4 years, qualified assistants may be promoted to signal installers or maintainers. Railroads prefer applicants who are high school graduates.

Employment, 1974	11,500
Projected 1985 requirements	11,200
Percent growth, 1974-85	-2.6
Average annual openings, 1974-85	250
Growth	-50
Replacements	300
Available training data	-

Station agents. Station agents 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, 1974	7,600
Projected 1985 requirements	3,700
Percent growth, 1974-85	-51.0
Average annual openings, 1974-85	-200
Growth	-350
Replacements	150
Available training data	-

Telegraphers, telephoners, and tower operators. New workers receive on-the-job training that covers operating rules, train orders, and station operations. Most railroads require trainees to pass examinations on train operating rules and demonstrate ability to use the equipment before they can qualify. High school graduates are preferred.

Employment, 1984	11,000
Projected 1985 requirements	6,600
Percent growth, 1974-85	-39.0
Average annual openings, 1974-85	-150
Growth	-400
Replacements	250
Available training data	-

Track workers (railroad). Most learn their skills through on-the-job training that lasts about 2 years. Applicants should be able to read, write, and perform heavy work.

Employment, 1974	57,000
Projected 1985 requirements	55,000
Percent growth, 1974-85	-2.9
Average annual openings, 1974-85	1,050
Growth	-150
Replacements	1,200
Available training data	-

Driving occupations

Intercity busdrivers. Minimum qualifications established by the U.S. Department of Transportation require intercity bus drivers to be at least 21 years old, and pass written and physical examinations; bus companies generally have even higher requirements. Most prefer applicants who are at least 25 years old, and many prefer those who have truck or bus driving experience. Most companies conduct 2- to 6-week training programs for new employees. Most States require busdrivers to have a chauffeur's license.

Employment, 1974	25,000
Projected 1985 requirements	26,000
Percent growth, 1974-85	3.9
Average annual openings, 1974-85	850
Growth	100
Replacements	750
Available training data	-

Local transit busdrivers. Generally, applicants must have a chauffeur's license. New drivers usually are trained on the job.

Employment, 1974	71,000
Projected 1985 requirements	78,500
Percent growth, 1974-85	10.4
Average annual openings, 1974-85	2,900
Growth	700
Replacements	2,200
Available training data	-

Local truckdrivers. Qualifications vary depending on the type of truck and nature of the business. In most States, however, applicants must have a chauffeur's license. New drivers usually are trained on the job.

Employment, 1974	1,600,000
Projected 1985 requirements	1,760,000
Percent growth, 1974-85	8.5
Average annual openings, 1974-85	38,500
Growth	12,500
Replacements	26,000

Available training data:

Job Corps completions	115
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¹ May include long-distance drivers.

Long-distance truckdrivers. Minimum qualifications set by the U.S. Department of Transportation require that drivers must be at least 21 years old and pass written and physical examinations. Most States require a chauffeur's license. Some trucking companies have even higher standards. Many companies specify height and weight limitations for drivers and some hire only applicants who have several years' experience driving trucks. In addition, they must pass an examination on the Motor Carrier Safety Regulations of the U.S. Department of Transportation. Driver training courses in high school or in a private driving school are good preparation.

Employment, 1974	540,000
Projected 1985 requirements	585,000
Percent growth, 1974-85	8.1
Average annual openings, 1974-85	12,000
Growth	4,000
Replacements	8,000

Available training data

Parking attendants. Employers prefer high school graduates. Applicants must have a valid driver's license and be able to drive all types of cars. The ability to keep records of claim tickets, compute parking charges, and make change also is important. Some employers offer training programs that review proper driving techniques and outline company policy on recordkeeping procedures and damage claims.

Employment, 1974	42,000
Projected 1985 requirements	45,000
Percent growth, 1974-85	7.0
Average annual openings, 1974-85	1,800

Growth	300
Replacements	1,500
Available training data	-

Taxicab drivers. In most cities taxi drivers must have a State-issued chauffeur's license, as well as a special operator's license issued by the local police, safety department, or Public Utilities Commission. Some companies teach the applicant taxicab regulations and

the location of streets. A large number of companies only hire applicants who are at least 21; some require drivers to be 25 years of age.

Employment, 1974	92,000
Projected 1985 requirements	89,000
Percent growth, 1974-85	-3.7
Average annual openings, 1974-85	2,450
Growth	-300
Replacements	2,750
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. Teaching and research generally require advanced degrees.

It is anticipated that an average of about 950 new entrants will be required annually over the 1974-85 period to meet projected requirements. Followup data on college graduates indicate that more than two-thirds of those obtaining bachelor's degrees in forestry have sought to enter the field. If this proportion were to seek employment in forestry in the future, 1,300 bachelor's degrees would have to be granted annually over the 1974-85 period to meet projected requirements. Projections of the National Center for Education Statistics indicate an average of almost 2,500 bachelor's degrees in forestry annually over this period. Thus, unless the number of degrees granted in forestry is lower than the number projected, a higher proportion of forestry graduates may have employment in other fields than in the past.

Employment, 1974	24,000
Projected 1985 requirements	29,000
Percent growth, 1974-85	20.5
Average annual openings, 1974-85	950
Growth	450
Replacements	500

Available training data:

<i>Degrees in forestry</i>	<i>Projected</i>	
	<i>1973-74</i>	<i>1974-85</i>
	<i>(annual average)</i>	
Bachelor's degrees .	2,337	2,480
Master's degrees	408	462
Doctor's degrees	35	89

Forestry technicians. Completion of specialized 1- or 2-year postsecondary school curriculums, government sponsored training programs, or experience in forest work such as planting trees or fighting fires generally is required for beginning technician jobs. Postsecondary training can be obtained in technical institutes, junior or community colleges, and some universities.

Employment, 1974	10,500
Projected 1985 requirements	13,800
Percent growth, 1974-85	32.1
Average annual openings, 1974-85	500
Growth	300
Replacements	200

Available training data:

Job Corps completions	216
Junior college graduates	1,980

Range managers. A bachelor's degree with a major in range management, range conservation, or a closely related field usually is required to become a range manager. An advanced degree is generally necessary for research and teaching positions. Many college students obtain valuable experience through summer jobs with Federal Government agencies such as the Forest Service or Bureau of Land Management.

Employment, 1974	2,500
Projected 1985 requirements	3,850
Percent growth 1974-85	53.9
Average annual openings, 1974-85	150
Growth	100
Replacements	50

Available training data:

Degrees in range management:

Bachelor's degrees	163
Master's degrees	43
Doctor's degrees	19

Engineers

A bachelor's degree in engineering generally is required for most entry positions. College graduates trained in one of the physical sciences or mathematics also may qualify for some jobs. Experienced technicians with some engineering education may advance to engineering jobs. Graduate training is emphasized for an increasing number of jobs; it is essential for college and university teaching and for some research positions, and is desirable for advancement in many areas. All 50 States and the District of Columbia require licensing for engineers whose work may affect life,

health, or property, or who offer their services to the public.

New graduates with engineering majors are the primary source of engineers. Limited data on past patterns of entry into the occupation indicate large numbers also have entered from other sources: workers who shift occupations (including workers who are upgraded); persons not in the labor force (including those in the Armed Forces); immigrants; and college graduates with majors in fields other than engineering.¹⁵ However, patterns of entry from these other sources are affected, to some extent, by the availability of engineering graduates. If the same proportion of openings as during the 1960's were to be filled from these other sources, an estimated 32,000 other entrants could be expected annually over the 1974-85 period. Under these assumptions, about 41,000 new engineering graduates would have to enter the field annually to meet projected requirements. Followup studies of new college graduates indicate that about 85 percent of bachelor's degree recipients in engineering eventually enter the profession. Therefore, about 48,000 engineering graduates would be needed annually to obtain this required number of new entrants.

Projections of the National Center for Education Statistics, however, indicate an average of almost 57,000 bachelor's degrees in engineering annually over this period. Therefore, to the extent that employers prefer to hire new engineering graduates, requirements for engineers could be met with less reliance on other entrants than in the past.

Employment, 1974	1,100,000
Projected 1985 requirements	1,500,000
Percent growth, 1974-85	32.8
Average annual openings, 1974-85	73,000
Growth	33,500
Replacements	139,600

Available training data:

	<i>Degrees in engineering</i> ²	
	1973-74	Projected 1974-85 (annual average)
Bachelor's degrees .	50,693	56,714
Master's degrees	15,385	17,128
Doctor's degrees	3,312	2,827

¹Includes an estimated 20,600 replacements for those who transfer to other occupations.

²Includes engineering technology.

¹⁵ Data on past patterns of entry are available from *Two Years After the College Degree—Work and Further Study Patterns* (National Science Foundation, 1963), and the *Postcensal Study of Professional and Technical Personnel*, a followup study of persons who were reported in professional and technical occupations in the 1960 Census. Selected data from the study are presented in *Technician Manpower: Requirements, Resources, and Training Needs*, Bulletin 1512 (Bureau of Labor Statistics, 1966). The Bureau currently is developing more recent entry rates. The National Science Foundation has published data on scientists and engineers from abroad, based on special tabulations prepared by the Immigration and Naturalization Service of the Department of Justice.

Environmental scientists

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

New college graduates with a major in geology are the major source of supply. However, limited data on past patterns of entry into the occupation indicate that a significant number of workers have entered geology from other sources: new college graduates not majoring in geology, immigrants, persons not in the labor force, and persons employed in other occupations.¹⁶ Although many factors affect the number of other entrants, including the availability of geology graduates, significant numbers probably will continue to enter. If past patterns of entry from these other sources continue, it is expected that about 900 new geology graduates would need to enter the occupation each year to meet projected requirements. Followup data on college graduates indicate that in the past, less than one-third of those who received bachelor's degrees in geology, including those who did graduate study in geology, actually entered the field. (Many of those not entering the field became high school teachers, or entered other occupations.) If this entry rate were to continue, an average of about 2,800 bachelor's degree graduates in geology would be needed annually to meet projected requirements. Projections of the NCES indicate an average of about 4,000 bachelor's degrees annually in geology.

Employment, 1974	23,000
Projected 1985 requirements	32,000
Percent growth, 1974-85	39.4
Average annual openings, 1974-85	1,900
Growth	800
Replacements	11,100

Available training data:

	<i>Degrees in geology</i>	
	73-74	Projected 1974-85 (annual average)
Bachelor's degrees	3,151	4,054
Master's degrees	870	866
Doctor's degrees	258	302

¹ Includes an estimated 600 replacements for those who transfer to other occupations.

Geophysicists. A bachelor's degree in geophysics or a geophysical specialty, or a bachelor's degree in a related field of science or engineering with courses in geophysics, physics, geology, mathematics, chemistry, and engineering is generally the minimum requirement

¹⁶ See footnote 15.

for employment as a geophysicist. Graduate training is usually necessary for research, college and university teaching, and for supervisory positions in exploration activities.

Employment, 1974	8,200
Projected 1985 requirements	11,400
Percent growth, 1974-85	39.4
Average annual openings, 1974-85	650
Growth	300
Replacements	1350

Available training data:

Degrees in geophysics and seismology:

Bachelor's degrees	84
Master's degrees	56
Doctor's degrees	47

¹ Includes an estimated 200 replacements for those who transfer to other occupations.

Meteorologists. A bachelor's degree in meteorology or in a related science—usually physics, mathematics, or engineering with courses in meteorology—is generally the minimum education required to become a meteorologist. An advanced degree is necessary for some positions, particularly in research and in college and university teaching.

Employment, 1974	5,000
Projected 1985 requirements	6,900
Percent growth, 1974-85	23.3
Average annual openings, 1974-85	200
Growth	100
Replacements	100

Available training data:

Degrees in atmospheric sciences and meteorology:

Bachelor's degrees	294
Master's degrees	195
Doctor's degrees	54

Oceanographers. An advanced degree, preferably a Ph.D. 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 research or laboratory assistant in oceanography.

Employment, 1974	2,500
Projected 1985 requirements	3,100
Percent growth, 1974-85	22.5
Average annual openings, 1974-85	100
Growth	50
Replacements	50

Available training data:

Degrees in oceanography:

Bachelor's degrees	237
Master's degrees	199
Doctor's degrees	70

Life science occupations

Life scientists. A bachelor's degree is adequate preparation for some jobs. However, many positions require graduate training; a Ph.D usually is required for college teaching and for senior research positions. A professional health degree is necessary for some jobs in medical research.

New graduates with a major in one of the life sciences are the primary source of supply of life scientists. However, limited data on patterns of entry into the occupation indicate that a significant number of workers have entered from other sources: immigration, reentrants to the labor force; graduates with majors other than in the life sciences; and workers who transfer from other occupations. Although many factors, including the relative availability of life science graduates, affect the number of other entrants, significant numbers probably will continue to enter the occupation. If past patterns of entry from these sources continue, it is expected that about 9,200 life science graduates would need to enter each year to meet projected requirements. Less than one-third of those who received bachelor's degrees in the life sciences in the past, including those who did graduate study in the life sciences, actually entered the field. (Many have become secondary school teachers and laboratory technicians or gone to medical, dental, and veterinary schools; some with degrees in agriculture have become farmers and ranchers.) If this entry rate were to continue, an average of 32,200 bachelor's degree graduates in the life sciences would be needed annually to meet projected requirements.

Projections of the NCES indicate an average of about 68,000 bachelor's degrees annually in the life sciences over this period. Therefore, unless the number of degrees granted in the life sciences is lower than the number projected, a higher proportion of graduates may have to seek employment in other fields than in the past.

Employment, 1974	190,000
Projected 1985 requirements	245,000
Percent growth, 1974-85	29.0
Average annual openings, 1974-85	16,400
Growth	5,400
Replacements	11,000

Available training data:

Degrees in biological sciences
and in agricultural and natural resources

	1973-74	Projected 1974-85 (annual average)
Bachelor's degrees ..	65,159	68,427
Master's degrees	9,520	10,665
Doctor's degrees	4,370	4,765

¹ Includes an estimated 5,700 replacements for those who transfer to other occupations.

Mathematics occupations

Mathematicians. For the majority of positions, at least a master's degree in mathematics generally is required; a Ph.D. generally is required for teaching in colleges and universities. However, for some positions, a bachelor's degree is adequate.

It is anticipated that an average of about 1,550 new entrants will be needed annually over the 1974-85 period to meet projected requirements. Projections of the NCES indicate an annual average of about 800 doctorates and about 4,200 master's degrees in mathematics over the period. Limited followup data on college graduates indicate that in the past, almost all doctorate holders and about a third of master's degree holders entered the field. (Many master's degree holders not entering the field have become high school teachers or entered computer-related occupations.) Limited data on past patterns of entry into the occupation indicate that some workers also entered from other sources: transfers from other occupations, reentrants into the labor force, immigrants, and new college graduates not majoring in mathematics.¹⁷ Data, however, are not sufficient to estimate future entrants from these sources.

Nevertheless, it appears likely that unless the number of advanced degrees granted in mathematics is lower than the number projected, a higher proportion of mathematics graduates may have to seek employment in other fields than in the past.

Employment, 1974	40,000
Projected 1985 requirements	46,100
Percent growth, 1974-85	16.5
Average annual openings, 1974-85	1,550
Growth	600
Replacements	950

Available training data:

<i>Degrees in mathematics</i>		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Bachelor's degrees .	21,813	19,205
Master's degrees	4,840	4,154
Doctor's degrees	1,031	769

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.

Employment, 1974	24,000
Projected 1985 requirements	31,000
Percent growth, 1974-85	32.6
Average annual openings, 1974-85	1,450
Growth	650
Replacements	800

¹⁷ See footnote 15, p. 47.

Available training data:

Degrees in statistics:

Bachelor's degrees	257
Master's degrees	453
Doctor's degrees	147

Physical scientists

Astronomers. A Ph.D. degree in astronomy usually is required for jobs as astronomers. Persons with less education may qualify for some jobs, but their advancement opportunities are limited.

Employment, 1974	2,000
Projected 1985 requirements	2,080
Percent growth, 1974-85	4.0
Average annual openings	30
Growth	10
Replacements	20

Available training data:

Degrees in astronomy:

Bachelor's degrees	152
Master's degrees	82
Doctor's degrees	77

Chemists. A bachelor's degree in chemistry is usually the minimum 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.

The major source of supply of chemists is from new graduates majoring in chemistry. However, limited data on past patterns of entry into the occupation indicate that a significant number of workers have entered chemistry from other sources: immigration; persons reentering the labor force; graduates who did not major in chemistry; and persons entering from other occupations.¹⁸ Although many factors affect the number of other entrants, including the availability of chemistry graduates, significant numbers probably still will continue to enter the occupation.

If past entry patterns continue, about 4,600 entrants could be expected from these other sources. Therefore it is expected that about 5,300 chemistry graduates would need to enter each year to meet projected requirements. Followup data on college graduates indicate that in the past fewer than half of those who received bachelor's degrees in chemistry, including those who did graduate study in chemistry, actually entered the field. (Many of those not entering chemistry have gone on to medical, dental or veterinary schools, or become secondary school teachers.) If this entry rate

¹⁸ See footnote 15, p. 47.

continues, an average of about 10,900 bachelor's degree graduates in chemistry would be needed annually over the 1974-85 period to meet projected requirements. Projections of the NCES indicated an average of about 10,100 bachelor's degrees annually in chemistry over this period.

Employment, 1974	135,000
Projected 1985 requirements	173,000
Percent growth, 1974-85	28.6
Average annual openings, 1974-85	10,000
Growth	3,500
Replacements	16,500

Available training data:

<i>Degrees in chemistry</i>	<i>Projected</i>	
	<i>1973-74</i>	<i>1974-85</i>
	<i>(annual average)</i>	
Bachelor's degrees .	10,517	10,064
Master's degrees	2,095	2,076
Doctor's degrees	1,760	1,507

¹ Includes an estimated 3,600 replacements for those who transfer to other occupations.

Physicists. Graduate training in physics or a related field is necessary for most jobs; a doctorate is usually required for teaching in colleges and universities and for senior research positions. For some jobs, however, a bachelor's degree is adequate.

College graduates with a major in physics are the primary source of supply of new physicists. However, limited data on past patterns of entry into the occupation indicate that a significant number of workers also have entered physics from other sources: immigration; college graduates with nonphysics majors; persons re-entering the labor force; and persons entering from other occupations.¹⁹ Although many factors, including the availability of physics graduates, affect the number of other entrants, significant numbers probably will continue to enter the occupation.

If past entry patterns continue, about 1,400 entrants could be expected from these sources. Thus, it is expected that about 1,600 physics graduates would need to enter each year to meet projected requirements. Followup data on college graduates indicate that in the past fewer than half of those who received bachelor's degrees in physics, including those who did graduate study in physics, actually entered the field. (Many of those not becoming physicists entered high school teaching, computer-related occupations, and engineering.) If this entry rate were to continue, about 3,300 bachelor's degree graduates in physics would be needed annually to meet projected requirements.

Projections of the NCES indicate an average of about 3,600 bachelor's degrees annually over this period.

Employment, 1974	48,000
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¹⁹ See footnote 15, p. 47.

Projected 1985 requirements	59,400
Percent growth, 1974-85	25.0
Average annual openings, 1974-85	3,000
Growth	11,900

Available training data:

<i>Degrees in physics</i>	<i>1973-74</i>	<i>Projected</i>
		<i>1974-85</i>
		<i>(annual average)</i>
Bachelor's degrees .	3,936	3,625
Master's degrees	1,645	1,514
Doctor's degrees	1,100	794

¹ Includes an estimated 1,300 replacements for those who transfer to other occupations.

Other scientific and technical occupations

Broadcast technicians. Technicians must obtain a Radio-Telephone First Class Operator license from the Federal Communications Commission. To obtain the license, applicants must pass a series of written tests covering subjects such as the construction and operation of transmission and receiving equipment. Courses in mathematics, science, and electronics and special courses designed to prepare students for the FCC's license test are good preparation. Technical school or college education is an advantage for those wanting to advance to supervisory positions or to more specialized jobs in large stations and in the networks.

Employment, 1974	22,000
Projected 1985 requirements	26,000
Percent growth, 1974-85	18.2
Average annual openings, 1974-85	1,350
Growth	350
Replacements	1,000

Available training data

Drafters. Post-high school drafting training in technical institutes, junior and community colleges, extension divisions of universities, and vocational and technical high schools generally provides adequate training for beginning drafters. Necessary skills also may be obtained on the job, combined with part-time schooling or through 3- or 4-year apprenticeship programs.

Employment, 1974	313,000
Projected 1985 requirements	444,000
Percent growth, 1974-85	41.7
Average annual openings, 1974-85	17,300
Growth	12,000
Replacements	5,300

Available training data:

Job Corps completions	65
Vocational education completions	30,151
Apprenticeship completions	324

Engineering and science technicians. Persons can qualify as engineering and science technicians through many combinations of education and work experience.

Post-high school technical training consists of 1 to 4 years of full-time study at a technical training institute, junior and community college, extension division of a college and university, or vocational-technical high school. Training also may be acquired on the job or through part-time courses in postsecondary schools or in correspondence schools. Qualifications also can be obtained through experience in technical jobs in the Armed Forces.

Employment, 1974	560,000
Projected 1985 requirements	794,000
Percent growth, 1974-85	41.4
Average annual openings, 1974-85	32,000
Growth	21,000
Replacements	11,000
Available training data:	
Vocational education completions	42,408

Apprenticeship completions	¹ 138
Junior college graduates	39,024

¹ Electronics technicians.

Surveyors. A combination of postsecondary school courses in surveying and extensive on-the-job training is the most common method of entry. Junior colleges, technical institutes, and vocational schools offer 1-, 2-, and 3-year programs in surveying. All 50 States require licensing or registration of those land surveyors responsible for locating and describing land boundaries.

Employment, 1974	55,000
Projected 1985 requirements	86,600
Percent growth, 1974-85	592
Average annual openings	3,600
Growth	2,700
Replacements	900
Available training data:	
Junior college graduates	2,203

Mechanics and Repairers

Telephone craft occupations

Central office craft occupations. Trainee jobs are filled by employees already with the company such as telephone operators, and occasionally by workers from outside the company. Although no formal education is required, a basic knowledge of electricity and electronics and/or telephone training in the Armed Forces is helpful. New craftworkers receive classroom instruction and on-the-job training.

Employment, 1974	110,000
Projected 1985 requirements	130,000
Percent growth, 1974-85	18.2
Average annual openings, 1974-85	2,900
Growth	1,800
Replacements	1,100
Available training data	-

Central office equipment installers. New workers receive on-the-job training and classroom instruction. It takes several years to become a skilled installer.

Employment, 1974	30,000
Projected 1985 requirements	36,000
Percent growth, 1974-85	18.0
Average annual openings, 1974-85	800
Growth	500
Replacements	300
Available training data	-

Line installers and cable splicers. Companies hire inexperienced workers as trainees. Knowledge of the basic principles of electricity and/or telephone training in the Armed Forces is helpful. Applicants usually must pass physical exams because some line and cable work is strenuous. Training includes classroom and on-the-job instruction.

Employment, 1974	55,000
Projected 1985 requirements	53,500
Percent growth, 1974-85	-3.6
Average annual openings, 1974-85	150
Growth	-200
Replacements	350
Available training data	-

Telephone and PBX installers and repairers. Applicants are selected from telephone company employees and inexperienced people from outside the company who have passed an aptitude test. Training includes both on-the-job and classroom instruction.

Employment, 1974	115,000
Projected 1985 requirements	130,000
Percent growth, 1974-85	12.1
Average annual openings, 1974-85	2,400
Growth	1,300
Replacements	1,100
Available training data	-

Other mechanics and repairers

Air-conditioning, refrigeration, and heating mechanics. Most mechanics start as helpers and learn their skills on the job. Employers prefer high school graduates who have studied mathematics, physics, electronics, and blueprint reading. Many high schools and vocational schools offer courses to prepare students for entry jobs.

Employment, 1974	200,000
Projected 1985 requirements	285,000
Percent growth, 1974-85	33.6
Average annual openings	10,900
Growth	7,000
Replacements	3,900

Available training data:

Job Corps completions	240
Vocational education completions	13,215
Apprenticeship completions	279

Appliance repairers. These workers usually start as helpers and are trained on the job. High school courses in electricity, electronics, shop math, and blueprint reading provide a good background for appliance repair work. Formal training in appliance repair and related subjects is available from some vocational schools, technical schools, and community colleges.

Employment, 1974	135,000
Projected 1985 requirements	170,000
Percent growth, 1974-85	24.1
Average annual openings	5,600
Growth	3,000
Replacements	2,600

Available training data:

Vocational education completions	4,877
Job Corps completions	108

Automobile body repairers. Generally, 3 to 4 years of on-the-job training are necessary to become fully qualified. Most training authorities recommend the completion of a 3- or 4-year apprenticeship program which includes on-the-job and related classroom instruction. Although high school graduation is not required for an entry job, most employers consider this an asset.

Employment, 1974	145,000
Projected 1985 requirements	176,000
Percent growth, 1974-85	21.4
Average annual openings, 1974-85	4,700
Growth	2,800
Replacements	1,900

Available training data:

Job Corps completions	765
Vocational education completions	17,310
Apprenticeship completions	307

Automobile mechanics. Most automobile mechanics learn the trade through 3 to 4 years of on-the-job experience. 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 as the best way to learn the trade. Auto mechanic training in the Armed Forces and courses offered at high schools, vocational schools, or private trade schools are helpful.

Employment, 1974	735,000
Projected 1985 requirements	875,000
Percent growth, 1974-85	19.3
Average annual openings, 1974-85	24,400
Growth	12,900
Replacements	11,500

Available training data:

Job Corps completions	1,962
Vocational education completions	76,280
Apprenticeship completions	1,330

Boat motor mechanics. Generally, 2 to 3 years of on-the-job training are necessary to become skilled in repairing both outboard and inboard gasoline motors. A high school diploma is preferred but not required. Courses in small engine repair, auto mechanics, and machine shop are helpful.

Employment, 1974	11,000
Projected 1985 requirements	14,000
Percent growth, 1974-85	29.0
Average annual openings	550
Growth	300
Replacements	250

Available training data

Bowling-pin-machine mechanics. Mechanics learn their skills at schools maintained by bowling-machine manufacturers or on the job. After attending factory schools, trainees need several months of on-the-job experience. Employers prefer to hire high school graduates.

Employment, 1974	5,000
Projected 1985 requirements	5,600
Percent growth, 1974-85	7.7
Average annual openings, 1974-85	150
Growth	50
Replacements	100

Available training data

Business machine repairers. Most acquire their skills through on-the-job training following instruction in manufacturers' training schools. Employers desire applicants who are at least high school graduates, and like to hire veterans who have had electronics training in the Armed Forces. Trainees usually need 1 to 3 years of on-the-job training following a formal training program before they are considered fully qualified.

Employment, 1974	65,000
Projected 1985 requirements	97,000
Percent change, 1974-85	49.8
Average annual openings, 1974-85	3,100
Growth	2,900
Replacements	200

Available training data:

Job Corps completions	60
Vocational education completions	1988
Apprenticeship completions	1387

¹ May include some computer service technicians.

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 a college. Electronics training in the Armed Forces is also excellent preparation for trainees.

Employment, 1974	50,000
Projected 1985 requirements	93,000
Percent growth, 1974-85	86.0
Average annual openings, 1974-85	4,300

Growth	3,900
Replacements	400
Available training data:	
Junior college completions	226

Diesel mechanics. Generally, mechanics need 3 to 4 years of on-the-job training or formal apprenticeship to become fully qualified. Employers prefer to hire high school graduates. Trade and technical school courses in diesel engine maintenance and experience in repairing gasoline engines are helpful.

Employment, 1974	95,000
Projected 1985 requirements	125,000
Percent growth, 1974-85	29.5
Average annual openings, 1974-85	3,400
Growth	1,700
Replacements	1,700
Available training data:	
Job Corps completions	93
Vocational education completions	4,308

Electric sign repairers. Most repairers are trained on the job. Some repairers qualify through 4-year electricians' apprenticeship programs. Employers prefer to hire high school graduates. Many cities require repairers to pass a comprehensive examination in electrical theory and its application to receive a license.

Employment, 1974	9,000
Projected 1985 requirements	12,000
Percent growth, 1974-85	29.4
Average annual openings, 1974-85	450
Growth	250
Replacements	200
Available training data	-

Farm equipment mechanics. Most farm equipment mechanics begin as helpers and learn skills on the job. Employers prefer high school graduates who have a farm background. Generally, at least 3 years of on-the-job training are necessary before a person can become a qualified mechanic. Some mechanics qualify by completing a 3- to 4-year apprenticeship program, or through a vocational education program.

Employment, 1974	60,000
Projected 1985 requirements	75,000
Percent growth, 1974-85	25.0
Average annual openings, 1974-85	2,700
Growth	1,300
Replacements	1,400
Available training data:	
Job Corps completions	49
Vocational education completions	127,822

¹ Includes other occupations related to agricultural machinery.

Industrial machinery repairers. Most workers who become industrial machinery repairers begin as helpers and acquire their skills through several years' experience on the job. Others learn their trade through 4-year

formal apprenticeship programs consisting of on-the-job training and related classroom instruction.

Employment, 1974	500,000
Projected 1985 requirements	840,000
Percent growth, 1974-85	65.8
Average annual openings, 1974-85	42,500
Growth	30,500
Replacements	12,000

Available training data:

Job Corps completions	68
Apprenticeship completions	721

Instrument repairers. Most learn their trade on the job or through formal apprenticeship programs. Apprenticeships generally last 4 years and combine classroom instruction with work experience. Some repairers train for instrument work in technical institutes or junior colleges. These schools offer programs that usually last 2 years and emphasize basic engineering courses, science, and mathematics. Armed Forces technical schools also offer training. Trainees or apprentices generally must be high school graduates.

Employment, 1974	110,000
Projected 1985 requirements	154,000
Percent growth, 1974-85	40.0
Average annual openings, 1974-85	6,600
Growth	4,000
Replacements	2,600

Available training data

Jewelers. These workers generally learn the jewelry trade either by serving a 3 to 4 year formal apprenticeship or through informal on-the-job training while working for an experienced jeweler. Some technical schools offer courses in jewelry repair.

Employment, 1974	18,000
Projected 1985 requirements	18,600
Percent growth, 1974-85	2.8
Average annual openings, 1974-85	750
Growth	50
Replacements	700

Available training data

Locksmiths. About 4 years of on-the-job training are needed to qualify as a locksmith. Additional training is needed to service electronic security systems. High school graduates are preferred. Some cities require locksmiths to be licensed.

Employment, 1974	9,000
Projected 1985 requirements	11,000
Percent growth, 1974-85	27.3
Average annual openings, 1974-85	400
Growth	200
Replacements	200

Available training data

Maintenance electricians. A high school education usually is required for electrician jobs. The skills of the trade are learned on the job or through formal appren-

ticeship programs. Apprenticeships usually last 4 years and combine on-the-job training with classroom instruction in related technical subjects. It may take more than 4 years to learn the trade informally on the job. Many cities and counties require electricians to pass a comprehensive examination and get a license.

Employment, 1974	280,000
Projected 1985 requirements	370,000
Percent growth, 1974-85	32.1
Average annual openings, 1974-85	13,800
Growth	8,200
Replacements	5,600

Available training data:

Apprenticeship completions	811
Vocational education completions	(¹)

¹ See construction electricians.

Piano and organ tuners and repairers. Trainees generally learn the trade on the job. It usually takes 3 to 4 years to become qualified in one of these fields, although piano tuning alone may be learned in less than 2 years. Electronic organ technician applicants usually need formal training in electronics available from technical schools, junior colleges, and some technical-vocational high schools.

Employment, 1974	8,000
Projected 1985 requirements	8,000
Percent growth, 1974-85	0.0
Average annual openings 1974-85	350
Growth	0
Replacements	350

Available training data

Shoe repairers. Most are hired as helpers and receive on-the-job training in large shoe repair shops. It usually takes about 2 years to become fully qualified. Some repairers learn the trade in vocational schools and a few enter the occupation through apprenticeship training programs.

Employment, 1974	30,000
Projected 1985 requirements	26,800
Percent growth, 1974-85	-10.5
Average annual openings, 1974-85	1,300
Growth	-300
Replacements	1,600

Available training data

Television and radio service technicians. Formal training in electronics in technical, vocational, or high schools or in the military combined with 2 to 4 years of on-the-job training is required to become a qualified technician. Inexperienced persons who show an aptitude for the work or have a hobby in electronics may be hired as helpers.

Employment, 1974	135,000
Projected 1985 requirements	180,000
Percent growth, 1974-85	26.9

Average annual openings, 1974-85	6,600
Growth	4,200
Replacements	2,400

Available training data:

Job Corps completions	87
Apprenticeship completions	247

Truck mechanics and bus mechanics. Most truck or bus mechanics learn their skills on the job. A formal 4-year apprenticeship is the recommended way to learn these trades. Apprentices typically have about 8,000 hours of shop training and at least 576 hours of related classroom instruction. High school or vocational school courses in automobile repair and mathematics provide a helpful background. For some jobs that require driving, the mechanic must have a State chauffeur's license and meet qualifications for drivers established by the U.S. Department of Transportation.

Employment, 1974	135,000
Projected 1985 requirements	173,000
Percent growth, 1974-85	27.9
Average annual openings, 1974-85	5,600
Growth	3,400
Replacements	2,200

Available training data

Vending machine mechanics. Many vending machine mechanics are high school graduates. High school or vocational school courses in electricity, refrigeration, and machine repair are helpful, but 1 to 2 years of on-the-job training, sometimes supplemented by manufacturer-sponsored training sessions, are required to qualify as a skilled mechanic. A commercial driver's license and a good driving record usually are required.

Employment, 1974	24,000
Projected 1985 requirements	25,000
Percent growth, 1974-85	4.2
Average annual openings, 1974-85	600
Growth	100
Replacements	500

Available training data

Watch repairers. Most persons prepare for this trade through 18- to 24-month courses in watch repair schools. Others are trained informally on the job or through formal apprenticeship. Most students in watch repair schools are high school graduates. A few States require watch repairers to pass a qualifying examination and obtain a license.

Employment, 1974	17,000
Projected 1985 requirements	17,700
Percent growth, 1974-85	5.6
Average annual openings, 1974-85	800
Growth	100
Replacements	700

Available training data

Health Occupations

Dental occupations

Dentists. All States require dentists to have a license to practice. To qualify for a license, a candidate must graduate from an approved dental school and pass a State board examination. In 13 States a dentist cannot be licensed as a "specialist" without 2 or 3 years of graduate education and passing a special State examination. Dental colleges require 2 or 3 years of pre-dental college education. However, about 3 out of 4 students entering dental school have a bachelor's degree. Dental school generally lasts 4 academic years although some school condense this into 3 calendar years.

If, over the 1974-85 period, the immigration of foreign dentists continues in line with past trends, (about 400 net additions a year), it is expected that dental schools will have to graduate about 5,800 dentists annually to meet projected requirements. U.S. Public Health Service projections indicate an average of about 5,200 dental school graduates annually over this period.

Employment, 1974	105,000
Projected 1985 requirements	145,000
Percent growth, 1974-85	34.9
Average annual openings, 1974-85	6,200
Growth	3,400
Replacements	2,800

Available training data:

	<i>Projected</i>
	1974-85
Graduates of	<i>1973-74 (annual average)</i>
dental schools	4,478 5,195

Dental assistants. Many dental assistants learn their skills on the job. An increasing number, however, are trained in formal post-high school programs. Most of these programs, available in vocational and technical schools, last 1 year, and lead to a certificate or a diploma. Two-year programs offered in junior and community colleges lead to an associate degree.

Employment, 1974	120,000
Projected 1985 requirements	155,000
Percent growth, 1974-85	32.5
Average annual openings, 1974-85	14,500
Growth	3,500
Replacements	11,000

Available training data:

Job Corps completions	35
Vocational education completions	7,949
Junior college graduates	1,197

Dental hygienists. Dental hygienists must be licensed, and for all States except Alabama, only graduates of accredited dental hygiene schools are eligible for licensing. To get a license they must pass both a written and a clinical examination. Most accredited programs last 2

years and lead to a certificate or an associate degree. Some schools have 4-year bachelor's degree programs. Generally the 2-year programs are sufficient for work in a private dental office. A bachelor's degree usually is required for research, teaching, and work in public or school health programs.

Employment, 1974	23,000
Projected 1985 requirements	58,000
Percent growth, 1974-85	156.7
Average annual openings, 1974-85	6,300
Growth	3,200
Replacements	3,100

Available training data:

Vocational education completions	1,699
Junior college graduates	3,738
Bachelor's degrees	875

Dental laboratory technicians. Most dental technicians acquire their skills on the job. This training usually lasts 4 or 5 years. Some are trained in 2-year education programs accredited by the American Dental Association. Dental technicians may become certified by passing an examination given by the National Board for Certification, a trust established by the National Association of Dental Laboratories.

Employment, 1974	32,000
Projected 1985 requirements	47,500
Percent growth, 1974-85	47.8
Average annual openings, 1974-85	2,600
Growth	1,400
Replacements	1,200

Available training data:

Vocational education completions	1,211
Junior college graduates	594

Medical practitioners

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

To meet projected needs for chiropractors between 1974 and 1985, schools would have to provide an average of 1,200 graduates each year or about 50 percent more than current levels. If the expansion in enrollments of recent years continues, supply could exceed projected requirements.

Employment, 1974	18,000
Projected 1985 requirements	22,500
Percent growth, 1974-85	25.6
Average annual openings, 1974-85	1,200
Growth	400
Replacements	800

Available training data:	
	1973-74
Doctor of Chiropractic degrees	1794
¹ Reported by chiropractic schools.	

Optometrists. All States require that optometrists be licensed. Applicants for a license must have a Doctor of Optometry degree from an accredited school of optometry and pass an 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 pre-optometric study at an approved university, college, or junior college. In 1974, the American Optometric Association accredited 12 optometric schools.

It is anticipated that optometry schools will have to graduate an average of 900 new optometrists annually over the 1974-85 period to meet projected requirements. U.S. Public Health Service projections indicate an average of about 960 graduates annually in optometry over this period.

Employment, 1974	19,000
Projected 1985 requirements	23,500
Percent growth, 1974-85	22.8
Average annual openings, 1974-85	900
Growth	400
Replacements	500

Available training data:		<i>Projected</i>
	1973-74	1974-85
Graduates in optometry schools	791	960

Physicians and osteopathic physicians. All States require a license for the practice of medicine. Applicants for a license must be graduates of an approved medical school or school of osteopathy, pass a State board examination, and in many States, serve a 1-year hospital internship. Most students who enter medical school or a school of osteopathy have earned a bachelor's degree, although many schools accept students with just 3 years of college. Most medical schools and schools of osteopathy have 4-year curriculums. Specialists must have 2 to 5 years of additional hospital training followed by 2 years of supervised practice in the specialty.

If, over the 1974-85 period, the influx of foreign medical graduates continues as in the past (about 5,000 net additions a year), medical schools will need to graduate about 18,000 physicians a year to meet projected requirements.

U.S. Public Health Service projections indicate that over the 1974-85 period the number of M.D. and D.O. degrees granted will average somewhat below the number needed to meet projected requirements.

Employment, 1974	350,000
Projected 1985 requirements	520,000

Percent growth, 1974-85	49.3
Average annual openings, 1974-85	23,000
Growth	15,600
Replacements	7,400

Available training data:		<i>Projected</i>
	1973-74	1974-85
M.D. degrees	11,447	14,966
D.O. degrees	685	811

Podiatrists. All States require a license for the practice of podiatry. To qualify for a license an applicant must graduate from an accredited 4-year program in a college of podiatric medicine and pass a State board examination. At least 2 years of college are required for admission to any of the six colleges of podiatric medicine.

It is anticipated that podiatry schools will have to graduate an average of about 400 podiatrists annually over the 1974-85 period to meet projected requirements. U.S. Public Health Service projections indicate an average of about 470 graduates of podiatry schools annually over this period.

Employment, 1974	7,500
Projected 1985 requirements	8,700
Percent growth, 1974-85	15.8
Average annual openings, 1974-85	400
Growth	100
Replacements	300

Available training data:		<i>Projected</i>
	1973-74	1974-85
Graduates in podiatry schools	371	471

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

Minimum requirements for the D.V.M. degree are 2 years of preveterinary college work (most applicants to veterinary schools have 3 or 4 years of college), followed by 4 years of study in a college of veterinary medicine.

It is anticipated that veterinary schools will have to graduate an average of about 1,500 veterinarians annually over the 1974-85 period to meet projected requirements.

U.S. Public Health Service projections indicate an average of almost 1,600 veterinary graduates annually over this period.

Employment, 1974	29,000
Projected 1985 requirements	38,500
Percent growth, 1974-85	33.0
Average annual openings, 1974-85	1,450
Growth	850
Replacements	600

Available training data:		
		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Graduates in veterinary schools	1,384	1,586

Medical technician, technologist, and assistant occupations

Electrocardiograph (EKG) technicians. Most EKG technicians are trained on the job for 3 months to a year by a senior EKG technician or a cardiologist. High school graduation generally is required for entry into the occupation.

Employment, 1974	11,000
Projected 1985 requirements	15,000
Percent growth, 1974-85	39.0
Average annual openings, 1974-85	1,000
Growth	400
Replacements	600

Available training data:

Job Corps completions	29
Junior college graduates	1 ²⁴

¹ Includes electroencephalographic (EEG) technicians.

Electroencephalographic (EEG) technicians. Most EEG technicians are trained on the job by experienced EEG personnel. However, with advances in medical technology, electroencephalograph equipment has become increasingly more complex and requires technicians with more training. A few training programs, lasting 6 months to 1 year, are available in some colleges and medical schools.

Employment, 1974	3,800
Projected 1985 requirements	5,500
Percent growth, 1974-85	44.7
Average annual openings, 1974-85	350
Growth	150
Replacements	200

Available training data:

Junior college graduates	1 ²⁴
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¹ Includes electrocardiograph (EKG) technicians.

Medical laboratory workers. A medical technologist usually needs at least 4 years of college including completion of a specialized training program in medical technology. Medical laboratory technicians generally need 1 year or more of post-high school training in a junior college or vocational school, although some are trained in the Armed Forces. Most medical laboratory assistants are trained on the job. In recent years, however, an increasing number have studied in 1-year training programs conducted by hospitals, junior colleges, and vocational schools.

Employment, 1974	175,000
Projected 1985 requirements	250,000

Percent growth, 1974-85	42.9
Average annual openings, 1974-85	18,800
Growth	6,800
Replacements	12,000

Available training data:

Job Corps completions	21
Vocational education completions	3,376
Degrees in medical laboratory technologies:	
Bachelor's degrees	4,840
Master's degrees	164
Junior college graduates	2,617
Apprenticeship completions	116

Medical record technicians and clerks. Most employers prefer to hire medical record technicians who have graduated from an accredited college or hospital-based program. These programs range from 10 months for a certificate to 2 years for an associate degree. High school graduates with basic secretarial skills can enter the medical record field as clerks. About one month of on-the-job training will prepare them for routine tasks.

Employment, 1974	53,000
Projected 1985 requirements	120,000
Percent growth, 1974-85	121.7
Average annual openings, 1974-85	11,500
Growth	5,900
Replacements	5,600

Available training data:

Junior college graduates	627
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Operating room technicians. Operating room technicians are trained in vocational and technical schools, community and junior colleges, and in the Armed Forces. Most training programs last from 9 months to 1 year; some junior college programs take 2 years and lead to an associate degree.

Employment, 1974	28,000
Projected 1985 requirements	41,000
Percent growth, 1974-85	43.7
Average annual openings, 1974-85	2,700
Growth	1,100
Replacements	1,600

Available training data:

Junior college graduates	183
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Optometric assistants. Most optometric assistants are trained on the job. Training also can be acquired in 1-year courses or in 2-year courses leading to an associate degree. High school graduation or its equivalent, including knowledge of mathematics and office procedures, is preferred for both on-the-job and formal training.

Employment, 1974	11,500
Projected 1985 requirements	19,000
Percent growth, 1974-85	63.8
Average annual openings, 1974-85	1,800
Growth	700
Replacements	1,100

Available training data:

Junior college graduates	395
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Radiologic (X-ray) technologists. A formal training program in X-ray technology generally is required to enter the field. These programs, which usually last 24 months, are offered in hospitals, medical schools, colleges, community colleges, vocational schools, and the military services. A few schools conduct 3- or 4-year programs and some award a bachelor's degree in X-ray technology. High school graduation is required for admission to all programs.

Employment, 1974	82,000
Projected 1985 requirements	112,000
Percent growth, 1974-85	36.5
Average annual openings, 1974-85	8,600
Growth	2,700
Replacements	5,900

Available training data:

Vocational education completions	2,413
Degrees in radiologic technologies:	
Bachelor's degrees	169
Master's degrees	48
Junior college graduates	2,758

Respiratory therapy workers. Although a few therapists are trained on the job, most entry level positions require formal training. High school graduation is required for entry to the more than 100 institutions offering educational programs in respiratory therapy. Courses last from 18 months to 4 years and include both theory and clinical work. A bachelor's degree is awarded for completing the 4-year program.

Employment, 1974	38,000
Projected 1985 requirements	80,000
Percent growth, 1974-85	110.5
Average annual openings, 1974-85	6,800
Growth	3,800
Replacements	3,000

Available training data:

Job Corps completions	2
Vocational education completions	1,608
Junior college graduates	1,824

Nursing occupations

Registered nurses. All States require the licensing of professional nurses. To obtain a license, a nurse must be a graduate of 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 completing 2-year courses earn associate degrees; those in 3-year courses earn a diploma; 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.

It is anticipated that an average of about 71,000 entrants will be needed annually over the 1974-85 period to meet projected requirements. The U.S. Public Health Service projects that the average annual number of graduates of nursing schools will approximate this total over the period.

A clear assessment of the adequacy of training in this field is difficult, however. Traditionally, not all graduates have entered nursing immediately upon graduation, or have left the labor force early in their careers. Thus, a substantial pool of qualified nurses exists outside the labor force. Many of these nurses are expected to seek entry or reentry into the field, but the number depends on many factors, which are difficult to analyze, including the availability of jobs in specific localities, overall economic conditions, and relative salaries between nursing and other occupations for which nurses are qualified.

Employment, 1974	860,000
Projected 1985 requirements	1,290,000
Percent growth, 1974-85	50.0
Average annual openings, 1974-85	71,000
Growth	39,000
Replacements	32,000

Available training data:

	Estimated 1973-74	Projected 1974-85 (annual average)
Graduates in schools of nursing ¹	61,951	71,054

¹ Includes, associate degree, baccalaureate degree, and diploma programs.

Licensed practical nurses. All States regulate the licensing of practical nurses. To be licensed, applicants must complete an approved course in practical nursing and pass an examination. Educational requirements for enrollment in State-approved training programs range from completion of eighth or ninth grade to high school graduation. The required course generally lasts 1 year, and is given in junior colleges, local hospitals, health agencies, and public schools.

Employment, 1974	495,000
Projected 1985 requirements	965,000
Percent growth, 1974-85	95.0
Average annual openings, 1974-85	93,000
Growth	43,000
Replacements	50,000

Available training data:

Job Corps completions	76
Vocational education completions	34,455
Junior college graduates	2,447

Nursing aides, orderlies, and attendants. Although some employers prefer high school graduates, many hire nongraduates. Training is usually acquired on the job, often in combination with classroom instruction.

Employment, 1974	970,000
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Projected 1985 requirements	1,500,000
Percent growth, 1974-85	54.6
Average annual openings, 1974-85	123,000
Growth	48,000
Replacements	75,000
Available training data:	
Job Corps completions	2,237
Vocational education completions	32,220

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 with 6 to 9 months of clinical experience may take the American Occupational Therapy Association examination to become registered occupational therapists (OTR).

Employment, 1974	9,400
Projected 1985 requirements	13,800
Percent growth, 1974-85	46.5
Average annual openings, 1974-85	1,000
Growth	400
Replacements	600

Available training data:

Degrees in occupational therapy:	1973-74
Bachelor's degrees	1,277
Master's degrees	174

Occupational therapy assistants. Most occupational therapy assistants are trained on the job in hospitals and other health care facilities. Some learn their skills in vocational and technical programs. Other assistants graduate from 1- or 2-year junior college programs or complete an approved military occupational therapy assistant program. Applicants for training programs must be high school graduates or the equivalent.

Employment, 1974	7,900
Projected 1985 requirements	14,300
Percent growth, 1974-85	81.4
Average annual openings, 1974-85	1,150
Growth	600
Replacements	550

Available training data:

Vocational education completions	829
Junior college graduates	491

Physical therapists. All States require a license to practice therapy. Applicants for a license must have a bachelor's degree in physical therapy and pass a State board examination. For those with bachelor's degrees in other fields, 12- to 16-month certificate programs and 2-year master's degree programs are available. A graduate degree combined with clinical experience increases advancement opportunities, especially in teaching, research, and administration.

Employment, 1974	20,000
Projected 1985 requirements	32,000
Percent growth, 1974-85	60.0
Average annual openings, 1974-85	2,400
Growth	1,100
Replacements	1,300

Available training data:

Degrees in physical therapy:	
Bachelor's degrees	1,900
Master's degrees	111

Physical therapist assistants and aides. Some States now license physical therapist assistants. Completion of an approved 2-year associate degree program is required for a license. Many of these States, however, also license experienced physical therapist assistants who learned their skills in vocational, technical, or adult education programs or from on-the-job training before associate degree programs were available.

Employment, 1974	10,500
Projected 1985 requirements	18,000
Percent growth, 1974-85	71.4
Average annual openings, 1974-85	1,400
Growth	650
Replacements	750

Available training data:

Job Corps completions	25
Vocational education completions	583
Junior college graduates	717

Speech pathologists and audiologists. Most States prefer and some require a master's degree or its equivalent in speech pathology or audiology for beginning jobs in public schools. A teacher's certificate often is required also and some States require that workers dealing with handicapped children have special training. Many Federal programs, such as Medicare and Medicaid, require participating speech pathologists and audiologists to have a master's degree.

Employment, 1974	31,000
Projected 1985 requirements	51,000
Percent growth, 1974-85	63.0
Average annual openings, 1974-85	3,700
Growth	1,800
Replacements	1,900

Available training data:

Degrees in speech pathology and audiology:	
Bachelor's degrees	3,278
Master's degrees	1,964
Doctor's degrees	78

Other health occupations

Dietitians. A bachelor's degree, preferably with a major in foods and nutrition or institution management, usually available in departments of home economics, is the basic educational requirement for dietitians. To qualify for professional recognition, the American Dietetic

Association recommends the completion after graduation of an approved dietetic internship or 2 years of experience. Some new programs combine a bachelor's degree and internship in a 4-year program.

Employment, 1974	33,000
Projected 1985 requirements	42,500
Percent growth, 1974-85	29.4
Average annual openings, 1974-85	3,200
Growth	900
Replacements	2,300
Available training data	-

Dispensing opticians. Employers prefer high school graduates who have had courses in the basic sciences. Most trainees learn their skills on the job. Some learn through 3- to 4-year apprenticeship programs. A small number of schools offer post-high school training, leading to an associate degree in optical fabricating and dispensing work. In 1974, 19 States had licensing requirements for dispensing opticians.

Employment, 1974	17,000
Projected 1985 requirements	27,000
Percent growth, 1974-85	58.8
Average annual openings, 1974-85	1,550
Growth	900
Replacements	650

Available training data:

Apprenticeship completions	150
Junior college graduates	395

Health services administrators. Educational requirements for health administrators vary. A master's degree in hospital and health care administration or in public health is sometimes required. However, some employers hire persons with other backgrounds. A few require administrators to be physicians or registered nurses.

Employment, 1974	150,000
Projected 1985 requirements	250,000
Percent growth, 1974-85	66.7
Average annual openings, 1974-85	17,400
Growth	9,100
Replacements	8,300

Available training data:

Degrees in hospital and health care administration:	
Bachelor's degrees	185

Master's degrees	990
Doctor's degrees	21

Medical record administrators. A bachelor's degree in medical record librarianship usually is required for this occupation. One-year certificate programs are available, however, for those who already have a bachelor's degree in another field.

Employment, 1974	12,000
Projected 1985 requirements	14,500
Percent growth, 1974-85	27.6
Average annual openings, 1974-85	1,100
Growth	300
Replacements	800

Available training data:

Degrees in medical record librarianship:

Bachelor's degrees	420
Master's degrees	7

Pharmacists. A license is required to practice pharmacy in all States. 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 under the supervision of a registered pharmacist. At least 5 years of study beyond high school are required to graduate from one of the 73 accredited colleges of pharmacy and receive a bachelor of science degree. Most colleges provide 3 or 4 years of professional instruction after prepharmacy education in an accredited junior college, college, or university.

It is anticipated that pharmacy schools will have to graduate an average of about 6,500 pharmacists annually over the 1974-85 period to meet projected requirements. U.S. Public Health Service projections indicate an average of about 6,300 graduates of pharmacy schools annually over the period.

Employment, 1974	117,000
Projected 1985 requirements	137,000
Percent growth, 1974-85	17.4
Average annual openings, 1974-85	6,500
Growth	1,900
Replacements	4,600

Available training data:

		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Pharmacy school graduates	5,773	6,306

Social Scientists

Anthropologists. A Ph.D. degree is usually necessary to become a professional anthropologist. A master's degree, plus field experience, is sufficient for many beginning jobs but advancement generally is limited. It is anticipated that an average of about 250 entrants will be required annually over the 1974-85 period to meet

projected requirements. NCES projects that an average of almost 600 doctorate degrees and almost 1,400 master's degrees will be awarded in anthropology annually over the period. Limited followup data on college graduates indicate that in the past, the majority of graduate degree holders have entered the field. (Some

not entering the field have become high school teachers.) Unless the number of degrees granted in the future is lower than the number projected, a higher proportion of graduates may have to find employment in other fields than in the past.

Employment, 1974	3,800
Projected 1985 requirements	5,400
Percent change, 1974-85	42.9
Average annual openings, 1974-85	250
Growth	150
Replacements	100

Available training data:

<i>Degrees in anthropology</i>		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Bachelor's degrees .	6,002	8,396
Master's degrees	885	1,356
Doctor's degrees	376	584

Economists. A bachelor's degree in economics is sufficient for many beginning jobs in government and private industry, but a master's degree is required for some positions. A Ph.D. degree generally is required for teaching in colleges and universities and is an asset for advancement in all areas.

Employment, 1974	71,000
Projected 1985 requirements	104,000
Percent change, 1974-85	45.9
Average annual openings, 1974-85	4,700
Growth	3,000
Replacements	1,700

Available training data:

<i>Degrees in economics</i>		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Bachelor's degrees	14,418	13,972
Master's degrees	2,145	2,184
Doctor's degrees	788	748

Geographers. A bachelor's degree with a major in geography is the minimum education required to become a geographer. However, for research, college, and university teaching, and for advancement in other areas, an advanced degree, preferably a Ph.D., is often required.

Employment, 1974	9,000
Projected 1985 requirements	13,000
Percent change, 1974-85	42.8
Average annual openings, 1974-85	650
Growth	350
Replacements	300

Available training data:

<i>Degrees in geography</i>		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Bachelor's degrees .	4,239	5,202
Master's degrees	763	822
Doctor's degrees	217	247

Historians. Graduate education usually is necessary for employment as a historian. A master's degree is the minimum requirement for college instructors. Many colleges and universities, however, require a Ph.D. degree for advancement. Most historians in the Federal Government and in nonprofit organizations have Ph.D. degrees or their equivalent. It is anticipated that an average of about 1,300 entrants will be required annually over the 1974-85 period to meet projected requirements. Projections of the NCES indicate an average of more than 1,000 doctor's degrees and about 4,400 master's degrees will be awarded annually over this period. Limited followup data show that in the past, the majority of doctorate degree holders and about one-fourth of the master's degree holders entered the field. (Many not entering the field became high school teachers.) Unless the number of degrees granted in the future is lower than the number projected, a higher proportion of graduates may have to find employment in other fields than in the past.

Employment, 1974	26,000
Projected 1985 requirements	32,000
Percent growth, 1974-85	19.8
Average annual openings, 1974-85	1,300
Growth	500
Replacements	800

Available training data:

<i>Degrees in history</i>		<i>Projected</i>
		<i>1974-85</i>
	<i>1973-74</i>	<i>(annual average)</i>
Bachelor's degrees .	37,381	33,436
Master's degrees	4,543	4,409
Doctor's degrees	1,114	1,051

Political scientists. Graduate training generally is required for employment as a political scientist. A Ph.D. normally is necessary for teaching in colleges and universities and is helpful for advancement in nonacademic areas. Those with a master's degree often qualify for various administrative and research jobs in government and in nonprofit research or civic organizations. It is anticipated that an average of about 600 entrants will be required annually over the 1974-85 period to meet projected requirements. The NCES projects that an average of almost 800 doctorates and more than 2,600 master's degrees will be awarded annually over the period. Limited followup data on college graduates indicate that in the past, the majority of doctorate degree holders and about one-third of master's degree holders entered the field. (Many advanced degree holders who did not enter the field reported being administrators, high school teachers, and writers and journalists.) Unless the number of degrees granted in the future is lower than the number projected, a higher proportion of graduates may have to find employment in other fields than in the past.

Employment, 1974	11,500
Projected 1985 requirements	14,500

Percent growth, 1974-85		27.5
Average annual openings, 1974-85		600
Growth		300
Replacements		300
Available training data:		
<i>Degrees in political science</i>		<i>Projected</i>
	1973-74	1974-85
		(annual average)
Bachelor's degrees .	30,932	32,760
Master's degrees	2,448	2,639
Doctor's degrees	766	781

Psychologists. A master's degree in psychology is generally the minimum education required for employment as a psychologist. A Ph.D., considered the full professional degree, is needed for many entrance positions and is becoming increasingly important for advancement. Psychologists who want to enter independent practice must meet certification or licensing requirements in most States.

Employment, 1974	75,000
Projected 1985 requirements	105,000
Percent growth, 1974-85	40.7
Average annual openings, 1974-85	5,200
Growth	2,800
Replacements	2,400

Available training data:		
<i>Degrees in psychology</i>		<i>Projected</i>
	1973-74	1974-85
		(annual average)
Bachelor's degrees .	52,258	69,045
Master's degrees	6,616	8,164
Doctor's degrees	2,630	3,534

Sociologists. A master's degree in sociology is generally the minimum requirement for employment as a sociologist. A Ph.D. is necessary for teaching at most colleges and universities. It also commonly is needed for jobs as directors of major research projects, administrative positions, and for consultants. It is anticipated that an average of about 750 entrants will be required annually over the 1974-85 period to meet projected requirements. The NCES projects an average of more than 800 doctorate degrees and more than 2,800 master's degrees to be awarded annually over this period. Limited followup data on college graduates indicate that in the past, the majority of those with advanced degrees have entered the field. Unless the number of degrees granted in the future is lower than the number projected, a larger proportion of graduates may have to find employment in other fields than in the past.

Employment, 1974	14,000
Projected 1985 requirements	18,000
Percent growth, 1974-85	28.7
Average annual openings, 1974-85	750
Growth	350
Replacements	400

Available training data:		
<i>Degrees in sociology</i>		<i>Projected</i>
	1973-74	1974-85
		(annual average)
Bachelor's degrees .	35,896	37,150
Master's degrees	2,196	2,871
Doctor's degrees	632	804

Social Service Occupations

Counseling occupations

School counselors. Most States require school counselors to have counseling and teaching certificates. Depending on the State, graduate work and from 1 to 5 years of teaching experience usually are required for a counseling certificate. Most college students interested in becoming school counselors usually take the regular program of teacher education with additional courses in psychology and sociology.

Employment, 1974	44,000
Projected 1985 requirements	48,000
Percent growth, 1974-85	8.9
Average annual openings, 1974-85	2,050
Growth	350
Replacements	1,700
Available training data	-

Employment counselors. State employment service offices require employment counselors to have 30 hours of graduate courses in a counseling field. One year of

counseling-related experience may be substituted for 15 graduate hours. For higher level jobs and work in private and community agencies, a master's degree in vocational counseling or in a related field such as psychology, personnel administration, or guidance education is preferred and sometimes required. All States require counselors in public employment offices to meet State civil service requirements that include minimum education and experience standards.

Employment, 1974	7,000
Projected 1985 requirements	10,800
Percent growth, 1974-85	54.2
Average annual openings, 1974-85	650
Growth	350
Replacements	300
Available training data	-

Rehabilitation counselors. The minimum educational requirement for rehabilitation counselors is a bachelor's degree with courses in counseling, psychology, and related fields. Increasing emphasis is being

placed, however, on a master's degree in vocational counseling or rehabilitation counseling or in related subjects such as psychology, education, and social work. Work experience in fields such as vocational counseling and placement, psychology, education, and social work is an asset for employment as a rehabilitation counselor.

Employment, 1974	19,000
Projected 1985 requirements	29,000
Percent growth, 1974-85	52.6
Average annual openings, 1974-85	2,100
Growth	900
Replacements	1,200
Available training data	-

College career planning and placement counselors. A bachelor's degree is generally the minimum requirement for career planning and placement work and a master's degree is being increasingly stressed. An undergraduate major in a behavioral science such as psychology or sociology and courses in counseling, personnel administration, and related business administration subjects are preferred for entry in the field.

Employment, 1974	4,100
Projected 1985 requirements	5,000
Percent growth, 1974-85	22.0
Average annual openings, 1974-85	250
Growth	100
Replacements	150
Available training data	-

Other social service occupations

Recreation workers. An associate degree from a community or junior college is preferred for jobs as recreation leaders. Activity specialists need training in a particular field such as drama, art, dance, or athletics. Generally, recreation directors have a bachelor's degree with a major in recreation or a related field as well as experience; a master's degree is helpful for advancement.

Art, Design, and Communications-Related Occupations

Design occupations

Architects. Architects must obtain a license to practice in every State and the District of Columbia. To qualify for a license, applicants must have a bachelor's degree in architecture, have 3 years of experience in an architect's office, and pass a 2-day written examination. Those with a master's degree need 2 years of experience. In most States 12 years of practical experience as an architect may be substituted for the bachelor's degree.

It is anticipated that an average of about 3,000 new

Employment, 1974	65,000
Projected 1985 requirements	96,000
Percent growth, 1974-85	42.6
Average annual openings, 1974-85	5,900
Growth	2,700
Replacements	3,200
Available training data	-

Social service aides. Graduation from high school generally is not required for social service aide jobs. Employers do not always look for the most highly skilled applicants. A person's need for work, as well as potential for upgrading skills, often is considered.

Employment, 1974	70,000
Projected 1985 requirements	115,000
Percent growth, 1974-85	60.9
Average annual openings, 1974-85	8,400
Growth	3,900
Replacements	4,500

Available training data:

Junior college graduates	3,731
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Social workers. A bachelor's degree, preferably in social work or a related field, generally is the minimum educational requirement for beginning jobs in social work. However, many positions require a master's degree in social work.

Employment, 1974	300,000
Projected 1985 requirements	435,000
Percent growth, 1974-85	45.7
Average annual openings, 1974-85	30,500
Growth	12,500
Replacements	18,000

Available training data:

	<i>Degrees in social work</i>	
	1973-74	Projected 1974-85 (annual average)
Bachelor's degrees .	9,960	11,220
Master's degrees	7,974	9,060
Doctor's degrees	109	204

entrants will be required in architecture annually over the 1974-85 period to meet projected requirements. About 60 percent of those receiving bachelor's degrees in architecture in 1965 became licensed architects, according to a followup study. If this entry rate continues, an average of almost 5,000 graduates would be needed annually to meet projected requirements. The NCES projected an average of about 4,800 bachelor's degree recipients annually in architecture between 1971 and 1982 who would be eligible for licensing over the 1974-85 period.

Employment, 1974	40,000
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Projected 1985 requirements	60,000
Percent growth, 1974-85	52.3
Average annual openings, 1974-85	3,000
Growth	1,900
Replacements	1,100

Available training data:

<i>Degrees in architecture</i>		1971-82 (annual 1973-74 average)
Bachelor's degrees	4,531	4,860
Master's degrees	929	1,145
Doctor's degrees	16	22

Commercial artists. Artistic ability and good taste are the most important qualifications for success in commercial art. However, these qualities must be developed by specialized training in the techniques of commercial and applied art. The course of study generally takes 2 or 3 years; a certificate is awarded on graduation. A growing number of art schools, particularly those connected with universities, require 4 years or more of study and confer a bachelor's degree. Limited training in commercial art also may be obtained through public vocational high schools and on-the-job experience but supplemental training usually is needed for advancement.

Employment, 1974	64,000
Projected 1985 requirements	80,000
Percent growth, 1974-85	24.3
Average annual openings, 1974-85	4,000
Growth	1,400
Replacements	2,600

Available training data:

Job Corps completions	42
Vocational education completions	6,272

Display workers. Most display workers learn their trade on the job in 2 or 3 years. Employers require high school graduates and some prefer applicants who have studied interior decorating, fashion design, and art.

Employment	34,000
Projected 1985 requirements	40,000
Percent growth, 1974-85	17.6
Average annual openings, 1974-85	2,200
Growth	500
Replacements	1,700

Available training data:

Job Corps completions	2
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Industrial designers. Persons usually enter this field by completing an industrial design curriculum in an art school, an art department of a university, or a technical college. Those with degrees in other fields such as engineering, architecture, and fine arts may qualify as industrial designers if they have the appropriate experience and artistic talent.

Employment, 1974	10,000
Projected 1985 requirements	11,500

Percent growth, 1974-85	15.0
Average annual openings, 1974-85	450
Growth	150
Replacements	300
Available training data	-

Interior designers. Formal training in interior design is becoming increasingly important for entry. Training is available through a 2- or 3-year course at a recognized art school or institute specializing in interior decorating and design or a 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 required.

Employment, 1974	34,000
Projected 1985 requirements	40,000
Percent growth, 1974-85	18.0
Average annual openings, 1974-85	1,550
Growth	550
Replacements	1,000

Available training data:

Degrees in interior design:

Bachelor's degrees	489
Master's degrees	15

Landscape architects. A bachelor's degree in landscape architecture requiring 4 to 5 years of study is the usual requirement for employment. More than half of all States require a license for independent practice. To qualify for a license, 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 degree.

Employment, 1974	12,000
Projected 1985 requirements	18,000
Percent growth, 1974-85	52.3
Average annual openings, 1974-85	900
Growth	600
Replacements	300

Available training data:

Degrees in landscape architecture:

Bachelor's degrees	601
Master's degrees	170
Doctor's degrees	-

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 undergo 2 or 3 years of on-the-job training. For work in industrial, scientific, or news photography, formal training and experience usually are needed. Photographic training is available in colleges, universities, community and junior colleges, and art schools. Programs leading to associate, bachelor's, and master's degrees in photography are offered, and some schools have certificate programs.

Employment, 1974	80,000
Projected 1985 requirements	95,000
Percent growth, 1974-85	19.2
Average annual openings, 1974-85	3,400
Growth	1,400
Replacements	2,000

Available training data:

Degrees in photography:

Bachelor's degrees	663
Master's degrees	59
Junior college graduates	645

Communications-related occupations

Newspaper reporters. Most large newspapers will consider only applicants with a college education; graduate work is becoming increasingly important. Some jobs for talented writers without college training are available on rural, small-town, and suburban papers.

Employment, 1974	40,000
Projected 1985 requirements	45,500
Percent change, 1974-85	13.9
Average annual openings, 1974-85	2,200
Growth	500
Replacements	1,700

Available training data:

<i>Degrees in journalism</i>	<i>1973-74</i>	<i>Projected 1974-85 (annual average)</i>
Bachelor's degrees .	6,710	7,709
Master's degrees	998	1,272
Doctor's degrees	20	20

Radio and television announcers. A college liberal arts education provides an excellent background for an announcer, and many universities offer courses of study in the broadcasting field. A number of private vocational schools also offer training. Some radio stations require announcers to have a Federal Communications Commission radiotelephone operator license.

Employment, 1974	19,000
Projected 1985 requirements	23,000
Percent growth, 1974-85	21.1
Average annual openings, 1974-85	600
Growth	350
Replacements	250

Available training data

Technical writers. A bachelor's degree generally is required to begin work in technical writing. Technical writers may qualify with a degree in engineering or science, and courses in writing or a degree in English or journalism and courses in scientific and technical subjects. Sometimes, experienced writers with less academic training but some knowledge of technical fields can qualify.

Employment, 1974	20,000
Projected 1985 requirements	26,000
Percent growth, 1974-85	24.9
Average annual openings, 1974-85	1,150
Growth	450
Replacements	700

Available training data

Appendix A. Methods and Assumptions for Projections of Manpower Requirements

The Bureau of Labor Statistics has developed a comprehensive model of the economy in 1985. The model is comprised of internally consistent projections of gross national product (GNP) and its components — consumer expenditures, 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.¹ The methods and assumptions used to develop the projected 1985 manpower requirements presented in this bulletin are the same as those used in other BLS studies of the economy. These are briefly summarized in the following sections.

Projection methods

Beginning with population projections by age, sex, and race developed by the Bureau of the Census, the total labor force is projected, using expected labor force participation rates. In developing the participation rates, the Bureau takes into account a variety of factors that affect a person's decision to enter the labor market, such as school attendance, retirement practices, and family responsibilities.

The labor force projection is then translated into the level of GNP that would be produced by a fully employed labor force.² Unemployed persons are subtracted from the labor force estimate and the result is multiplied by a projection of output per worker. The estimates of future output per worker are based on analysis of trends in productivity growth among industries and changes in the average weekly hours of work. Next, the projection of GNP is divided among its major components: consumer expenditures, business investment, and government expenditures — Federal, State, and local — and net exports. Each of these components is broken down by producing industry. Thus, consumer expenditures, for example, are divided among industries producing goods and services such as housing, food, automobiles, medical care, and education.

Once developed for these products and services, estimates are translated into detailed projections of industry output, not only for the industries producing the final product, but also for the intermediate and basic industries which provide the raw materials, electric power, transportation, and other inputs required in the production process. To facilitate this translation, the Department of Commerce has developed input-output tables which indicate the amount of output of each industry—steel, glass, plastics, etc.—that is required to produce a final product, automobiles for example.

Using estimates of future output per hour based on studies of productivity and technological trends for each industry, industry employment projections may be derived from the output estimates.

These projections then are compared with employment projections from 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 from input-output and regression analysis, it is possible to identify areas where one method produces a projection inconsistent with past trends or the Bureau's economic model, and the projections are adjusted accordingly.

Projections of industry employment then are translated into occupational employment projections from an industry-occupation matrix. This matrix, which is divided into 201 industry sectors and 421 occupation sectors, describes the current and expected occupational structure of each industry.³ By applying the projected patterns of occupational structure for each industry to the industry employment projection and aggregating the resulting estimates, employment for each of the 421 occupations contained in the matrix can be projected.

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

¹ See the *Monthly Labor Review*, March 1976.

² The Bureau's labor force projections, which were developed in January 1975, assume a 4-percent unemployment rate.

³ A detailed report will be published as a supplement to *Tomorrow's Manpower Needs*.

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, the number of replacements is estimated. Separations constitute a significant source of openings. In most occupations, more workers are needed to replace those who retire or die than to fill jobs created by growth. Consequently, even declining occupations offer employment opportunities.

To estimate replacement openings, the Bureau has developed tables of working life based on actuarial experience for deaths and on decennial census data on general patterns of labor force participation by age and sex.⁴ Withdrawals from each occupation are calculated separately for men and women by age group and used to compute a separation rate for the occupation. These rates are used to estimate average annual replacement needs for each occupation over the period.

The effects of interoccupational transfers are not considered when calculating replacement needs because little information is available on this type of separation. The BLS is currently developing such estimates from the 1970 Decennial Census.

⁴ For detailed information see *Tomorrow's Manpower Needs, Supplement No. 4, Estimating Occupational Separations from the Labor Force for States* (Bureau of Labor Statistics, 1974).

Supply estimates used to analyze the prospective job outlook for certain occupations represent the numbers of workers who would seek jobs in particular occupation if past trends of entry to the occupation continue. These estimates are developed independently of the demand estimates and, therefore, demand relationships are not discussed in the usual economic sense in which wages play a major role in equating supply and demand.

Assumptions

The Bureau's projections to 1985 are based on the following general assumptions:

The institutional framework of the U.S. economy will not change radically.

Current social, technological, and scientific trends will continue, including values placed on work, education, income, and leisure.

The economy will gradually recover from the high unemployment levels of the mid-1970's and reach full employment (defined as 4-percent unemployment) in the mid-1980's.

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.

Trends in the occupational structure of industries will not be altered radically by changes in relative wages, technological changes, or other factors.

Appendix B. Detailed Occupational Projections

This appendix presents employment estimates, projected requirements, and average annual job openings in tabular form for 241 occupations, analyzed as part of the research underlying information in the 1976-77 edition of the *Occupational Outlook Handbook*. These data are classified into the 13 occupational clusters used to group *Handbook* occupations: industrial production and related occupations; office occupations; service occupations; education 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 art, design, and communications - related occupations. The descriptions of occupational training

in chapter 4 are classified by the same 13 clusters as are the training data in appendix C. Within each of the 13 major occupational clusters, data are subclassified into related fields: printing occupations, engineers, etc.

When applicable, table B-1 includes the program codes for related instructional programs for both vocational and higher education (Vocational Education Codes and Higher Education General Information Survey (HEGIS) Codes). This coding helps to bridge the gap between education and manpower data.

In the table, absolute figures are rounded and percentages are shown to one decimal place. Hence, totals and percentages calculated on the basis of unrounded figures do not always correspond exactly with rounded data.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Industrial production and related occupations:								
Foundry occupations:								
Patternmakers	17.2302	.....	20,500	21,200	3.4	500	50	450
Molders	17.2301	.....	60,000	62,000	3.3	1,300	200	1,100
Coremakers	17.2301	.....	24,500	25,300	3.3	550	50	500
Machining occupations:								
All-round machinists	17.2302	.....	335,000	414,000	23.6	14,500	7,200	7,300
Instrument makers (mechanical)	17.2302	.....	5,500	6,000	5.2	150	50	100
Machine tool operators	17.2303	.....	600,000	650,000	8.3	18,000	4,500	13,500
Setup workers (machine tools)	17.2302	.....	50,000	55,000	5.2	1,350	250	1,100
Tool and die makers	17.2307	.....	170,000	200,000	19.9	6,600	3,000	3,600
Printing occupations	17.1900	5009	.....	.....	.....	.....	.....	.....
Bookbinders and related workers	17.1906	.....	35,000	38,000	9.1	1,900	300	1,600
Composing room occupations	17.1901	.....	165,000	158,000	- 4.6	3,900	-700	4,600
Electrotypers and stereotypers	17.1903	.....	4,000	3,200	-20.9	20	- 80	100
Lithographic occupations	17.1902	.....	85,000	108,000	30.3	4,300	2,300	2,000
Photoengravers	17.1904	.....	17,000	16,000	- 5.9	250	-100	350

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Industrial production and related occupations—Continued								
Printing occupations—Continued								
Printing press operators and assistants	17.1902	.....	140,000	170,000	22.3	5,600	2,800	2,800
Other industrial production and related occupations:								
Assemblers .....		.....	1,140,000	1,350,000	18.5	63,000	19,000	44,000
Automobile painters	17.0301	.....	25,000	32,000	21.1	900	500	400
Blacksmiths	17.2399	.....	9,000	6,100	-30.8	50	-250	300
Blue-collar worker supervisors	17.1700	.....	1,460,000	1,770,000	21.0	61,000	28,000	33,000
Boilermaking occupations	17.1099	.....	45,000	62,000	40.9	2,700	1,600	1,100
Boiler tenders	17.3200	.....	90,000	86,000	- 4.4	2,100	-400	2,500
Electroplaters	17.2399	.....	34,000	41,000	18.8	1,250	600	650
Forge shop occupations	17.2399	.....	65,000	73,000	8.9	1,750	550	1,200
Furniture upholsterers	17.3500	.....	34,000	35,500	7.6	1,200	200	1,000
Inspectors	17.2400	.....	790,000	1,000,000	26.5	51,000	19,000	32,000
Millwrights	17.1099	.....	95,000	115,000	21.0	3,800	1,800	2,000
Motion picture projectionists .....		.....	18,000	19,500	8.5	1,000	150	850
Ophthalmic laboratory technicians	07.0601	.....					
.....	17.2101	5212	22,000	35,000	59.1	2,100	1,300	800
Photographic laboratory occupations	17.0900	5007	50,000	61,000	26.5	3,300	1,200	2,100
Power truck operators	17.100302	.....	347,000	400,000	15.3	9,100	4,800	4,300
Production painters .....		.....	125,000	151,000	19.1	5,000	2,200	2,800
Stationary engineers	17.3200	.....	193,000	193,000	0.0	5,000	0	5,000
Wastewater treatment plant operators	17.3203	.....	62,000	100,000	61.3	6,100	3,450	2,650
Welders	17.2306	5308	645,000	815,000	26.2	27,000	15,500	11,500
Office occupations	14.00	.....					
Clerical occupations:								
Bookkeeping workers	14.0102	.....	1,700,000	1,875,000	10.9	121,000	17,000	104,000
Cashiers	14.0103	.....	1,111,000	1,340,000	20.6	97,000	21,000	76,000
Collection workers	04.0800	.....					
.....	14.9900	.....	63,000	81,500	29.4	4,500	1,700	2,800
File clerks	14.0302	.....	275,000	320,000	15.9	25,000	4,000	21,000
Hotel front office clerks	04.1100	.....	54,000	63,000	17.3	4,250	850	3,400
Office machine operators	14.0104	5005	170,000	190,000	13.1	12,800	2,100	10,700
Postal clerks	14.0403	.....	293,000	302,000	3.1	9,700	800	8,900
Receptionists	14.0406	.....	460,000	635,000	38.3	57,500	16,000	41,500
Secretaries and stenographers	14.0700	5005	3,300,000	4,860,000	47.8	439,000	142,500	296,500
Shipping and receiving clerks	14.0503	.....	465,000	560,000	20.4	20,500	8,700	11,800
Statistical clerks	14.0303	.....	325,000	375,000	15.8	23,000	4,500	18,500
Stock clerks	14.0504	.....	490,000	610,000	25.0	26,000	11,000	15,000
Typists	14.0900	5005	1,000,000	1,400,000	34.9	125,000	33,000	92,000
Computer and related occupations	14.0200	.....					
Computer operating personnel	14.0201	5102	500,000	545,000	10.1	27,500	4,500	23,000
.....	14.0202	5104						
.....	14.020201	.....					
Programmers	14.0203	0704	200,000	285,000	42.5	13,000	7,800	5,200
.....		5103						
Systems analysts	14.0204	0705	115,000	190,000	65.2	9,100	7,000	2,100
Banking occupations:								
Bank clerks	14.0102	.....	517,000	718,000	38.9	54,000	18,000	36,000
.....	14.0104	.....					
.....	14.0303	.....					
.....	14.0399	.....					

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Office occupations—Continued								
Banking occupations—Continued								
Bank officers	04.0400	0504 5003	240,000	333,000	38.9	16,000	8,500	7,500
Bank tellers	14.0105	.....	270,000	377,000	38.9	30,000	10,000	20,000
Insurance occupations								
Actuaries	04.1300	0512	.....	.....	.....	.....	.....	.....
Claim representatives	04.1300	1703	10,700	14,400	34.1	700	350	350
Insurance agents, brokers and underwriters	04.1300	.....	125,000	152,000	21.8	6,600	2,500	4,100
.....	04.1300	.....	470,000	536,000	15.0	19,400	6,400	13,000
Administrative and related occupations:								
Accountants .....	.....	0502 5002	805,000	995,000	23.9	45,500	17,500	28,000
Buyers	04.0800	0509 5004	110,000	150,000	37.6	9,000	4,000	5,000
City managers .....	.....	2102	2,900	4,200	47.4	150	100	50
Credit managers	14.0899	0504 5003	66,000	90,000	36.4	4,500	2,200	2,300
Hotel managers and assistants	04.1100	0508 5010	120,000	150,000	22.8	6,500	2,500	4,000
Lawyers .....	.....	1401	342,000	490,000	43.3	26,400	13,500	12,900
Personnel and labor relations workers	14.0602	.....	320,000	450,000	40.2	23,000	12,000	11,000
.....	14.0603	0515	.....	.....	.....	.....	.....	.....
.....	14.0699	0516	.....	.....	.....	.....	.....	.....
Public relations workers	04.0100	.....	100,000	134,000	28.8	6,500	2,300	4,000
Purchasing agents	04.0800	0509 5004	189,000	258,000	36.5	11,700	6,300	5,400
Urban planners .....	.....	0206	13,000	18,000	38.5	700	450	250
Service occupations:								
Cleaning and related occupations:								
Building custodians	17.1100	.....	1,900,000	2,400,000	26.6	146,000	47,000	99,000
Hotel housekeepers and assistants	09.0205	.....	18,000	21,000	15.6	1,450	250	1,200
Pest controllers .....	.....	.....	27,000	36,500	32.1	2,100	800	1,300
Food service occupations								
Bartenders .....	.....	.....	233,000	300,000	28.8	15,200	6,100	9,100
Cooks and chefs	17.2902	.....	955,000	1,250,000	30.9	78,600	26,800	51,800
Dining room attendants and dishwashers .....	.....	.....	370,000	435,000	17.6	17,200	6,800	10,400
Food counter workers	17.2904	.....	350,000	425,000	21.4	29,200	6,700	22,500
Meatcutters	17.2903	.....	202,000	204,000	0.9	5,000	200	4,800
Waiters and waitresses	17.2904	.....	1,180,000	1,440,000	21.8	105,000	24,000	81,000
Personal service occupations:								
Barbers	17.2601	5006	130,000	135,000	3.6	5,550	450	5,100
Bellhops and bell captains	04.1100	.....	17,000	19,000	9.6	600	150	450
Cosmetologists	17.2602	5006	500,000	622,000	24.9	50,800	11,300	39,500
Funeral directors and embalmers	07.0909	.....	45,000	45,000	0.0	1,400	0	1,400
Private household service occupations:								
Private household workers	09.0201	.....	1,200,000	900,000	-26.7	52,000	-30,000	82,000
.....	09.0202	.....	.....	.....	.....	.....	.....	.....
.....	09.0203	.....	.....	.....	.....	.....	.....	.....
.....	09.0205	.....	.....	.....	.....	.....	.....	.....

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Service occupations—Continued								
Protective and related service occupations:								
Firefighters	17.2801	5507	220,000	270,000	23.3	7,300	4,600	2,700
Guards	17.2802	.....	475,000	508,000	7.4	26,000	3,000	23,000
Police officers	17.2802	2105	480,000	650,000	35.5	22,000	15,500	6,500
		2209	.....	.....	.....	.....	.....	.....
		5505	.....	.....	.....	.....	.....	.....
State police officers	17.2802	2105	45,500	76,000	68.3	3,600	2,850	750
		2209	.....	.....	.....	.....	.....	.....
		5505	.....	.....	.....	.....	.....	.....
Construction inspectors (government)	17.2899	.....	22,000	30,000	43.0	1,700	750	950
Health and regulatory inspectors (government)	17.2899	5408	110,000	160,000	44.0	7,900	4,500	3,400
Occupational safety and health workers	16.0602	.....	25,000	32,500	29.0	1,100	700	400
	17.2801	.....	.....	.....	.....	.....	.....	.....
	17.2899	.....	.....	.....	.....	.....	.....	.....
Other service occupations:								
Mail carriers	14.0403	.....	267,000	275,000	3.0	5,600	700	4,900
Telephone operators	14.0401	.....	390,000	385,000	- 1.3	28,000	- 500	28,500
Education and related occupations:								
Teaching occupations:								
Kindergarten and elementary school teachers .....	.....	0802	1,276,000	1,439,000	12.8	94,000	15,000	79,000
Secondary school teachers .....	.....	0803	1,086,000	998,000	- 8.1	37,500	-4,000	41,500
College and university teachers .....	.....	0805	527,000	516,000	- 2.1	14,000	-1,000	15,000
Library occupations:								
Librarians .....	.....	1601	125,000	150,000	20.0	10,700	2,300	8,400
Library technicians and assistants	14.0499	5504	135,000	175,000	29.3	14,100	3,600	10,500
Sales occupations:								
Automobile parts counter workers	04.0300	0509	75,000	96,000	27.5	3,500	1,900	1,600
		5004	.....	.....	.....	.....	.....	.....
Automobile salesworkers	04.0300	0509	130,000	160,000	25.5	5,500	2,900	2,600
		5004	.....	.....	.....	.....	.....	.....
Automobile service advisors	04.0300	0509	20,000	28,000	21.3	800	450	350
		5004	.....	.....	.....	.....	.....	.....
Gasoline service station attendants	04.1600	.....	450,000	525,000	16.3	12,700	6,700	6,000
Manufacturers' salesworkers	04.1200	0509	380,000	387,000	2.4	9,500	800	8,700
		5004	.....	.....	.....	.....	.....	.....
Real estate salesworkers and brokers	04.1700	0511	400,000	480,000	21.8	28,500	7,800	20,700
		5004	.....	.....	.....	.....	.....	.....
Retail trade salesworkers	04.0800	0509	2,800,000	3,175,000	15.1	190,000	38,000	152,000
		5004	.....	.....	.....	.....	.....	.....
Route drivers .....	.....	.....	190,000	200,000	4.1	3,700	700	3,000
Securities salesworkers	04.0400	0505	100,000	130,000	31.9	6,100	2,900	3,200
		5004	.....	.....	.....	.....	.....	.....
Wholesale trade salesworkers	04.0800	0509	770,000	883,000	15.0	30,000	10,000	20,000
		5004	.....	.....	.....	.....	.....	.....
Construction occupations:								
Asbestos and insulation workers	17.1099	.....	30,000	50,000	66.7	2,300	1,800	500

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Construction occupations—Continued								
Bricklayers and stonemasons	17.1004	.....	165,000	205,000	24.2	6,500	3,600	2,900
Carpenters	17.1001	.....	1,060,000	1,300,000	22.5	49,100	21,700	27,400
Cement masons (cement and concrete finishers)	17.1099	.....	90,000	120,000	33.3	4,300	2,700	1,600
Construction laborers	17.1099	.....	865,000	1,004,000	16.1	28,400	12,600	15,800
Drywall installers and finishers	17.1008	.....	60,000	75,000	25.0	1,900	1,400	500
Electricians (construction)	17.1002	.....	245,000	320,000	30.6	11,700	6,800	4,900
Elevator constructors	17.1099	.....	19,000	25,000	31.6	1,050	550	500
Floor covering installers	17.1099	.....	85,000	100,000	17.6	2,400	1,400	1,000
Glaziers	17.1099	.....	9,000	13,000	44.4	500	350	150
Lathers	17.1006	.....	25,000	25,000	0.0	200	0	200
Operating engineers (construction machinery operators)	17.100302	.....	400,000	610,000	51.4	27,000	18,800	8,200
Painters and paperhangers:								
Painters	17.1005	.....	450,000	500,000	10.1	16,700	4,200	12,500
Paperhangers .....	.....	.....	20,000	25,000	25.0	1,400	500	900
Plasterers	17.1006	.....	26,000	25,000	- 3.8	450	-100	550
Plumbers and pipefitters	17.1007	.....	375,000	535,000	42.7	23,500	14,600	8,900
Roofers	17.1010	.....	90,000	130,000	44.4	5,000	3,600	1,400
Sheet-metal workers	17.2305	.....	65,000	75,000	15.4	2,000	900	1,100
Structural, ornamental, and reinforcing iron workers, riggers, and machine movers	17.1099	.....	85,000	112,000	31.8	3,900	2,500	1,400
Occupations in transportation activities:								
Air transportation occupations:								
Air traffic controllers	17.0403	.....	22,000	27,500	24.8	750	500	250
Airplane mechanics	17.0401	.....	130,000	145,000	12.1	3,200	1,400	1,800
Airplane pilots	16.0601	.....	79,000	101,000	28.7	2,800	2,100	700
Flight attendants	04.1900	5006	41,000	56,000	35.2	6,400	1,300	5,100
Reservation, ticket, and passenger agents	04.1900	.....	56,000	76,000	35.8	4,250	1,800	2,450
Merchant marine occupations:								
Merchant marine officers	17.0802	.....	7,500	7,500	0.0	150	0	150
Merchant marine sailors	17.0801	.....	20,000	17,150	-14.2	50	- 250	300
Railroad occupations:								
Brake operators .....	.....	.....	73,000	69,000	- 5.8	700	- 400	1,100
Conductors .....	.....	.....	39,500	41,000	4.6	1,250	150	1,100
Locomotive engineers .....	.....	.....	37,000	38,500	4.3	1,350	150	1,200
Shop trades .....	.....	.....	75,000	57,000	-27.0	-300	-1,900	1,600
Signal department workers	17.1402	.....	11,500	11,200	- 2.6	250	- 50	300
Station agents	04.1900	.....	7,600	3,700	-51.0	-200	-350	150
Telegraphers, telephoners, and tower operators	14.0103	.....	.....	.....	.....	.....	.....	.....
Track workers	14.0401	.....	11,000	6,600	-39.0	-150	- 400	250
.....	.....	.....	57,000	55,000	- 2.9	1,050	- 150	1,200
Driving occupations:								
Intercity busdrivers	04.1900	.....	25,000	26,000	3.9	850	100	750
Local transit busdrivers	04.1900	.....	71,000	78,500	10.4	2,900	700	2,200
Local truck drivers .....	.....	.....	1,600,000	1,760,000	8.5	38,500	12,500	26,000
Long distance truck drivers .....	.....	.....	540,000	585,000	8.1	12,000	4,000	8,000
Parking attendants	04.0300	.....	42,000	45,000	7.0	1,800	300	1,500
Taxicab drivers	04.1900	.....	92,000	89,000	- 3.7	2,450	- 300	2,750

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Scientific and technical occupations:								
Conservation occupations:								
Foresters	01.0700	0114	24,000	29,000	20.5	950	450	500
Forestry technicians	01.0601	5403	10,500	13,800	32.1	500	300	200
Range managers	01.0608	0117	2,500	3,850	53.9	150	100	50
Engineers:		0900	41,100,000	41,500,000	32.8	452,500	433,500	419,000
Aerospace		0902	52,000	58,300	12.1	1,100	550	550
Agricultural		0903	12,000	15,900	32.5	550	350	200
Biomedical		0905	3,000	4,000	33.3	150	100	50
Ceramic		0916	12,000	15,900	32.5	550	350	200
Chemical		0906	50,000	62,800	25.6	1,850	1,200	650
Civil		0908	170,000	228,100	36.6	9,300	5,600	3,700
Electrical		0909	290,000	378,900	32.0	12,200	8,400	3,800
Industrial		0913	180,000	227,100	26.2	7,200	4,300	2,900
Mechanical		0910	185,000	237,000	29.5	7,900	4,900	3,000
Metallurgical		0914	17,000	20,000	21.2	550	300	250
Mining		0918	5,000	7,100	42.0	350	200	150
Petroleum		0907	12,000	18,200	51.7	750	550	200
Environmental scientists:								
Geologists		1914	23,000	32,000	39.4	1,300	800	500
Geophysicists		1916	8,200	11,400	39.4	450	300	150
Meteorologists		1913	5,600	6,900	23.3	200	100	100
Oceanographers		1919	2,500	3,100	22.5	100	50	50
Life science occupations:								
Life scientists		0400	190,000	245,000	29.0	10,700	5,400	5,300
Mathematics occupations:								
Mathematicians		1701	40,000	46,100	16.5	1,550	600	950
Statisticians		1702	24,000	31,000	32.6	1,450	650	800
Physical scientists:								
Astronomers		1911	2,000	2,100	4.0	30	10	20
Chemists		1905	135,000	173,000	28.6	6,400	3,500	2,900
Physicists		1902	48,000	59,400	25.0	1,700	1,100	600
Other scientific and technical occupations:								
Broadcast technicians	16.0108	5008	22,000	26,000	18.2	1,350	350	1,000
Drafters	17.1300	5304	313,000	444,000	41.7	17,300	12,000	5,300
Engineering and science technicians	16.0100	5300	560,000	794,000	41.4	32,000	21,000	11,000
		5401						
		5407						
Surveyors		5309	55,000	86,600	59.2	3,600	2,700	900
Mechanics and repairers:								
Telephone craft occupations:								
Central office craft occupations	17.1501		110,000	130,000	18.2	2,900	1,800	1,100
Central office equipment installers	17.1501		30,000	36,000	18.0	800	500	300
Line installers and cable splicers	17.1402		55,000	53,500	- 3.6	150	-200	350
Telephone and PBX installers and repairers	17.1501		115,000	130,000	12.1	2,400	1,300	1,100

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Mechanics and repairers—Continued								
Other mechanics and repairers:								
Air-conditioning, refrigeration, and heating mechanics	17.0100	5317	200,000	285,000	33.6	10,900	7,000	3,900
Appliance repairers	17.0200	5310	135,000	170,000	24.1	5,600	3,000	2,600
Automobile body repairers	17.0301	.....	145,000	176,000	21.4	4,700	2,800	1,900
Automobile mechanics	17.0302	5306	735,000	875,000	19.3	24,400	12,900	11,500
Boat motor mechanics	17.2200	.....	11,000	14,000	29.0	550	300	250
Bowling pin-machine mechanics	17.1401	.....	5,000	5,600	7.7	150	50	100
Business machine repairers	17.0600	5310	65,000	97,000	49.8	3,100	2,900	200
Computer service technicians	16.0108	5105	50,000	93,000	86.0	4,300	3,900	400
Diesel mechanics	17.1200	5307	95,000	125,000	29.5	3,400	1,700	1,700
Electric sign repairers	17.1002	.....	9,000	12,000	29.4	450	250	200
Farm equipment mechanics	01.0301	.....	60,000	75,000	25.0	2,700	1,300	1,400
Industrial machinery repairers	17.10031	.....	500,000	840,000	65.8	42,500	30,500	12,000
Instrument repairers	17.2101	5314	110,000	154,000	40.0	6,600	4,000	2,600
Jewelers .....	.....	.....	18,000	18,600	2.8	750	50	700
Locksmiths .....	.....	.....	9,000	11,000	27.3	400	200	200
Maintenance electricians	17.1400	.....	280,000	370,000	32.1	13,800	8,200	5,600
Piano and organ tuners and repairers .....	.....	.....	8,000	8,000	0.0	350	0	350
Shoe repairers	17.3402	.....	30,000	26,800	-10.5	1,300	-300	1,600
Television and radio service technicians	17.1503	5310	135,000	180,000	26.9	6,600	4,200	2,400
Truck mechanics and bus mechanics .....	.....	5306	135,000	173,000	27.9	5,600	3,400	2,200
Vending machine mechanics .....	.....	.....	24,000	25,000	4.2	600	100	500
Watch repairers	17.2102	.....	17,000	17,700	5.6	800	100	700
Health occupations:								
Dental occupations:								
Dentists .....	.....	1204	105,000	145,000	34.9	6,200	3,400	2,800
Dental assistants	07.0101	5202	120,000	155,000	32.5	14,500	3,500	11,000
Dental hygienists	07.0102	5203	23,000	58,000	156.7	6,300	3,200	3,100
Dental laboratory technicians	07.0103	5204	32,000	47,500	47.8	2,600	1,400	1,200
Medical practitioners:								
Chiropractors .....	.....	1221	18,000	22,500	25.6	1,200	400	800
Optometrists .....	.....	1209	19,000	23,500	22.8	900	400	500
Physicians and osteopathic physicians .....	.....	1206	350,000	520,000	49.3	23,000	15,600	7,400
Podiatrists .....	.....	1210	.....	.....	.....	.....	.....	.....
Podiatrists .....	.....	1216	7,500	8,700	15.8	400	100	300
Veterinarians .....	.....	1218	29,000	38,500	33.0	1,450	850	600
Medical technologist, technician, and assistant occupations:								
Electrocardiograph technicians	07.0902	5217	11,000	15,000	39.0	1,000	400	600
Electroencephalographic technicians	07.0901	5217	3,800	5,500	44.7	350	150	200
Medical laboratory workers	07.0200	1223	175,000	250,000	42.9	18,800	6,800	12,000
.....	07.0203	5205	.....	.....	.....	.....	.....	.....
.....	07.0299	.....	.....	.....	.....	.....	.....	.....
Medical record technicians and clerks	14.0499	5213	53,000	120,000	121.7	11,500	5,900	5,600
Operating room technicians	07.0305	5211	28,000	41,000	43.7	2,700	1,100	1,600
Optometric assistants	07.0603	5212	11,500	19,000	63.8	1,800	700	1,100
Radiologic (X-ray) technologists	07.0501	5207	82,000	112,000	36.5	8,600	2,700	5,900
Respiratory therapy workers	07.0903	5215	38,000	80,000	110.5	6,800	3,800	3,000
Nursing occupations:								
Registered nurses	07.0301	1203	860,000	1,290,000	50.0	71,000	39,000	32,000
.....	16.0305	5208	.....	.....	.....	.....	.....	.....

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Health occupations—Continued								
Nursing occupations—Continued								
Licensed practical nurses	07.0302	5209	495,000	965,000	95.0	93,000	43,000	50,000
Nursing aides, orderlies, and attendants	07.0303	.....	970,000	1,500,000	54.6	123,000	48,000	75,000
Therapy and rehabilitation occupations:								
Occupational therapists .....	.....	1208	9,400	13,800	46.5	1,000	400	600
Occupational therapy assistants	07.0401	5210	7,900	14,300	81.4	1,150	600	550
Physical therapists .....	.....	1212	20,000	32,000	60.0	2,400	1,100	1,300
Physical therapist assistants and aides	07.0402	5219	10,500	18,000	71.4	1,400	650	750
Speech pathologists and audiologists .....	.....	1220	31,000	51,000	63.0	3,700	1,800	1,900
Other health occupations:								
Dietitians .....	.....	1306	33,000	42,500	29.4	3,200	900	2,300
Dispensing opticians	07.0601	5212	17,000	27,000	58.8	1,550	900	650
.....	17.2101	.....	.....	.....	.....	.....	.....	.....
Health services administrators .....	.....	1202	150,000	250,000	66.7	17,400	9,100	8,300
Medical record administrators .....	.....	1202	12,000	14,500	27.6	1,100	300	800
Pharmacists .....	.....	1211	117,000	137,000	17.4	6,500	1,900	4,600
Social scientists:								
Anthropologists .....	.....	2202	3,800	5,400	42.9	250	150	100
.....	.....	2203	.....	.....	.....	.....	.....	.....
Economists .....	.....	2204	71,000	104,000	45.9	4,700	3,000	1,700
Geographers .....	.....	2206	9,000	13,000	42.8	650	350	300
Historians .....	.....	2205	26,000	32,000	19.8	1,300	500	800
Political scientists .....	.....	2207	11,500	14,500	27.5	600	300	300
Psychologists .....	.....	2000	75,000	105,000	40.7	5,200	2,800	2,400
Sociologists .....	.....	2208	14,000	18,000	28.7	750	350	400
Social service occupations:								
Counseling occupations:								
School counselors .....	.....	0826	44,000	48,000	8.9	2,050	350	1,700
Employment counselors .....	.....	.....	7,000	10,800	54.2	650	350	300
Rehabilitation counselors .....	.....	.....	19,000	29,000	52.6	2,100	900	1,200
College career planning and placement counselors	14.0602	0826	4,100	5,000	22.0	250	100	150
Other social service occupations:								
Recreation workers	04.1800	2103	65,000	96,000	42.6	5,900	2,700	3,200
.....	.....	5506	.....	.....	.....	.....	.....	.....
Social service aides .....	.....	5506	70,000	115,000	60.9	8,400	3,900	4,500
Social workers .....	.....	2104	300,000	435,000	45.7	30,500	12,500	18,000
Art, design, and communications-related occupations:								
Design occupations:								
Architects .....	.....	0202	40,000	60,000	52.3	3,000	1,900	1,100
Commercial artists	17.0700	1009	64,000	80,000	24.3	4,000	1,400	2,600
Display workers	04.0100	.....	34,000	40,000	17.6	2,200	500	1,700
.....	.....	17.0702	.....	.....	.....	.....	.....	.....
Industrial designers	17.0703	.....	10,000	11,500	15.0	450	150	300
Interior designers	17.0701	0203	34,000	40,000	18.0	1,550	550	1,000
Landscape architects .....	.....	0204	12,000	18,000	52.3	900	600	300
Photographers .....	.....	1011	80,000	95,000	19.2	3,400	1,400	2,000

See footnotes at end of table.

Table B-1. Estimated 1974 employment, projected 1985 requirements, and average annual openings, by occupation, 1974-85—Continued

Occupation	Vocational education code ¹	Hegis code ²	Estimated employment 1974	Projected requirements 1985	Percent change 1974-85	Annual average openings, 1974-85		
						Total	Employment change	Replacement needs ³
Art, design, and communications-related occupations—Continued								
Communications-related occupations:								
Newspaper reporters	0602	40,000	45,500	13.7	2,200	500	1,700
Radio and television announcers	0603	19,000	23,000	21.1	600	350	250
Technical writers	20,000	26,000	24.9	1,150	450	700

¹ Vocational education codes are from *Vocational Education and Occupations* (U.S. Department of Health, Education, and Welfare, and U.S. Department of Labor, 1969).

² HEGIS codes are from the Higher Education General Information Survey. See *A Taxonomy of Instructional Programs in Higher Education* (U.S. Department of Health, Education, and Welfare, 1970).

³ Replacement needs include openings arising from deaths, retirements, and other

separations from the labor force. Does not include transfers to other occupations.

⁴ Totals do not equal the sum of the individual estimates because all branches of engineering are not covered separately.

NOTE: Percentages were calculated using unrounded numbers and therefore may not agree with rounded numbers on employment and projected requirements shown in the table.

Appendix C. Detailed Training Statistics

This appendix presents tabulations of all available statistics on the numbers of persons completing training for occupations for which appendix B presents projections. Table C-1 presents statistics for occupations that generally require fewer than 4 years of college; tables C-2 and C-3 present data for bachelor's, master's, doctor's, and first professional degrees awarded. Chapter 4 also presents these data, along with information on how workers trained for specific occupations and projections of occupational requirements.

Tables C-4 and C-5 present limited trend data for junior college graduates and apprenticeship completions. Table C-6 presents Armed Forces manpower data by occupational specialty. Table C-7 presents data

on vocational education completions.

Data in table C-1 are not strictly comparable because different programs cover different time periods (fiscal years, calendar years, and academic years). CETA training and private vocational training are not listed because data on completions are insufficient to match training with related occupations. Furthermore, not all junior college completions in table C-5 and all vocational education completions in table C-7 could be matched with a related occupation. Table C-1 emphasizes the fragmentary and inconsistent nature of the data on occupational training and the need for improvement. Extensive footnotes indicate data limitations.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Industrial production and related occupations:						
Foundry occupations:						
Patternmakers	17.2302	.....	.....	.....	.....	167
Molders	17.2301	.....	.....	.....	.....	78
Coremakers	17.2301	.....	.....	.....	.....	.....
Machining occupations:						
All-round machinists	17.2302	.....	.....	.....	.....	1,879
Instrument makers (mechanical)	17.2302	.....	.....	.....	.....	.....
Machine tool operators	17.2303	.....	.....	76	.....	.....
Setup workers (machine tools)	17.2302	.....	.....	.....	.....	138
Tool and die makers	17.2307	.....	.....	.....	.....	1,971
Printing occupations ¹	17.1900	5009	535	.....	17,658	2,302
Bookbinders and related workers	17.1906	.....	.....	27	.....	150
Composing room occupations	17.1901	.....	.....	.....	.....	430
Electrotypers and stereotypers	17.1903	.....	.....	.....	.....	.....
Lithographic occupations	17.1902	.....	.....	.....	.....	574
Photoengravers	17.1904	.....	.....	.....	.....	.....
Printing press operators and assistants	17.1902	.....	.....	288	.....	581

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Industrial production and related occupations—Continued						
Other industrial production and related occupations:						
Assemblers				441		
Automobile painters	17.0301					
Blacksmiths	17.2399					
Blue-collar worker supervisors	17.1700				8,506	
Boilermaking occupations	17.1099					352
Boiler tenders	17.3200				1,031	
Electroplaters	17.2399					
Forge shop occupations	17.2399					
Furniture upholsterers	17.3500			139	26,258	
Inspectors	17.2400					
Millwrights	17.1099					561
Motion picture projectionists						
Ophthalmic laboratory technicians ..	07.0601 17.2101	5212				
Photographic laboratory occupations ³	17.0900	5007	645		4,680	
Power truck operators	17.100302					
Production painters						
Stationary engineers	17.3200				1,031	164
Wastewater treatment plant operators	17.3203				2,620	
Welders	17.2306	5308		1,523		
Office occupations:	14.00					
Clerical occupations				4634,006		
Bookkeeping workers	14.0102			21		
Cashiers	14.0103			161		
Collection workers	04.0800 14.9900					
File clerks	14.0302			393		
Hotel front office clerks	04.1100					
Office machine operators	14.0104	5005		274		
Postal clerks	14.0403			42		
Receptionists	14.0406			38		
Secretaries and stenographers	14.0700	5005	18,650	157	166,926	
Shipping and receiving clerks	14.0503					
Statistical clerks	14.0303					
Stock clerks	14.0504			174		
Typists	14.0900	5005		877	119,477	
Computer and related occupations	14.0200				41,666	
Computer operating personnel		5101				
	14.0201	5102	64,754	6353		
	14.0202	5104				
	14.020201	5199				
Programmers	14.0203	0704 5103	2,018			
Banking occupations			1,605			
Bank clerks	14.0102 14.0104 14.0303 14.0399					
Bank tellers	14.0105					
Insurance occupations	04.1300	0512				
Claim representatives	04.1300					
Insurance agents, brokers and underwriters	04.1300					

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Office occupations—Continued						
Administrative and related occupations:						
Accountants		0502				
		5002	7,880			
Buyers	04.0800	0509				
		5004				
Credit managers	14.0899	0504				
		5003				
Hotel managers and assistants	04.1100	0508				
		5010	71,852		3,430	
Service occupations:						
Cleaning and related occupations:						
Building custodians	17.1100			1,104	3,412	
Hotel housekeepers and assistants ..	09.0205				4,700	
Pest controllers						
Food service occupations	17.2900				14,127	
Bartenders						
Cooks and chefs	17.2902			81,803		8225
Dining room attendants and dishwashers						
Food counter workers	17.2904					
Meatcutters	17.2903			124		914
Waiters and waitresses	17.2904			70		
Personal service occupations:						
Barbers	17.2601	5006		3	940	316
Bellhops and bell captains	04.1100					
Cosmetologists	17.2602	5006		182	19,270	
Funeral directors and embalmers ...	07.0909					
Private household service occupations:						
Private household workers	09.0201					
	09.0202					
	09.0203					
	09.0205					
Protective and related service occupations:						
Firefighters	17.2801	5507	2,013		4,084	
Guards	17.2802			6		
Police officers ⁹	17.2802	2105		3	23,511	
		2209				
		5505	14,915			
State police officers	17.2802	2105				
		2209				
		5505				
Construction inspectors (government)	17.2899					
Health and regulatory inspectors (government)	17.2899	5408	464			
Occupational safety and health workers	16.0602					
	17.2801					
	17.2899					
Other service occupations:						
Mail carriers	14.0403					
Telephone operators	14.0401			7		

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Education and related occupations:						
Library occupations:						
Library technicians and assistants	14.0499	5504	506	4	.....	.....
Sales occupations	04.0000	.....	¹⁰ 13,559	.....	¹¹ 225,436	.....
Automobile parts counter workers	04.0300	0509 5004	.....	31	.....	.....
Automobile salesworkers	04.0300	0509 5004	.....	.....	.....	.....
Automobile service advisors	04.0300	0509 5004	.....	.....	.....	.....
Gasoline service station attendants	04.1600	.....	.....	174	.....	.....
Manufacturers salesworkers	04.1200	0509 5004	.....	.....	.....	.....
Real estate salesworkers and brokers	04.1700	5004	.....	.....	31,937	.....
Retail trade salesworkers	04.0800	0509 5004	.....	141	¹² 69,319	.....
Route drivers .....	.....	.....	.....	.....	.....	.....
Securities salesworkers	04.0400	0505 5004	.....	.....	.....	.....
Wholesales trade salesworkers	04.0800	0509 5004	.....	.....	.....	.....
Construction occupations .....	.....	5317	.....	.....	.....	.....
Asbestos and insulation workers	17.1099	.....	.....	.....	.....	277
Bricklayers and stonemasons	17.1004	.....	.....	785	8,908	¹³ 1,162
Carpenters	17.1001	.....	.....	2,758	30,173	5,153
Cement masons (cement and concrete finishers)	17.1099	.....	.....	344	.....	520
Construction laborers	17.1099	.....	.....	37	.....	.....
Drywall installers and finishers	17.1008	.....	.....	.....	.....	.....
Electricians (construction) ¹⁴	17.1002	.....	.....	595	12,776	5,933
Elevator constructors	17.1099	.....	.....	.....	.....	.....
Floor covering installers	17.1099	.....	.....	2	.....	295
Glaziers	17.1099	.....	.....	.....	.....	295
Lathers	17.1006	.....	.....	.....	.....	277
Operating engineers (construction machinery operators)	17.100302	.....	.....	914	.....	806
Painters and paperhangers	17.1005	.....	.....	605	.....	1,037
Plasterers	17.1006	.....	.....	187	.....	182
Plumbers and pipefitters ¹⁵	17.1007	.....	.....	127	7,174	5,860
Roofers	17.1010	.....	.....	.....	.....	387
Sheet-metal workers	17.2305	.....	.....	129	.....	2,464
Structural ornamental, and reinforcing iron workers, riggers, and machine movers	17.1099	.....	.....	.....	.....	1,615
Occupations in transportation activities:						
Air transportation occupations	17.0400	.....	.....	.....	5,830	.....
Air traffic controllers	17.0403	.....	.....	.....	.....	.....
Airplane mechanics	17.0401	.....	.....	.....	.....	19
Airplane pilots	16.0601	.....	.....	.....	1,016	.....
Flight attendants	04.1900	5006	.....	.....	.....	.....
Reservation, ticket, and passenger agents	04.1900	.....	.....	.....	.....	.....
Merchant marine occupations:						
Merchant marine officers	17.0802	.....	.....	.....	.....	.....
Merchant marine sailors	17.0801	.....	.....	.....	.....	.....

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Occupations in transportation activities—Continued						
Railroad occupations:						
Brake operators .....	.....	.....	.....	.....	.....	.....
Conductors .....	.....	.....	.....	.....	.....	.....
Locomotive engineers .....	.....	.....	.....	.....	.....	.....
Shop trades .....	.....	.....	.....	.....	.....	.....
Signal department workers	17.1402	.....	.....	.....	.....	.....
Station agents	04.1900	.....	.....	.....	.....	.....
	14.0103	.....	.....	.....	.....	.....
Telegraphers, telephoners, and tower operators	14.0401	.....	.....	.....	.....	.....
Track workers .....	.....	.....	.....	.....	.....	.....
Driving occupations:						
Intercity busdrivers	04.1900	.....	.....	.....	.....	.....
Local transit busdrivers	04.1900	.....	.....	.....	.....	.....
Local truck drivers .....	.....	.....	.....	¹⁶ 115	.....	.....
Long distance truck drivers .....	.....	.....	.....	.....	.....	.....
Parking attendants	04.0300	.....	.....	.....	.....	.....
Taxicab drivers	04.1900	.....	.....	.....	.....	.....
Scientific and technical occupations:						
Conservation occupations:						
Forestry technicians	01.0601	5403	1,980	216	.....	.....
Other scientific and technical occupations:						
Broadcast technicians	16.0108	5008	.....	.....	.....	.....
Drafters	17.1300	5304	.....	65	30,151	324
Engineering and science technicians	16.0100	5300	¹⁷ 39,024	.....	42,408	¹⁸ 138
	.....	5401	.....	.....	.....	.....
	.....	5407	.....	.....	.....	.....
Surveyors .....	.....	5309	2,203	.....	.....	.....
Mechanics and repairers:						
Telephone craft occupations:						
Central office craft occupations	17.1501	.....	.....	.....	.....	.....
Central office equipment installers	17.1501	.....	.....	.....	.....	.....
Line installers and cable splicers	17.1402	.....	.....	.....	.....	.....
Telephone and PBX installers and repairers	17.1501	.....	.....	.....	.....	.....
Other mechanics and repairers:						
Air-conditioning, refrigeration, and heating mechanics	17.0100	5317	.....	240	13,215	279
Appliance repairers	17.0200	5310	.....	108	4,877	.....
Automobile body repairers	17.0301	.....	.....	765	17,310	307
Automobile mechanics	17.0302	5306	.....	1,962	76,280	1,330
Boat motor mechanics	17.2200	.....	.....	.....	.....	.....
Bowling-pin-machine mechanics	17.1401	.....	.....	.....	.....	.....
Business machine repairers ¹⁹	17.0600	5310	.....	60	988	387
Computer service technicians	16.0108	5105	226	.....	.....	.....
Diesel mechanics	17.1200	5307	.....	93	4,308	.....
Electric sign repairers	17.1002	.....	.....	.....	.....	.....
Farm equipment mechanics	01.0301	.....	.....	49	²⁰ 27,822	.....
Industrial machinery repairers	17.10031	.....	.....	62	.....	721
Instrument repairers	17.2101	5314	.....	.....	.....	.....
Jewelers .....	.....	.....	.....	.....	.....	.....

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Mechanics and repairers— Continued						
Other mechanics and repairers— Continued						
Locksmiths						
Maintenance electricians	17.1400			11	(21)	811
Piano and organ tuners and repairers						
Shoe repairers	17.3402					
Television and radio service technicians	17.1503	5310		87		247
Truck mechanics and bus mechanics		5306				
Vending machine mechanics						
Watch repairers	17.2102					
Health occupations:						
Dental occupations:						
Dental assistants	07.0101	5202	1,197	35	7,949	
Dental hygienists	07.0102	5203	3,738		1,699	
Dental laboratory technicians	07.0103	5204	594		1,211	
Medical technologist, technician, and assistant occupations:						
Electrocardiograph technicians	07.0902	5217	²² 24	29		
Electroencephalographic technicians	07.0901	5217	²² 24			
Medical laboratory workers	07.0200 07.0203 07.0299	1223 5205		21	2,497 879	116
Medical record technicians and clerks	14.0499	5213	627			
Operating room technicians	07.0305	5211	183			
Optometric assistants	07.0603	5212	395			
Radiologic (X-ray) technologists	07.0501	5207	2,758	5	2,413	
Respiratory therapy workers	07.0903	5215	1,824	2	1,608	
Nursing occupations:						
Registered nurses ²³	07.0301 16.0305	1203 5208				
Licensed practical nurses	07.0302	5209	28,158 2,447	76	19,019 34,455	
Nursing aides, orderlies, and attendants	07.0303			2,237	32,220	
Therapy and rehabilitation occupations:						
Occupational therapy assistants	07.0401	5210	491		829	
Physical therapist assistants and aides	07.0402	5219	717	25	583	
Other health occupations:						
Dispensing opticians	07.0601 17.2101	5212	395			150
Social service occupations:						
Social service aides		5506	3,731			
Art, design, and communications- related occupations:						
Design occupations:						
Commercial artists	17.0700	1009		42	6,272	
Display workers	04.0100 17.0702					

See footnotes at end of table.

Table C-1. Known training in occupations which generally require less than a bachelor's degree, for which projections of manpower requirements have been prepared—Continued

Occupation	Vocational education code	Hegis code	Junior college graduates 1973-74	Job corps completions Fy 1974	Vocational education completions Fy 1974	Apprenticeship completions 1974
Art, design, and communications-related occupations—Continued						
Design occupations—Continued						
Interior designers	17.0701	0203	.....	.....	.....	.....
Photographers .....	.....	1011	.....	.....	.....	.....
Communications-related occupations:						
Interpreters .....	.....	.....	.....	.....	.....	.....
Newspaper reporters .....	.....	0602	.....	.....	.....	.....
Radio and television announcers .....	.....	0402	.....	.....	.....	.....
Technical writers .....	.....	.....	.....	.....	.....	.....

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 occupations programs.

⁵ Includes office machine training.

⁶ Includes training for keypunch and other input technologies, computer operators and peripheral equipment operators, and general data processing workers.

⁷ Includes restaurant management.

⁸ Includes bakers.

⁹ May include some State police officers.

¹⁰ Recipients of associate degrees in marketing, distribution, purchasing, business, and industrial management.

¹¹ Includes all distribution programs.

¹² Includes training for other occupations in retail trade.

¹³ Includes stonemasons, marble-setters, and tile setters.

¹⁴ All electricians, including maintenance.

¹⁵ Includes sprinkler-fitters.

¹⁶ May include some over-the-road drivers.

¹⁷ Includes an unknown number of workers trained for skilled craft occupations and technical occupations such as industrial drafter.

¹⁸ Electronics technicians.

¹⁹ May include some computer service technicians.

²⁰ Includes other occupations related to agricultural machinery.

²¹ See construction electricians.

²² EKG and EEG technicians combined.

²³ Some graduates may be counted in both junior college and vocational education programs. In addition to training sources shown, many nurses were trained in 4-year college programs.

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1973-74

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	954,316	270,259	33,826
Agriculture and natural resources	16,303	2,939	930
Agriculture, general	1,833	220	3
Agronomy	833	271	156
Soil science	379	87	72
Animal science	3,118	370	129
Dairy science	239	55	27
Poultry science	77	46	10
Fish, game, and wildlife management	1,344	295	58
Horticulture	639	166	45
Ornamental horticulture	252	24	2
Agricultural and farm management	200	14	10
Agriculture economics	1,178	415	165
Agriculture business	867	27	3
Food science and technology	402	197	88
Forestry	2,337	408	78
Natural resources management	1,519	160	26
Agriculture and forestry technologies	117	8	12
Range management	163	43	19
Other	808	133	27
Architecture and environmental design	7,840	2,733	69
Environmental design, general	1,284	75	1
Architecture	4,531	929	16
Interior design	489	15	—
Landscape architecture	601	170	—
Urban architecture	26	98	1
City, community, and regional planning	410	1,380	51
Other	499	66	—
Area studies	3,203	1,142	163
Asian studies, general	242	126	7
East Asian studies	176	93	9
South Asian (India, etc.) studies	24	11	2
Southeast Asian studies	13	15	1
African studies	17	56	9
Islamic studies	2	—	1
Russian and Slavic studies	150	74	8
Latin American studies	280	136	7
Middle Eastern studies	52	21	5
European studies, general	34	—	—
Eastern European studies	16	12	—
West European studies	90	10	—
American studies	1,844	326	80
Pacific area studies	1	1	—
Other	262	261	34
Biological sciences	48,856	6,581	3,440
Biology, general	36,630	3,210	657
Botany, general	865	323	182
Bacteriology	404	57	36
Plant pathology	29	90	82
Plant pharmacology	—	—	10
Plant physiology	24	16	34
Zoology, general	5,788	683	278
Pathology, human and animal	63	66	89
Pharmacology, human and animal	1	93	153
Physiology, human and animal	207	210	227
Microbiology	1,907	452	348
Anatomy	2	93	116
Histology	—	7	—
Biochemistry	1,101	249	451
Biophysics	74	43	83
Molecular biology	92	25	57
Cell biology	43	5	9

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1973-74—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.)
Biological sciences—Continued			
Marine biology	163	99	25
Biometrics and biostatistics	13	71	27
Ecology	298	130	29
Entomology	203	198	172
Genetics	46	97	93
Radiobiology	—	25	15
Nutrition, scientific	96	144	81
Neurosciences	20	3	16
Toxicology	8	19	8
Embryology	—	—	1
Other	779	173	161
Business and management			
Business and commerce, general	133,905	32,820	983
Accounting	33,007	8,787	176
Business statistics	29,770	1,806	70
Banking and finance	126	67	11
Investments and securities	6,518	2,252	34
Business management and administration	1	44	—
Operations research	37,052	14,964	445
Hotel and restaurant management	126	472	62
Marketing and purchasing	1,188	64	1
Transportation and public utilities	14,834	1,331	59
Real estate	618	109	2
Insurance	769	76	4
International business	441	48	6
Secretarial studies	274	870	4
Personnel management	1,896	29	—
Labor and industrial relations	1,122	369	5
Business economics	1,220	385	19
Other	2,525	266	69
	2,418	881	16
Communications			
Communications, general	17,096	2,642	175
Journalism	4,711	942	85
Radio/television	6,710	998	20
Advertising	3,183	248	1
Communication media	1,031	49	—
Other	846	137	7
	615	268	62
Computer and information sciences			
Computer and information sciences, general	4,757	2,276	198
Information sciences and systems	3,761	1,801	178
Data processing	338	198	13
Computer programming	540	113	—
Systems analysis	15	8	—
Other	54	124	—
	49	32	7
Education			
Education, general	186,623	112,739	7,293
Elementary education, general	3,752	13,419	1,754
Secondary education, general	81,041	22,032	230
Junior high school education	5,296	7,238	202
Higher education, general	471	138	2
Junior and community college education	9	351	306
Adult and continuing education	—	208	4
Special education, general	53	579	117
Administrative or special education	6,701	5,249	159
Education of the mentally retarded	—	174	27
Education of the gifted	5,517	1,443	28
Education of the deaf	12	13	—
Education of the culturally disadvantaged	476	287	6
Education of the visually handicapped	—	70	6
Speech correction	143	129	4
Education of the emotionally disturbed	3,286	809	8
Remedial education	915	634	18
	2	112	1

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1973-74—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—Continued			
Special learning disabilities	424	835	2
Education of the physically handicapped	266	202	6
Education of the multiply handicapped	173	101	1
Social foundations	190	644	174
Educational psychology	318	2,208	536
Pre-elementary education	6,988	1,544	24
Educational statistics and research	4	82	50
Educational testing, evaluation, and measurement	—	106	31
Student personnel	51	17,497	632
Educational administration	5	9,417	1,096
Educational supervision	—	884	66
Curriculum and instruction	390	2,979	568
Reading education	155	4,954	101
Art education	5,969	1,036	49
Music education	7,752	1,472	87
Mathematics education	2,039	828	59
Science education	941	904	83
Physical education	27,823	4,701	290
Driver and safety education	71	127	—
Health education	1,519	715	47
Business, commerce, and distributive education	7,153	1,911	70
Industrial arts, vocational and technical education	8,055	2,613	205
Agricultural education	1,107	474	27
Education of exceptional children, not classified above	174	55	1
Home economics education	5,676	607	20
Nursing education	719	144	29
Other	987	2,814	167
Engineering	50,693	15,385	3,312
Engineering, general	3,087	907	260
Aerospace, aeronautical, astronautical engineering	1,210	557	173
Agricultural engineering	522	151	45
Architectural engineering	306	24	3
Bioengineering and biomedical engineering	152	142	43
Chemical engineering	3,454	1,045	400
Petroleum engineering	372	66	25
Civil, construction, and transportation engineering	8,145	2,653	368
Electrical, electronics, communications engineering	11,419	3,499	705
Mechanical engineering	7,737	1,844	385
Geological engineering	127	34	14
Geophysical engineering	37	13	7
Industrial and management engineering	2,921	1,734	146
Metallurgical engineering	458	216	119
Materials engineering	161	208	94
Ceramic engineering	191	68	19
Textile engineering	52	22	3
Mining and mineral engineering	279	64	7
Engineering physics	281	116	21
Nuclear engineering	309	403	106
Engineering mechanics	146	214	157
Environmental and sanitary engineering	182	570	59
Naval architecture and marine engineering	379	55	3
Ocean engineering	138	80	36
Engineering technologies	7,456	209	4
Other	1,174	491	110
Fine and applied arts	40,016	8,001	585
Fine arts, general	5,112	817	36
Art	14,268	1,888	10
Art history and appreciation	2,130	327	67
Music (performing, composition, theory)	4,439	2,271	257
Music (liberal arts program)	3,273	600	82
Music history and appreciation	164	134	46
Dramatic arts	5,412	1,250	74
Dance	516	142	1
Applied design	3,004	204	1

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1973-74—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.)
Fine and applied arts—Continued			
Cinematography	338	141	2
Photography	663	59	—
Other	697	168	9
Foreign languages	19,479	3,991	923
Foreign languages, general	848	496	198
French	6,293	1,195	213
German	2,425	550	149
Italian	292	81	19
Spanish	7,859	1,242	203
Russian	624	100	27
Chinese	121	37	5
Japanese	142	8	2
Latin	311	63	6
Greek, classical	122	26	12
Hebrew	152	42	4
Arabic	20	5	1
Indian (Asiatic)	5	2	1
Scandinavian languages	33	7	2
Slavic languages (other than Russian)	77	53	41
African languages (non-Semitic)	4	2	1
Other	101	82	29
Health professions	41,809	9,741	578
Health professions, general	901	208	3
Hospital and health care administration	185	990	21
Nursing	19,409	2,293	14
Dental specialties	40	410	1
Medical specialties	22	105	33
Occupational therapy	1,277	174	—
Optometry	309	8	7
Pharmacy	5,773	240	132
Physical therapy	1,900	111	—
Dental hygiene	875	18	—
Public health	273	1,781	113
Medical record librarianship	420	7	—
Podiatry or podiatric medicine	57	—	—
Biomedical communication	21	—	—
Veterinary medicine specialties	104	110	46
Speech pathology and audiology	3,278	1,964	78
Chiropractic	—	—	—
Clinical social work	65	511	10
Medical laboratory technologies	4,840	164	—
Dental technologies	14	—	—
Radiologic technologies	169	48	6
Other	1,931	599	114
Home economics	15,433	1,869	136
Home economics, general	6,080	726	21
Home decoration and home equipment	692	35	—
Clothing and textiles	2,235	125	15
Consumer economics and home management	511	100	1
Family relations and child development	3,282	412	47
Foods and nutrition	1,925	407	51
Institutional management and cafeteria management	356	31	—
Other	372	33	1
Law	494	1,181	27
Law, general	450	687	27
Other	44	494	—
Letters	65,325	12,165	2,633
English, general	42,853	6,442	1,074
Literature, English	3,597	897	365
Comparative literature	406	231	130
Classics	450	126	46

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1973-74—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—Continued			
Linguistics	431	455	145
Speech, debate, and forensic science	7,271	1,689	281
Creative writing	162	218	—
Teaching of English as a foreign language	265	388	—
Philosophy	5,809	664	413
Religious studies	3,653	721	144
Other	428	334	34
Library science	1,164	8,185	60
Library science, general	1,071	7,964	56
Other	93	221	4
Mathematics	21,813	4,840	1,031
Mathematics, general	20,937	4,196	819
Statistics, mathematical and theoretical	257	453	147
Applied mathematics	519	155	52
Other	100	36	13
Military sciences	328	—	—
Military science (Army)	6	—	—
Naval science (Navy, Marines)	9	—	—
Aerospace science (Air Force)	65	—	—
Other	79	—	—
Physical sciences	21,287	6,087	3,631
Physical sciences, general	1,079	263	36
Physics, general	3,936	1,645	1,100
Molecular physics	11	2	8
Nuclear physics	15	15	7
Chemistry, general	10,435	2,021	1,635
Inorganic chemistry	—	3	13
Organic chemistry	76	48	65
Physical chemistry	6	21	43
Analytical chemistry	—	2	4
Pharmaceutical chemistry	8	43	68
Astronomy	152	82	77
Astrophysics	27	7	6
Atmospheric sciences and meteorology	294	195	54
Geology	3,151	870	258
Geochemistry	21	12	10
Geophysics and seismology	84	56	47
Earth sciences, general	1,028	343	30
Paleontology	8	4	1
Oceanography	237	199	70
Metallurgy	11	29	14
Other earth sciences	294	91	36
Other physical sciences	414	136	49
Psychology	52,256	6,616	2,339
Psychology, general	51,076	4,686	1,723
Experimental psychology	98	69	71
Clinical psychology	85	482	280
Psychology for counseling	31	847	53
Social psychology	365	58	58
Psychometrics	6	24	—
Statistics in psychology	1	1	1
Industrial psychology	42	47	7
Development psychology	383	113	62
Physiological psychology	18	5	7
Other	153	284	77
Public affairs and services	24,264	12,694	230
Community services, general	1,002	107	9
Public administration	1,024	3,296	76
Parks and recreation management	3,705	440	25
Social work and helping services	9,960	7,974	109

Table C-2. Bachelor's, master's, and doctor's degrees conferred by institutions of higher education, by field of study, 1973-74—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.)
Public affairs and services—Continued			
Law enforcement and corrections	8,257	561	3
International public service	22	44	1
Other	294	272	7
Social sciences			
Social sciences, general	152,203	17,297	4,126
Anthropology	17,050	2,319	67
Archaeology	6,002	885	376
Economics	78	11	12
History	14,418	2,145	788
Geography	37,381	4,543	1,114
Political science and government	4,239	763	217
Sociology	30,932	2,448	766
Criminology	35,896	2,196	632
International relations	1,497	140	19
Afro-American (Black culture) studies	1,193	706	76
American Indian cultural studies	392	19	3
Mexican-American cultural studies	20	—	—
Urban studies	111	12	—
Demography	1,289	794	7
Other	19	40	9
Theology			
Theological professions, general	1,686	276	40
Religious music	4,231	2,898	768
Biblical languages	2,530	1,340	685
Religious education	160	145	4
Other	78	76	4
Interdisciplinary studies			
General liberal arts and sciences	1,301	1,229	35
Biological and physical sciences	162	108	40
Humanities and social sciences	24,938	3,437	196
Engineering and other disciplines	9,860	1,593	20
Other	4,245	500	15
	3,620	898	70
	298	217	28
	6,920	429	63

SOURCE: Department of Health, Education, and Welfare.

Table C-3. First professional degrees¹ conferred by institutions of higher education, 1973-74

Field of study	First professional degrees	Field of study	First professional degrees
Total, all institutions	54,278	Podiatry (Pod. D. or D.P.) or Podiatry Medicine (D.P.M.)	371
Dentistry (D.D.S. or D.M.D.)	4,478	Veterinary Medicine (D.V.M.)	1,384
Medicine (M.D.)	11,447	Law (LL.B. or J.D.)	29,652
Optometry (O.D.)	791	Theology (B.D., M. Div., or Rabbi)	5,048
Osteopathy (D.O.)	685	Other	422

¹Includes degrees which require at least 6 years of college work for completion (including at least 2 years of preprofessional training).

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

Table C-4. Apprentice completions in selected trades, 1962-74

Trade	1962	1963	1964	1965	1966	1967 ¹	1968 ²	1969 ³	1970	1971	1972	1973	1974
Construction trades:⁴													
Asbestos workers										312	282	365	277
Bricklayers, stone and tilesetters	1,527	1,484	1,369	1,342	1,346	1,602	1,206	1,651	1,801	1,431	1,998	1,400	1,162
Carpenters	2,986	3,013	2,882	3,272	3,340	4,249	3,423	3,698	3,083	3,639	5,054	5,719	5,153
Cement masons	327	312	222	297	293	372	386	300	273	384	825	460	520
Dry-wall finishers												446	404
Electricians	3,279	3,148	3,887	3,327	3,654	6,075	4,742	5,091	5,224	4,364	5,991	5,730	5,933
Glaziers	202	201	266	222	239	223	244	217	228	248	335	296	295
Lathers	387	216	240	268	198	466	290	145	202	188	276	214	277
Operating engineers										439	1,035	848	806
Painters	790	895	770	969	807	1,019	868	829	832	992	983	909	1,037
Plasterers	290	338	267	181	215	264	201	228	161	161	245	176	182
Plumbers-pipefitters	3,409	2,924	3,101	3,050	2,736	3,601	3,788	4,888	4,266	4,880	5,255	4,656	5,526
Roofers	228	197	282	272	241	379	226	290	278	257	383	426	387
Sheet-metal workers	1,749	1,558	1,742	1,477	1,568	2,184	2,401	2,544	2,309	2,401	2,768	2,775	2,464
Sprinkler-fitters										200	408	187	334
Structural iron workers	896	773	732	870	1,075	1,387	1,209	2,006	1,536	1,381	2,098	1,801	1,503
Construction workers not classified above	407	500	526	654	640	230	1,279	1,063	1,221	451	552	87	112
Metalworking trades:													
Boilermakers	59	59	52	111	91	199	135	180	364	405	504	353	352
Machine set-up and operators												112	138
Machinists	1,011	1,330	1,309	1,339	1,616	2,367	2,108	3,527	3,822	3,234	3,695	2,357	1,879
Patternmakers	195	150	131	160	150	326	350	395	444	290	275	166	167
Toolmakers, diemakers	1,339	1,367	1,489	1,293	1,704	3,596	2,502	4,125	4,748	3,482	3,825	2,716	1,971
Not classified above	294	333	290	350	558	1,239	902	822	1,032	446	531		
Graphic art trades:													
Bookbinders	246	453	235	182	160	116	170	315	223	142	231	81	150
Compositors	869	730	666	675	559	807	810	837	774	623	844	377	430
Lithographers, photoengravers	223	458	538	264	380	403	250	785	906	320	518	183	574
Press operators	611	598	551	304	423	517	721	826	637	354	635	507	581
Not classified above	337	280	277	140	170	230	173	214	360	285	478	387	567
Miscellaneous trades:⁴													
Air conditioning and refrigeration mechanics												153	279
Aircraft mechanics										149	65	53	19
Automotive body builders- repairers	154	117	135	133	151	218	214	211	595	307	308	238	307
Automotive mechanics	559	443	517	334	529	525	705	1,017	641	774	1,269	1,231	1,330
Barbers, beauticians												176	316
Butchers, meatcutters	401	350	369	448	531	631	756	362	727	817	997	794	914
Cabinetmakers-millmen	248	243	213	207	235	177	164	120	186	212	278	241	266
Car repairers	20	42	13	24	9	77	140	82	101	138	128	174	185
Cooks, bakers										261	229	105	225
Drafters	197	131	128	126	182	243	311	447	538	528	453	273	324
Electrical workers										1,074	1,691	833	811
Electronic technicians										377	400	163	138
Floor coverers										316	256	294	295
Line erectors, light and power									603	621	586	669	1,152
Maintenance mechanics (repairers)	552	439	322	354	442	718	1,072	1,293	1,682	1,253	1,846	774	721
Medical and dental technicians	25	23	18	32	13	30	59	65	92	78	145	88	116
Millwrights	191	218	251	165	270	780	331	615	763	695	1,080	786	561
Molders, coremakers												67	78
Office machine servicers												199	387
Optical workers												67	150
Radio and TV repairers												156	247
Stationary engineers												130	164
Not classified above										2,146	3,304	2,182	2,602

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.

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, 1967-68 to 1973-74

HEGIS code ¹	Curriculum	Academic year						
		1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74
	All curriculums	88,082	108,088	124,327	153,549	190,039	174,101	201,538
5000	Business and commerce technologies	-	-	-	51,037	61,077	55,311	65,326
5001	Business and commerce technologies, general	10,156	12,591	14,666	11,008	12,781	11,402	12,379
5002	Accounting technologies	4,203	4,741	4,824	5,301	6,583	6,331	7,880
5003	Banking and finance technologies	-	-	-	272	349	460	1,605
5004	Marketing, distribution, purchasing, business and industrial management	2,158	3,685	4,048	9,237	10,155	9,989	13,559
5005	Secretarial technologies (includes office machines training)	13,770	14,858	15,388	16,534	20,355	15,526	18,650
5006	Personal service technologies (flight attendant, cosmetologist, etc.)	-	-	-	1,262	1,297	552	468
5007	Photography technologies	-	-	-	577	619	661	645
5008	Communications and broadcasting technologies (radio/television, newspapers)	-	-	-	728	986	1,032	1,292
5009	Printing and lithography technologies	-	-	-	512	600	450	535
5010	Hotel and restaurant management technologies	-	-	-	916	1,258	1,451	1,852
5011	Transportation and public utilities technologies	-	-	-	324	409	467	462
5012	Applied arts, graphic arts, and fine arts technologies (includes advertising design)	3,433	3,537	4,249	2,998	3,873	4,107	4,594
5099	Other	-	-	-	1,368	1,832	2,883	1,405
5100	Data processing technologies	2,908	4,623	6,487	8,745	8,971	7,640	6,998
5101	Data processing technologies, general	-	-	-	5,027	5,669	4,584	4,360
5102	Keypunch operator and other input preparation technologies	-	-	-	648	402	327	133
5103	Computer programmer technologies	-	-	-	2,149	2,198	2,118	2,018
5104	Computer operator and peripheral equipment operation technologies	-	-	-	387	431	249	205
5105	Data processing equipment maintenance technologies	-	-	-	431	104	103	226
5199	Other	-	-	-	103	167	259	56
5200	Health services and paramedical technologies	16,903	21,876	26,778	34,518	45,412	42,910	51,207
5201	Health services assistant	-	-	-	258	202	121	771
5202	Dental assistant technologies	1,013	1,307	1,663	2,191	2,779	1,255	1,197
5203	Dental hygiene technologies	1,555	1,956	2,229	2,506	3,113	3,465	3,738
5204	Dental laboratory technologies	229	364	362	264	374	414	594
5205	Medical or biological laboratory assistant technologies	829	772	970	1,335	1,826	1,902	2,617
5206	Animal laboratory assistant technologies	-	-	-	55	162	202	387
5207	Radiologic technologies (X-ray, etc.)	587	570	647	1,139	1,727	2,157	2,758
5208	Nursing, R.N. (less than 4-year program)	6,930	8,960	11,730	14,408	18,211	23,252	28,158
5209	Nursing, practical (L.P.N. or L.V.N.—less than 4-year program)	4,380	5,564	6,102	7,708	9,939	2,637	2,447
5210	Occupational therapy technologies	52	154	166	243	287	435	491
5211	Surgical technologies	7	53	133	244	423	110	183
5212	Optical technologies (includes ocular care, ophthalmic, optometric technologies)	-	29	60	81	146	215	395
5213	Medical record technologies	-	-	-	374	447	581	627
5214	Medical assistant and medical office assistant technologies	-	-	-	1,256	1,828	1,340	1,623
5215	Inhalation therapy technologies	-	-	-	570	982	1,542	1,824
5216	Psychiatric technologies (includes mental health aide programs)	-	-	-	634	842	1,138	1,785
5217	Electrodiagnostic technologies (includes EKG, EEG, etc.)	-	11	23	22	55	29	24
5218	Institutional management technologies (rest home, etc.)	-	-	-	176	225	22	64
5219	Physical therapy technologies	-	-	-	239	355	469	717
5299	Other	-	-	-	815	1,489	1,624	807
5300	Mechanical and engineering technologies	22,686	26,736	28,959	37,437	44,145	34,781	37,631
5301	Mechanical and engineering technologies, general	-	-	-	2,560	2,925	2,455	3,295
5302	Aeronautical and aviation technologies	1,400	1,528	1,672	2,173	2,656	2,378	2,060
5303	Engineering graphics (tool and machine drafting and design)	-	-	-	2,917	2,907	2,122	2,385
5304	Architectural drafting technologies	-	-	-	1,938	2,369	1,897	2,249
5305	Chemical technologies (includes plastics)	426	513	556	589	529	576	555
5306	Automotive technologies	-	-	-	4,041	5,109	3,676	4,300
5307	Diesel technologies	-	-	-	721	835	603	785
5308	Welding technologies	-	-	-	1,097	1,548	652	579
5309	Civil technologies (surveying, photogrammetry, etc.)	1,103	1,391	1,537	1,637	2,095	2,290	2,203

See footnote at end of table.

Table C-5. Associate degrees and other formal awards below the baccalaureate, 1967-68 to 1973-74—Continued

HEGIS code ¹	Curriculum	Academic year						
		1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74
5310	Electronics and machine technologies (television, appliance, office machine repair, etc.)	-	-	-	7,851	9,129	6,397	7,470
5311	Electromechanical technologies	-	-	-	1,301	1,530	1,179	1,670
5312	Industrial technologies	1,121	1,653	1,755	1,657	2,313	1,315	1,928
5313	Textile technologies	-	-	-	155	244	245	223
5314	Instrumentation technologies	120	180	207	203	189	276	259
5315	Mechanical technologies	3,745	8,069	9,391	2,749	2,678	1,954	2,496
5316	Nuclear technologies	14	17	38	65	79	88	77
5317	Construction and building technologies (carpentry, electric work, plumbing, sheet-metal, air conditioning, heating, etc.)	-	-	-	4,299	4,927	3,648	4,652
5399	Other	-	-	-	1,554	2,083	3,030	508
5400	Natural science technologies	-	-	-	7,028	9,418	9,242	11,496
5401	Natural science technologies, general	-	-	-	656	795	648	768
5402	Agriculture technologies (includes horticulture)	1,648	2,282	2,596	2,870	3,321	3,440	4,470
5403	Forestry and wildlife technologies (includes fisheries)	564	596	727	1,087	1,523	1,671	1,980
5404	Food services technologies	-	-	-	693	886	704	1,581
5405	Home economics technologies	723	776	841	872	1,210	1,042	1,542
5406	Marine and oceanographic technologies	-	-	-	183	334	378	414
5407	Laboratory technologies, general	-	-	-	144	162	189	211
5408	Sanitation and public health inspection technologies (environmental health technologies)	-	-	-	145	632	346	464
5499	Other	-	-	-	378	555	874	66
5500	Public-service-related technologies	-	-	-	14,784	21,016	24,167	28,880
5501	Public service technologies, general	-	-	-	277	504	509	834
5502	Bible study or religion-related occupations	762	690	642	744	929	612	558
5503	Education technologies (teacher aide and 2-year teacher training programs)	1,998	2,694	3,218	3,856	5,170	4,839	5,840
5504	Library assistant technologies	107	134	313	471	571	586	506
5505	Police, law enforcement, correction technologies	1,840	2,851	4,084	6,873	9,204	11,658	14,915
5506	Recreation and social work and related technologies	-	-	-	1,146	1,965	2,269	3,731
5507	Fire control technology	-	-	-	735	1,205	1,448	2,013
5508	Public administration and management technologies	-	-	-	111	186	240	354
5509	Other	-	-	-	571	1,282	2,008	129

¹ HEGIS codes are from the Higher Education General Information Survey. See *A Taxonomy of Instructional Programs in Higher Education* (U.S. Department of Health, Education, and Welfare, 1970).

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

NOTE: Dash means data are not available or there were no programs.

Table C-6. Enlisted strength in Department of Defense occupational groups, June 30, 1975

DOD code	Group title and description of coverage	Enlisted strength
0	INFANTRY, GUN CREWS, AND SEAMANSHIP SPECIALISTS	223,558
01	<i>Infantry</i> —Includes light and heavy weapons infantrymen, related weapons specialists, ground reconnaissance men, and infantry leaders.	113,004
02	<i>Armor and Amphibious</i> —Includes land and amphibious tank crews and leaders.	18,950
03	<i>Combat Engineering</i> —Includes hasty and temporary construction of forward area airfields, roads, and bridges, demolition, field illumination, and chemical warfare.	22,408
04	<i>Artillery/Gunnery, Rockets, and Missiles</i> —Includes conventional field, anti-aircraft and shipboard guns and artillery, rockets, and missiles.	50,139
05	<i>Combat Air Crew</i> —Includes enlisted pilots and navigators, flight engineers, and flight crew ordnancemen.	4,237
06	<i>Seamanship</i> —Includes boatswains, navigators, and similar seamanship specialists.	14,780
1	ELECTRONIC EQUIPMENT REPAIRMEN	179,077
10	<i>Radio/Radar</i> —Includes fixed and mobile radio, electronic communication gear, navigation and countermeasure equipment and surveillance, air traffic and tracking radar.	88,478
11	<i>Fire Control Electronic Systems (Non-Missile)</i> —Includes maintenance and repair of electronic fire control and bomb navigation equipment, excluding missile and underwater fire control equipment.	11,147
12	<i>Missile Guidance, Control, and Checkout</i> —Includes electronic and electrical missile and torpedo systems and components, including guidance, control, and checkout equipment for both guided and ballistic missiles.	23,929
13	<i>Sonar Equipment</i> —Includes underwater detection and fire control systems, oceanographic and mine detection equipment, and related antisubmarine electronic gear.	5,760
14	<i>Nuclear Weapons Equipment</i> —Includes nuclear weapons control and test equipment.	1,844
15	<i>ADP Computers</i> —Includes all digital and analog computers.	8,174
16	<i>Teletype and Cryptographic Equipment</i> —Includes teletype and associated on-and-off line encryption devices.	17,229
19	<i>Other Electronic Equipment</i> —Includes electronic instruments, training devices, medical equipment, television, electronic photographic controls, infra-red devices, and other electronic sensing and control equipment.	22,516
2	COMMUNICATIONS AND INTELLIGENCE SPECIALISTS	122,538
20	<i>Radio and Radio Code</i> —Includes the operation of radio, "continuous wave" equipment, radio teletype, and visual communication equipment.	40,775
21	<i>Sonar</i> —Includes the operation of sonar and related detection equipment.	3,808
22	<i>Radar and Air Traffic Control</i> —Includes the operation of surveillance, target acquisition and tracking radars, fire distribution devices, and air traffic control visual and electronic navigational aides.	27,641
23	<i>Signal Intelligence/Electronic Warfare</i> —Includes the intercept, translation, and analysis of foreign communications, and electronic countermeasure equipment operation.	24,432
24	<i>Military Intelligence</i> —Includes gathering, receipt, and analysis of intelligence data, prisoner interrogation, image interpretation, and counterintelligence and investigational activities.	11,572
25	<i>Combat Operations Control</i> —Includes forward area tactical operations and intelligence, combat information center and command post control activities.	14,310
3	MEDICAL AND DENTAL SPECIALISTS	83,803
30	<i>Medical Care</i> —Includes all medical care and treatment, technical and related medical and dental services.	57,726
31	<i>Technical Medical Services</i> —Includes pharmaceutical, laboratory, X-ray, and diagnostic test services.	10,699
32	<i>Related Medical Services</i> —Includes sanitation, health preservation and veterinary services, and preventive medicine services.	5,117
33	<i>Dental Care</i> —Includes dental care and treatment and related technical and laboratory services.	10,261

Table C-6. Enlisted strength in Department of Defense occupational groups, June 30, 1975—Continued

DOD code	Group title and description of coverage	Enlisted strength
4	OTHER TECHNICAL AND ALLIED SPECIALISTS	33,872
40	<i>Photography</i> —Includes still, motion, and television cameramen, precision photographic processing, editing, and sound synchronization.	8,316
41	<i>Drafting, Surveying, and Mapping</i> —Includes drafting, illustrating, photomapping, map compiling and construction, and topographic surveying and computing.	8,738
42	<i>Weather</i> —Includes the observation, recording, reporting, and collection of weather and sea condition data and weather forecasting.	6,018
43	<i>Ordnance Disposal and Diving</i> —Includes the excavation and rendering safe of explosive ordnance, chemical and nuclear agents, underwater demolition, and diving.	2,147
44	<i>Scientific and Engineering Aides</i> —Includes professional college-graduate level assistance to physical and biological scientists and engineers.	359
45	<i>Musicians</i> —Includes military bandmen and special band musicians.	5,853
49	<i>Technical Specialists, N.E.C.</i> —Includes physical laboratory analysts, nuclear, biological, and chemical warfare specialists, safety specialists, and memorial activities.	2,441
5	ADMINISTRATIVE SPECIALISTS AND CLERKS	323,253
50	<i>Personnel</i> —Includes personnel administration, personnel and manpower management, recruiting and personnel testing.	44,758
51	<i>Administration</i> —Includes administrative personnel, general clerks, not elsewhere classified.	109,260
52	<i>Clerical Personnel</i> —Includes non-technical First Sergeants and Sergeant Majors and a combined personnel management and administrative clerk in Marine Corps units.	8,014
53	<i>Data Processing</i> —Includes EAM and ADP equipment operators and programmers.	18,054
54	<i>Accounting, Finance, and Disbursing</i> —Includes audit, accounting and disbursing.	16,033
55	<i>Supply and Logistics</i> —Includes supply accounting, stock control, requisitioning, and related activities.	87,523
56	<i>Religious, Morale, and Welfare</i> —Includes recreation, morale, welfare, and religious activities.	6,459
57	<i>Information and Education</i> —Includes troop and public information and education.	6,542
58	<i>Communications Center Operations</i> —Includes receipt and distribution of messages, the operation of communications center equipment, and setting up and administering of major field communications systems.	26,610
6	ELECTRICAL AND MECHANICAL EQUIPMENT REPAIRMEN	360,006
60	<i>Aircraft</i> —Includes aircraft powerplants, electrical systems, structural components and surfaces, and related instruments and accessories.	161,183
61	<i>Automotive</i> —Includes wheel and track vehicles and components and related construction equipment.	53,084
62	<i>Wire Communications</i> —Includes installation and maintenance of telephones, switchboards, and central office and related interior communications equipment.	27,490
63	<i>Missile, Mechanical and Electrical</i> —Includes missile propulsion and structures, and missile mechanical, electrical, hydraulic, and pneumatic systems and components.	6,218
64	<i>Armament and Munitions</i> —Includes small arms, artillery, mines, bombs, and associated mountings, and ammunition renovation.	34,373
65	<i>Shipboard Propulsion</i> —Includes marine and rail main engines, boilers, and auxiliary equipment.	35,278
66	<i>Power Generating Equipment</i> —Includes nuclear power reactors and primary electric generating plants.	30,806
67	<i>Precision Equipment</i> —Includes optical, mechanical, and electrical instruments, office machines, and non-electronic photographic, dental, and topographic equipment.	3,550

Table C-6. Enlisted strength in Department of Defense occupational groups, June 30, 1975—Continued

DOD code	Group title and description of coverage	Enlisted strength
	ELECTRICAL AND MECHANICAL EQUIPMENT REPAIRMEN—Continued	
68	<i>Aircraft Launch Equipment</i> —Includes operation, maintenance, and repair of aircraft catapult and arresting gear and related equipment.	5,774
69	<i>Other Mechanical and Electrical Equipment</i> —Includes materials handling reproduction, chemical warfare and other mechanical and electrical equipment maintenance, n.e.c.	2,250
7	CRAFTSMEN	86,574
70	<i>Metalworking</i> —Includes the machining, shaping, and forming of metal and fabrication of metal parts.	15,078
71	<i>Construction</i> —Includes construction trades and pipeline construction and operation.	15,215
72	<i>Utilities</i> —Includes plumbing, heating, air conditioning, water supply and sanitation, electric wiring, power distribution, and related trades.	21,149
73	<i>Construction Equipment Operation</i> —Includes construction machines, power tools, cranes, quarry equipment, and asphalt and concrete equipment operators.	12,414
74	<i>Lithography</i> —Includes the making of printing plates, composing, and the operation of offset and letter presses.	2,565
75	<i>Industrial Gas and Fuel Production</i> —Includes the production of liquid oxygen, hydrogen, nitrogen, and carbon dioxide.	1,105
76	<i>Fabric, Leather and Rubber</i> —Includes leather, rubber, and other fabric repair.	1,466
78	<i>Firefighting and Damage Control</i> —Includes firefighting, damage control, and rescue and survival activities.	8,924
79	<i>Other Craftsmen, N.E.C.</i> —Includes modelmaking, molding, camouflage, and other crafts not elsewhere classified.	8,658
8	SERVICE AND SUPPLY HANDLERS	192,611
80	<i>Food Service</i> —Includes handling, preparation, and serving of food.	49,799
81	<i>Motor Transport</i> —Includes the operation of wheel and track vehicles and railway equipment for general transport purposes, aerial and parachute delivery operations.	37,955
82	<i>Material Receipt, Storage and Issue</i> —Includes receipt, storage, issue, and shipment of both general and specialized classes of supplies, excluding ammunition.	32,830
83	<i>Military Police</i> —Includes protective and custodial services, military police, and criminal investigation.	62,556
84	<i>Personal Service</i> —Includes laundry, dry cleaning, and related services.	1,654
85	<i>Auxiliary Labor</i> —Includes unskilled labor and unskilled labor supervisors.	393
86	<i>Forward Area Equipment Support</i> —Includes parachute packing and repair, aerial delivery operations, and flight equipment fitting and maintenance.	7,424

SOURCE: U.S. Department of Defense, *Occupational Conversion Table, Enlisted, March 1974*, DOD 1312. 1-E, and Department of Defense unpublished data.

Table C-7. Completions in vocational education by Office of Education instructional program, fiscal years 1973 and 1974

OE instructional code and title		1973	1974	OE instructional code and title		1973	1974
Grand total (Unduplicated)		2,285,720	2,411,822	Home economics (gainful)—Continued			
01.	Agriculture	138,207	140,424	09.0204	Home furnishings, equipment, service	7,833	7,530
01.0100	Agricultural production	65,051	63,545	09.0205	Institutional and home management, and supervision	3,954	4,700
01.0200	Agricultural supplies/services	7,991	8,210	09.0299	Other	16,557	7,340
01.0300	Agricultural mechanics	25,876	27,822	14.	Office occupations ¹	572,453	634,006
01.0400	Agricultural products	2,748	2,894	14.0100	Accounting and computing	79,644	94,396
01.0500	Ornamental horticulture	17,110	19,361	14.0200	Business data processing systems	39,221	41,666
01.0600	Agricultural resources	5,349	5,696	14.0300	Filing, office machines	147,883	161,216
01.0700	Forestry	4,825	4,476	14.0400	Information, communication occupations	9,282	10,011
01.9900	Other	8,833	8,398	14.0500	Materials support, transportation, etc.	2,252	2,488
04.	Distribution ¹	208,226	225,436	14.0600	Personnel, training, and related occupations	4,266	4,602
04.0100	Advertising services	6,642	4,024	14.0700	Stenographer, secretary, and related occupations	143,738	166,926
04.0200	Apparel and accessories	8,996	11,618	14.0800	Supervisory and administrative management	10,212	11,125
04.0300	Automotive	3,655	4,052	14.0900	Typing and related occupations	111,399	119,477
04.0400	Finance and credit	6,324	7,642	14.9900	Other	21,168	22,100
04.0500	Floristry	2,305	2,595	16.	Technical ¹	65,932	73,969
04.0600	Food distribution	13,393	15,190	16.0101	Aeronautical technology	1,330	2,180
04.0700	Food services	14,202	13,134	16.0103	Architectural technology	3,075	3,269
04.0800	General merchandise	64,104	69,319	16.0104	Automotive technology	1,404	990
04.0900	Hardware, building materials, etc.	2,859	2,628	16.0105	Chemical technology	997	838
04.1000	Home furnishings	2,238	1,592	16.0106	Civil technology	4,330	4,017
04.1100	Hotel and lodging	4,102	3,430	16.0107	Electrical technology	2,602	2,785
04.1200	Industrial marketing	3,917	3,930	16.0108	Electronics technology	13,673	14,341
04.1300	Insurance	3,572	3,514	16.0109	Electromechanical technology	870	960
04.1400	International trade	211	294	16.0110	Environmental control technology	1,052	1,420
04.1500	Personal services	6,783	6,585	16.0111	Industrial technology	911	1,486
04.1600	Petroleum	2,339	2,182	16.0112	Instrumentation technology	745	413
04.1700	Real estate	28,065	31,937	16.0113	Mechanical technology	4,034	4,779
04.1800	Recreation and tourism	3,230	4,492	16.0114	Metallurgical technology	385	318
04.1900	Transportation	4,383	4,281	16.0117	Scientific data technology	3,787	4,612
04.9900	Other	26,318	22,995	16.0601	Commercial pilot training	1,098	1,016
07.	Health ¹	128,889	143,010	16.0602	Fire and safety technology	1,325	4,181
07.0101	Dental assistant	6,589	7,949	16.0603	Forestry technology	629	758
07.0102	Dental hygienists (associate)	1,284	1,699	16.0604	Oceanographic technology	490	348
07.0103	Dental laboratory technician	931	1,211	16.0605	Pollution science technology	9,381	12,262
07.0203	Medical laboratory assisting	2,741	2,497	16.9901	Air pollution technology	187	192
07.0299	Other medical laboratory technology	627	879	16.9902	Water and wastewater technology	978	2,620
07.0301	Nurse, associate degree	17,390	19,019	16.9900	Other	12,498	10,194
07.0302	Practical (vocational) nurse	32,436	34,455	17.	Trade and industrial ¹	591,518	593,523
07.0303	Nurses' assistants (aide)	32,497	32,220	17.0100	Air conditioning	15,064	13,215
07.0401	Occupational therapy	407	829	17.0200	Appliance repair	4,259	4,877
07.0402	Physical therapy	527	583	17.0301	Body and fender, auto	14,919	17,310
07.0501	Radiologic technology	1,992	2,413	17.0302	Mechanics, auto	70,313	76,280
07.0700	Environmental health	379	526	17.0399	Other automotive	15,081	17,740
07.0800	Mental health technology	1,413	2,137	17.0400	Aviation occupations	7,035	5,830
07.0903	Inhalation therapy technology	1,677	1,608	17.0500	Blueprint reading	2,306	2,318
07.0904	Medical assistant	3,554	5,587	17.0600	Business machine maintenance	846	988
07.0906	Health aide	4,232	5,663	17.0700	Commercial art occupations	6,753	6,272
07.9900	Other	19,673	23,728	17.0800	Commercial fishery occupations	746	608
09.0100	Consumer and homemaking ¹	479,918	490,944	17.0900	Commercial photographic occupations	3,680	4,680
09.0102	Child development	30,019	27,363	17.1001	Carpentry	28,356	30,173
09.0103	Clothing and textiles	71,635	70,457	17.1002	Electricity	12,970	12,776
09.0104	Consumer education	17,357	25,100	17.1004	Masonry	8,881	8,908
09.0106	Family relations	47,896	52,436	17.1007	Plumbing and pipefitting	7,016	7,174
09.0107	Food and nutrition	45,029	51,156	17.1099	Other construction and maintenance	18,446	24,758
09.0108	Home management	5,561	7,023	17.1100	Custodial services	4,055	3,412
09.0109	Housing and home furnishings	16,580	22,702	17.1200	Diesel mechanic	3,734	4,308
09.0199	Other	245,841	217,041	17.1300	Drafting occupations	27,595	30,151
09.0200	Home economics (gainful) ¹	101,485	93,852	17.1400	Electrical occupations	12,945	15,119
09.0201	Care and guidance of children	23,702	27,323				
09.0202	Clothing management, production, service	18,984	15,413				
09.0203	Food management, production, and service	30,230	31,546				

See footnotes at end of table.

Table C-7. Completions in vocational education by Office of Education instructional program, fiscal years 1973 and 1974—Continued

OE instructional code and title		1973	1974	OE instructional code and title		1973	1974
Trade and industrial ¹ —Continued				Trade and industrial ¹ —Continued			
17.1500	Electronic occupations	25,877	27,228	17.2801	Fireman training	37,372	4,084
17.1600	Fabric maintenance services	1,872	1,116	17.2802	Law enforcement training	25,242	23,511
17.1700	Foremanship, supervisor, and management development	13,813	8,506	17.2899	Other public services	18,648	10,886
17.1900	Graphic arts occupations	15,431	17,658	17.2900	Quantity food occupation	10,600	14,127
17.2000	Industrial atomic energy	100	21	17.3000	Refrigeration	2,000	2,568
17.2100	Instrument maintenance and repair	611	924	17.3100	Small engine repair	8,359	9,979
17.2200	Maritime occupations	854	768	17.3200	Stationary energy sources occupations	816	1,031
17.2300	Metalworking	68,209	3,203	17.3300	Textile production and fabrica- tion	17,426	15,306
17.2400	Metallurgy	512	495	17.3400	Leather working	912	481
17.2601	Barbering	1,027	940	17.3500	Upholstering	5,621	6,258
17.2602	Cosmetology	18,105	19,270	17.3600	Woodworking occupations	12,197	15,805
17.2699	Other personal services	1,258	1,061	17.9900	Other	33,910	38,042
17.2700	Plastics occupation	1,629	2,430	99.	Special programs	—	7,428

¹Unduplicated total.

Source: Summary Data Vocational Education, Fiscal Years 1973 and 1974,

U.S. Dept. of Health, Education, and Welfare, Office of Education, Bureau of Occupational and Adult Education.

Appendix D. State Employment Security Agencies

State employment security agencies are engaged in developing occupational projections and related manpower 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	Research and Statistics Division, Department of Industrial Relations, Industrial Relations Building, Montgomery 36130
Alaska	Director, Employment Security Division, Department of Labor, Box 3-7000, Juneau 99802
Arizona.....	Chief, Bureau of Statistical Information, Research and Analysis, Department of Economic Security, P.O. Box 29026, Phoenix 85038
Arkansas.....	Chief, Research and Statistics Section, Employment Security Division, Department of Labor, P.O. Box 2981, Little Rock 72202
California	Chief, Employment Data and Research Division, MIC 57, P.O. Box 1679, Sacramento 95808
Colorado.....	Chief of Research and Analysis, Division of Employment and Training, Department of Labor and Employment, 1210 Sherman Street, Denver 80203
Connecticut	Director of Research and Information, Employment Security Division, Labor Department, 200 Folly Brook Boulevard, Weathersfield 06109
Delaware.....	Chief of Administration, Department of Labor, P.O. Box 2168, Wilmington 19899
District of Columbia	Chief, Division of Manpower Reports and Analysis, D.C. Manpower Administration, Room 625, 500 C Street, NW. Washington, D.C. 20001
Florida.....	Secretary of Commerce and Employment Security Administrator, Caldwell Building, 1720 South Gadsden Street, Tallahassee 32304
Georgia.....	Chief, Labor Information Systems, Employment Security Agency, Department of Labor, 254 Washington St. S.W. Atlanta 30334
Hawaii.....	Director of Labor and Industrial Relations, 825 Mililani Street, Honolulu 96813
Idaho.....	Chief, Research and Analysis Bureau, Department of Employment, 317 Main Street, Boise 83707
Illinois	Manager, Research and Analysis Division, Bureau of Employment Security, 910 South Michigan Street, (4th Floor), Chicago 60605
Indiana	Chief, Research and Statistics Section, Employment Security Division, 10 North Senate Avenue, Indianapolis 46204
Iowa.....	Executive Secretary, Employment Security Commission, 1000 East Grand Avenue, Des Moines 50319
Kansas	Chief, Research and Analysis, Employment Security Division, Department of Labor, 401 Topeka Boulevard, Topeka 66603
Kentucky	Director, Division for Research and Special Projects, Dept. for Human Resources, 275 East Main Street, Frankfort 40601
Louisiana	Chief of Research and Statistics, Department of Employment Security, P.O. Box 44094, Baton Rouge 70804
Maine	Manpower Research Division, Employment Security Commission, 20 Union Street, Augusta 04330
Maryland	Director, Research and Analysis Division, Department of Human Resources, Employment Security Administration, 1100 North Eutaw Street, Baltimore 21201
Massachusetts.....	Director, Division of Employment Security, Charles F. Hurley Building, Government Center, Boston 02114

Michigan	Director, Research and Statistics Division, Employment Security Commission, 7310 Woodward Avenue, Detroit 48202
Minnesota	Commissioner, Department of Employment Service, 390 North Robert Street, St. Paul 55101
Mississippi	Chief, Research and Statistics Department, Mississippi Employment Security Commission, Box 1699, Jackson 39205
Missouri.....	Chief, Methods and Procedures, Division of Employment Security, Dept. of Labor and Industrial Relations, P.O. Box 59, Jefferson City 65101
Montana	Administrator, Employment Security Division, Dept. of Labor and Industry, P.O. Box 1782, Helena 59601
Nebraska	Chief, Research and Statistics, Division of Employment, Dept. of Labor, P.O. Box 94600, Lincoln 68509
Nevada	Chief, Manpower Information and Research Section, Employment Security Dept., 500 East Third Street, Carson City 89713
New Hampshire	Commissioner, Department of Employment Security, 32 South Main Street, Concord 03301
New Jersey	Assistant Director, Office of Statistics, Reports and Analysis, Division of Planning and Research, Dept. of Labor and Industry, P.O. Box 359, Trenton 08625
New Mexico	Chairman, Employment Security Commission, Albuquerque 87103
New York	Division of Research and Statistics, State Dept. of Labor, State Campus, Albany 12201
North Carolina	Bureau of Employment Security Research, Employment Security Commission, P.O. Box 25903, Raleigh 27611
North Dakota.....	Director, Employment Security Bureau, P.O. Box 1537, Bismarck 58505
Ohio.....	Administrator, Bureau of Employment Services, P.O. Box 1618, Columbus 43216
Oklahoma.....	Chief of Research and Planning, Employment Security Commission, Will Rogers Memorial Office Building, Oklahoma City 73105
Oregon	Chief, Research and Statistics Section, Dept. of Human Resources, 875 Union Street N.E., Salem 97310
Pennsylvania.....	Director, Research and Statistics, Bureau of Employment Security, Dept. of Labor and Industry, Seventh and Forster Streets, Harrisburg 17121
Puerto Rico	Dept. of Labor, Bureau of Employment Security, Hato Rey 00917
Rhode Island	Director, Dept. of Employment Security, 24 Mason Street, Providence 02903
South Carolina	Director of Manpower Research and Analysis, Employment Security Commission, P.O. Box 995, Columbia 29202
South Dakota.....	Chief of Research and Statistics, Office of Administrative Services, Dept. of Labor, P.O. Box 1730, Aberdeen 57401
Tennessee	Chief of Research and Statistics, Dept of Employment Security, Nashville 37219
Texas	Chief, Manpower Data Analysis & Research (MDAR), Employment Commission, TEC Building, 15th and Congress Ave., Austin 78778
Utah.....	Director of Reports and Analysis, Dept. of Employment Security, P.O. Box 11249, Salt Lake City 84111
Vermont.....	Chief of Research and Statistics, Dept. of Employment Security, P.O. Box 488, Montpelier 05602
Virginia.....	Director of Research and Statistics, Dept. of Labor and Industry, P.O. Box 1814, Richmond 23214
Washington.....	Chief, Research and Statistics, Employment Security Dept., P.O. Box 367, Olympia 98504
West Virginia	Chief, Research and Statistics Section, Dept. of Employment Security, 112 California Ave., Charleston 25305
Wisconsin	Director, Bureau of Research and Statistics, Dept. of Industry Labor and Human Relations, P.O. Box 608, Madison 53701
Wyoming.....	Chief, Research and Analysis, Employment Security Commission, P.O. Box 2760, Casper 82601

Appendix E. Bibliography

This appendix lists selected sources of occupational information discussed in this bulletin. Although many useful data sources are not included here, the listing is intended to provide a representative sampling in a number of areas.

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. *Tomorrow's Manpower Needs*, Bulletin 1606, Supplement 3, 1973.

Contains conversion tables for matching occupational classifications of BLS projections to vocational education program codes. Based on 1960 census.

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.

U.S. Department of Labor. *Employment and Training Report of the President, 1976*. Annual since 1963 under title *Manpower Report of the President*.

Statistical appendix presents summary data on Federal manpower programs, including total enrollments, completions, and post-training employment. Manpower policy developments of each year are discussed in the text of the report. For further information see *Index to the Manpower Reports of the President, 1963-72*.

U.S. Department of Labor, Manpower Administration. *Manpower Research and Development Projects*. Annual since 1971.

Lists completed research and development projects funded by the Manpower Administration, with annotations.

Training data

U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, Office of Education. *Digest of Educational Statistics*. Annual since 1962.

Contains data on enrollments, degrees, and other items. Compiled from various sources indicated in table footnotes.

U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, Office of Education. *Projections of Educational Statistics*. Annual since 1964.

Lists projections of enrollments, graduates, faculty, and expenditures for higher education, as well as similar projections for elementary and secondary schools.

U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, Office of Education. *Enrollment in Vocational Education Occupation Programs*. Vocational Education Information No. 11. Annual since fiscal year 1966.

Contains enrollments by detailed occupational programs for fiscal years.

U.S. Department of Labor. *Employment and Training Report of the President, 1976*. Annual since 1963 under title *Manpower Report of the President*.

Contains summary data on annual new registrations, cancellations, and completions of apprenticeship training since 1947.

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 Defense, Office of Assistant Secretary. *Selected Manpower Statistics*. Annual.

Data on persons discharged from the Armed Forces, by broad military job classification.

U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, Office of Education. *Directory of Postsecondary Schools with Occupational Programs*, 1971. DHEW Publication No. (OE)73-11410, 1973.

A comprehensive list of all schools offering post-secondary occupational training, including private vocational schools as well as 2- and 4-year colleges.

U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, Office of Education. *Survey of Programs and Enrollments in Postsecondary Schools*. In process 1976.

Survey of a sample of schools drawn from the *Directory* cited in the previous source.

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 Ann S. Bisconti. *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 Ann S. Bisconti. *Undergraduate and Graduate Study in Scientific Fields*. Washington, D.C.: American Council on Education, ACE Research Reports, Vol. 8, No. 3, August 1973.

This report examines the flow of a national cohort of college freshmen of 1961 over a decade focusing on patterns of undergraduate study, attrition, de-

gree 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, Elaine El-Khawas, and Ann S. Bisconti. *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, Jeannie Royer, and Richard Webb. *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 freshmen 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 five 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.

College Placement Council, Inc., *Four-Year Liberal Arts Graduates: Their Utilization in Business, Industry, and Government—The Problem and Some Solutions*, 1975.

A position statement covering the dilemma facing liberal arts graduates, dimensions of the dilemma, new directions, areas in which action is needed, and conclusions.

El-Khawas, Elaine, and Ann S. Bisconti. *Five and Ten Years After College Entry*. Washington, D.C.: American Council on Education, ACE Research Reports, Vol. 9, No. 1, 1974.

Descriptive report including 1971 data on college freshmen of 1961 and 1966.

Engineering Manpower Commission. *Engineering and Technology Graduates*. New York: Engineers Joint Council. Annual.

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. Number and percentages of graduates entering employment, graduate school, and military service are given.

National Research Council, National Academy of Sciences. *Careers of Ph.D.'s — Academic Versus Non-Academic — A Second Report on Follow-up of Doctorate Cohorts 1935–1960*. Career Patterns Report No. 2, Publication 1577, 1968.

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.

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.

Duis, Harold. "Employment of Vocational Program Graduates," *American Education*, February 1968.

Gives data on entrance rates of graduates from vocational training programs into different occupational classifications.

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.

Sharp, Laure M., and Albert D. Biderman. *Employment of Retired Military Personnel*. BSSR 361. Washington, D.C.: Bureau of Social Science Research, 1966.

A detailed study of the employment practices of those leaving the military. Occupational information is given by age, race, and rank. Excerpts are published in the *Monthly Labor Review*, January and February, 1967.

Project Talent—One Year Follow-up Studies. Pittsburgh: University of Pittsburgh, School of Education, 1966.

From an original study in 1966 of a 5-percent sample of high school students (440,000) in 1,353 schools, the report compiles information on each group one year after graduation. It studies the nature of their employment and job satisfaction, the nature and extent of their post-high school education, and long-range career plans.

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 followup of the high school graduates, their activities during the 5 years after graduation, examining employment and continuing education.

U.S. Department of Health, Education, and Welfare, National Center for Educational Statistics, Office of Education. *National Longitudinal Study of the High School Class of 1972, Comparative Profiles—One and One-Half Years After Graduation*. DHEW Publication No. (NCES) 76-220, 1975.

Study is designed to followup a sample of 20,000 high school seniors of 1972 for several years to examine their postsecondary educational and occupational status, and its relation to high school training experience.

Occupational transfers

A promising source of occupational mobility data is the 5-percent sample of the 1970 Census, which provides information on occupations in 1970 and in 1965. Data are published only for 10 major occupation groups. However, unpublished tabulations for detailed occupations obtained by the Bureau of Labor Statistics are currently being analyzed. Several articles dealing with this subject are scheduled to be published in the *Monthly Labor Review* in 1976.

Seltzer, Norman. "The 1972 Postcensal Survey of Professional, Scientific, and Technical Manpower," *American Statistical Association, Proceedings of the Social Statistics Section*, 1972, 1973, pp. 178-80.

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.

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.

Geographic migration

U.S. Department of Commerce, Bureau of the Census, Census of Population: 1960, Subject Reports, Final Report PC(2)-2B, *Mobility for States and State Economic Areas*, 1963.

Contains data on economic, demographic, and social characteristics, including major occupational groups, of the population classified by mobility status.

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*.

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.

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.

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, Education, and Welfare, 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 use in the United States. Includes only publications before September 1972.

Entrants from outside the labor force

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.

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. *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.

Earnings

Directory of Industry Wage Surveys and Union Wages and Hours Studies, 1960-75, 1976.

Lists industries covered in the BLS industry wage survey program, including publication titles, bulletin numbers, and a limited description of their content.

Area Wage Surveys, Metropolitan Areas, United States and Regional Summaries, 1973-74. Bulletin 1850-28, 1976. Annual since 1950, various bulletin numbers. Before Bulletin 1465 (1965-66) the series were called Occupational Wage Surveys. Data for individual metropolitan areas are published in individual volumes.

College Placement Council, Inc. *Men's Salary Survey and Women's Salary Survey*. Annual.

Data include high, low, and average beginning salaries in business and industry, by type of curriculum and type of employment (industry), for recent college graduates. Data are collected from college placement offices, covering male graduates in accounting, business, humanities-social sciences, marketing, seven areas of engineering, agricultural science, chemistry-math-physics, and computer science, and female graduates in accounting, business communications, community service work, EDP, engineering, health, home economics, libraries, mathematics, merchandising, research, and secretarial services.

Endicott, Frank S. *Trends in Employment of College and University Graduates in Business and Industry*. American Society for Personnel Administration. 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 Dental Association
American Dental Assistants Association
American Dental Hygienists Association
American Insurance Association/American Mutual Insurance Alliance
American Marketing Association
American Medical Association
American Medical Record Association
American Osteopathic Association
American Speech and Hearing Association
Business Automation, EDP Salary Survey
Flight Engineers International Association
Life Office Management Association, Actuarial Student Salary Survey
National Association of Certified Dental Laboratories
National Farm and Power Equipment Dealers Association
Public Personnel Association, *Pay Rates in Public Service*

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.

Data on salary levels and distributions and 80 occupation-work levels, including accounting, legal services, personnel management, engineering and chemistry, buying, clerical supervisory, drafting, and clerical jobs. Averages are shown for annual, monthly, or weekly rates, excluding overtime pay. Data are shown for total United States, for metropolitan areas combined, for establishments of 2,500 or more, and for major industry divisions.

Sommers, Dixie, "Occupational Rankings for Men and Women by Earnings," *Monthly Labor Review*, August 1974, pp. 34-51.

Ranks selected occupations of men and women according to 1969 median earnings, based on 1970 Census data.

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, Employment and Training Administration. *Worklife*, monthly.

Presents articles on a wide variety of manpower-related topics — people, jobs, poverty, employment and unemployment, transportation, education, economics, housing, training, health services, upgrading, apprenticeship, research.

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*.

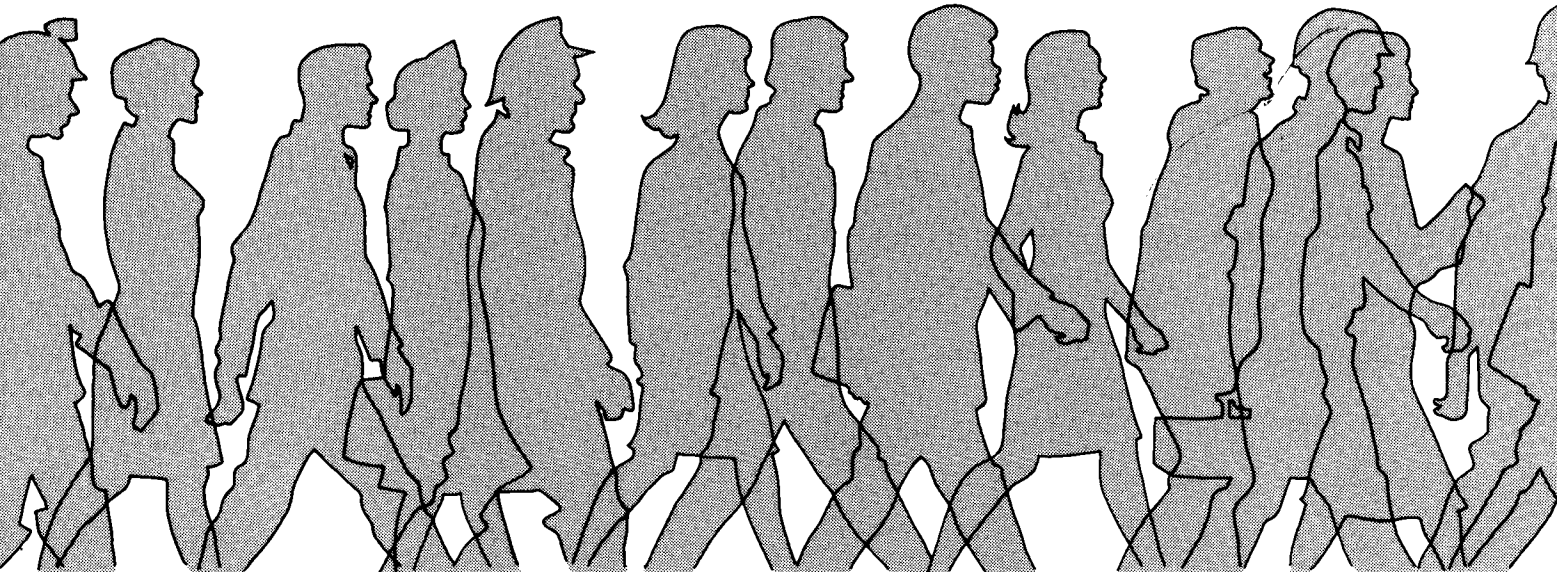
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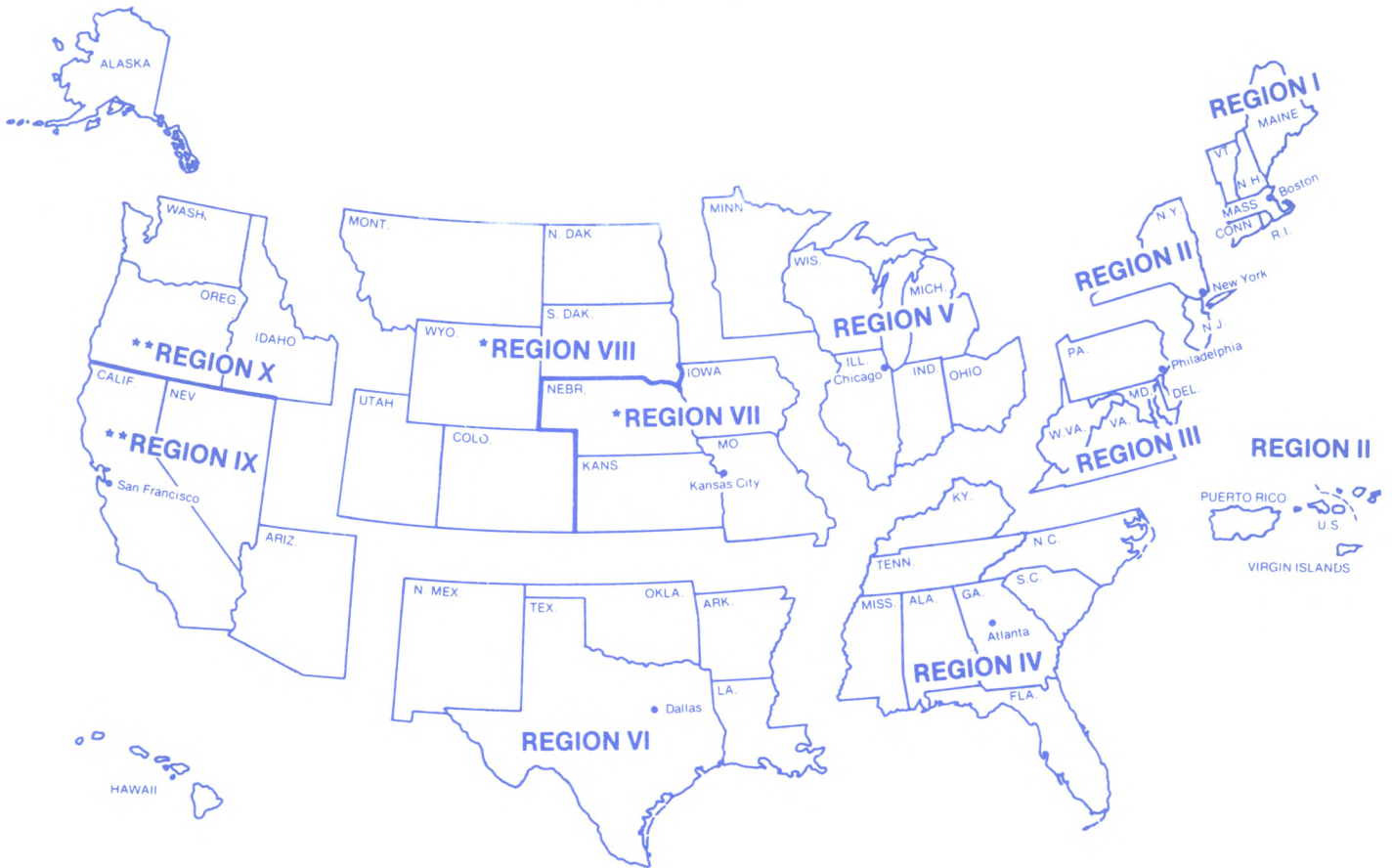
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