Report of the Allied Health Professions
Education Subcommittee
of the National Advisory Health Council

Education for the Allied Health Professions and Services

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service

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Public Health Service

Bureau of Health Manpower

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* At the time of the preparation of this report these staff members were in the Division of Public Health Methods. With the reorganization of the Public Health Service, the health manpower activities of the Service have been placed in the Bureau of Health Manpower.

William H. Stewart, M.D.
The Surgeon General
Public Health Service
Dear Dr. Stewart:

I am transmitting herewith the report "Education for the Allied Health Professions and Services," prepared at your request by the Allied Health Professions Educational Subcommittee of the National Advisory Health Council.

The group has been concerned both with the problems of meeting the needs for health manpower, particularly for the allied health professions and services, and the problems of the education of allied health manpower, and the development of new kinds of workers. We have reviewed the supply and the needs for personnel in the allied health field, the educational patterns, and the availability of educational opportunities in various parts of the country. The Subcommittee has found need for greater attention to the analysis of duties and qualifications required for the delivery of health care services; the development of career ladders to reduce the "dead end" jobs in the health occupations; and the improvement of methods to identify and recruit individuals into the allied health occupations.

We have emphasized the importance of the development of a strengthened educational structure for the preparation of health personnel, as an essential to the provision of high quality care to all people. We believe that the Public Health Service has a great opportunity at this time to assist in the development of these programs and urge you to stimulate planning, development, and implementation of new programs in these areas.

Sincerely yours,

Boisfeuillet Jones

Boisfeuillet Jones
Chairman

April 19, 1967

Contents

Tables

Figures

Appendix Tables

Preface

Surgeon General William H. Stewart, in his charge to this Subcommittee, reviewed the general picture of health manpower needs in the United States and the concerns of the Public Health Service in this area. He discussed the studies and findings of the Surgeon General's Consultant Group on Medical Education in 1959, and the resulting Health Professions Educational Assistance Act in 1963, and the findings of the Surgeon General's Consultant Group on Nursing, and the ensuing Nurse Education Act of 1964. He pointed to the health manpower problem which should next be faced—that of the allied health professions and services. He called attention to the lack of a coherent educational structure for preparation for the health services, to lacks in faculty and curriculum, and to the need for creative thinking and experimentation and for a systematic approach to better utilization of health manpower. He discussed in general terms the legislative proposal, then before the Congress, to provide assistance to education for the allied health professions and services.

The Surgeon General then asked the Subcommittee to help him in two ways: To prepare guidelines to help meet these manpower needs, and to prepare a document which could be of help to the health professions, to educational institutions, to public health officials, and others, in the identification of needs, the development of educational programs for the allied health services, and in suggesting new paths and new opportunities.

The group has followed the development of the legislation which has now been enacted, and has consulted with the Subcommittee staff and with others in the development of policy recommendations leading to the implementation of the Allied Health Professions Personnel Training Act, P.L. 89-751.

In this document the group, in response to the Surgeon General's request, reviews the situation with respect to manpower supply and needs, educational patterns, and availability of educational opportunity, and makes recommendations for the future.

Chapter I

Summary and Recommendations

There are now major unmet needs for health manpower. Indeed, the lack of adequate health manpower is a most serious problem as we aspire to bring the full potential of modern medicine to all members of our society.

Needs in medicine, dentistry, and nursing have received major attention for a number of years, and fairly well-defined goals for educational progress and expansion have been established. But with a few exceptions relatively little attention has been given to the needs and the educational potential for the many allied health occupations which are essential to modern health services.

Today no one or two individuals alone are capable of acquiring the breadth of knowledge to deliver the range of potential health services. Many types of skills must be drawn on to provide comprehensive health care. The concept of the health team is an old one, but one more honored in the breach than in practice. The problems are found both in the availability of personnel, and the ways in which they are used. This unfortunate situation in part is the result of haphazard development of educational programs for health workers, both professional and technical, and in part to organizational patterns for the delivery of health services, which seldom facilitate the provision of personal, continuous, and comprehensive care.

This report is concerned with the problems of meeting needs for health personnel, particularly for the allied health professions and services. It is concerned primarily with education, while recognizing closely woven needs with respect to improved utilization, to the development of new kinds of workers, and to the organizational setting in which health services are provided. But it recognizes the need for comprehensive planning for the development of education for health service, and for strengthened interrelationships among these fields.

The "allied" health occupations include a broad range—perhaps every group beyond medicine and dentistry. We speak often of professional and technical fields, but the terms tend to defy definition. A professional is presumably educated to develop a high degree of professional judgment, and insofar as possible he should use that capability at the level of diagnosis, planning, supervising, and teaching, as well as at a specialist level. By the same token, the professional person should not have his time encumbered with repetitive tasks which require less than his best talents. This is true for the sake of society, which has many unmet needs which can only be filled by a highly-prepared person. But it is also true for the sake of the professional who needs the challenge of tasks and opportunities that require his special talents. Thus we need not only more professional people, but more and new kinds of technicians and assistants as well.

Our goal of having comprehensive health services available for all people requires an educational structure of a magnitude sufficient to supply adequate numbers of well-prepared personnel, and of an organizational pattern that promotes the development of smooth-functioning health teams. Today we have neither. For the allied health occupations the output of schools is grossly inadequate. At the same time, the placement of educational programs is sadly fragmented.

There is a great opportunity today for the Public Health Service to assist in the development of educational capability, and to encourage the development and demonstration of effective and efficient use of health manpower. The recent enactment of the Allied Health Professions Personnel Training Act is already giving impetus to developments in this area.

Other recent legislation will have an impact on the training of health manpower. As an integral part of comprehensive regional medical programs, training

programs of continuing education for physicians and other health occupations may receive assistance under the Heart Disease, Cancer and Stroke Amendments of 1965 (P.L. 89-239). Under the Comprehensive Health Planning and Public Health Services Amendments of 1966 (P.L. 89-749), planning programs will identify health manpower needs as they relate to comprehensive health services. Specific provisions authorize the Surgeon General to make grants to any public or nonprofit private agency, institution, or other organization for training projects of two types: (1) training oriented toward the development of improved or more effective comprehensive health *planning* throughout the Nation, and (2) training designed to develop new methods or improve existing methods of providing health services. In addition, the law authorizes grants to schools of public health for provision of comprehensive professional training in the fields of public health and in the administration of State or local health programs.

We propose as a quantitative goal the doubling of the output of educational programs for professional and technical workers for the allied health services, with particular attention to achieving a better balance of opportunity among the geographic regions of the United States.

To assure the highest quality preparation, we recommend that the Public Health Service, in cooperation with other governmental and voluntary agencies and educational institutions, encourage and assist in:

1. Further experimentation with the development of university schools of allied health professions,
2. Further experimentation with the development of other interdisciplinary health personnel educational centers,
3. Preparation of teachers both for professional and technical programs, with formal courses in educational methods and techniques,
4. Developmental work in interdisciplinary and core curriculums, looking to the development of career ladders,
5. Studies of methods of delivery of health services with identification of new occupational needs and support of development of appropriate curriculums,
6. Programs to help professional workers develop methods of making optimum use of technical and auxiliary personnel,
7. Regional, State, and community-wide planning for development of educational programs, including strengthened liaison between junior and senior colleges and medical centers,
8. Studies of the roles of certification, licensing, and accreditation in providing adequate numbers, utilization, and quality of health service personnel, and
9. Recruitment for health careers, on an interdisciplinary basis, including studies in recruitment methods.

Chapter II

Health Manpower Supply and Needs

With the rising capacity of medicine to provide a satisfying array of services, the lowering of financial barriers to service, and the growing acceptance of a public responsibility to assure that all people have adequate medical service, needs and demands for medical care continue to outstrip their availability. Today we find that health manpower is the critical factor in the provision of health services.

Many people are struggling with approaches to the measurement of health manpower shortages. But no one figure can express the total need. And even if it were possible to envision ideal health services staffing for a community, a State, or a nation, the continuing development of new knowledge and techniques, new patterns of service, and new methods of payment are constantly changing the needs, both for numbers and varieties of health workers.

As the opportunities of medical science are growing and changing, so are the talents and skills of the people who provide health services. New knowledge creates the need for new technologies, and with the development of new bodies of knowledge come new professions. In their wake arise new divisions of labor. There are today a great many health occupations. For some a baccalaureate or graduate education is a prerequisite to entering the field. Others are in a state of transition—with some programs leading to a baccalaureate degree and others requiring 2 or 3 years of post-high school preparation. Still others are identified at the technical level—with 2-year college programs leading usually to an associate degree. These in turn cannot always be differentiated in work level of the graduates from some of the 1-year programs of vocational and technical schools. There are also a number of categories of aides with short term on-the-job or apprentice training.

Trends in Supply

Some 2.8 million persons were employed in the health occupations in 1966. The detail is shown in table 1, grouped insofar as possible by level of training. These 2.8 million health personnel represent 3.7 percent of the civilian labor force. The rise since the beginning of this century is shown in table 2.

The rising level of education in the United States and the fast-developing technology in industry and agriculture are important among the factors which make it possible to devote an increasing share of manpower to health services. It was less than 15 years ago that service workers first outnumbered farm workers, and that "white collar" workers outnumbered "blue collar" workers. Fig. 1 indicates (on a logarithmic scale) that the rate of increase of workers in the health occupations has been even greater than that of all service occupations considered together.

Table 1. Supply of health workers, by level of training: 1966

Level of training and occupation	Number of persons
Total	2,786,200
Physician, dentist, and other doctoral level	442,400
Physician (M.D. and D.O.)	297,000
Dentist	95,400
Other	50,000
Nurse (baccalaureate, diploma, and associate degree)	640,000
Other occupations which may have baccalaureate or post-baccalaureate preparation	422,000
Dental hygienist [1]	16,000
Medical record librarian [2]	12,000
Medical technologist [3]	40,000
Occupational therapist	6,500
Physical therapist	12,500
Speech pathologist and audiologist	13,000
Radiologic technologist [4]	72,000
Other	250,000
Other 1-3 year post-high school	531,800
Certified laboratory assistant	1,500
Cytotechnologist	3,300
Dental assistant	95,000
Dental laboratory technician	27,000
Inhalation therapist	5,000
Practical nurse	300,000
Other	100,000
Short training	750,000

[1] Some baccalaureate, primarily 2-year programs.
[2] Employed in hospitals.
[3] ASCP registered (both baccalaureate and less than baccalaureate). Hospitals report 22,000 not ASCP registered employed in 1966.
[4] Both baccalaureate and less than baccalaureate.

Source: Bureau of Health Manpower

Table 2. Persons in the health occupations in relation to the civilian labor force: 1900–75

Year	Experienced civilian labor force [1]		Percent in health occupations
	Total	In health occupations [2]	
1900	29,030,000	345,000	1.2
1910	37,291,500	500,000	1.3
1920	42,205,700	650,000	1.5
1930	48,685,600	900,000	1.8
1940	51,742,000	1,090,000	2.1
1950	62,208,000	1,440,000	2.4
1960	69,628,000	2,040,000	3.0
1966	75,770,000	2,786,000 [3]	3.7
1975	89,083,000	3,800,000 [3]	4.3

[1] For 1900-30, data include civilian gainful workers 10 years old and over; for 1940, data include persons 14 years old and over in the experienced civilian labor force; for 1950-75, data include persons 16 years of age and over in the civilian labor force.

[2] Includes those health occupations identifiable from decennial census data.

[3] Estimated by Bureau of Health Manpower.

Source: References (*38*) and (*51*).

Needs for Health Manpower

There is evidence of unmet needs for health services on every hand. This can be seen in relation to:

1) Population growth and change
2) Differentials in health status in relation to income level
3) Technological changes
4) Studies of professional groups
5) Hospital and nursing home staffing studies
6) State studies
7) Variation among States

Population Growth and Change

The population of the United States stood at 195 million in 1965. It will reach an estimated 224 million by 1975, and by 1980 it may reach 243 million. This is an average increase of 3.8 million people a year. The number of people aged 65 and over is expected to rise from the present 18 million to 21 million by 1975, and to 23 million by 1980.

Differentials in Health Status in Relation to Income Level

The findings of the National Health Survey provide ample evidence of the relationship between low income and poor health (*26*). Measuring the impact of illness by the number of days on which people missed work, school or otherwise had to reduce their usual activities, the National Health Survey found that those in families with annual incomes below $2,000 had more than twice as many days of restricted activity as those in families with incomes over $7,000 (*64*).

Technological Changes

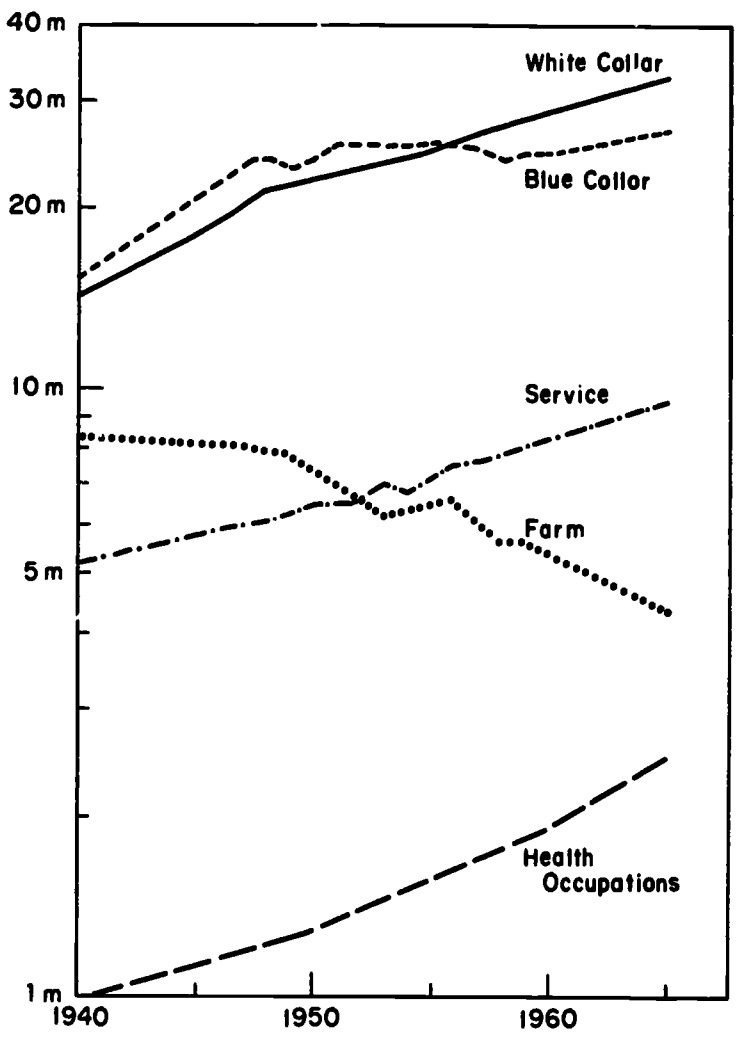
The National Commission on Technology, Automation, and Economic Progress has stated that new technological developments have brought substantial needs for more health manpower, with better preparation (*31*). The Commission points out:

"The tasks that lie ahead include not only implementation of the programs recently passed, but a broader effort to achieve the following goals: (1) fuller access to diagnostic and patient care facilities by all groups in the population; (2) broader and bolder use of the computer and other new health technologies; (3) increased spread and use of health statistics, information, and indexes; and (4) new programs for training health manpower.

"One major barrier to achieving more adequate health care is that there are not enough physicians and other health care personnel. . .The gap between the technological potential and our ability to apply it effectively is partly due to the lack of a significant improvement in the proportion of physicians to population. We have also not developed the proper manpower training programs for the new technologies. We continued to hold on to our traditional and basic training programs in the various health and medical fields without analyzing the new technologies available and the real possibility of training new categories of manpower who can perform many of the functions now carried out by highly skilled and scarce professional personnel.

"One solution lies in restructuring our training programs in accordance with current scientific and technological developments. The only solution, in the long run, is an increase in the number of trained medical personnel, physicians, nurses, and medical technicians in all categories."

Fig. 1. Employment in health occupations in relation to major occupational groups: 1940–65



Studies of Professional Groups

A number of studies have dealt with present and future needs for physicians, dentists, and nurses. Among these are the 1959 report of the Surgeon General's Consultant Group on Medical Education (*46*), the 1961 report of the Commission on the Survey of Dentistry in the United States (*14*), and the 1963 report of the Surgeon General's Consultant Group on Nursing (*47*). These saw needs far beyond the capacity of the Nation's schools of medicine, dentistry, and nursing. Testimony presented before the House Interstate and Foreign Commerce Committee (*52*) and the Senate Labor and Public Welfare Committee, in support of the Allied Health Professions Personnel Training Act, showed parallel situations in medical record library science, dental hygiene, medical technology, occupational therapy, physical therapy, radiologic technology, and other allied fields.

Hospital and Nursing Home Staffing Studies

Hospitals.—Almost two-thirds of all health personnel are employed by hospitals. A study of the staffing needs of these institutions, just completed by the Public Health Service and American Hospital Association, indicates that hospitals see a need for 257,000 additional health personnel, if staffing needs for optimum care are to be met (table 3). In total, the staff required to give optimum care would be 20 percent higher than present staff levels.

The greatest needs, at the professional level, apart from nursing, are for radiologic technologists, dietitians, occupational therapists, physical therapists, medical records personnel, and social workers.

For technical personnel, greatest needs are seen for laboratory assistants, inhalation therapy technicians, and surgical technicians.

These reports from hospitals, of course, represent present patterns of service. The gross dispari-

Table 3. Personnel needs in hospitals: 1966

Category of personnel	Present staff	Additional needed to give optimum care
Total professional and technical	1,332,100	257,200
Nursing service:		
Nurse—R.N.	361,000	79,500
Licensed practical nurse	150,600	41,400
Surgical technician	17,600	3,900
Aide, orderly (except in psychiatric hospitals)	374,400	51,300
Aide, orderly in psychiatric hospitals	117,600	18,500
Diagnostic services:		
Medical technologist	54,500	9,200
Laboratory assistant	14,600	2,500
Cytotechnologist	1,600	500
Histologic technician	3,900	700
Electrocardiograph technician	5,900	800
Therapeutic services:		
Occupational therapist	4,100	2,300
Occupational therapy assistant	3,800	1,200
Physical therapist	8,500	2,900
Physical therapy assistant	5,200	1,100
Social worker	10,700	5,100
Social work assistant	1,500	500
Recreation therapist	3,800	1,600
Inhalation therapist	5,600	2,200
Speech pathologist and audiologist	1,200	500
Radiology:		
Radiologic technologist	24,000	3,900
X-ray assistant	6,000	900
Pharmacy:		
Pharmacist	9,400	1,900
Pharmacy assistant	5,600	900
Medical records:		
Medical record librarian	6,300	1,800
Medical record technician	10,100	1,800
Dietary:		
Dietitian	12,700	3,500
Food service manager	5,400	800
All other professional and technical	106,500	16,000

Source: Estimates for 7,000 A.H.A. registered hospitals based on 5,300 returns in P.H.S.-A.H.A. survey.

ties between supply and demand in many fields point not only to training needs, but also to the need for the development of new patterns of manpower utilization.

Nursing homes and other extended care facilities.—A parallel study of the staffing and staffing requirements of extended care facilities is being conducted by the Nursing Division of the Public Health Service. Preliminary analysis of a small sample of returns indicates that extended care facilities would need some 32,000 additional professional, technical, and auxiliary workers to meet optimum care needs (table 4). This represents an increase of 12 percent over present professional and technical staff.

Greatest needs reported, in addition to nursing personnel, are for physical therapists, dietitians, occupational therapists, and recreational therapists. Nursing homes, like hospitals, put first emphasis on strengthening professional and supervisory staffs.

State Studies

In the past 4 years studies of health manpower needs have been made in no less than 25 States. Some of these studies have been concerned with needs in one profession; some cover the whole range of health services. These studies have been made by medical and nursing societies, hospital associations, health careers councils, departments of health, commissions on education, mental health agencies, and employment security commissions. They all indicate severe shortages of trained personnel. For example, the report of a joint committee representing the University System of Georgia, the Georgia State Department of Education, and the Georgia Department of Public Health showed: Of 11 occupations surveyed, the need by 1970 was estimated at 21,329—three times the number that could be educated under present conditions. Appendix B contains summaries of these reports.

Variation Among States

Disparities among the States in the supply of health manpower are very substantial. The ratio of health personnel to population in the Northeast is more than 50 percent higher than the South. These differences are found with respect to all categories of health personnel.

Three examples will show the differences with respect to allied health personnel. There are 27 registered medical technologists per 100,000 persons in the West North Central States, but only 13 per 100,000 in the Middle Atlantic States. The distribution of registered occupational therapists varies from 6 per 100,000 in the Pacific States to 1 per 100,000 in the East South Central States. For physical therapists the range is from 9 per 100,000 in New England to 2 in the East South Central States (table 5).

Table 4. Personnel needs in extended care facilities: 1966

Category of personnel	Present staff	Additional needed to give optimum care
Total professional and technical	275,000	31,900
Nursing service:		
Nurse—R.N.	31,000	6,000
Licensed practical nurse	33,600	9,400
Aide, orderly, attendant	177,400	10,700
Therapeutic services:		
Occupational therapist	1,600	800
Occupational therapy assistant	1,300	300
Physical therapist	2,000	1,200
Physical therapy assistant	900	300
Social worker	1,200	500
Recreation therapist	2,600	900
Speech pathologist and audiologist	300	400
Medical records:		
Medical record librarian	300	100
Medical record technician	800	100
Dietary:		
Dietitian	4,600	900
All other professional and technical	17,400	300

Source: Estimates for all known nursing homes based on 499 returns in PHS survey.

Table 5. Distribution of selected allied health personnel in relation to population, by geographic division

Geographic division	ASCP Registered medical technologists 1966	AOTA Registered occupational therapists 1965	Members of American Physical Therapy Association 1965
	Rate per 100,000 persons		
United States	19.2	3.7	5.2
New England	15.7	5.0	9.0
Middle Atlantic	12.6	3.7	5.1
South Atlantic	15.8	2.5	4.3
East South Central	19.7	.9	2.3
West South Central	22.2	1.7	3.6
East North Central	22.1	4.3	4.8
West North Central	26.7	4.3	4.7
Mountain	24.5	3.7	6.3
Pacific	21.3	6.2	8.4

Source: Computed from data in reference (57).

Summary

Needs for health services are great, demands are increasing, and the shortage of health manpower is a critical factor in our ability to meet health service needs.

There are 2.8 million persons in health occupations today. This number will probably increase to 3.8 million persons by 1975. The expected increase in population, especially in the older years, will require ever increasing numbers of health personnel to provide adequate health services.

An indication of the magnitude of the present shortage of health personnel can be obtained from recent surveys of hospitals and nursing homes. The returns show over 300,000 additional health workers are needed to provide optimum patient care.

Specific indications of needs are found in studies made in a number of States. Testimony in support of the Allied Health Professions Personnel Training Act of 1966 showed the existence of shortages of medical record librarians, dental hygienists, medical technologists, occupational therapists, physical therapists, and radiologic technologists.

Chapter III

Education and Training for the Allied Health Occupations

The Allied Health Occupations

The development of a systematic description of the allied health occupations presents several difficulties.

The first is that of language. What is a health profession? For some purposes it can be defined as one for which preparation is at least at the baccalaureate level—a point at which there is presumably some mastery of both the theoretical and technical aspects of the body of knowledge of a professional area, and at which the student has gained a broad general education in the humanities and social sciences as well as preparation in the biomedical sciences. But for some fields the professional organization and licensing laws give equal recognition to 2- or 3- or 4-year post-high school preparation, so the above definition is a hard one to stick to.

For some fields the word "technologist" is used to mean a person with baccalaureate level preparation, and "technician" 1- or 2-year preparation. There might be a philologic basis for this, in the sense that "technologia" means "systematic treatment" or "a practical art, utilizing scientific knowledge, as medicine" while "technician" is one "versed or skilled in the technical details of a subject"; or "skilled in a practical way." There are exceptions to this usage, and at the present time, a lack of general agreement as to the educational qualifications and responsibilities which differentiate between technologists and technicians.

In similar fashion the word "therapist" may denote a wide range of educational levels. A physical therapist has a baccalaureate degree; an inhalation therapist often receives 1 year of technical preparation. "Assistant" is another word which in some fields means 1 or 2 years of post-high school preparation, in others a baccalaureate degree.

A second difficulty is that for many of the occupations related to the provision of health services, the educational patterns are undergoing substantial change both in length and in locus of training. Greatest attention has been given to changes in nursing education, and to substantial growth of educational responsibility in both senior and junior colleges but with growing appreciation of the essential and complementary roles of educational and clinical facility. Parallel educational changes are found in most of the allied health fields.

While there is no single way of grouping the allied health occupations to sharply differentiate educational requirements, there is a similar problem in identifying work areas. To make a beginning, however, in the following table 6 the major health service occupations are grouped by educational level and by the most typical work area.

A description of the functions of each of these types of workers is beyond the scope of this report. Detailed information can be found in the Health Careers Guidebook published by the Department of Labor in 1965 (*60*).

New Types of Health Workers

Experimentation and development of educational programs for new types of health workers is essential to the improvement of health care. Programs are now being developed to train health workers to perform a variety of duties which are supportive of and complementary to existing health occupations. It is important that some of these training programs and occupations be oriented toward training individuals in "dead end jobs" who have had previous training or experience but are blocked in their development. These programs should allow individuals to improve their career opportunities and to permit them to assume additional responsibilities.

Some of the new curriculums are focused toward training of individuals to be assistants to physicians, dentists, and optometrists. For some the training is

Table 6. Examples of allied health professional and technical occupations for which education is provided in 4-year colleges, junior colleges, and technical schools, by level of education and major orientation

Level of education	Patient oriented	Laboratory oriented	Administration oriented	Community oriented	Other
Primarily post-baccalaureate	Audiologist Clinical psychologist Medical social worker Rehabilitation counsellor Speech pathologist	Pharmacist Radiobiologist	Hospital administrator Biostatistician	Public health administrator Health educator Nutritionist Engineering specialties	Biomedical engineer Medical economist Medical sociologist
Primarily baccalaureate (some with post-baccalaureate clinical training)	Dietitian Occupational therapist Physical therapist	Medical technologist	Medical record librarian	Sanitarian Radiological health technologist	Medical illustrator Science writer
Baccalaureate and prebaccalaureate	Dental hygienist Nurse Orthoptic technologist	Prosthetist Radiologic technologist			
Associate degree and other prebaccalaureate	Dental assistant Dispensing optician Food service supervisor Occupational therapy assistant Orthoptic technician Psychiatric aide	Cytotochnologist* Dental laboratory technician Medical laboratory assistant X-ray assistant	Medical record technician		
1 year	Practical nurse Inhalation therapist Operating room assistant Surgical technician	Certified laboratory assistant	Medical assistant Medical office assistant Medical secretary Nursing unit management assistant		

*There is also 1 baccalaureate program.

fairly short and for some it requires a college degree plus 1 or 2 years special education after college.

The following experimental and developing programs are illustrative:

(a) The "pediatric nurse practitioner" is being trained to assume an expanded role in child health. In one of these programs nurses with the regular nursing bachelor of science degree receive four months of intensive training at a medical center, followed by twenty months of field experience (*63*) which prepares them to furnish comprehensive well child care to children of all ages, to identify and appraise acute and chronic conditions and refer them to other facilities as indicated, and to evaluate and temporarily manage emergency situations until medical assistance is available. Similarly trained nurses are also joining the offices of private pediatricians to act as the doctor's associate.

(b) A 2-year program for ex-medical corpsmen or others with comparable experience in the health field. The broad objective is to develop highly skilled, career-oriented assistants for physicians, who will assume responsibility for repetitive and technical tasks classically performed by physicians. They will extend the eyes, ears and arms of the doctor and allow him to serve more people. (*28*)

(c) Training of men as "medical emergency technicians" and ambulance technicians is conducted at a few universities. Since physicians no longer ride ambulances, there is a need for well-trained ambulance attendants to direct emergency operations and to render emergency care on the scene and en route to the hospital (*22*). New York State has recently enacted legislation requiring training for ambulance technicians.

(d) Dentist's assistants. Experiments in the training and use of dental auxiliaries with expanded functions have been conducted by the Divisions of Dental Health and of Indian Health of the Public Health Service. In evaluating the work performed by these auxiliary workers, no significant difference has been found in the quality of fillings placed by the dentist or by the auxiliary, in cavities first prepared by the dentist.

In New Zealand, dental nurses with expanded functions which include filling teeth, have functioned effectively in the school dental health program, after 2 years of training. They carry out a very clearly defined and limited range of dental operations on preschool and primary school children, including teaching them good oral hygiene habits, under dental supervision (*18*).

(e) A program for the training of mental health aides is being conducted in the New York area in a hospital affiliate of a medical school. The hospital, as part of its mental health service unit established four neighborhood service centers to be staffed by workers representative of the local community. These workers were specifically selected and trained by the hospital staff to be mental health aides. They are first prepared for the roles of interviewer and expeditor, then trained on-the-job to acquire more knowledge about the agencies and the resources that can be suggested to the neighborhood people to assist them in handling their day-to-day living problems. These mental health aides can provide and expedite service for large numbers of disadvantaged persons, and increase the understanding of the professionals of problems in the local community (*42*).

(f) Obstetrician's assistant with much of the training of a nurse-midwife.

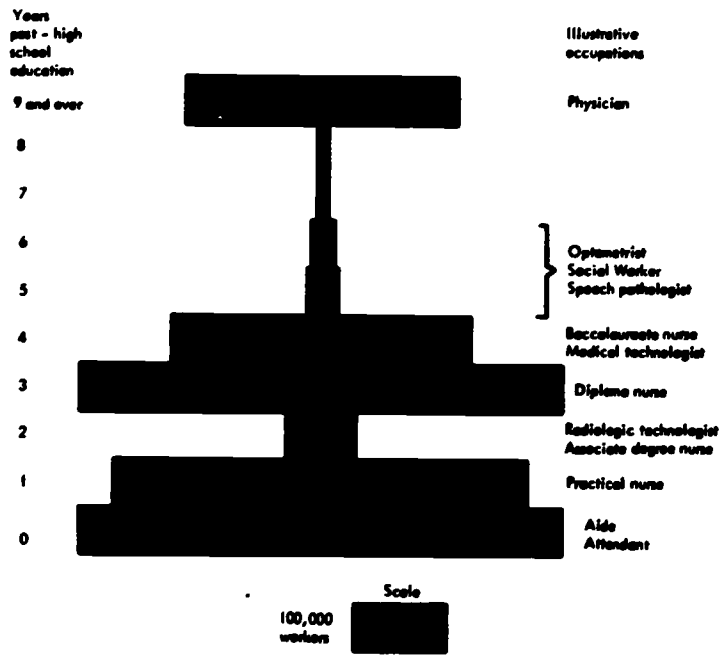
(g) Surgical assistants trained to assist in the operating room as "scrub" assistants. (*34, 35*).

Directly related to the problem of developing new occupations is that of properly utilizing trained people whose training is outside the generally accepted and established academic patterns. Methods must be devised to provide these individuals with additional training to permit them to meet the educational and licensure requirements of their occupation. Every year more than 10,000 corpsmen and other health technicians are released from the armed services. These men have been trained and have functioned effectively in many areas, including medical, dental, optical, operating room, physical therapy, radiology, and others. But there have been no mechanisms for finding these men, attracting them to civilian medical services, and utilizing their valuable skills.

Educational Programs [1]

The balance among educational levels in the health service occupations is a remarkable one. Of the 2.5 million workers in the health occupations, the greatest numbers are prepared at the doctoral level, and at the 1- and 3-year post-high level. (Fig. 2.)

Fig. 2. The medical services pyramid



This distribution of career opportunities shows little relation to the general education aspirations of young people today—most generally stated in terms of completion of junior college, senior college, or graduate work. In 1965, over 45 percent of all persons 18-21 years of age were enrolled in institutions of higher education. Fig. 2 suggests strongly the need for changes in the educational structure for the health occupations to bring it into the main stream of educational patterns.

Preparation for the allied health occupations is offered in educational institutions at every level from university to vocational high school, in hospitals, laboratories, and independent schools.

Within the university settings are concentrated the post-baccalaureate and baccalaureate degree programs. Almost all of the schools of medicine, dentistry, veterinary medicine, and pharmacy are located within universities; although a few are independent schools. Curriculums for physical therapy, occupational therapy, and social work are usually organized in university settings, with clinical training provided in an affiliated teaching hospital. Preparation of medical technologists is increasingly provided in a university or college setting, but there are many small independent hospital schools. The majority of the nursing programs are in hospital schools, but the numbers in universities and junior colleges are increasing rapidly. Two-year radiologic technology programs are found primarily in hospitals but are increasingly being found in university settings. Dental hygiene programs may be placed within dental schools, but are also being established in junior colleges. Graduate schools prepare for a number of health-related specialties. Newly emerging schools of allied health professions are experimenting with bringing the preparation for health service occupations into a closer educational relationship, as are junior colleges, and other technical and vocational schools.

To indicate this range, table 7 shows the number of educational programs for selected health occupations, by type of institution in which the program is offered.

There are no neat patterns or structured guidelines for the organizational placement of educational programs in academic settings. While a few schools have educational structures which recognize and encourage inter-relationships among health workers, a significant number of schools are now struggling with the problem of moving from isolated curriculums toward comprehensive programming, and there are many small independent schools preparing workers for a single field. Programs vary considerably in the closeness of the relationship between educational institutions and hospitals.

The patterns of educational placement and organization for health occupations can be grouped:

1) Schools of the allied health professions
2) Other organizational placements in universities with medical and dental schools
3) Programs in other universities and colleges
4) Technical and vocational schools
   (a) Junior colleges
   (b) Other technical and vocational schools
5) Hospitals
6) Military training programs
7) Proprietary schools

[1] Much of the material on the curriculum and organization of courses in the allied health programs is taken from questionnaires and on-site visits to schools by staff and members of the Subcommittee.

Table 7. Educational programs in selected health occupations, by category of personnel and type of institution: 1965

Category of personnel	Type of institution [1]								
	Total	University with medical school	Other university [2]	4-year college	Junior college	Technical or vocational school	Secondary school	Hospital or laboratory	Independent school
Physician (M.D. and D.O.)	93	78	—	—	—	—	—	—	15
Dentist	49	45	4	—	—	—	—	—	—
Optometrist	10	3	2	—	—	—	—	—	5
Pharmacist	75	39	30	2 [3]	—	—	—	—	4 [3]
Veterinarian	18	6	12	—	—	—	—	—	—
Medical record librarian	29	11	3	8	—	—	—	7	—
Medical technologist	692	63	127	349	19	—	—	133	1
Occupational therapist	32	21	6	5	—	—	—	—	—
Physical therapist	42	37	2	—	—	—	—	3	—
Speech therapist	152	43	53	56	—	—	—	—	—
Dental hygienist	55	29	7	3	15	—	—	—	1
Radiologic technologist	693	44	17	29	31	—	—	572	—
Social worker	60	44	15	1	—	—	—	—	—
Nurse—R.N.	1,170	63	64	102	123	—	—	781	37
Cytotechnologist	75	26	—	—	—	—	—	48	1
Inhalation therapist	25	1	—	—	4	—	—	20	—
Dental assistant	94	7	3	3	47	30	—	2	2
Dental laboratory technician	11	2	1	—	3	5	—	—	—
Laboratory technician, assistant	147	2	—	—	10	16	—	118	1
Practical nurse	1,002	1	7	9	133	549	60	232	11
Medical assistant	43	—	1	1	28	13	—	—	—
Medical record technician	14	—	—	—	2	—	—	12	—
Surgical technician	12	—	—	—	1	5	—	6	—
Dietitian's assistant	4	—	—	—	2	1	—	1	—
Podiatrist	5	—	—	—	—	—	—	—	5

[1] Includes institutions in 50 States, District of Columbia, and Puerto Rico.
[2] Offering either doctoral or master's degree and having a program in liberal arts with 1 or more professional schools.
[3] Includes 1 not accredited.

Source: Compiled from data in appendix tables 1 and 2.

Schools of the Allied Health Professions

A promising approach to education for the health professions at the baccalaureate and graduate level today is the grouping of a number of health curriculums in a college or school within a university medical center. In this approach the individual curriculums gain status and strength. The programs which are inherently related are placed in an environment where constant interaction is possible. With the combining of several programs in a college or central unit, duplications in such areas as administration, faculty, and facilities can be minimized. More importantly, individuals who will later work together in the medical scene are prepared together. Communication with other health professionals, a critical factor in the provision of health services, is learned during their educational experience.

Nine universities with medical centers have or are developing formal structures for interdisciplinary programs in preparation for the allied health professions:[2]

Loma Linda University	Loma Linda, California
University of California, San Francisco Medical Center	San Francisco, California
University of Florida	Gainesville, Florida
Indiana University	Indianapolis, Indiana
St. Louis University	St. Louis, Missouri
State University of New York at Buffalo	Buffalo, New York
Ohio State University	Columbus, Ohio
University of Pennsylvania	Philadelphia, Pennsylvania
Temple University	Philadelphia, Pennsylvania

A tenth school, Northeastern University, has a division of allied medical sciences, which while not part of a medical center. is closely affiliated with the hospitals, medical and dental schools, and clinics in the Boston area. Other universities are actively exploring or studying such program development. The following discussion is based on the programs of these 10 universities.

[2] Since the preparation of this report, other universities have or are developing schools of allied health professions. Some of these are: University of Alabama, Birmingham, Alabama; University of Illinois, Chicago, Illinois; University of Kentucky, Lexington, Kentucky; Boston University (Sargent College), Boston, Massachusetts; State University of New York Downstate Medical Center, Brooklyn, New York; Jefferson Medical College, Philadelphia, Pennsylvania; Medical College of South Carolina, Charleston, South Carolina.

Organization.—These schools with formally structured curriculums in the field of allied health are primarily administered and budgeted in one of two ways: they are either independent schools in a medical center, equal to the school of medicine or nursing, or they are administered by the school of medicine as a department within the school. The programs at Loma Linda University, University of Florida, St. Louis University, the University of Pennsylvania, the State University of New York at Buffalo, and Temple University are administered as separate schools in an academic medical center. The programs at Ohio State University and Indiana University are administered as departments within the school of medicine.

There is considerable variation in the organization and grouping of health professions education in these universities. In some the programs are tightly organized and administered in a single organizational unit. In other universities the health programs are located in one or more departments and are coordinated through a dean or vice president for health affairs. In still others, some of the allied health programs are located in a school of allied health professions and some in the dental school, the school of arts and sciences, or university hospital center, with little coordination. In each case, however, there is some university organization to provide program quality and flexibility.

An example of a tightly-knit organization is the College of Health Related Professions at the University of Florida, which includes programs in medical technology, physical therapy, occupational therapy, rehabilitation counseling, health and hospital administration, clinical psychology, communicative disorders, and a Rehabilitation Research Institute. An example of a university which has some health programs in the School of Allied Medical Professions and in other parts of the university is the University of Pennsylvania. In the School of Allied Medical Professions baccalaureate degrees are awarded by the divisions of medical technology, occupational therapy, and physical therapy. In addition there are health curriculums offered by five other units of the university: the Dental School (dental hygiene program), the School of Social Work (medical social work program), Graduate School of Arts and Sciences (clinical psychology and biomedical electronic engineering), the University Hospital (inhalation therapy, radiologic technology, medical technology) and the Graduate Hospital (histologic technology, medical records science and radiologic technology).

Northeastern University offers programs leading to a baccalaureate degree and organized on the cooperative plan of education in which students alternate periods of academic study on campus with periods of paid employment in jobs related to their professional objectives. These programs are medical technology (College of Liberal Arts and Lincoln College), speech and hearing therapy (College of Education), physical therapy (Boston Bouve College), pharmacy (College of Pharmacy), and nursing (College of Nursing).

There are nursing programs or colleges of nursing in all of the 10 universities listed above. However, in only two of them are the schools for nursing organizationally related to the allied health programs. St. Louis University has a combined School of Nursing and Health Services. During the first 2 years the students in the school attend combined classes in liberal arts, anatomy, physiology, psychology, and medical ethics. At Temple University, nursing is one of the programs in the College of Allied Health Sciences. In other universities, the nursing program is in a separate school or college of nursing, which may be in the university health center. At Loma Linda University, the students in nursing and some of the allied health professions combine classwork in physiology, bacteriology, pathology, and introduction to medicine. Other course work, such as psychology, counseling, anthropology, and history is also open to other students.

Eight of the ten universities have programs in dental hygiene. Each is administratively related to the dental school. Two dental hygiene programs are of particular interest. The first, at Loma Linda University, combines classes in microbiology and pathology for dental hygiene and nursing students. The second, at Northeastern University, has flexibility in the educational pattern. Students can earn either an associate of science degree or a baccalaureate degree in dental hygiene. Graduates of the associate degree program may transfer their credits to complete the requirements for a bachelor of science degree by part-time study. Northeastern University is affiliated with Forsyth School for Dental Hygienists. Students take their studies at Northeastern and earn an associate degree from its University College, at the same time they earn a certificate in dental hygiene from Forsyth. Graduates of this program may also complete the requirements for a bachelor of science degree by part-time study in the sciences.

Baccalaureate level programs.—Curriculums offered at the baccalaureate level in some of these 10 universities are: medical technology, occupational therapy, physical therapy, medical record library science, dental hygiene, radiologic technology, medical dietetics, and medical illustration. In addition to 4 years of academic study some of the programs require clinical training in the year following the awarding of the baccalaureate degree. These curriculums usually include 2 years of study in the liberal arts and sciences prior to specialization in a health profession. During the first 2 years very few courses are offered specifically for students in the allied health professions. The ones which are offered are generally introductory courses to the health occupations or basic sciences.

During the last 2 years of baccalaureate degree programs, most of the schools include in the curriculum subjects which are common to, and are required for, all students in health related occupations. The background courses typically include medical terminology, medical ethics, medical records and administration, anatomy, physiology, pathology, and psychology. Some of these courses are combined for only one or two of the occupations. Usually the combined courses are for those occupations in which the course content provides background information and supportive skills rather than specialized skills. Courses providing specialized training related only to one of the occupations are taught in classes specifically directed to the needs of that occupation.

Examples of specialized courses and classes which have been combined in some of the schools of allied health professions are:

Pathology and microbiology—classes combined for students of physical therapy, occupational therapy, medical records administration, dental hygiene, and nursing.

Physiology and anatomy—classes combined for students of occupational therapy, physical therapy, medical records administration, and medical technology.

The occupational therapy and physical therapy programs share the greatest number of combined courses. These may include anatomy, physiology, applied neuroanatomy, kinesiology, psychology, child development, and a survey of the field of emotional and physical rehabilitation.

The combined clinical experience, planned in such a way as to insure that students are prepared to work as part of a medical team is an essential part of the program in schools of allied health professions. Some

schools offer courses on medical and surgical disorders, with discussions on a variety of medical problems, and particular emphasis on the role of each of the health related occupations in the diagnosis and treatment of the disorder. One of the schools requires, for all students enrolled in the allied health programs, attendance at a series of lectures and clinical presentations by the hospital and teaching staff on dietetics, geriatrics, obstetrics, gynecology, urology, otolaryngology, dermatology, ophthalmology, speech therapy, sight and hearing, rehabilitation counseling, and public health education. These lectures emphasize the coordinated role for each of the health professionals including the role of the rehabilitation counselor, the clinical psychologist, and the medical social worker.

Certificate programs.—Certificate programs are programs providing the clinical and academic background which lead to certification by professional associations. These programs may or may not carry academic credit toward a degree. They are usually 2 years or less in length and are located in the university hospital or medical school but not sponsored by the school of allied health professions. Four of the universities with schools of allied health professions offer certificate programs. Examples are: radiologic technology (Loma Linda University, University of Pennsylvania, Ohio State University, and Indiana University), cytotechnology (Ohio State University), laboratory technology (University of Pennsylvania), inhalation therapy (Indiana University), and orthoptics and nurse anesthesia (Ohio State University).

The University of Pennsylvania also offers a postgraduate certificate program in occupational therapy and physical therapy. All students in this program have a baccalaureate degree from an accredited college and the required prerequisites in natural and social sciences.

There is a unique program combining certificate and associate degree programs in health related fields at Northeastern University. Noncredit certificate programs are offered in radiologic technique (2 years), medical laboratory assisting (15 months), dental assisting (3-month course in cooperation with Tufts Dental School), and an institute for nursing home administration (a series of programs of 1 week duration each on various aspects of nursing home management). At Northeastern University, students who complete the coursework for an associate degree through part-time or evening study (at Lincoln College) can apply their credits toward the bachelor of science degree at the University College. Associate in science degrees are offered in biomedical engineering technology and chemical-biological technology.

Graduate programs.—Most of the universities with schools of allied health professions offer graduate degrees in health related occupations. Examples of curriculums are clinical psychology, medical social work, speech pathology and audiology, dietetics, and hospital administration. These programs are typically located outside of the school of allied health professions. In many instances the course work is conducted in more than one department and also requires a period of clinical training in a hospital or medical center.

The graduate programs in clinical psychology, speech pathology, and audiology are either offered in the graduate schools of liberal arts and sciences or in the schools of education. Bioengineering programs are either located in or coordinated with the department of engineering. The medical social work programs are located in the schools of social work with clinical experience in hospitals. The hospital administration programs are usually conducted in cooperation with the school of business administration.

Of the nine universities with schools of allied health professions, only one offers graduate courses in its school of allied health. The College of Health Related Professions at the University of Florida offers courses leading to a master's degree in rehabilitation counseling, and in a joint arrangement with the College of Business Administration a master's degree in health and hospital administration. The Department of Psychology in the College of Arts and Sciences has "sub-contracted" all specialized courses and the internship and practicum in clinical psychology to the Department of Clinical Psychology in the College of Health Related Professions. This College provides specialized courses and clinical affiliation for the programs of the Department of Speech in the College of Arts and Sciences (*27*).

St. Louis University offers graduate programs in five health related occupations: medical social work, dietetics, clinical psychology, speech pathology, and hospital administration. All of these programs include clinical training in a hospital or medical environment.

The University of Pennsylvania offers graduate programs in three health related occupations: medical social work, bioengineering, and clinical psychology. All of these programs include training in a medical environment.

Ohio State University offers graduate degrees in bioengineering, dietetics, and clinical psychology. The State University of New York at Buffalo offers graduate degrees in rehabilitation counseling, medical social work, clinical psychology, and speech pathology. The programs responsible for the training of health professionals outside the School of Health Related Professions are closely associated and integrated with this program through a clinical council, with representatives from all of the health fields sharing representation on this body.

Temple University currently offers a master's degree in medical technology through its Graduate School. Additional graduate work in the areas of nursing, occupational therapy, physical therapy, and medical records is planned. Indiana University offers dietetics, and has other programs in process of formation within the Graduate School of Education.

Discussion.—The vital element in the organization of these allied health programs is their location in an environment which can foster interaction and communication between the students and the staff in health related occupations.

Combining of general background courses for one or more of the health occupations has the advantage of utilizing the faculty and facilities more effectively. In addition, such combinations allow students more time and exposure before making a decision to concentrate in a specific health occupation. They also provide students with a better perspective of each of the specific health fields and the interaction of them in direct patient care. An outline of the components of a course in "basic health technology" appeared in a recent article by Robert E. Kinsinger (*22a*). He suggested that a course content be developed which would enable students to become: (1) oriented toward health service resources, (2) gain experience with medical team relationships, (3) become acquainted with legal and ethical responsibilities relating to health services, (4) gain knowledge of pathophysiology and pathopsychology, (5) learn about the diagnostic and therapeutic techniques relating to health care, and (6) develop the necessary skills in maintaining an environment which is conducive to the welfare of patients, such as record keeping, principles of asepsis, sterilization, disinfection, and antisepsis.

In addition to the combined curriculums and clinical experience, there are values in providing student facilities, such as lounges and dining rooms, which will foster and continue the communication between students. Such informal settings facilitate interaction among students and reinforce classroom relationships.

Each university must develop its own program with an organizational pattern which will maximize its strengths of faculty, facilities, and curriculum. Combinations of curriculum, faculty, and organization which will provide the most flexibility for initiating curriculum changes and the best clinical experience must be responsive to varying needs and opportunities.

Other Organizational Placements in Universities with Medical and Dental Schools

In addition to the universities with schools of allied health professions, some 50 other universities with medical and dental schools offer three or more programs of education for the allied health professions.

The fields most commonly offered, either in the medical school, the school of liberal arts, or independent schools, include medical technology, physical therapy, occupational therapy, and radiologic technology. Only a few of these institutions include programs in medical record librarianship. The dental hygiene and dental laboratory technician training programs are administered by or affiliated with the schools of dentistry.

While the majority of the programs are located in the medical school or the college of liberal arts, many of these universities have substantial programs for health services in other departments and independent schools of the university. Important examples are programs of speech therapy in schools of education; dietetics in departments of home economics; and schools of nursing, pharmacy, podiatry, and optometry. These schools often train technicians in supportive roles for their profession.

University centers with medical schools and graduate departments in the sciences, engineering, and psychology are able to offer a combination of courses leading to advanced degrees in fields directly related to health occupations. Some are bioengineering (college of engineering and medical school physiology department), biostatistics (department of mathematics and medical school), radiobiology (department of physics, medical school department of radiological science), and clinical psychology (psychology department and medical school psychiatry department).

Programs in Other Universities and Colleges

Close to 600 other universities and colleges offer specialization in one or more of the allied health occupations at the baccalaureate and graduate level. These programs are designed to permit students to combine curriculums for preparation in the allied health professions, liberal arts, and basic sciences. Approximately 60 of the schools offer programs in three or more of the allied health fields. The greatest number of programs is in medical technology (476 programs). The next largest groupings are baccalaureate degree nursing (166 programs) and speech therapy (109 programs). Smaller numbers of programs are offered in radiologic technology, medical record library science, social work, occupational therapy, and physical therapy. (See table 7.) Of the 476 schools offering medical technology programs, 279 have no other programs in the health field, while 189 offer at least one other health curriculum.

These programs generally follow the educational patterns prescribed in the minimum training essentials established by the Council on Medical Education of the American Medical Association. The programs typically follow one of two patterns—the baccalaureate degree program and the post-baccalaureate certificate program. The baccalaureate program permits students to complete 2 to 3 years of undergraduate education in liberal arts and sciences and then specialize in a health field in the last 1 or 2 years. Depending upon the course of study, the clinical experience requirement may be fulfilled either prior to or just following the baccalaureate degree.

The second type of program is the post-baccalaureate certificate program. Students with baccalaureate degrees and acceptable college prerequisites are given advanced standing in allied health programs. The academic course of study usually lasts for a year; the length of the program may vary with the background of the individual student. The required clinical training follows the didactic training.

In medical technology programs, the minimum educational requirements for a baccalaureate degree are 3 years of college plus 12 months of specialized training in a hospital school of medical technology. The colleges give students 1 year of academic credit for the 12 months of study.

In the occupational therapy and physical therapy programs, the usual pattern is for students to complete a 4-year baccalaureate program, and then fulfill their clinical training requirements. Some colleges also offer a shorter post-baccalaureate certificate program in occupational therapy and physical therapy for qualified college graduates. The required clinical experience for certification is 6 months for occupational therapy and 4 months for physical therapy. The master's degree programs for physical therapy are offered at the present time only in universities with medical schools.

Although the training for the radiologic technology program is usually 24 months, a few of the programs extend over a 4-year period and lead to a bachelor of science degree.

Some of the colleges offer experimental or unusual educational programs in the allied health fields. One school offers a special program of 3 years of professional work in occupational therapy leading to a certificate in occupational therapy rather than a college degree. This program is designed for individuals who might not qualify for admission to a baccalaureate degree program. Another college permits college graduates with appropriate backgrounds to be admitted to the final hospital year of its undergraduate programs in orthoptics and medical technology. These graduates are awarded a diploma in one of these fields.

Technical and Vocational Schools

Vocational schools have given considerable attention to the health services for many years. As early as 1950 vocational schools were preparing some 5,000 practical nurses annually. Today these schools prepare students for more than a dozen health occupations. In recent years technical and vocational programs have developed into several patterns and levels. Most important, with respect to education for the health occupations, are the technical or vocational schools which emphasize 1-year post-high school programs, and the junior or community colleges which emphasize 2-year programs. But the programs of the two types of institutions are by no means mutually exclusive.

In the past most of these programs have been operated as independent entities, with little or no interrelationship. Yet increasingly a common core is being identified that makes possible the sharing of instructors, classes, facilities, library, clinical resources, and other educational services, and centers for interdisciplinary education are being developed. These are

proving more effective in producing the kinds and quality of workers needed for the variety of occupations in the health field. Instructional equipment and facilities are being shared. Faculty for special subjects such as anatomy, bacteriology, or community health and resources, are serving all groups. And finally, these centers are providing one location and one administrative group with which health agencies in the community may communicate in relation to the training of students and placement of graduates. Further, such centers give trainees the opportunity to select from a number of occupational objectives, and they may be more readily counseled into the career best suited to their capabilities.

Junior colleges.—The 2-year community junior colleges are innovating and experimenting with programs for health technicians. The associate degree programs most frequently offered are: nursing, radiologic technology, dental hygiene, dental assistant, medical assistant, medical laboratory assistant. Other 1- or 2-year programs include: medical secretary, practical nurse, medical office assistant, dental laboratory technician, medical record technician, and occupational therapy assistant.

Two examples of such programs visited by members of this study group are St. Mary's Junior College in Minnesota and Foothill College in California. Seven training programs for the allied health occupations are offered by St. Mary's Junior College in Minneapolis. These are medical laboratory assistant, medical record technician, medical secretary, nurse-technician, occupational therapy assistant, radiologic technologist, and food service. Several additional curricula are being proposed.

All programs require a core of general education courses on which technical courses build rather directly. Some courses cut across departmental lines and are intended for all persons engaged in work in the health field. Laboratory hours, utilizing the clinical facilities of nearby hospitals and health agencies, are central to each of the programs. These students' clinical laboratory experiences, utilizing pre- and post-discussion periods, are chosen, directed, and evaluated by instructors to exploit the individual learning possibilities to the utmost.

Foothill College, one of the four community colleges serving northern Santa Clara County, in California, offers six health science programs leading to the associate of arts degree. These programs were established and designed with the cooperation of an advisory group from the community to meet the specific needs of county residents. The programs included in the curriculum are nursing, dental assisting, dental hygiene, inhalation therapy, medical assisting, and X-ray technology. This course-work is supplemented by actual clinical experience. In the medical assisting and dental assisting programs, clinical experience is conducted in local medical clinics, and selected dental offices.

Vocational schools and technical institutes.—Multidisciplinary programs offering 1-year preparation for health service have been developed under the sponsorship of State and local boards of education in Massachusetts and in Wisconsin. Others are being developed in many States, including Pennsylvania, West Virginia, Arizona, Florida, and South Carolina.

An outstanding example of this type of program is that of the Springfield Technical Institute, in Springfield, Massachusetts. This offers seven post-secondary school programs to train students in allied health occupations. The programs offered are dental assistant, medical assistant, medical laboratory assistant, surgical technician, physical therapy assistant, practical nursing, and a pilot study program for inhalation therapists. Others are planned. All are 10 months in duration except for medical laboratory assistants, 12 months, and practical nursing which is 15 months. The training facilities housed in the Institute include a dental clinic, laboratory, and classrooms. Other facilities include a five-floor building, formerly a hospital, which provides medical, surgical, and nursing laboratories; classrooms; specialized teaching units; visual aids; and a medical library. Faculty in subject fields such as anatomy, physiology, and bacteriology, may instruct in all of the programs. Clinical experience is gained in Springfield area hospitals. Cooperative hospital-school externship agreements with 16 community affiliating agencies make it possible for students to correlate theory and practice with supervised on-the-job clinical experience. The curriculum is established and revised through the recommendations of an advisory committee representing community business, industry, dental and medical professions, and hospitals. Their guidance is essential in keeping the program attuned to the medical needs of the community (49).

Educational Programs in Hospitals

The role of the hospital as a training institution has been changing over the past decades. Once the pri-

mary training ground for many health occupations, it is increasingly the locus of the clinical training and experience, as technical schools, colleges, and universities play greater roles in the education of health personnel. As educational demands increase, these institutions have accepted broad educational responsibility, while the hospitals retain the vital role of providing the clinical setting which is essential to the total educational process. The development of strong and constructive relationships between a school and its teaching hospital is essential to a good educational program.

Hospital training activities related to the allied health occupations can be categorized in three areas: they provide basic education for students enrolled in their own programs, they provide clinical experience for students of health related occupations in affiliated educational institutions, and they provide inservice training for their own staff and for new employees.

Hospitals provide basic education for many health related occupations, and clinical experience for many more. There are 781 hospital programs for nurses and 572 for radiologic technologists. Others include practical nurses (232), medical technologists (133), laboratory technologists (118), inhalation therapists (20), cytotechnologists (48), and less than 20 programs each for medical record technicians, surgical technicians, medical record librarians, and dietitians' assistants.

The radiologic technology curriculum is representative of post-secondary school programs of 2 years or less which are taught entirely within the hospital.[2] Both didactic and clinical training are under the direct supervision and responsibility of the hospital staff. Examples of other programs in this group are those for cytotechnologists, inhalation therapists, and medical record technicians. The Council on Medical Education of the American Medical Association has prepared essentials of acceptable schools for each of these occupations.

The clinical portion of most baccalaureate, associate degree, and other technical programs is provided in a hospital setting, in affiliation with the educational institution. Usually this follows a prescribed academic program in the educational institution, with clinical experience supervised in part by faculty from the affiliated school. This relationship has been discussed earlier.

[2] Preparation for this field is also offered as a baccalaureate program.

A few of the major cities have established pilot programs in which the Board of Education and the hospitals have established a joint program for the short-term training of allied health workers. In one of these programs, the public school system and the hospitals have cooperated to develop a variety of short-term intensive technical training courses in health care specialties (*17*). The adult education program includes courses for practical nurses, food service supervisors, operating room technicians, nursing aides, orderlies, and laboratory aides. Courses are being planned for physical therapy aides, occupational therapy aides, inhalation therapy aides, and social service aides. In addition they are exploring the possibilities for courses for ward clerks, housekeeping supervisors, pharmacy aides, central supply aides, electrocardiographic technicians, medical assistants, medical secretaries, and others. This particular community is now planning for a unified training center for health occupations under the auspices of the public schools and the hospitals. It would combine all courses in the same building, unify the administration, and make maximum use of the classrooms, laboratories, and instructors. Such a program can remove the cost of training from the hospital and assure quality education (*44*).

Hospitals have extensive training programs and refresher programs for health occupations under the Federal Manpower Development and Training Act program, as well as within their own resources (*19*).

Military Training Programs

Within the Department of Defense, each of the three services trains medical corpsmen, laboratory assistants and technicians, medical record personnel, dental auxiliary workers, and many other allied health workers.

An example of the military training program is that of the U.S. Naval Hospital Corps School at Great Lakes, Illinois which offers the basic curriculum of study for all navy hospital corpsmen. The basic program, which has required up to 20 weeks for completion, has currently been reduced to 14 weeks to meet the demands for hospital corpsmen resulting from increased military commitments.

The curriculum includes 560 hours of didactic and practical instruction in seven subject matter areas—theory and techniques of patient care, anatomy and physiology, first aid and emergency procedures, pre-

ventive medicine, materia medica and therapeutics, NBC warfare defense, and military requirements. All material except patient care is taught by senior enlisted men with an average of 15 years of military service as hospital corpsmen. The course work in theory and techniques of patient care is taught by Nurse Corps officers with at least a baccalaureate degree.

The corpsmen receive the majority of their patient care training after the completion of basic school through on-the-job training in the wards of hospitals and dispensaries. After completion of the on-the-job training, the hospital corpsmen may be assigned to one or more of the 35 technical specialty schools.

The instructors in the program have all been graduated from an intensive 4-week course at the Navy Instructors' Training School where they are taught to teach with excellent teaching aids. This instructors' training program demonstrates that selected persons in a technical field with long experience practicing in the field can be utilized as effective instructors with only a minimum background in the liberal arts and in instructional methodology.

One of the major implications of this program which merits consideration by nonmilitary schools is that the common core of skills and knowledge for all corpsmen has enabled the many specialists within the hospital corps to be versatile and flexible in responding to changing service needs.

Proprietary Schools

There are no adequate statistics or studies of either the quantity or the quality of commercial school programs or their graduates. Programs of commercial schools range from 3 to 18 months. Their appeal is often one of professional prestige, and of high earning power after a short course of training. The cost is usually higher than that of public institutions offering vocational education on a similar level.

The schools present several problems of public concern. First is the problem of cost, both to the school and the student. The public schools are able to meet all or part of these costs through tax support. Commercial schools must charge the student actual costs, which for a good program, must be fairly high. The students, in turn, usually do not have substantial financial resources, and are being prepared for positions which are not highly paid. Thus the school has a difficult problem in trying to meet standards on a minimal budget.

Second is the problem of professional recognition. Hospitals and other employers look for accreditation or other evidence of quality of program, or licensure or certification of the individual. These recognitions are not given to many of these programs. Thus the graduates have a handicap in finding employment.

Third is the problem of countering the educationally desirable trend of bringing education for the health occupations into the main stream of education.

On the other hand, these schools give evidence to an important fact: today's educational system is not meeting either the demand for workers on the part of employers, or the demand for training on the part of potential students.

Discussion

Planning for education in the allied health occupations must begin with certain assumptions. First of all, the demand for health services will continue to grow and will, for the foreseeable future, outstrip our capacity to produce the quantity and quality of service personnel needed.

Second is the fact of technological evolution. We must plan educational programs to provide a secure general base on which career development and mobility is possible with a minimum of wasted time and effort.

Third, since the present pattern of organization and delivery of health services is neither perfect nor unchangeable, room must be left for innovation and experimentation in the delivery of health care, types of personnel, and educational preparation.

Fourth, education and training are primarily the business of educators in educational institutions. Education for the health professions must include a substantial portion of clinical experience; yet the character and nature of that experience should be under the control of the educational institution primarily responsible for the program, to insure that the clinical exposure provides the requisite educational value.

Fifth, teachers should have preparation in teaching and in view of the fact that so many teachers in these

areas lack even a baccalaureate degree, the problem of faculty and faculty preparation is critical.

Sixth, regular planning for educational priorities is essential—nationally, regionally, and locally.

Administration and Organization

A practical and hopeful model for education at the baccalaureate level is found in the university-based school for the allied health professions, administratively equal to other colleges in the university. While the ideal setting for such a college for the health professions is in a university with a medical and dental school and with an affiliated hospital, the number of such institutions is inadequate to meet the needs. Therefore, liberal arts and community colleges will increasingly provide bases for interdisciplinary programs, with appropriate cooperative relationships with nearby medical and dental schools, medical centers, hospitals, and other health service facilities.

Parallel interdisciplinary programs are developing in junior colleges and technical and vocational institutions. The need for appropriate relationships with medical centers and hospitals must be stressed.

Curriculum

Curriculum design is central to the accomplishment of goals in education. The baccalaureate program requires a basic liberal education. The amount of material which has so far been identified as amenable to common instruction for all disciplines is rather small. Nonetheless, the possibilities of core courses for certain groups of professions has not been adequately explored. To the extent that students with different occupational objectives receive core instruction, economy in teaching will be promoted, the student's career choice will be broadened, and the functioning of the health team will be strengthened.

The major potentialities for combined instruction would seem to exist for patient-centered, laboratory-centered, and doctor-dentist related occupations. Patient-centered groups—nurses, dietitians, and physical therapists—might share courses in the principles of medicine, for example. Laboratory-centered personnel such as medical technologists might study biochemistry with medical students in the general professional training period. Dental hygienists and dentists can share instruction on some aspects of clinical technique.

Attention to core curriculum and equivalency of training is vital in both the professional and technical curriculums. Experimentation with the establishment of "career ladders" in the allied health occupations will require new types of courses. Upward mobility should be encouraged but should be linked realistically with the capabilities of the individual. While it is desirable to have certain courses in a junior college accepted for credit in a senior college, it is perhaps more important to adopt the principle of credit for attainment in a field which could be tested by examination. There should be less concern for formal course requirements, and more for grasp of knowledge and skill. Programs should be designed to facilitate progress from the technical to the more advanced levels of education and practice in the health occupations.

There is a great need for developing leadership in curriculum planning. The work of program administrators and teachers in the development of courses and teaching materials should be subsidized and otherwise encouraged. Objective studies should be made within hospitals and elsewhere in order to identify new needs both in the teaching of existing occupational groups and in the development of new types of workers.

Faculty

The lack of adequate numbers of competent faculty today constitutes the major obstacle to improvement and enlargement of education for the allied health professions. Every means available must be utilized to ensure that teachers are utilized at their maximum potential. This includes adoption of some organizational principles already mentioned, such as placing the college of allied health professions in a university with a medical school. Such placement makes possible the sharing of faculty with other departments, the development of core courses, and the increase in the number of students in a class. However, all the structural reform, in view of the tremendous need for expansion of the schools, will not make the present or anticipated future supply of faculty adequate. The first job of the schools will be to identify and encourage potential teaching talent for the future.

Although there is no magic formula for producing a good teacher, certain generally accepted standards of quality exist. First, the teachers should have

preparation more advanced than that offered by the program in which they will teach. This does not necessarily call for establishment of advanced degree programs in each of the existing allied health professions; but the competency of teachers can be strengthened by advanced education in allied fields, complementary to the particular health profession, as well as in instructional methodology.

It must be equally clear that didactic instruction alone is not enough. Instructors concerned with clinical practice should have, in addition to adequate educational experience, service responsibility. There must be an appropriate balance between the academic and clinical aspects of education, but clinical teaching should never be separated from the service environment completely.

Hospital Affiliation

For those educational programs for which hospital experience is a requisite, the teaching hospital affiliated with a medical or dental school is the ideal setting for clinical experience. However, where this is not possible, certain basic standards should be met. The hospital should have sufficient patient population to provide an adequately varied experience. It should have a full-time house staff. The teaching staff in the allied health professions should have faculty appointments in the appropriate educational institution. The practical experience of the students should be under the direction of such faculty members.

Accreditation

Accreditation has been one of the important methods by which standards of excellence have been upheld in educational programs in the United States. In the field of higher education generally, accreditation (defined as a process whereby an agency or organization recognizes certain institutions or programs as meeting predetermined standards of quality) has taken three main forms: approval of schools or programs by State departments of education or other State agencies; accreditation of *programs* of study by national professional organizations; and accreditation of *schools* by regional associations of schools and colleges.

Accreditation by professional organizations was begun by the American Medical Association in 1906. In the health field the National Commission on Accrediting now recognizes professional agencies which grant specialized program accreditation in the following fields: Medicine, dentistry, nursing, dental hygiene, medical record library science, medical technology, occupational therapy, optometry, pharmacy, physical therapy, psychology (clinical), public health, and speech pathology and audiology.

The Council on Medical Education of the American Medical Association, in addition to accrediting programs in medicine, has developed minimum standards for, and grants "approval" or accreditation of, schools or programs for medical technologists, radiologic technologists, occupational therapists, physical therapists, medical record librarians, medical record technicians, cytotechnologists, and inhalation therapists.

In the health field, as in the field of higher education as a whole, accreditation of particular occupational programs has been largely confined to those at the senior college or graduate level. At the junior college level, the prevailing pattern is that of accreditation of the general education program of the college by the appropriate regional association. In some States, certain health occupation training programs are approved by State agencies or boards.

With the development of an increased number and variety of allied health occupations, a question arises as to the appropriate role of professional organizations in the accreditation process. Today various centers of leadership in the community have a legitimate concern with the character and quality of education in the health occupations. Among these are educators, practitioners, State licensing boards, employers, and lay groups.

The individual professional organizations can be expected to continue to play a key role in accreditation. However, as we move toward new kinds of training centers and programs in education for the health services, we need flexibility and experimentation in the evaluation and maintenance of quality in curriculum content. There is growing interest on the part of accrediting organizations in experimenting with various mechanisms both in evaluating institutions and specific programs. For instance, some attention is being given to mechanisms whereby accrediting agencies assessing a college as a whole, use on their assessment teams evaluators named by professional organizations. In this way the professional organizations concerned have opportunity to give of their knowledge and skills in the accreditation process, in

relation to the total education program. There is need to experiment with varying kinds of membership on accrediting bodies with a view to developing and evaluating different means of joint accreditation of a variety of programs within a single institution. Such membership might, for example, include representatives of the relevant professions, regional accrediting associations, users of health services, and even under certain conditions some government agencies. In an area such as health, where the public interest is so great, the need for quality evaluation of the health training as such is essential. At the same time it is necessary to develop a realistic balance between such quality assessment and the assessment of the institution as a whole. The overall objective, of course, must be to assure excellence in the training of persons who will be rendering health services, while meeting in the most relevant and effective manner the ever changing needs for such services.

Program Planning and Development

So much of this report stresses the need for integration in the teaching of allied health personnel that it may seem redundant to restate the concept. The school of allied health professions must have the most intimate relationship with other health professions to make possible the fullest development of the team approach to health care. One way to make this possible is to encourage team instruction in the clinical setting. For example, the total care of the rehabilitation patient involves the physician, nurse, dietitian, occupational and physical therapist—each with different services to offer, but each made more effective in association with other colleagues.

Relations with other divisions of the universities are also significant—particularly in the basic sciences related to health. To assure opportunities for upward mobility of students trained initially at lower levels, colleges of allied health professions should also be intimately related to technical training centers, probably the most significant of which, in the future, will be those in junior colleges.

The direction of national planning in such areas as hospital construction and specialized patient care is toward regionalization. Likewise, the allied health professions must recognize community needs on a regional basis and make realistic plans in conjunction with hospitals, junior colleges, and universities to meet these needs. Where a university medical center-based program exists, it should lead the way in such planning, working jointly with junior colleges, technical and vocational schools, hospitals, and public health agencies in the area. The important thing, however, is not who provides the leadership, but that all the vertically as well as horizontally related groups contribute to the solution of community problems on a cooperative basis.

As a permanent responsibility, the planning group should recommend priorities for expansion and inauguration of educational programs based on: (a) health service needs of the community; (b) skills and knowledge required by health personnel; (c) identification of educational experiences required; (d) selection of appropriate educational institutions to provide these experiences; (e) plans for preparing instructors; and (f) follow-up and evaluation of graduates.

Recruitment

If this Nation is to have sufficient health personnel, we must attract young people to careers in the health occupations and provide them with information about health careers and the kinds of opportunities which exist to prepare them for such careers. These tasks will require major effort on the part of communities, States, and the Federal Government. Voluntary agencies and the public schools must be participants in this essential effort.

Among the important factors which must be given greater attention are these: the need to project a true picture of the health professions today and the related requirements for ability and education; the need to provide counseling which will direct applicants into educational programs appropriate for their interests and abilities; and the need to enlarge the recruitment pool by including age groups, minority groups, and others presently restricted from some schools.

There is considerable evidence that adequate and accurate information is not reaching potential recruits in many secondary schools throughout the country. Guidance counselors and school officials are often unaware of the opportunities for students in the various types of educational programs and of the appropriateness of each for the different types of students. Particularly serious is the general lack of public understanding of many of the health professions and their requirements for higher than average students and many more college-bound students.

Chapter IV

The Output of Educational Programs

The preceding chapter discussed the educational programs for allied health workers. The present chapter will deal with the location of these programs, their output, and the number of graduates in relation to young people, to total population, and to hospital beds. It will also suggest the relative needs for additional training centers in various parts of the country.

It should be noted here again that nursing, pharmacy, optometry, engineering, and certain other professions are outside of the scope of this report. The occupations on which the following discussion is based are listed in table 8. They include programs at the baccalaureate, associate degree, and 1-year post-high school level.

Table 8. Number of educational programs and number of jurisdictions with programs for selected allied health occupations: 1965
(Baccalaureate and less than baccalaureate)

Occupation	Number of programs	Number of jurisdictions [1]
Medical technology	692	52
Radiologic technology	693	51
Laboratory technician and assistant	147	36
Dental hygiene	55	32
Cytotechnology	75	32
Dental assistant	94	30
Physical therapy	42	23
Occupational therapy	32	21
Medical record library science	29	21
Medical office assistant	43	15
Inhalation therapy	25	13
Medical record technician	14	13
Dental laboratory technician	11	9
Surgical technician	12	9

[1] Includes 50 States, District of Columbia, and Puerto Rico.

Source: Compiled from data in appendix tables 1 and 2.

Distribution of Educational Programs

Programs of training for the allied health occupations are very unevenly distributed throughout the United States. While there are medical technology programs in every State, less than half of the States have educational opportunities for medical record librarians, physical therapists, and occupational therapists (table 9).

The distribution of baccalaureate level and less than baccalaureate level programs for each of these fields are shown by State and geographic division in appendix tables 1 and 2. These show strikingly how limited are the opportunities for preparation for these occupations.

Table 9. Baccalaureate graduates in relation to young people for selected allied health professions, by geographic division: 1965

Geographic division	Total	Medical occupations [1]	Dental hygiene
	Graduates per 100,000 persons age 18 years		
United States [2]	135.6	124.8	10.8
New England	182.1	182.1	—
Middle Atlantic	102.6	95.3	7.3
South Atlantic	76.8	73.5	3.3
East South Central	49.7	49.2	0.5
West South Central	118.1	118.1	—
East North Central	181.7	163.4	18.3
West North Central	272.2	248.9	23.3
Mountain	137.0	137.0	—
Pacific	151.2	119.6	31.6

[1] Includes medical record library science, medical technology, occupational therapy, physical therapy, and radiologic technology.
[2] Includes Puerto Rico.

Source: Computed from data in appendix table 3.

Distribution of Graduates

In 1965 there were 13,500 graduates of the selected allied health occupations discussed in this chapter. Of this number, 3,800 were at the baccalaureate level and 9,700 at less than baccalaureate level (appendix tables 3 and 4). At the baccalaureate level, the largest number of graduates was in medical technology (2,000), followed by physical therapy (870) and occupational therapy (460,

At less than baccalaureate level, radiologic technology had the largest number of graduates (3,140). There were 1,480 graduates of programs for dental assistants, 1,320 for medical technology, and 1,190 for dental hygiene.

The number of graduates at the baccalaureate level is shown for each State in appendix table 3, while appendix table 4 contains parallel data for those programs at less than baccalaureate level.

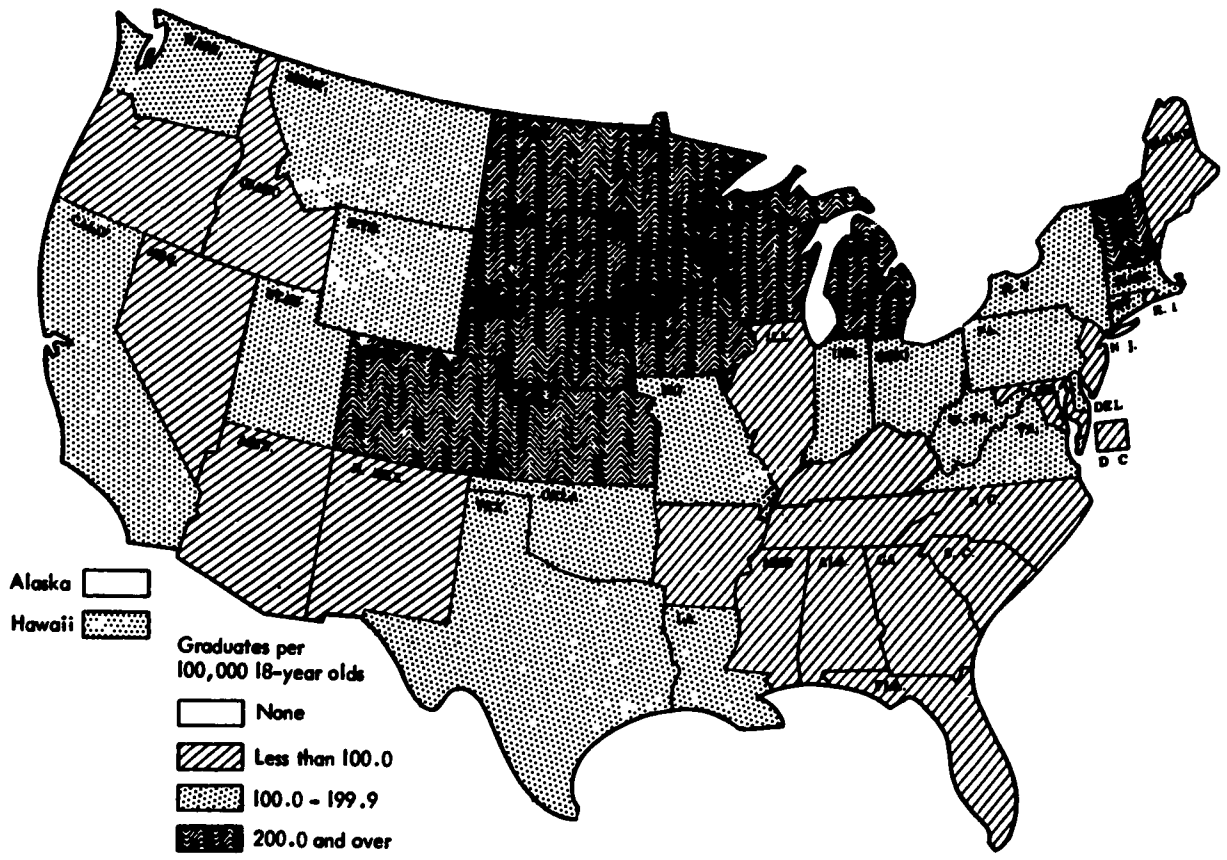
Annual Graduates in Relation to Young People

To measure the extent to which the various parts of the United States are providing training opportunities in the allied health occupations for their own young people, the annual number of graduates has been related to the number of young people in each State and geographic division. In the following discussion the rate is computed as the number of graduates per 100,000 18-year-olds.

In fig. 3 the rate of baccalaureate graduates in relation to young people is shown for each State. Ten States in the New England and North Central parts of the United States had rates of 200 or more graduates per 100,000 young people. Most of the 19 States with rates of less than 100 were in the South.

There were 351 graduates at less than baccalaureate level per 100,000 young people (table 10). The East South Central States had only 222 such graduates per 100,000 while the New England States had 571. The rates for graduates at less than baccalaureate level are shown for each State in fig. 4. The lowest rate was 90 in Mississippi; the highest, 775 in Vermont. Ten States had rates of less than 200 while 17 had rates of 400 or more. The rates for baccalaureate and less than baccalaureate programs together can be seen in fig. 5.

Fig. 3. Baccalaureate graduates of programs in selected allied health professions in relation to young people: 1965



See appendix table 3 for a list of the professions included.

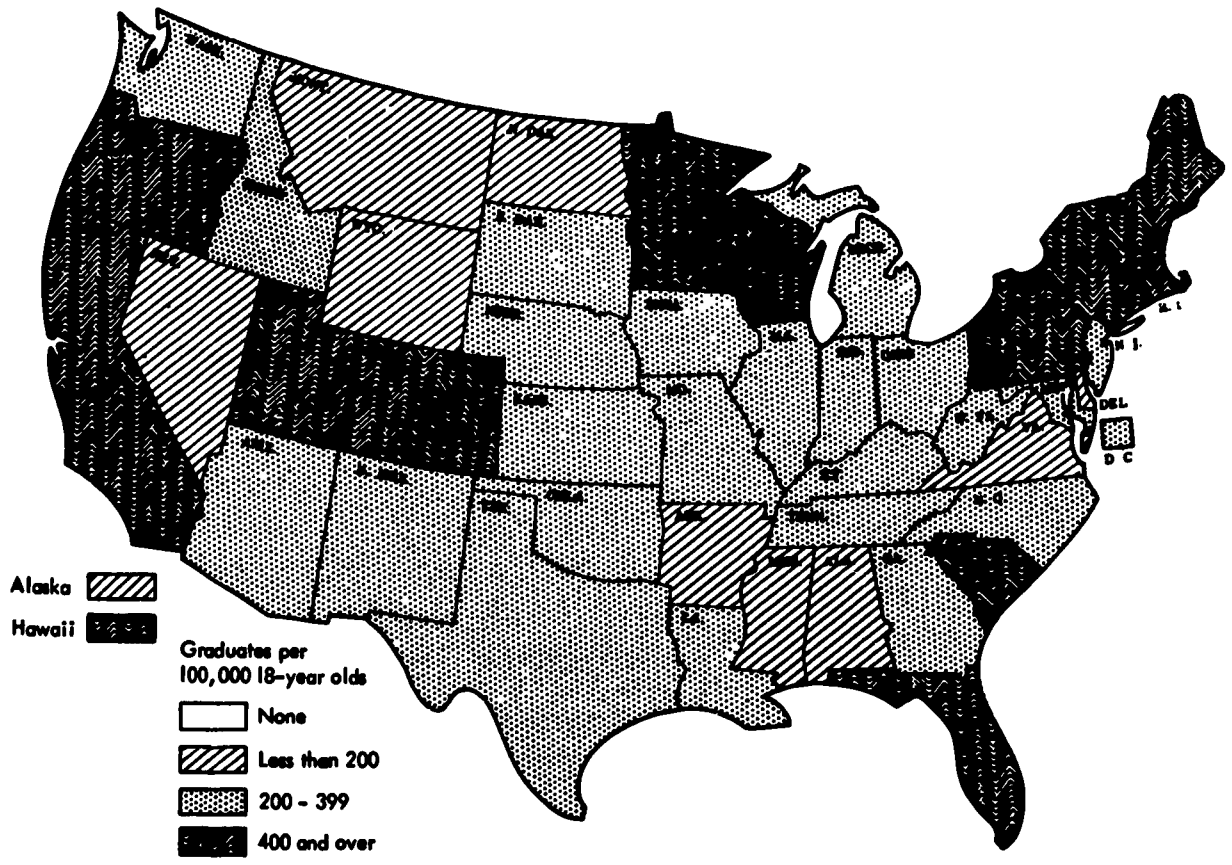
Table 10. Graduates at less than baccalaureate level in relation to young people of programs for selected allied health occupations, by geographic division: 1965

Geographic division	Total	Medical occupations [1]	Dental occupations [2]
	Graduates per 100,000 persons age 18 years		
United States [3]	340.7	238.1	102.6
New England	566.0	382.0	184.0
Middle Atlantic	397.0	258.7	138.3
South Atlantic	267.2	201.1	66.1
East South Central	221.6	164.9	56.7
West South Central	214.1	184.6	29.5
East North Central	338.1	263.0	75.0
West North Central	349.1	287.3	61.8
Mountain	372.3	277.5	94.8
Pacific	469.5	225.9	243.6

[1] Includes medical record library science, medical technology, laboratory technician, medical record technician, radiologic technology, cytotechnology, inhalation therapy technician, surgical technician, and medical office assistant.
[2] Includes dental assistant, dental hygiene, and dental laboratory technician.
[3] Includes Puerto Rico.

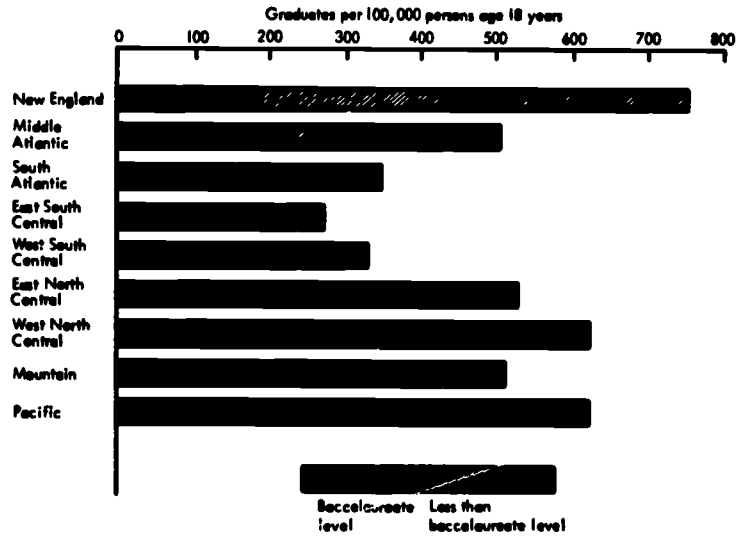
Source: Computed from data in appendix table 4.

Fig. 4. Graduates at less than baccalaureate level of programs in selected allied health occupations in relation to young people: 1965



See appendix table 4 for a list of the occupations included.

Fig. 5. Graduates of programs in selected allied health occupations in relation to young people in each geographic division: 1965



See tables 9 and 10 for a list of occupations included.

The foregoing discussion has been related to academic level. Dental hygiene, medical record library science, medical technology, and radiologic technology are each considered as an occupational grouping in the following paragraphs, with baccalaureate and certificate graduates considered together.

Dental Hygiene

In the country as a whole there were 54 dental hygiene graduates per 100,000 young people in 1965. The lowest rate among the States which had any graduates was 17 per 100,000 young people in North Carolina; the highest was 258 in Vermont. Fig. 6 shows the range of rates among the States as well as the location of baccalaureate and certificate programs. The highest rates were in the Northeast and North Central States, Florida, and Oregon. A broad band of States across the South, the West North Central, and Southwest States had no programs at all.

Medical Record Library Science

There were 6.3 graduates of programs in medical record library science per 100,000 young people. Only 21 States had such programs (fig. 7). In these States the lowest rate was 2.1 for New York, the highest was 37.6 for Nebraska. Only five States had rates higher than 15 per 100,000 18-year olds.

Occupational Therapy

For the country as a whole, there were 17 occupational therapy graduates per 100,000 young people. New Hampshire had the highest rate, 240; while Pennsylvania had the lowest, 8 (fig. 8). Only Minnesota and North Dakota along with New Hampshire had rates of 75 or more. Twenty-nine States, mostly in the South and in the Mountain States, had no programs in occupational therapy.

Fig. 6. Dental hygiene graduates in relation to young people and location of programs: 1965

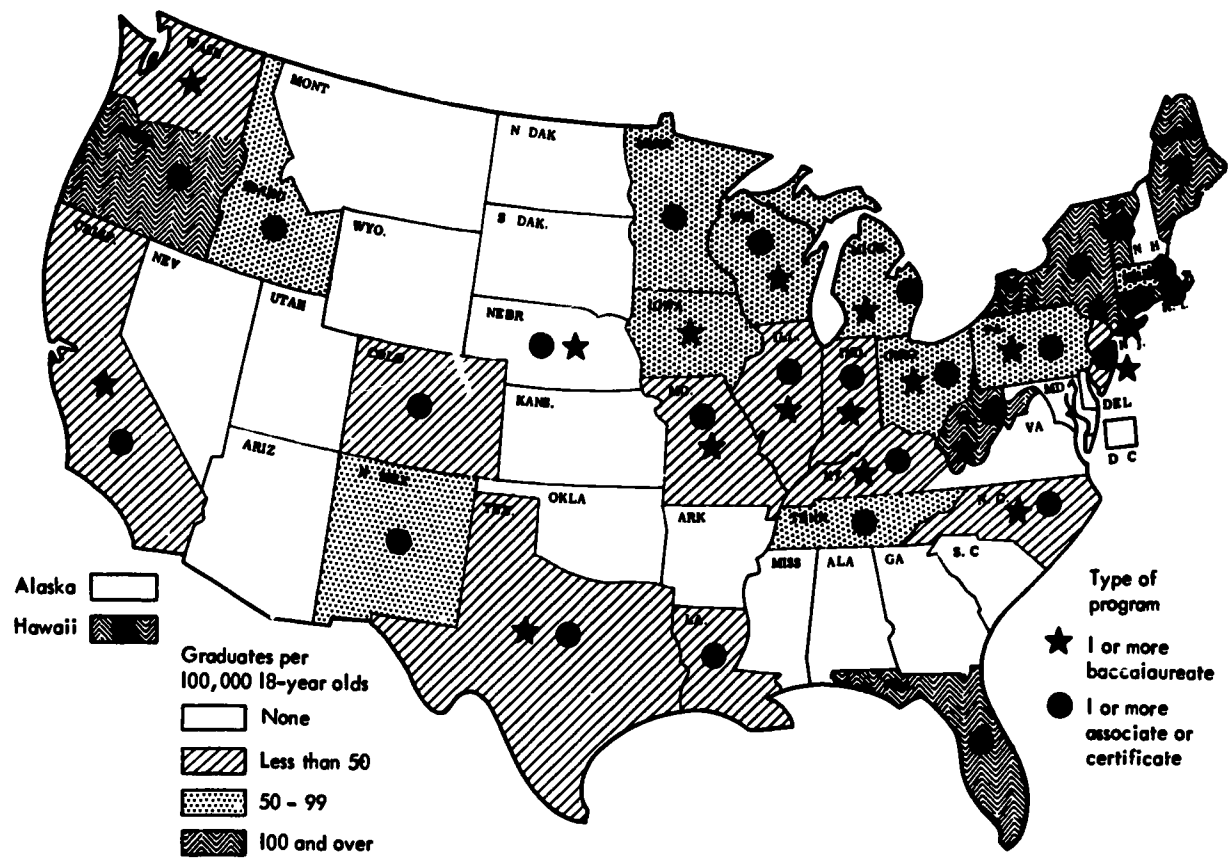
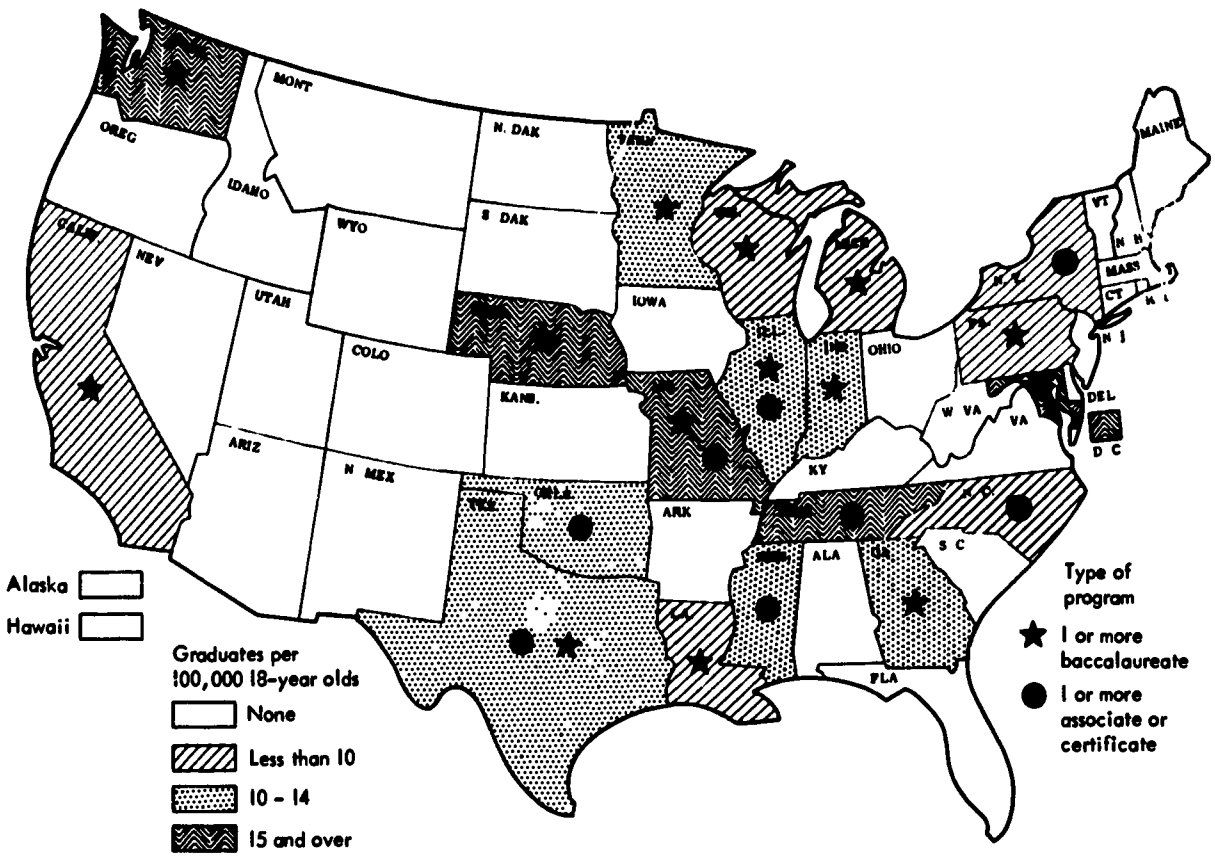


Fig. 7. Medical record librarian graduates in relation to young people and location of programs: 1965



Physical Therapy

The number of physical therapy graduates in relation to young people varied from 11 per 100,000 young people in Florida to 145 in Connecticut, with an average for the United States of 32 (fig. 9). Five States had rates of 75 or more while 28 States had no programs in physical therapy. These States with no programs were located principally in the South and Mountain States.

Medical Technology

All States had medical technology graduates. The rates per 100,000 young people varied from 24 in South Carolina to 253 in Nebraska. The rate for the United States was 121. There were 19 States with rates of 150 or more, mostly in the central part of the United States (fig. 10).

Radiologic Technology

In the United States the average number of radiologic technology graduates was 115 per 100,000 young people. All States except Alaska had graduates (fig. 11). The rates ranged from 28 in Mississippi to 420 in Vermont. The rates of 150 or more were largely in the New England States and the West North Central States. Almost all States in the South and West had rates of less than 100.

Fig. 8. Occupational therapy graduates in relation to young people: 1964

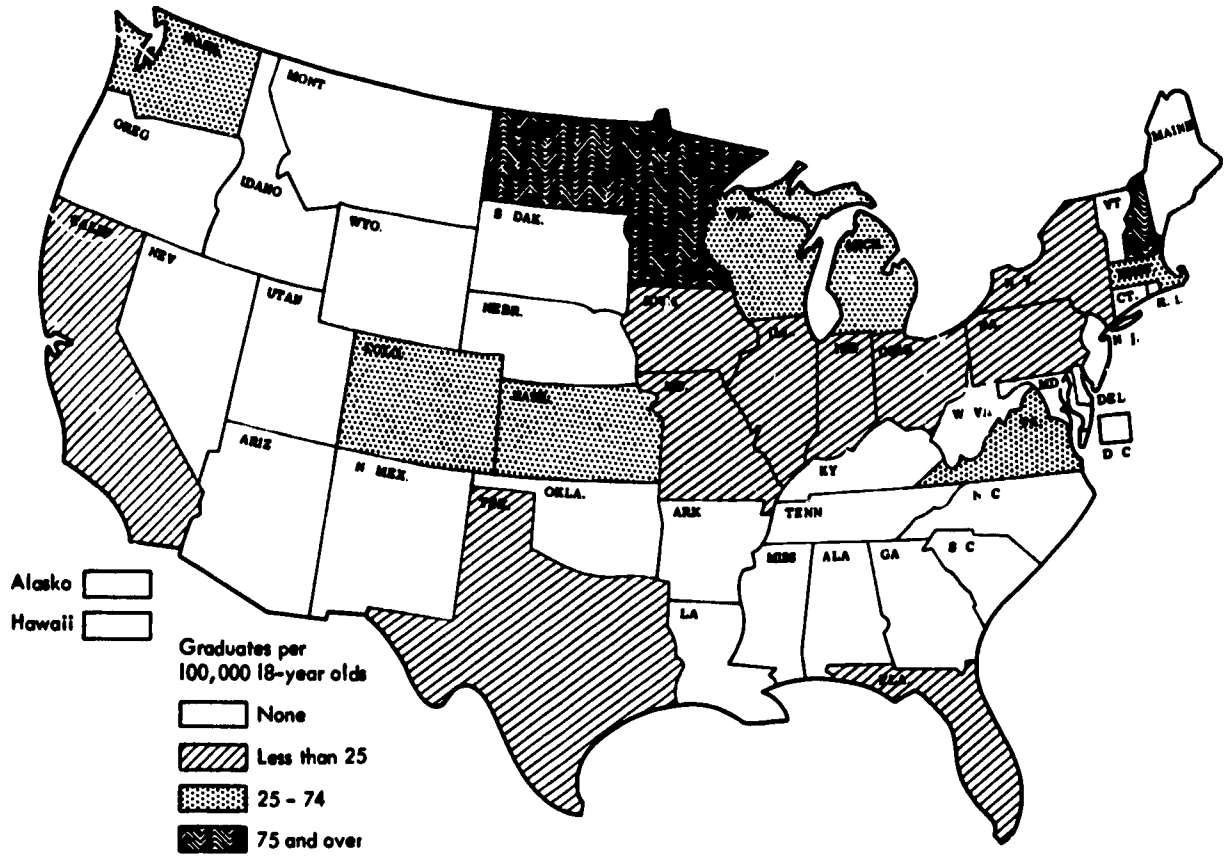


Fig. 9. Physical therapy graduates in relation to young people: 1964

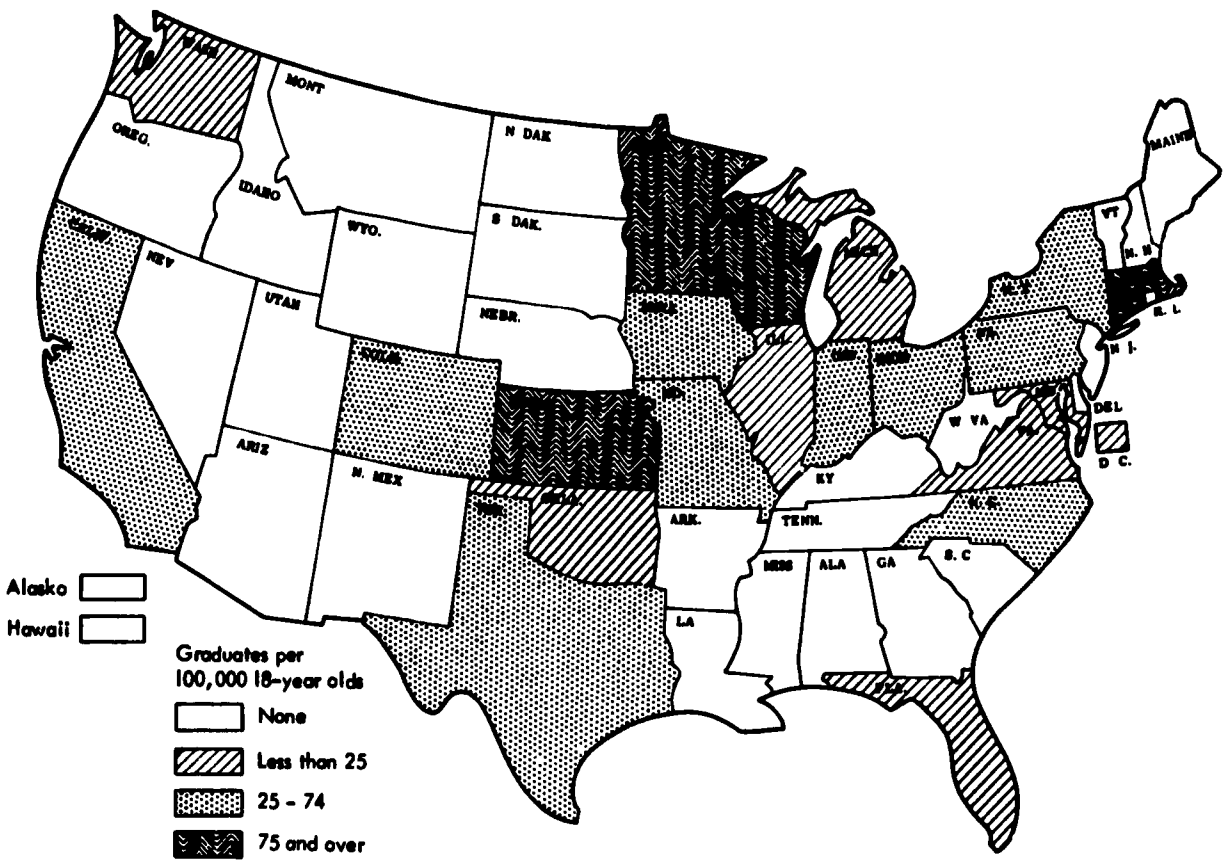


Fig. 10. Medical technology graduates in relation to young people and location of programs: 1965

(All States have 1 or more baccalaureate programs)

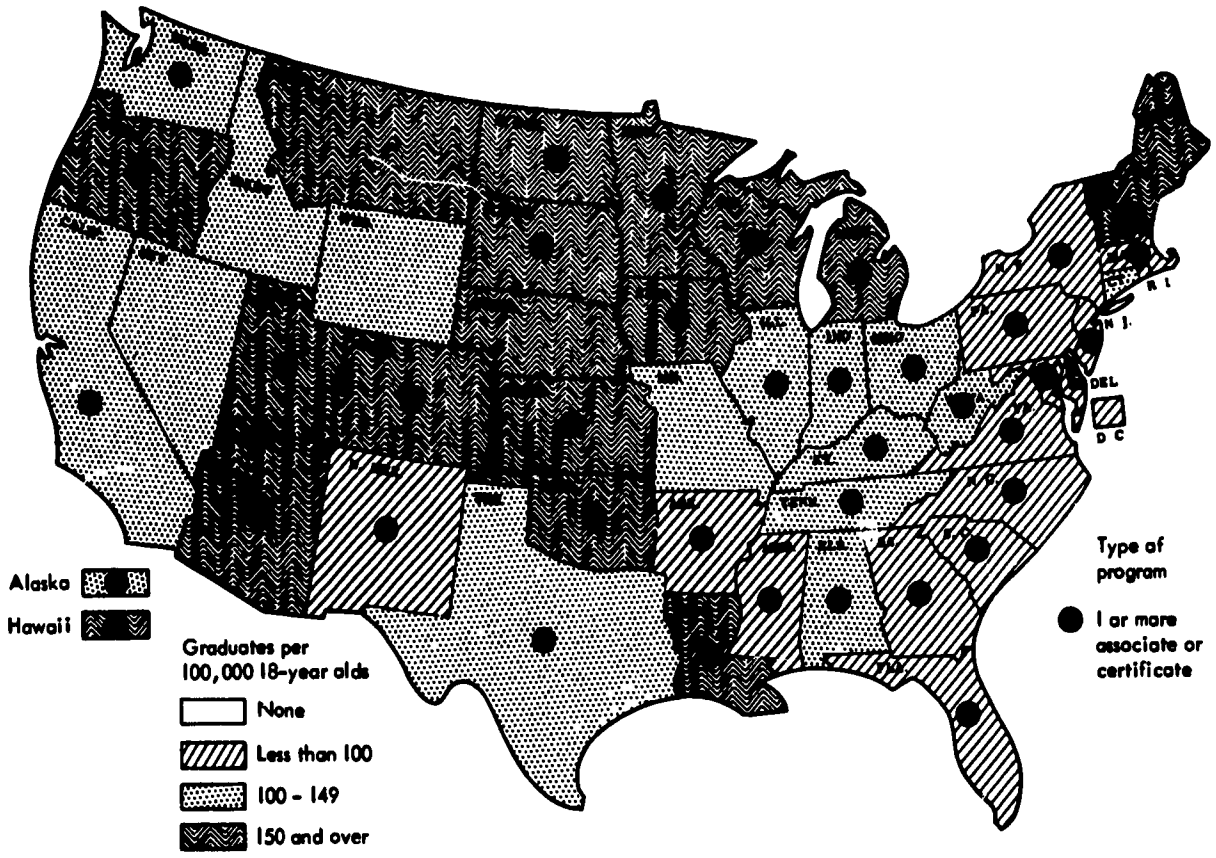
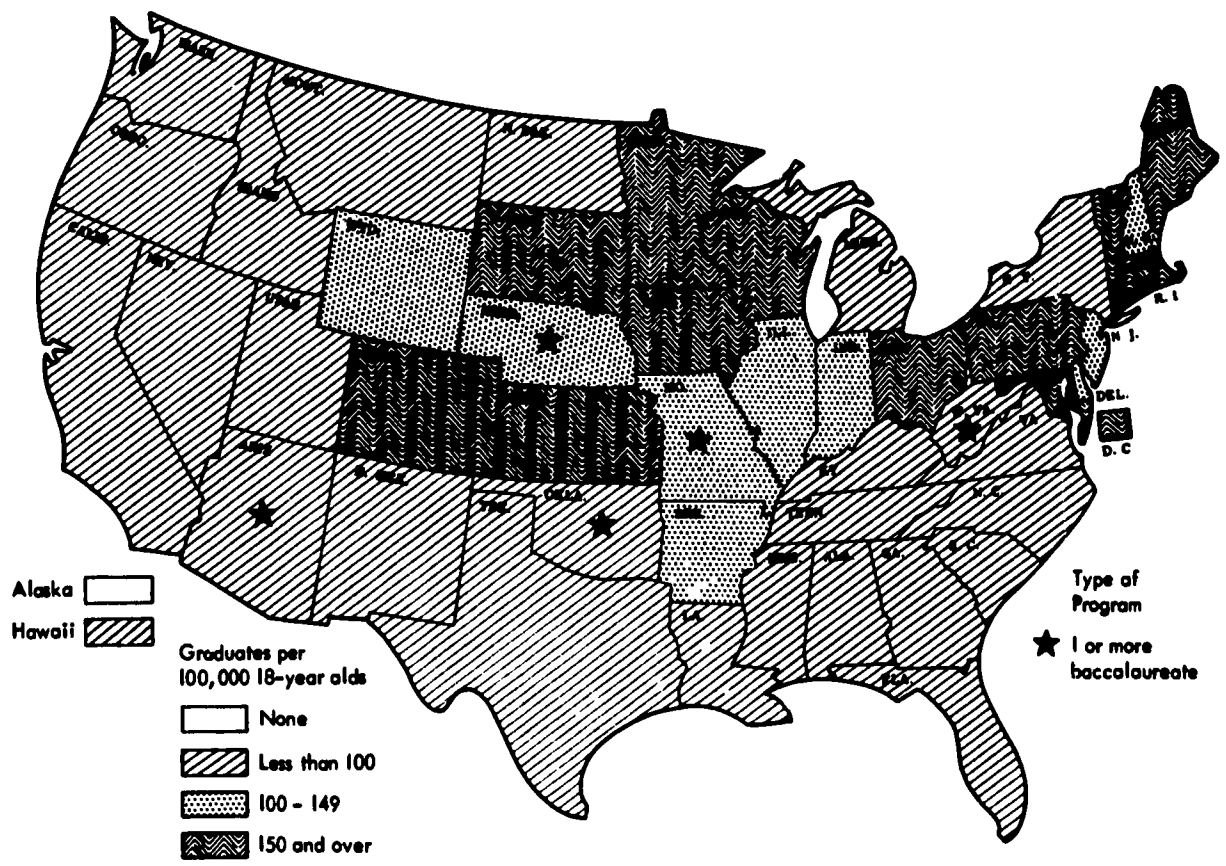


Fig. 11. Radiologic technology graduates in relation to young people and location of programs: 1965

(49 States have 1 or more associate or certificate programs)



Annual Graduates in Relation to Total Population

The preceding section was concerned with the distribution of training opportunities in relation to the potential pool from which students could be drawn. It could be argued that to measure the need the output might be more appropriately measured in relation to the total population to be served.

In the United States there were 1.9 baccalaureate graduates a year per 100,000 total population while graduates at less than baccalaureate level of selected allied health occupations averaged 5.0 per 100,000 total population (appendix table 6).

For baccalaureate and less than baccalaureate programs combined, the number of graduates in relation to total population was 6.9 for the United States. The differences among geographic divisions were much the same as we have seen in relation to the number of young people.

Annual Graduates in Relation to Hospital Beds

Since so many graduates of the selected allied health occupations are employed in hospitals, the number of annual graduates (baccalaureate and less than baccalaureate) in the foregoing occupational groups (excepting those related to dentistry) has been related to hospital beds (table 11). There were 6.0 such graduates per 1,000 hospital beds in the United States as a whole. The Mountain States had the highest rate, 9.1; and the Middle Atlantic States the lowest, 4.4.

Table 11. Graduates of programs of education for selected health occupations allied to medicine and relation to hospital beds, by geographic division: 1965

Geographic division	Number of graduates [1]	Hospital beds	Graduates per 1,000 beds
United States [2]	10,171	1,713,780	5.9
New England	849	124,518	6.8
Middle Atlantic	1,697	394,106	4.3
South Atlantic	1,180	250,793	4.7
East South Central	457	94,063	4.9
West South Central	851	130,442	6.5
East North Central	2,234	334,766	6.7
West North Central	1,241	142,558	8.7
Mountain	481	53,046	9.1
Pacific	1,115	179,230	6.2

[1] Includes both baccalaureate and less than baccalaureate graduates in medical record library science, medical technology, occupational therapy, physical therapy, radiologic technology, cytotechnology, laboratory technician, medical record technician, inhalation therapy technician, surgical technician, and medical office assistant.
[2] Includes Puerto Rico.

Source: Computed from data in appendix table 5.

Needs For New Programs

The 1966 hospital and extended care facilities survey referred to earlier in this report showed budgeted vacancies for about 11,000 allied health workers in the categories shown in table 12. These are all of the occupations discussed above, except those related to dentistry, plus needs for an additional 22,000 workers to provide optimum patient care. This means a present need for some 33,000 more workers in these occupations, in contrast to a present annual training capacity of a little over 9,000. A modest immediate goal, then, would be to double the present output.

For baccalaureate programs, this would mean raising the annual rate of graduates from 1.9 to 4.0 per 100,000 total population. For graduates at less than baccalaureate level this would mean raising the graduation rate from 5.0 to 10.0.

The rate of 4.0 baccalaureate graduates per 100,000 population is currently the rate in the geographic division with the highest rate, West North Central. If this rate were applied to each State with a lower rate (keeping the present rates for the eight States with higher than 4.0) the number of graduates for the country as a whole would be increased from the present 3,800 to a total of 8,000.

The rate of 10.0 graduates for programs at less than baccalaureate is now reached by only three states—Vermont, Colorado, and Oregon. If this rate were reached by each State with a lower rate, the number of graduates would be increased from the present 9,700 to a total of 20,000.

The additional number of annual graduates in the selected allied health occupations needed to bring each State up to 4.0 and 10.0 respectively is summarized below:

Additional number of graduates needed	Number of States: Baccalaureate level	Number of States: Less than baccalaureate level
Total.....	50	50
None, or less than 25..	18	6
25-49	8	9
50-99	10	5
100-149	5	6
150-199	2	8
200-249	2	2
250-299	2	4
300 and over.....	3	10

The detail is shown in appendix table 7.

These figures are presented simply as a basis for discussion—a first approximation for program planning inquiry.

Table 12. Needs for selected allied health personnel in hospitals and extended care facilities and annual number of graduates

Occupation	Additional needed for optimum care 1966	Annual graduates 1965
Total	33,200	9,353
Medical technologist	9,200	3,300
Radiologic technologist	3,900	3,200
Laboratory technician	2,500	737
Medical record personnel:		
Professional	1,900	170
Technical	1,900	70
Surgical technician	3,900	78
Cytotechnologist	500	325
Occupational therapist	3,100	450
Physical therapist	4,100	870
Inhalation therapy technician.....	2,200	153

Source: Column 1 was estimated on the basis of returns from 5,300 hospitals and 499 nursing homes; column 2 from appendix tables 4 and 5.

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American Medical Association, Council on Medical Education with the cooperation of American Society of Clinical Pathologists and American Society of Medical Technologists. Essentials of an Acceptable School of Medical Technology. Revised to December 1, 1963.

——— with the cooperation of American Society of Clinical Pathologists. Essentials of an Acceptable School of Cytotechnology. Revised to December 1, 1962.

——— with the cooperation of American College of Radiology and American Society of Radiologic Technologists. Essentials of an Accredited School of X-ray Technology. Revised to June 16, 1960.

——— in collaboration with American Physical Therapy Association. Essentials of an Acceptable School of Physical Therapy. Revised to December 1, 1955.

——— in collaboration with American Occupational Therapy Association. Essentials of an Accredited Curriculum in Occupational Therapy. Revised to December, 1965.

——— with the cooperation of American College of Chest Physicians and American Association of Inhalation Therapists. Essentials of an Acceptable School for Inhalation Therapy Technicians. December 1, 1962.

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Association of American Medical Colleges, April 1965, 107 pp.

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Appendix A

Summary of Aid Available for Education and Training of Allied Health Personnel Under the Allied Health Professions Personnel Training Act of 1966 (P.L. 89-751)

Type of grant	Type of aid [1]	Extent of support	Amount of aid (millions)
Grants for construction of new, expanded or improved teaching facilities	Grants for up to 66⅔% of costs of construction of new schools or major expansion of existing schools; 50% of costs of minor expansion, renovation, or replacement	Accredited training centers for allied health professions eligible for aid	No funds provided for fiscal year 1967
Improvement grants	Formula grants and project grants to schools for improvement of educational programs; no matching required	Same as above	$2.8 (approximate share of 1967 appropriation)
Advanced traineeships	Support for traineeships for advanced training of individuals preparing to be teachers, supervisors, administrators, specialists; no matching required	Training centers for allied health personnel which are affiliated with a medical or dental school may apply for grants	$0.75 (approximate share of 1967 appropriation)
Project grants for curriculum development	Project grants for curriculum development; no matching required	Same as construction grants above	$0.2 (approximate share of 1967 appropriation)

[1] Aid available for junior college, baccalaureate, and graduate or specialized levels of training.

Appendix B

Annotated Bibliography of State Reports on Allied Health Manpower

Alabama

Dunbar, John B. Expanding Needs in the Paramedical Professions. *University of Alabama Extension News Bulletin* 23:1-3, August 1965.

Total job openings in 1965.

"The Health Careers Council, from interviews with leaders around the state, estimates that Alabama could now provide aproximately 7,000 jobs in the health-related professions. Most of these are in the field of nursing. This number does not include jobs for sub-professional personnel such as orderlies, file clerks, and assistants of various sorts. If we added these, more than 17,000 jobs would now be open .... Regardless of the route that is taken, the state must divest itself of the notion that paramedical workers are a by-product of routine hospital and university operation."

Alaska

Clark, Dean A. and Associates. Health Service Resources, A Profile of the State of Alaska. Pittsburgh, Pa., Graduate School of Public Health, University of Pittsburgh, April 12, 1965, 52 pp.

Ratio of M.D.'s, R N.'s and psychologists to 1960 population.

"In the category of technicians, either medical or dental, therapists and other health workers, the State of Alaska falls considerably behind the United States averages. This is applicable also in the fields of practical nursing, midwives, pharmacists, dietitians, dentists, and optometrists."

Arizona

Interim Report of the Joint Committee to Study Nursing Needs and Resources in Arizona. *Arizona Nurse* 18:23-38, November-December 1965.

R.N. enrollment in 1965 was 1,089
R.N. enrollment needed by 1975 to meet goal is 1,500
L.P.N. enrollment in 1965 was 164
L.P.N. enrollment needed by 1975 to meet goal is 700

Nurses for Arizona Committee. Nurses for Arizona. The Committee, May 1964.

"By 1970, it is estimated that Arizona will need 7,700 or an increase of 2,563 registered nurses."

Arkansas

Statistical Report of the Arkansas State Board of Nurse Examiners January 1, 1965 to September 1, 1965.

Nursing figures, present only.

"Based on 350 per 100,000 population, we need 6,252 R.N.'s and we only have 2,595."
"Based on 233 per 100,000 population, we need 4,162 L.P.N.'s and we only have 2,690."

California

State of California, Department of Public Health, Division of Community Health Services. Compensation of Full-time Professional and Technical Public Health Personnel in Local Health Departments in California. March 1965.

In public health departments, there are 408 vacancies out of a total budgeted force of 5,539. This includes 103 vacancies of 1,774 budgeted positions in nursing, and 32 vacancies of 129 positions in therapy, both occupational and physical.

State of California, Department of Public Health, Division of Public Health Training. Health Manpower Needs in California. [no date, 47 pp.] (mimeographed)

For 20 health occupations gives numbers currently employed, numbers needed by mid 1970's, and numbers presently being trained.

Georgia

Fincher, Cameron. Nursing and Paramedical Personnel in Georgia, A Survey of Supply and Demand. Atlanta, Georgia, Georgia State College, December 1962.

Of 11 occupations surveyed, the need by 1970 was estimated at 21,329. Of this figure, the maximum number that can be trained under present conditions is 7,416.

Hawaii

Kosaki, Mildred D. Nursing and Nursing Education in Hawaii. Report No. 3. Honolulu, Legislative Reference Bureau, University of Hawaii, 1962, 117 pp.

Present supply and 1970 needs.

Using a ratio of 350 nurses per 100,000 population, the Western Interstate Commission for Higher Education estimated in 1960 that Hawaii would need in 1970 a total of 1,889 additional nurses including all levels of training, and that this would mean 189 annual graduates needed. In 1960, Hawaii had an annual 107 graduates. This compares with a figure of 108 annual graduates in 1958.

Idaho

Consultants from the Department of Medical and Hospital Administration of the Graduate School of Public Health, University of Pittsburgh. Hospital and Health Resources in Idaho. Boulder, Colorado, Western Interstate Commission for Higher Education, May 1964, 20 pp.

Ratios to 1960 population for several occupations.

"Idaho's 235 registered nurses in active practice per 100,000 population is somewhat lower than the national ratio of 297 R.N.'s per 100,000 population. Idaho has only 5.2 social workers and but 0.8 occupational therapists per 100,000 while the country at large has 19.5 social workers and 3.7 occupational therapists per 100,000. Data for other professions indicate that Idaho does rather poorly in the case of dietitians, physical therapists, podiatrists, and psychologists."

Illinois

Health Careers Council of Illinois. IHA Study Reveals Massive Increase in Personnel Vacancies. *Pathways* Issue No. 1, November 1965.

Total budgeted vacancies 1963, 1965.

"All doubts about the extent of personnel vacancies in Illinois hospitals have been removed by the just released study of budgeted hospital personnel vacancies, conducted by the Illinois Hospital Association. Total budgeted vacancies have increased 79% from 1,950 vacancies reported in 1963 by 2[illegible] hospitals to 3,485 reported in 1965 by only 270 hospitals. Add your own estimate of the number of non-budgeted vacancies that exist as well as the number of vacancies existing in Illinois hospitals not responding to the survey."

Indiana

Indiana Employment Security Division, Research and Statistics Section. Occupational Shortages in Indiana Hospitals. Indianapolis, The Division, November 1963, 12 pp.

Present needs and present training capacities.

"The majority of the hospitals cannot train personnel for their needs. Training programs are both costly and time consuming, and many hospitals have neither the funds nor the facilities for conducting training."

Kansas

Gentry, Frank L. Education is Helping to Solve Long-Standing Personnel Shortages. *Hospitals* 39: 55-60, June 1, 1965.

Figures from 117 reporting hospitals.

"Only recently, 117 hospitals in Kansas responded to a hurried survey and tallied 1168 job openings in some 28 positions for which they would have immediately employed a trained person if he had been available. Kansas now has six schools, providing 12-month courses for licensed practical nurses; it seems safe to predict that Kansas hospitals could absorb the graduates of 15 L.P.N. schools . . ."

Kansas Health Facilities Information Service, Inc. A Study of Nursing Needs and Goals in Kansas Through 1975. Pub. No. 108. August 1965, [47 pp.].

R.N.'s: Employed, 1964—6,203
Needed, 1964—7,002
Needed, 1975—7,913

L.P.N.'s: Employed, 1963—1,096
Needed, 1964—3,867
Needed, 1975—4,711

Committee on Manpower, Governor's Council on Mental Retardation. Report on Initial Meeting, March 4, 1965.

Mental health personnel needs—1965 and 1976.

Kentucky

Teague, Russel E. Health Manpower Statistics. February 7, 1966 (unpublished).

Present supply for many health occupations.

Minnesota

Health Manpower Study Commission. Health Manpower for the Upper Midwest. A Study of the Needs for Physicians

and Dentists in Minnesota, North Dakota, South Dakota, and Montana. St. Paul, Louis W. and Maud Hill Family Foundation, June 1966, 135 pp.

"The Commission strongly recommends that the body charged with regional planning of health services lay plans for continuing regular data collection and study of material relative to such professional groups as nursing, medical technology, physiotherapy, occupational therapy, dental hygienists, and others that are needed to maintain a high quality of medical and dental care and to meet the demands of an affluent and growing population . . . The Commission lastly recommends that the junior colleges incorporate programs for training health manpower among their educational offerings."

Montana

Consultant from the Department of Medical and Hospital Administration of the Graduate School of Public Health, University of Pittsburgh. Hospital and Health Resources in Montana. Boulder, Colorado, Western Interstate Commission for Higher Education, May 1964, 20 pp.

Ratios to 1960 population for several occupations.

"With only 83 licensed practical nurses per 100,000 people, Montana is well below the national average of 115 per 100,000. . . . The health professions with which Montana is relatively poorly supplied include medical record librarians, pharmacists, podiatrists, and psychologists, in regard to all of which it is below the national average. Finally . . . Montana is far below the national average for social workers, having a ratio of 8.2 per 100,000, compared to a figure of 19.5 per 100,000 nationally."

Nevada

Consultants from the Department of Medical and Hospital Administration of the Graduate School of Public Health, University of Pittsburgh. Hospital and Health Resources in Nevada. Boulder, Colorado, Western Interstate Commission for Higher Education, May 1964, 20 pp.

Ratios to 1960 population for several occupations.

Nevada has ratios below those for the nation with respect to dietitians, medical technologists, occupational therapists, optometrists, and veterinarians.

Nursing Committee of Nevada Public Health Association. Nursing in Nevada 1964. Nevada Tuberculosis and Health Association, 1964, [121 pp.].

Using a ratio of 350 per 100,000 population, Nevada will need 1,586 R.N.'s in 1970, which constitutes an increase of 919 over the 1963 supply.

New Mexico

Dillman, Everett G. New Mexico Nursing Needs and Resources: The Situation. Albuquerque, University of New Mexico Bureau of Business Research, 1964, 19 pp.

Present supply and needs to 1970.

R.N.'s 1964 supply—2,227 (201 per 100,000 population)
1964 unmet need in hospitals and other institutions—315

"Computed conservatively, the annual demand until 1970 will require at least 100 nurses more than the expected net increase in supply. This probable annual deficit is cumulative, and can only serve to curtail nursing services available in the State, unless it is eliminated by definite action programs."

Mariani, Rose R. Survey of the Manpower and Training Needs of New Mexico State Institutions. Albuquerque, The University of New Mexico School of Medicine, January 1965, 148 pp.

Present supply and need in State institutions.

North Carolina

Employment Security Commission of North Carolina. Manpower and Training Needs for Medical and Health Service Occupations in North Carolina. Raleigh, North Carolina, Bureau of Employment Security Research, September 1963, 63 pp.

1963 supply, 1963 and 1966 needs.

Hospitals, medical institutions, and schools now do extensive training in many of the 34 occupations covered in this survey. An examination of the survey data indicates that such training will meet only 73 percent of the need by year-end 1966. Thus, additional training will be required to meet anticipated shortages of about 3,075 by year-end 1966.

Oklahoma

Oklahoma Mental Health Planning Committee. Long Range Plan for Mental Health in Oklahoma. Oklahoma City, The Committee, [no date], 65 pp.

"All service professions are in short supply. Demands are increasing out of proportion to population increase."

Oregon

Report of Committee on Manpower and Training, 1963-1965. State of Oregon Division of Mental Health, February 9, 1965, 20 pp.

Pennsylvania

Pennsylvania Health Careers Committee, Pennsylvania Health Council. Health Careers. Harrisburg, The Committee, [1965].

General employment outlook in many health occupations.

"The demand for public health nurses far exceeds the supply."

Rhode Island

Hospital Association of Rhode Island. Personnel Employment and Training Survey, January 1966.

In a survey of two hospitals, there were 152 R.N.'s employed, with 50 budgeted vacancies, and 111 LPN's employed, with 28 budgeted vacancies.

A Plan for the Consolidation of Public Health Services in Rhode Island. New York, Community Research Associates, Inc., 1965, 126 pp.

Present employment figures for several occupations.

Nursing Needs and Resources in Rhode Island. A Survey by The Rhode Island Council of Community Services, Inc. in Cooperation with The Rhode Island League for Nursing. August 1964, 84 pp.

1963 data on R.N.'s and L.P.N.'s including age, education, and type of employment.

South Carolina

South Carolina Hospital Association and South Carolina Employment Security Commission. Manpower Requirements for Health Facilities in South Carolina. Columbia, South Carolina, The Commission, March 1966, 54 pp.

"Manpower requirements in medical and health services in South Carolina will increase substantially in the next five years . . . Employment totaled approximately 17,400 in the 81 surveyed occupations . . . The number of additional workers required to meet both expansion and replacement needs will total nearly 6,600 by 1967 and 14,900 by 1970."

South Carolina Hospital Association. Crisis in Health Care in South Carolina. Preliminary Report on Professional, Paramedical, and Technical Personnel, November 9, 1964.

Present supply and needs for all categories of hospital personnel.

According to a survey of 70 South Carolina hospitals in August 1964, there is a shortage of 1,381 hospital employees . . . The shortage of professional and paramedical personnel is approximately 775, or 20.8%."

South Carolina Hospital Association's Committee on Hospital Careers. Medical Technology in South Carolina and Hospital Dietitics in South Carolina. *Hospital Careers Digest* Vol. II, Nos. 2, 3, October and November 1964.

Present supply figures.

Alford, Elizabeth M. Nursing in South Carolina 1964. Columbia, South Carolina, South Carolina Hospital Association, December 1964, 55 pp.

A statistical study of the quantity of nurses and the quality of their training including figures for need through 1970.

South Carolina State Nurses' Association. Nurses for South Carolina. [1964], 15 pp.

Projected needs for 1970.

The ratio of 187 nurses per 100,000 population in 1962 is far below the national ratio. Using a ratio of 300 per 100,000 population, in 1970 the state will need 7,944 R.N.'s. an increase of 3,602 over the supply in 1960. The State will also need 4,766 L.P.N.'s, an increase of 3,156 over the 1960 supply.

Vermont

Report of the Task Force on Mental Health Manpower. Appendix to the Vermont Mental Health Plan. Montpelier, Vermont, Vermont Department of Mental Health, August 1965, 26 pp.

Present supply and budgeted vacancies in mental health and mental retardation positions.

There are 20 unfilled budgeted positions in the mental health and mental retardation fields in Vermont, including six positions for social workers, as of May 1, 1965.

Virginia

McGlothlin, William J. Educational Programs in Virginia for Fields Related to Health. Staff Report #6. Richmond, Virginia, The Higher Education Study Commission, Commonwealth of Virginia, 1965, 55 pp.

1965 supply and demand figures for 17 occupations.

"One estimate by the Virginia Council on Health and Medical Care shows only 557 dental assistants in full-time employment, less than half the 1,200 needed. Most of these have been trained by individual dentists in offices rather than in any formal program . . . . There are too few medical technologists — they cannot be trained fast enough to meet the demand. It is estimated, for example, that the need in Virginia is for perhaps 2,000 medical technologists, but there are only about 800 in the state . . . . This number [graduated from training schools in Virginia now] is insufficient to meet the need of replacements caused by turnover, let alone satisfying the needs caused by the expansion of laboratory tests. The number of laboratory tests has doubled in the last five years alone, and hospital beds and outpatient visits have increased at the same time. Growth of the laboratories has been almost astronomical."

Wyoming

Consultants from the Department of Medical and Hospital Administration of the Graduate School of Public Health, University of Pittsburgh. Hospital and Health Resources in Wyoming. Boulder, Colorado, Western Interstate Commission for Higher Education, May 1964, 20 pp.

Ratios to 1960 population for several occupations.

"Wyoming's number of licensed practical nurses, 104 per 100,000 population, is somewhat lower than the average of 115 per 100,000 for the United States as a whole . . . . [Wyoming] is well below the averages for the country as a whole in regard to occupational therapists, podiatrists, psychologists, and social workers. . . ."

Appendix C

Universities with Schools of Allied Health Professions

University of Alabama (Program in development stage.)	Charles H. Winkler, Ph.D. University of Alabama Medical School 1919 7th Avenue South Birmingham, Alabama 35233
Loma Linda University	Ivor C. Woodward, M.A., Dean School of Health Related Professions Loma Linda University Loma Linda, California 92354
University of California	Willard C. Fleming, D.D.S., Chancellor University of California San Francisco Medical Center San Francisco, California 94122
University of Florida	Darrel J. Mase, Ph.D., Dean College of Health Related Professions University of Florida Gainesville, Florida 32603
University of Illinois	Charles E. Richards, M.D., Director School of Associated Medical Sciences College of Medicine University of Illinois Chicago, Illinois 60680
Indiana University	J. L. Arbogast, M.D., Director Division of Allied Health Sciences School of Medicine Indiana University Medical Center 1100 West Michigan Street Indianapolis, Indiana 46207
University of Kentucky	Joseph Hamburg, M.D., Dean Allied Medical School University of Kentucky Medical Center 800 Rose Street Lexington, Kentucky 40506
Boston University	George K. Mackechnie, M.A., Dean Sargent College of Allied Health Professions University Road Boston, Massachusetts 02215
Northeastern University	Edmund J. McTernan, Chairman Allied Medical Sciences Northeastern University 104 Hayden Hall Boston, Massachusetts 02115
St. Louis University	Sister Mary Stephen Noth, S.S.M, Dean School of Nursing and Health Services St. Louis University Nicholas Building 1504 South Grand Blvd. St. Louis, Missouri 63104

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University of Pennsylvania	Wesley G. Hutchinson, Ph.D., Dean School of Allied Medical Professions University of Pennsylvania Philadelphia, Pennsylvania 19104
Temple University	Aaron L. Andrews, Ph. D., Dean College of Allied Health Professions Temple University Philadelphia, Pennsylvania 19122
Jefferson Medical College	John W. Goldschmidt, M.D., Dean School of Allied Health Sciences Jefferson Medical College Philadelphia, Pennsylvania 19107
Medical College of South Carolina	George Stevenson, M.D. School of Allied Health Medical College of South Carolina Charleston, South Carolina 29401

Appendix table 1. Number of baccalaureate programs in selected allied health professions, by geographic division, State, and program: 1965

Geographic division and State	Dental hygiene	Medical record library science [1]	Medical technology	Occupational therapy	Physical therapy	Radiologic technology
United States [2]	21	19	300	32	42	6
New England	1	—	21	3	4	—
Connecticut	1	—	4	—	1	—
Maine	—	—	3	—	—	—
Massachusetts	—	—	7	2	3	—
New Hampshire	—	—	2	1	—	—
Rhode Island	—	—	2	—	—	—
Vermont	—	—	3	—	—	—
Middle Atlantic	3	2	28	4	7	—
New Jersey	1	—	3	—	—	—
New York	1	—	10	3	5	—
Pennsylvania	1	2	15	1	2	—
South Atlantic	3	4	40	2	5	1
Delaware	—	—	1	—	—	—
District of Columbia	—	1	2	—	—	—
Florida	—	—	4	1	1	—
Georgia	—	2	6	—	—	—
Maryland	—	1	2	—	1	—
North Carolina	1	—	10	—	2	—
South Carolina	—	—	4	—	—	—
Virginia	—	—	6	1	1	—
West Virginia	2	—	5	—	—	1
East South Central	1	—	24	—	—	—
Alabama	—	—	4	—	—	—
Kentucky	1	—	8	—	—	—
Mississippi	—	—	2	—	—	—
Tennessee	—	—	10	—	—	—
West South Central	1	2	32	1	4	1
Arkansas	—	—	4	—	—	—

Louisiana	—	1	11	—	—	—
Oklahoma	—	—	4	—	1	1
Texas	1	1	13	1	3	—
East North Central	5	4	67	9	7	—
Illinois	1	1	13	1	1	—
Indiana	1	1	8	1	1	—
Michigan	1	1	13	3	1	—
Ohio	1	—	15	1	2	—
Wisconsin	1	1	18	3	2	—
West North Central	3	3	46	6	7	3
Iowa	1	—	5	1	1	—
Kansas	—	—	8	1	1	—
Minnesota	—	1	7	2	2	—
Missouri	1	1	8	1	3	1
Nebraska	1	1	9	—	—	2
North Dakota	—	—	2	1	—	—
South Dakota	—	—	7	—	—	—
Mountain	—	—	21	1	1	1
Arizona	—	—	2	—	—	1
Colorado	—	—	7	1	1	—
Idaho	—	—	2	—	—	—
Montana	—	—	4	—	—	—
Nevada	—	—	1	—	—	—
New Mexico	—	—	1	—	—	—
Utah	—	—	3	—	—	—
Wyoming	—	—	1	—	—	—
Pacific	4	3	20	5	6	—
Alaska	—	—	—	—	—	—
California	3	2	9	3	5	—
Hawaii	—	—	1	—	—	—
Oregon	—	—	4	—	—	—
Washington	1	1	6	2	1	—
Puerto Rico	—	1	1	1	1	—

[1] Includes 4 post-baccalaureate programs.
[2] Includes Puerto Rico.

Source: Reference (57) and unpublished data from the Council on Medical Education, American Medical Association.

Appendix table 2. Number of programs at less than baccalaureate level in selected allied health occupations, by geographic division, State, and program: 1965

Geographic division and State	Cytotechnology	Dental assistant	Dental hygiene	Dental laboratory technician	Inhalation therapy technician	Laboratory technician	Medical office assistant	Medical record library science	Medical record technician	Medical technology	Surgical technician	Radiologic technology
United States[1] ...	75	94	47	11	25	147	43	9	14	392	12	692
New England	3	7	5	1	—	17	6	—	1	19	2	47
Connecticut	2	1	1	—	—	4	—	—	—	1	—	15
Maine	—	—	1	1	—	1	—	—	—	—	—	8
Massachusetts	—	6	1	—	—	6	6	—	1	16	2	13
New Hampshire	—	—	—	—	—	3	—	—	—	1	—	4
Rhode Island	1	—	1	—	—	2	—	—	—	—	—	4
Vermont	—	—	1	—	—	1	—	—	—	1	—	3
Middle Atlantic	12	8	[illegible]	2	5	42	10	1	—	47	2	106
New Jersey	—	2	1	—	—	7	4	—	—	8	—	19
New York	4	4	7	2	1	11	5	1	—	17	1	29
Pennsylvania	8	2	3	—	4	24	1	—	—	22	1	58
South Atlantic	21	9	7	2	3	29	3	1	2	49	2	102
Delaware	—	—	—	—	—	1	—	—	—	—	—	2
District of Columbia..	1	—	1	—	—	—	—	—	—	6	—	4
Florida	3	4	3	1	—	5	1	—	—	9	2	13
Georgia	2	1	—	—	1	3	1	—	—	10	—	13
Maryland	2	1	—	—	—	2	—	—	1	3	—	13
North Carolina	8	3	2	1	1	4	—	1	1	7	—	19
South Carolina	1	—	—	—	1	1	—	—	—	6	—	12
Virginia	3	—	—	—	—	7	1	—	—	5	—	14
West Virginia	1	—	1	—	—	6	—	—	—	3	—	12
East South Central	3	2	3	1	3	10	—	2	1	34	1	32
Alabama	1	—	—	—	—	2	—	—	—	8	—	6
Kentucky	1	1	1	1	1	4	—	—	—	9	—	12
Mississippi	—	—	—	—	—	1	—	1	—	6	—	5
Tennessee	1	1	2	—	2	3	—	1	1	11	1	9
West South Central	7	1	3	—	—	10	—	2	1	49	3	63

Arkansas	—	—	—	—	—	2	—	—	—	3	—	5
Louisiana	1	—	1	—	—	—	—	—	—	4	2	11
Oklahoma	1	—	—	—	—	—	—	1	—	11	—	9
Texas	5	1	2	—	—	8	—	1	1	31	1	38
East North Central	15	14	8	2	8	25	6	2	3	65	2	170
Illinois	2	4	1	1	5	9	—	2	—	15	1	53
Indiana	2	1	1	—	—	4	—	—	1	12	—	16
Michigan	2	6	3	1	—	1	2	—	—	14	—	32
Ohio	7	2	2	—	2	7	1	—	1	22	—	48
Wisconsin	2	1	1	—	1	4	3	—	1	2	1	21
West North Central	3	7	3	—	2	12	1	1	2	55	—	83
Iowa	—	—	—	—	—	1	1	—	—	16	—	18
Kansas	1	1	—	—	—	1	—	—	—	14	—	17
Minnesota	1	3	1	—	—	6	—	—	1	8	—	10
Missouri	—	1	1	—	—	2	—	1	1	11	—	24
Nebraska	1	2	1	—	—	1	—	—	—	—	—	7
North Dakota	—	—	—	—	—	—	—	—	—	3	—	1
South Dakota	—	—	—	—	2	1	—	—	—	3	—	6
Mountain	2	7	3	—	—	—	2	—	1	16	—	37
Arizona	—	2	—	—	—	—	—	—	—	1	—	3
Colorado	1	—	1	—	—	—	2	—	—	4	—	15
Idaho	—	1	1	—	—	—	—	—	—	1	—	5
Montana	—	—	—	—	—	—	—	—	—	2	—	4
Nevada	—	—	—	—	—	—	—	—	—	—	—	1
New Mexico	—	1	1	—	—	—	—	—	—	5	—	3
Utah	1	3	—	—	—	—	—	—	1	3	—	4
Wyoming	—	—	—	—	—	—	—	—	—	—	—	2
Pacific	8	38	4	3	4	2	15	—	3	58	—	52
Alaska	—	—	—	—	—	—	—	—	—	1	—	—
California	4	29	2	2	3	1	13	—	1	44	—	39
Hawaii	—	1	1	—	—	—	—	—	—	1	—	2
Oregon	1	5	1	1	—	—	1	—	—	3	—	7
Washington	3	3	—	—	1	1	1	—	2	9	—	4
Puerto Rico	1	1	—	—	—	—	—	—	—	—	—	—

[1] Includes Puerto Rico.

Sources: American Medical Association, Dental Students' Register, Board of Certified Laboratory Assistants, American Association of Medical Record Librarians, U.S. Office of Education Survey of Health Occupations Curriculums.

Appendix table 3. Number of baccalaureate graduates of programs in selected allied health professions, by geographic division, State and program: 1965

Geographic division and State	Total	Dental hygiene	Medical record library science [1]	Medical technology	Occupational therapy	Physical therapy	Radiologic technology
United States [2]	3,799	302	118	2,004	471	891	13
New England	274	—	—	105	39	130	—
Connecticut	67	—	—	14	—	53	—
Maine	9	—	—	9	—	—	—
Massachusetts	124	—	—	29	18	77	—
New Hampshire	44	—	—	23	21	—	—
Rhode Island	11	—	—	11	—	—	—
Vermont	19	—	—	19	—	—	—
Middle Atlantic	492	35	11	238	46	162	—
New Jersey	36	8	—	28	—	—	—
New York	253	21	—	104	33	95	—
Pennsylvania	203	6	11	106	13	67	—
South Atlantic	330	14	22	204	31	56	3
Delaware	10	—	—	10	—	—	—
District of Columbia	10	—	3	7	—	—	—
Florida	55	—	—	34	13	8	—
Georgia	19	—	7	12	—	—	—
Maryland	38	—	12	16	—	10	—
North Carolina	66	5	—	37	—	24	—
South Carolina	8	—	—	8	—	—	—
Virginia	75	—	—	43	18	14	—
West Virginia	49	9	—	37	—	—	3
East South Central	106	1	—	105	—	—	—
Alabama	23	—	—	23	—	—	—
Kentucky	36	1	—	35	—	—	—
Mississippi	7	—	—	7	—	—	—
Tennessee	40	—	—	40	—	—	—
West South Central	332	—	11	224	20	74	3
Arkansas	19	—	—	19	—	—	—

Louisiana	99	—	3	96	—	—	—
Oklahoma	42	—	—	31	—	88	3
Texas	172	—	8	78	20	66	—
East North Central	952	96	19	545	133	159	—
Illinois	119	32	—	57	12	18	—
Indiana	113	8	9	64	6	26	—
Michigan	250	28	5	142	59	16	—
Ohio	198	21	—	117	18	42	—
Wisconsin	272	7	5	165	38	57	—
West North Central	630	54	22	312	98	138	6
Iowa	112	36	—	47	9	20	—
Kansas	84	—	—	39	16	29	—
Minnesota	187	—	7	84	45	51	—
Missouri	112	18	7	33	13	38	3
Nebraska	69	—	8	58	—	—	3
North Dakota	39	—	—	24	15	—	—
South Dakota	27	—	—	27	—	—	—
Mountain	159	—	—	119	18	21	1
Arizona	20	—	—	19	—	—	1
Colorado	88	—	—	49	18	21	—
Idaho	3	—	—	3	—	—	—
Montana	19	—	—	19	—	—	—
Nevada	2	—	—	2	—	—	—
New Mexico	1	—	—	1	—	—	—
Utah	19	—	—	19	—	—	—
Wyoming	7	—	—	7	—	—	—
Pacific	488	102	27	152	75	132	—
Alaska	—	—	—	—	—	—	—
California	373	84	16	92	56	125	—
Hawaii	14	—	—	14	—	—	—
Oregon	24	—	—	24	—	—	—
Washington	77	18	11	22	19	7	—
Puerto Rico	36	—	6	—	11	19	—

[1] Includes 27 post-baccalaureate graduates.

Source: Reference (57) and unpublished data from the Council on Medical Education, American Medical Association.

Appendix table 4. Number of graduates at less than baccalaureate level of training in selected allied health occupations, by geographic division, State, and program: 1965

Geographic division and State	Total	Cyto-technology	Dental assistant	Dental hygiene	Dental laboratory technician	Inhalation therapy technician	Laboratory technician	Medical office assistant	Medical record library science	Medical record technician	Medical technology	Surgical technician	Radiologic technology
United States[1]	9,549	325	1,499	1,194	182	153	737	762	60	70	1,344	78	3,145
New England.....	852	19	97	170	10	—	84	61	—	—	84	18	309
Connecticut	215	9	24	53	—	—	4	—	—	—	35	—	90
Maine	87	—	—	21	10	—	6	—	—	—	14	—	36
Massachusetts	414	—	73	65	—	—	42	61	—	—	27	18	128
New Hampshire.....	36	—	—	—	—	—	22	—	—	—	4	—	10
Rhode Island.....	52	10	—	15	—	—	8	—	—	—	—	—	19
Vermont	48	—	—	16	—	—	2	—	—	—	4	—	26
Middle Atlantic	1,903	26	161	436	66	27	282	245	5	—	133	17	505
New Jersey	280	—	38	18	—	—	22	65	—	—	46	—	91
New York	972	11	69	329	66	4	133	160	5	—	38	6	151
Pennsylvania	651	15	54	89	—	23	127	20	—	—	49	11	263
South Atlantic.....	1,148	72	135	129	20	16	112	32	6	14	140	8	464
Delaware	7	—	—	—	—	—	—	—	—	—	—	—	7
District of Columbia..	42	2	—	16	—	—	—	—	—	—	18	—	6
Florida	338	8	92	74	9	—	43	10	—	—	24	8	70
Georgia	161	9	—	—	—	6	24	13	—	—	43	—	66
Maryland	159	9	10	—	—	—	—	—	—	8	16	—	116
North Carolina	206	21	33	9	11	4	19	—	6	6	31	—	66
South Carolina	61	2	—	—	—	6	4	—	—	—	8	—	41
Virginia	98	15	—	—	—	—	12	9	—	—	—	—	62
West Virginia	76	6	—	30	—	—	10	—	—	—	—	—	30
East South Central	473	24	56	65	—	10	32	—	14	10	121	7	134
Alabama	76	4	—	—	—	—	10	—	—	—	37	—	25
Kentucky	160	6	41	15	—	3	14	—	—	—	31	—	50
Mississippi	38	—	—	—	—	—	—	—	5	—	21	—	12
Tennessee	199	14	15	50	—	7	8	—	9	10	32	7	47
West South Central.....	602	42	5	78	—	—	4	—	12	5	167	24	265

Arkansas	47	—	—	—	—	—	4	—	—	—	7	—	36
Louisiana	134	6	—	18	—	—	—	—	—	—	36	22	52
Oklahoma	80	10	—	—	—	—	—	—	4	—	41	—	25
Texas	341	26	5	60	—	—	—	—	8	5	83	2	152
East North Central	1,771	64	173	185	35	42	109	120	18	5	258	4	758
Illinois	494	21	39	16	21	33	59	—	18	—	33	—	204
Indiana	178	4	—	25	—	—	16	—	—	—	35	—	98
Michigan	343	7	62	42	14	—	2	56	—	—	47	—	113
Ohio	492	23	51	53	—	5	27	—	—	3	89	—	241
Wisconsin	264	9	21	49	—	4	5	64	—	2	4	4	102
West North Central	808	15	100	43	—	3	99	14	5	13	124	—	392
Iowa	121	—	—	—	—	—	2	14	—	—	33	—	72
Kansas	87	6	—	—	—	—	8	—	—	—	21	—	52
Minnesota	331	7	59	37	—	—	89	—	—	—	11	—	128
Missouri	175	—	16	6	—	—	—	—	5	13	54	—	81
Nebraska	57	2	25	—	—	—	—	—	—	—	3	—	27
North Dakota	11	—	—	—	—	—	—	—	—	—	—	—	11
South Dakota	26	—	—	—	—	3	—	—	—	—	2	—	21
Mountain	432	6	82	28	—	—	—	90	—	6	78	—	142
Arizona	56	—	16	—	—	—	—	—	—	—	25	—	15
Colorado	196	4	—	10	—	—	—	90	—	—	22	—	70
Idaho	44	—	13	9	—	—	—	—	—	—	11	—	11
Montana	14	—	—	—	—	—	—	—	—	—	6	—	8
Nevada	9	—	—	—	—	—	—	—	—	—	4	—	5
New Mexico	35	—	8	9	—	—	—	—	—	—	4	—	14
Utah	71	2	45	—	—	—	—	—	—	6	6	—	12
Wyoming	7	—	—	—	—	—	—	—	—	—	—	—	7
Pacific	1,515	53	675	60	51	55	15	200	—	17	213	—	176
Alaska	4	—	—	—	—	—	—	—	—	—	4	—	—
California	1,076	38	467	15	51	55	1	166	—	4	148	—	131
Hawaii	59	—	36	15	—	—	—	—	—	—	4	—	4
Oregon	207	9	95	30	—	—	—	22	—	—	26	—	25
Washington	169	6	77	—	—	—	14	12	—	13	31	—	16
Puerto Rico	45	4	15	—	—	—	—	—	—	—	26	—	—

[1] Includes Puerto Rico.

Sources: American Medical Association, Dental Students' Register, Board of Certified Laboratory Assistants, American Association of Medical Record Librarians, U.S. Office of Education Survey of Health Occupations Curriculums.

Appendix table 5. Graduates of programs for selected allied health occupations, by geographic division, State, and program: 1965

Geographic division and State	Total						Less than baccalaureate level	
	Dental hygiene	Medical record library science	Medical technology	Occupational therapy	Physical therapy	Radiologic technology	Selected medical [1]	Selected dental [2]
United States[3]	1,496	178	3,348	471	891	3,158	2,125	1,681
New England	170	—	189	39	130	209	182	107
Connecticut	53	—	49	—	53	90	13	24
Maine	21	—	23	—	—	36	6	10
Massachusetts	65	—	56	18	77	128	121	73
New Hampshire	—	—	27	21	—	10	22	—
Rhode Island	15	—	11	—	—	19	18	—
Vermont	16	—	23	—	—	26	2	—
Middle Atlantic	471	16	371	46	162	505	597	227
New Jersey	26	—	74	—	—	91	87	38
New York	350	5	142	33	95	151	314	135
Pennsylvania	95	11	155	13	67	263	196	54
South Atlantic	143	28	344	31	56	467	254	155
Delaware	—	—	10	—	—	7	—	—
District of Columbia	16	3	25	—	—	6	2	—
Florida	74	—	58	13	8	70	69	101
Georgia	—	7	55	—	—	66	52	—
Maryland	—	12	32	—	10	116	17	10
North Carolina	14	6	68	—	24	66	50	44
South Carolina	—	—	16	18	—	41	12	—
Virginia	—	—	43	—	14	62	36	—
West Virginia	39	—	37	—	—	33	16	—
East South Central	66	14	226	—	—	134	83	56
Alabama	—	—	60	—	—	25	14	—
Kentucky	16	—	66	—	—	50	23	41
Mississippi	—	5	28	—	—	12	—	—
Tennessee	50	9	72	—	—	47	46	15
West South Central	78	23	391	20	74	268	75	5
Arkansas	—	—	26	—	—	36	4	—
Louisiana	18	3	132	—	—	52	28	—

Oklahoma	—	4	72	—	8	28	10	—
Texas	60	16	161	20	66	152	33	5
East North Central	281	37	803	133	159	758	344	208
Illinois	48	18	140	12	18	204	113	60
Indiana	33	9	99	6	26	98	20	—
Michigan	70	5	189	59	16	113	65	76
Ohio	74	—	206	18	42	241	58	51
Wisconsin	56	5	169	38	57	102	88	21
West North Central	97	27	436	98	138	398	144	100
Iowa	36	—	80	9	20	72	16	—
Kansas	—	—	60	16	29	52	14	—
Minnesota	37	7	95	45	51	128	96	59
Missouri	24	12	87	13	38	84	13	16
Nebraska	—	8	61	—	—	30	2	25
North Dakota	—	—	24	15	—	11	—	—
South Dakota	—	—	29	—	—	21	3	—
Mountain	28	—	197	18	21	143	102	82
Arizona	—	—	44	—	—	16	—	16
Colorado	10	—	71	18	21	70	94	—
Idaho	9	—	14	—	—	11	—	13
Montana	—	—	25	—	—	8	—	—
Nevada	—	—	6	—	—	5	—	—
New Mexico	9	—	5	—	—	14	—	8
Utah	—	—	25	—	—	12	8	45
Wyoming	—	—	7	—	—	7	—	—
Pacific	162	27	365	75	132	176	340	726
Alaska	—	—	4	—	—	—	—	—
California	99	16	240	56	125	131	264	518
Hawaii	15	—	18	—	—	4	—	36
Oregon	30	—	50	—	—	25	31	95
Washington	18	11	53	19	7	16	45	77
Puerto Rico	—	6	26	11	19	—	4	15

[1] Includes cytotechnologist, laboratory assistant, medical record technician, inhalation therapy technician, surgical technician, and medical office assistant.
[2] Includes dental assistant and dental laboratory technician.
[3] Includes Puerto Rico.

Sources: American Medical Association, Dental Students' Register, Board of Certified Laboratory Assistants, American Association of Medical Record Librarians, U.S. Office of Education Survey of Health Occupations Curriculums.

Appendix table 6. Graduates in relation to total population of baccalaureate and less than baccalaureate level programs for selected allied health occupations, by geographic division and State: 1965

Geographic division and State	Total population (1,000's)	Graduates per 100,000 total population		
		Total	Selected baccalaureate level programs [1]	Selected programs at less than baccalaureate level [2]
United States[3]	196,428	6.8	1.9	4.9
New England	11,146	10.1	2.5	7.6
Connecticut	2,830	10.0	2.4	7.6
Maine	986	9.7	0.9	8.8
Massachusetts	5,361	10.0	2.3	7.7
New Hampshire	673	11.8	6.5	5.3
Rhode Island	891	7.0	1.2	5.8
Vermont	404	16.6	4.7	11.9
Middle Atlantic	36,471	6.5	1.3	5.2
New Jersey	6,781	4.6	0.5	4.1
New York	18,106	6.8	1.4	5.4
Pennsylvania	11,583	7.4	1.8	5.6
South Atlantic	28,748	5.1	1.1	4.0
Delaware	503	3.4	2.0	1.4
District of Columbia	802	6.4	1.2	5.2
Florida	5,796	6.7	0.9	5.8
Georgia	4,391	4.1	0.4	3.7
Maryland	3,534	5.6	1.1	4.5
North Carolina	4,935	5.5	1.3	4.2
South Carolina	2,550	2.7	0.3	2.4
Virginia	4,420	3.9	1.7	2.2
West Virginia	1,815	6.9	2.7	4.2
East South Central	12,819	4.5	0.8	3.7
Alabama	3,486	2.9	0.7	2.2
Kentucky	3,173	6.1	1.1	5.0
Mississippi	2,309	1.9	0.3	1.6
Tennessee	3,850	6.2	1.0	5.2
West South Central	18,540	5.0	1.8	3.2

Arkansas	1,941	3.4	1.0	2.4
Louisiana	3,560	6.6	2.8	3.8
Oklahoma	2,448	5.0	1.7	3.3
Texas	10,591	4.8	1.6	3.2
East North Central	38,231	7.1	2.5	4.6
Illinois	10,641	5.7	1.1	4.6
Indiana	4,893	5.9	2.3	3.6
Michigan	8,317	7.1	3.0	4.1
Ohio	10,241	6.7	1.9	4.8
Wisconsin	4,140	13.0	6.6	6.4
West North Central	15,858	9.1	4.0	5.1
Iowa	2,758	8.5	4.1	4.4
Kansas	2,248	7.6	3.7	3.9
Minnesota	2,562	14.5	5.2	9.3
Missouri	4,492	6.4	2.5	3.9
Nebraska	1,459	8.6	4.7	3.9
North Dakota	652	7.7	6.0	1.7
South Dakota	686	7.7	3.9	3.8
Mountain	7,693	7.7	2.1	5.6
Arizona	1,575	4.9	1.3	3.6
Colorado	1,949	14.6	4.5	10.1
Idaho	693	6.7	0.4	6.3
Montana	705	4.7	2.7	2.0
Nevada	434	2.6	0.5	2.1
New Mexico	1,014	3.6	0.1	3.5
Utah	994	9.0	1.9	7.1
Wyoming	330	4.2	2.1	2.1
Pacific	24,290	8.2	2.0	6.2
Alaska	267	1.5	—	1.5
California	18,403	7.8	2.0	5.8
Hawaii	710	10.3	2.0	8.3
Oregon	1,938	11.9	1.2	10.7
Washington	2,973	8.3	2.6	5.7
Puerto Rico	2,633	3.1	1.4	1.7

[1] Includes dental hygiene, medical record library science, medical technology, occupational therapy, physical therapy, and radiologic technology.
[2] Includes dental hygiene, medical record library science, medical technology, radiologic technology, cytotechnology, laboratory technician, medical record technician, inhalation therapy, surgical technician, medical office assistant, dental assistant, and dental laboratory technician.
[3] Includes Puerto Rico.

Source: Computed from data in Appendix tables 3 and 4.

Appendix table 7. Number of additional annual graduates needed to bring each State up to the level of the highest States, by State and level of program: 1965

x — based on rate per 100,000 total population
— based on rate per 100,000 persons age 18 years

State	Baccalaureate level								Less than baccalaureate level							
	None or less than 25	25-49	50-99	100-149	150-199	200-249	250-299	300 and over	None or less than 25	25-49	50-99	100-149	150-199	200-249	250-299	300 and over
New England:																
Connecticut		x#								#	x					
Maine		x#							x#							
Massachusetts			x#								#	x				
New Hampshire	x#									x#						
Rhode Island	#	x								x#						
Vermont	x#								x#							
Middle Atlantic:																
New Jersey					#	x										x#
New York								x#								x#
Pennsylvania						#	x									x#
South Atlantic:																
Delaware	x#									x#						
District of Columbia	x#								#	x						
Florida				#	x								#	x		
Georgia					x#										x	#
Maryland			#	x									x#			
North Carolina				x	#										x	#
South Carolina			x	#									x		#	
Virginia				x#												x#
West Virginia	x	#										x	#			
East South Central:																
Alabama				x#											x	#
Kentucky			x	#									x	#		
Mississippi			x	#									x		#	
Tennessee				x#									x	#		

West South Central:																	
Arkansas			x#									x#					
Louisiana		x	#											x		#	
Oklahoma			x#										x#				
Texas							x#										x#
East North Central:																	
Illinois							#	x									x#
Indiana			x#														x#
Michigan			x#														x#
Ohio					#	x											x#
Wisconsin	x#												x#				
West North Central:																	
Iowa	x#												x#				
Kansas	x#											x#					
Minnesota	x#									x#							
Missouri			x#													x#	
Nebraska	x#										x#						
North Dakota	x#										x#						
South Dakota	x#									x	#						
Mountain:																	
Arizona		x#									#	x					
Colorado	x#								x#								
Idaho		x#								x#							
Montana	x#										x#						
Nevada	x#									x#							
New Mexico		x#									x#						
Utah	x#									x#							
Wyoming	x#									x#							
Pacific:																	
Alaska	x#								x#								
California							#	x									x#
Hawaii	x#								x#								
Oregon			x#						x#								
Washington		x#										x#					
Puerto Rico			x#												x		#

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