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ABSTRACT

Second in a series, this report presents recent trends in the supply and characteristics of health professionals, developments in health professions education, and projected requirements for health professions personnel are reported. In addition to data on the supply of health personnel and population growth, information is provided on the activities of health professionals, kinds of practice they pursue, and their practice settings. Attention is also directed to the role of foreign medical graduates in health care and the potential reduction in their role under present legislation, and the representation of women and minorities in the health professions. Additional topics include: accessibility to professional services, geographic distribution of health professionals, increasing specialization among health care practitioners, and health professions personnel shortage areas. Developments in health professions education are covered, including: enrollment patterns, trends in student characteristics, the establishment of new schools and programs, and students' financing of their education. In addition, efforts of the Bureau of Health Manpower and the National Center for Health Statistics to provide information and comprehensive data on health personnel are addressed. Finally, estimated requirements for physicians and other health personnel are presented. (SW)

A REPORT TO THE PRESIDENT & CONGRESS

ON THE STATUS OF HEALTH PROFESSIONS PERSONNEL

IN THE UNITED STATES

April 10, 1980

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Resources Administration
Bureau of Health Manpower
Division of Manpower Analysis

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INTRODUCTION

This is the second in a series of reports that the Secretary of the Department of Health, Education, and Welfare is required to submit to the President and the Congress of the United States under provisions of Section 708(d) of the Public Health Service Act as amended by the Health Professions Educational Assistance Act of 1976 (P.L. 94-484). The first report presented broad background information on the status of personnel in allopathic and osteopathic medicine, dentistry, optometry, pharmacy, podiatry, and veterinary medicine, and identified possible future developments that may have a major impact on those professions in the coming years. This report focuses on the statistical changes in the supply of health professionals since the first report was submitted and on the topics that have attracted the most attention from both providers and consumers as the Nation strives to achieve its goal of quality health care for all of its citizens at reasonable cost. The information in this report provides a framework for examining current developments, problems, and issues in health care delivery and their possible future impact on health professions personnel.

The professions covered in this report include medicine (allopathic and osteopathic), dentistry, optometry, pharmacy, podiatry, and veterinary medicine. As required by section 951 of the Nurse Training Act of 1975, P.L. 94-63, the supply and distribution of and requirements for nurses are covered in a separate report prepared by Health Resource Administration's Division of Nursing, Elinor D. Stanford, Acting Director.

This report is divided into four major sections:

1) recent developments in the health professions;

2) recent developments in health professions education;

3) recent data and analytical developments; and

4) projections of requirements for health professions personnel.

The opening chapter of the first section, Trends in the Number and Characteristics of Health Professionals, provides information about numerical changes in the supply of health professionals and compares the growth in supply with the growth in population. The activities of health professions personnel, kinds of practice they engage in, and their practice settings are described briefly. The chapter is also concerned with the role of foreign medical graduates in health care and the potential reduction in their role under present legislation.

In addition, the representation of women and minorities in the health professions is examined.

The second chapter, Developments in Health Care, discusses several topics on which national attention and concern have focused in recent years, including accessibility to professional services, geographic distribution of health professionals, increasing specialization among health care practitioners, and the definition and designation of health professions personnel shortage areas and some related program developments.

Accessibility to professional services has long been a concern of both providers and consumers of health care. Indications are that the increasing supply of practitioners and the growth of insurance coverage are making health care more accessible to the general population, although some population subgroups and geographic areas continue underserved. Increasing specialization of physicians has led to a decrease in the proportion of physicians in general practice and, consequently, in the availability of primary care practitoners. However, the establishment and present popularity of family practice as a specialty have resulted in a reversal of this declining trend. Unevenness in the geographic distribution of health personnel has been eased somewhat by the increases in supply; and by the assignment of National Health Service Corps personnel. However, the problem is not fully solved, and the accurate definition and appropriate identification of geographic areas with personnel shortages are subjects under continuing investigation amd development.

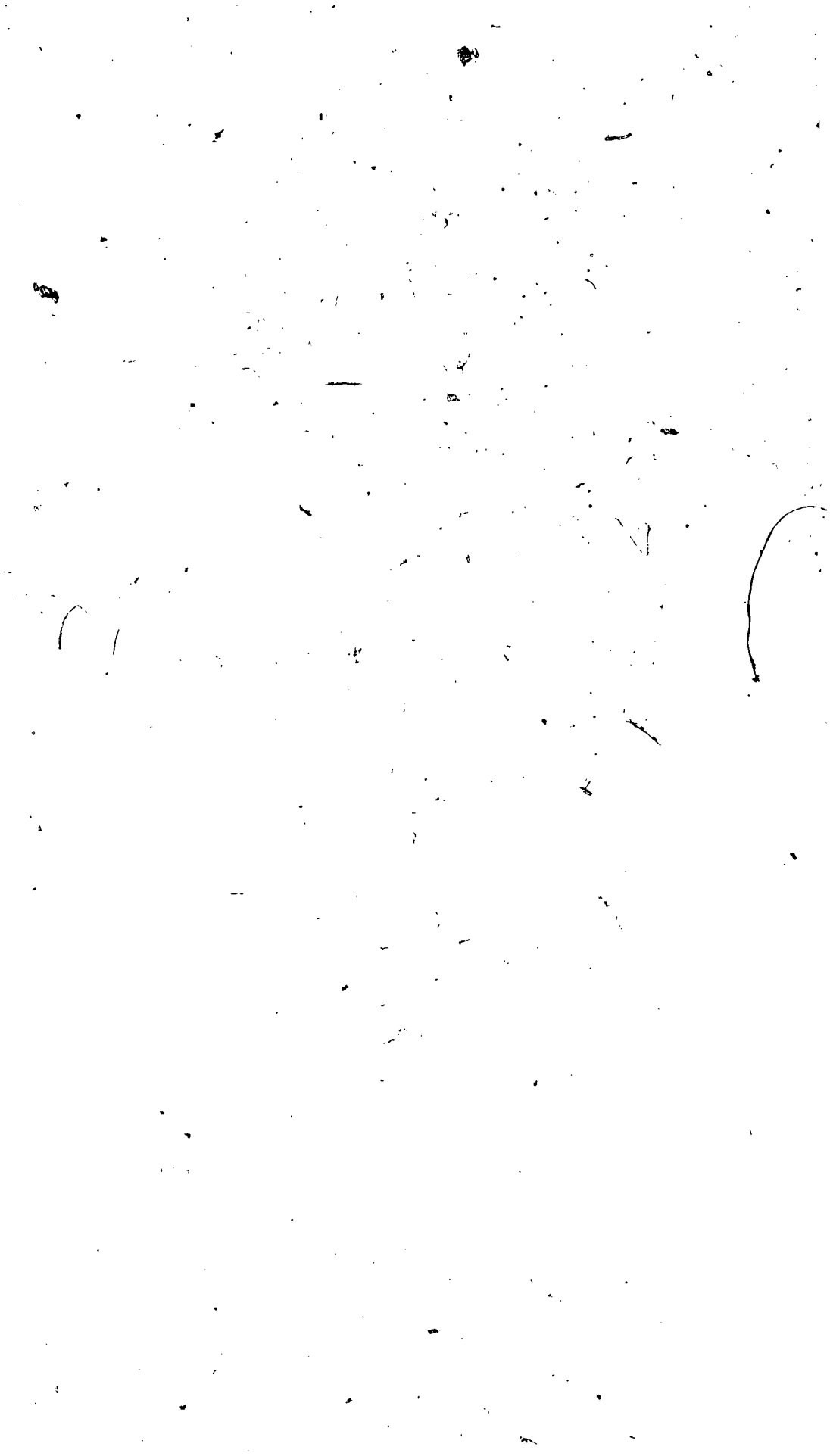
The second section of this report discusses developments in health professions education. Trends in school enrollments and graduates and in student characteristics are described, as is the outlook for change or continuation of current trends in these areas. Information about the establishment of new schools and about changes in programs and/or curriculum is provided in the succeeding chapter. Some of the programs of student and institutional support for which the next. In some instances, the scope of the program and its anticipated or potential impact are also described. The section concludes with an account of how students in health professions schools finance their education, including the sources and amount of their income, their expenses, and their indebtedness, and the apparent relationship between students' patterns of financing their professional education and their sex and racial-ethnic identification. This account is based on findings from a recent survey of students in health professions schools.

Recent Data and Analytical Developments, the third section of this report, discusses the separate and cooperative efforts of the Bureau of Health Manpower and the National Center for Health Statistics to provide information and comprehensive data on health

personnel and to conduct the needed analyses of these data. The status of these efforts is described, and information about needed and proposed expansion of related activities is provided.

The fourth and final section of this report, Projected Requirements for Health Professionals, presents estimated requirements for physicians and other health care practitioners. The estimates follow a brief summary of the general approaches to requirements forecasting that are utilized by most models and a technical overview of the general model used for BHPr's Division of Health Professions Analysis (DHPA) forecasts. The chapter concludes with a discussion of some major potential developments that may exert substantial influence on the present health care delivery system.

This report was prepared in the Health Resources Administration's Bureau of Health Professions (formerly the Bureau of Health Manpower), Thomas D. Hatch, Acting Director; by the Division of Health Professions Analysis (formerly the Division of Manpower Analysis), Howard V. Stambler, Director; in cooperation with the Division of Associated Health Professions, Thomas D. Hatch, Director; the Division of Dentistry, Dr. Thomas L. Louden, Director; the Division of Medicine, Dr. Kenneth Moritsugu, Director; the Division of Manpower Training and Support, Clifford Allen, Director; and the Office of Program Operations, Elizabeth Haglund, Director. Staff of these Bureau components who contributed especially to the preparation of the report were: James Ake, Stuart Bernstein, Roger Cole, James Cultice, John Drabek, Thomas Nelson, Donald Parks, Daniel Smith, and Kenneth Stant. The report was coordinated by Anna R. Crocker of the Division of Health Professions Analysis. Special acknowledgment is due to Peggy Mitchell and Robin Imber of the Division of Health Professions Analysis, who provided the substantial secretarial assistance required for the report's completion.



Summary and Overview: Health Professional Trends and Issues

During the 1970s, the surge in enrollments in and graduates from health professions institutions in the United States that began in the mid-1960s continued to add to the nation's supply of health professionals. Although it is too early to assess the ultimate impact of these additions to supply, an examination of their current and potential effect on the amount, distribution, and quality of health care services is both necessary and appropriate. This report, the second in a series of reports mandated by P.L. 94-484 on the status of health professions personnel, provides a statistical update of the information presented in the first report, and presents in-depth discussions of several topics that are likely to be of importance in the coming years.

Since physicians are the usual entry point to the health care delivery system for most of the population and are seen as having the greatest impact on health status, the geographic and specialty distributions of physicians are analyzed more often and in more detail than those of practitioners in other disciplines. Despite the recent increases in the aggregate supply of health professionals, there has been only limited progress toward a more even geographic distribution of practitioners. In particular, inner-city and rural areas continue to experience shortages of most categories of health professionals. The designations of specific areas with shortages of health personnel encompass a broad range of different types of areas, and although a majority of areas designated are rural (nonmetropolitan), the urban shortage areas contain about half of the shortage area population. Efforts to identify these areas are increasing and a number of expanding Federal programs, including especially the National Health Service Corps, deal with problems of access. Special population groups, such as American Indians, Spanish-speaking, and medically indigent populations, have been designated under special provisions, as have special facilities such as State and county jails. Although expansion of the National Health Service Corps is expected to diminish shortages in these areas, no immediate or permanent solution is foreseen.

After several years of decline, the 1970s have seen a renewed interest in primary care practice among physicians and the subsequent emergence of a new primary care specialty, family practice. If this interest continues, the primary care specialties (which include general practice, family practice, internal medicine, and pediatrics) will undoubtedly increase as a proportion of all specialties.

Foreign-trained physicians (FMGs) increased from 11 percent of the M.D. population in 1963 to 20 percent by the end of 1977. The extent to which entry restrictions mandated by P.L. 94-484 are expected to lessen the number of new FMGs is not certain, although by December

1977 there was a 33 percent decline from the previous year in the total number of foreign graduate residents. The impact of this decline on areas with high concentrations of FMGs (such as New York and New Jersey) and on medical facilities (such as State mental institutions) will require continued monitoring to determine the extent to which there is disruption of essential services.

Increases in the supply of practitioners in the health professions have, of course, resulted primarily from the unprecedented expansion of the capacity of the Nation's health professions institutions. Since 1965, a remarkable feature of that growth has been the generally rapid and steep increase in the enrollment of racial/ethnic minority persons and women. However, total enrollment of Black Americans in medical schools decreased in 1978-79, and their enrollment in dental schools has decreased since 1975. The enrollment of women has continued to climb in all of the disciplines, and the enrollment of other racial/ethnic minority groups has grown also.

The number of applicants for admission to medical schools has decreased in each school year since 1975, and there has been a 20 percent decrease in the number of applicants to dental schools in the last 2 years. It is unclear whether this reflects general demographic and higher education trends or whether the decrease in the number of applicants is an artifact of rising tuition costs. There is currently no empirical evidence to indicate whether or not the present cost of health professions education or the prospect of future cost increases has served as a deterrent to students aspiring to careers in the health professions.

The total physician supply is expected to be somewhat greater than requirements by 1990. The supply of dentists is also expected to exceed requirements in the 1990s if anticipated increases in dental productivity materialize from more effective employment of aides and from technological advances. Estimates of requirements for optometrists and podiatrists are difficult to determine since there is possible cross-substitution between their services and those of physicians. It is likely that the projected supply of optometrists will be roughly in line with the number of optometrists required, whereas the currently perceived shortfall in podiatry may very well continue into the 1990s.

Increases in the availability and utilization of health services and facilities have accompanied the increases in numbers of practitioners of the last 15 years. However, the spiraling health care costs that have followed these increases have claimed a growing share of the Gross National Product. Concern has mounted over the possible relationship between increased practitioner supplies, greater utilization and demand for services, and increasing costs of care.

A number of factors influence consumers demand for health care, including level of educational attainment, awareness of the quality and effectiveness of health care, level of income, and kind and amount of health insurance coverage. Evaluation of the relative importance of these factors as determinants of health care costs in comparison with the role of providers in increasing utilization of services is a necessary and critical first step in the formulation of a health manpower policy that will achieve quality health care at a reasonable cost for the Nation's population.

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RECENT DEVELOPMENTS IN THE HEALTH PROFESSIONS

Trends in the Number and Characteristics of Health Professionals

Latest available data show the upward trend in the number of practitioners continued for all of the health professions. The total number of allopathic physicians was 363,600, and the estimated total for osteopathic physicians was 15,000 as of December 31, 1977; the number of dentists rose to 120,620 as of December 31, 1978; optometrists to 21,200 (1978), pharmacists to 134,600, podiatrists to 8,100, and veterinarians to 34,200 (1978). Since 1970 increases in the number of health professionals have ranged from 8.4 percent for podiatrists to 29.3 percent for veterinarians (Table 1-1).

In terms of ratios of practitioners to population, the period from 1970 to 1977 saw the national ratios rise by 6.6 percent for allopathic physicians, 15.5 percent for osteopathic physicians, 9.0 percent for dentists, 5.6 percent for optometrists, 10.5 percent for pharmacists, and 22.2 percent for veterinarians. There was no change in the ratio of podiatrists to population. In addition, changing geographic and specialty distributions and practitioner characteristics brought about major changes in the profile of most health professions which are described below.

Supply of Physicians. The supply of active physicians in the U.S. reached an estimated total of 379,000 physicians as of December 31, 1977, 363,600 M.D.s and more than 15,400 D.O.s.

Between 1976 and 1977 more than 16,000 physicians were added to the active supply, a 4.4 percent increase, while the resident population of the U.S. is estimated to have increased by less than 1.0 percent. In 1977, the estimated ratio of active physicians per 100,000 resident population was 174.1, up from 168.5 in 1976. Over the long run, the ratio of active M.D.s to population has increased substantially, going from 134.8 per 100,000 in 1963 to 167.0 per 100,000 in 1977.

Table 1-1. Numbers of active health professionals in 1970 and 1977, ratios of practitioners-to-population, and percent change in ratios: 1970-1977

Health professionals	Number of active health professionals			Number of practitioners per 100,000 population		
	1970	1977 1/	Percent increase 1970-77	1970	1977	Percent increase 1970-77
Physicians (M.D.)	311,200	348,400	12.0	151.7	161.7	6.6
Physicians (D.O.)	12,000	14,500	20.8	5.8	6.7	15.5
Dentists	102,000	117,900	15.4	49.8	54.3	9.0
Optometrists	18,400	20,700	12.5	9.0	9.5	5.6
Pharmacists	109,600	128,300	17.1	53.4	59.0	10.5
Podiatrists	7,100	7,700	8.4	3.5	3.5	0.0
Veterinarians	25,900	33,500	29.3	12.6	15.4	22.2

1/ December 31, 1976 estimates.

Source: Physicians (M.D.): American Medical Association. Physician Distribution and Medical Licensure, 1970 and 1976 editions.
Dentists: Estimates from Division of Dentistry, Bureau of Health Manpower.
Other Disciplines: Estimates from Manpower Analysis Branch, Bureau of Health Manpower.
Population Estimates: Bureau of the Census. Current Population Reports, Series P-25, No. 720, May 1978.

Activity Distribution of Physicians. The activities of physicians are of major importance in assessing the overall health system capability to provide care, and in projecting requirements for the services of physicians and other health professionals. Since 1974, the University of Southern California (USC), Division of Research in Medical Education, has been conducting a series of the most comprehensive studies ever undertaken on physicians' activities. 1/ This statistical baseline, covering 24 medical and surgical specialties, was developed with at least two major health care issues in mind: the need to develop improved requirements and need estimates for physician manpower across all specialties, and concern for the adequacy of primary and specialty care delivered at an aggregate level as well as within and between specialties.

To address these issues, a survey was conducted on a national sample of physicians in each of 24 specialties--approximately 15,000 physicians. The respondents provided various kinds of detailed minute-to-minute, task-by-task, and patient-by-patient data about their professional and nonprofessional activities by completing a standardized log diary covering three consecutive "sample" days, thereby ensuring comparability of the data base.

The information sought focused on the types of patients seen by physicians, the physicians' diagnoses, and the care patients receive. Practice profiles are now being developed to afford comparisons within and between specialties and to determine how

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1/ U.S. DHEW, HRA, BHM, Division of Medicine. Analysis of Effort Distribution of Physicians in Twenty-four Specialties. University of Southern California School of Medicine, Division of Research in Medical Education.

physicians' activities, vary by geographic location (metropolitan and nonmetropolitan) and type of practice arrangement (solo, partnership, group, and institutional). When synthesized with other data sources, these baseline data will provide the kinds of information necessary to analyze the major components of physicians' practices.

One of the forthcoming analyses of these data will compare the USC data with information about medical undergraduate, graduate, and continuing medical education curricula. This analysis will assist medical educators in focusing their training more directly on the kinds of skills actually utilized and required within different specialties, different organizations of medical care delivery, and in metropolitan and nonmetropolitan areas.

Preliminary data tabulations and displays have been completed for seven specialties -- (1) general internal medicine, (2) dermatology, (3) obstetrics-gynecology, (4) gastroenterology, (5) otorhinolaryngology, (6) pulmonary diseases, and (7) allergy. Seventeen additional specialty reports will be completed by December 1979--cardiology, endocrinology, infectious diseases, rheumatology, nephrology, hematology, oncology, neurosurgery, family practice, general practice, pediatrics, psychiatry, ophthalmology, general surgery, neurology, emergency medicine, and orthopedic surgery. Descriptive reports on each specialty are now being developed and when completed for the 24 specialties, in-depth analyses of physician productivity, types of care provided, including various kinds of comparative analyses of selected specialties, will be possible. This information will be summarized in a subsequent report to the Congress.

Foreign Medical Graduates (FMGs). FMGs continue to play a significant role in the United States health care system, although recent entry restrictions mandated by P.L. 94-484 and enforced as of January 10, 1977, are expected to lessen the numbers entering the pool of M.D.s.

A substantial part of the overall increase in physician supply between 1963 and 1977 was accounted for by the entry of FMGs into the U.S. The number of foreign-trained physicians was 30,900 in 1963, or about 11 percent of physician supply; by 1977, the number had increased to 86,800, or 20 percent of the supply (Table 1-2). Of these 86,800 FMGs, 72,700 were professionally active compared with 62,509 in 1973, and only 54,142 in 1970. These figures imply an average annual net gain of about 3,800 FMGs, the same as the 3,800 average annual net gain for U.S. trained M.D.s (USMGs) over the same period. (There are no foreign trained D.O.s in the U.S., because comparable osteopathic training does not exist in other countries.)

Of the 72,700 professionally active FMGs 35 percent were in primary care specialties, 24 percent in surgical specialties, and 41 percent

Table 1-2. Number and percent of professionally active foreign medical graduates by major activity, United States and possessions: 1970 and 1977

Major activity	Professionally active FMGs			
	1970		1977	
	Number	Percent	Number	Percent
All activities	54,142	100.0	72,686	100.0
Patient care	48,191	89.0	66,738	91.8
Office based	20,980	38.7	39,559	54.4
Hospital based	27,211	50.3	27,179	37.4
Residents	16,648	30.7	13,146	18.1
Full time M.D. staff	10,563	19.5	14,033	19.3
Other non-patient care activity	5,951	11.0	5,948	8.2

Source: Physician Distribution and Medical Licensure in the U.S., 1971 and 1978 Editions. Chicago, American Medical Association.

in other specialties. When compared with 1970, there is an increase in the proportion of FMGs in primary care (35 percent compared with 31 percent), little change in the proportion in surgery, and a decline in the proportion in the remaining specialty groups. In comparison with U.S. graduates, proportionately more FMGs are in specialties outside the primary care and surgical specialty groups and fewer are in the medical subspecialty groups. Foreign medical graduates make up varying proportions of the total supply of physicians in each specialty, ranging from about 38 percent of all physicians in anesthesiology to 7 percent in dermatology.

In 1970, about one-half of the total FMG supply was in hospital based practice (including interns, residents, and full-time physician staff), and just under 40 percent were in office based practice. Seven years later, FMGs in hospital based practice dropped to about 37 percent, while those in office based practice rose to 54 percent.

The reduction in the percent of FMGs in hospital based practice is reflected specifically in their participation in graduate medical education (GME). In 1970, FMGs filled approximately 33 percent of the graduate training positions. This percentage dropped in 1976 to 23 percent and dropped further to 18 percent in 1977. However, declines in available slots for FMGs in graduate training would be expected since a slight but gradual increase in total GME slots occurred during the period from 1970 to 1974. Also, by 1976 the number of slots had levelled off and remained stable through 1977. At the same time the number of graduates of U.S. medical schools exhibited unprecedented growth, with increases averaging about 1,000 a year between 1970 and 1976. An examination of Immigration and Naturalization Service data reveals that between fiscal years 1976 and 1977 (both 12 month periods) there was a reduction of approximately 1,000 in the number of new entrant FMGs. However, new entrant permanent immigrants (PIs) increased by 200 while exchange visitor new entrants (J-visa) declined by almost 1,000. These changes occurred prior to the enactment of the entry restrictions imposed by P.L. 94-484. Even fiscal year 1977 data include a 9 month period prior to the enforcement of the legislation.

When observing graduate training slots by geography and specialty, it is not clear that decreases in the number of FMG J-visas were compensated for by one-for-one increases in USMGs. An examination of the distributional characteristics of J-visa aliens reveals, however, that they either reflect the respective distributions of USMGs or represent a hybrid distribution between USMGs and aliens with permanent resident status. For example, of all USMGs in filled residency positions in 1977, only 3 percent were located in psychiatric hospitals. The same percentage resulted for J-visa FMGs. However, 8 percent of the PI aliens in training were located in psychiatric hospitals. Approximately 2 percent of all USMGs filled residency slots in Anesthesiology; J-visa aliens 5 percent, PI aliens

7 percent. New York City attracted 9 percent of USMGs in filled positions; 19 percent of J-visa aliens and 32 percent of PI aliens.

Historical declines in J-visa aliens, prior to the legislative impact have most likely been compensated in part by USMG supply. Following the legislation, hospitals and other sites relatively more reliant upon FMGs, specifically permanent immigrant FMGs, are expected to experience significant declines in new entrant permanent immigrants for which no waiver provisions exist.

In contrast to changes in the percentage of FMGs in hospital based practice, there has been little change in the percentage of foreign medical graduates in research, teaching and administration. FMGs not classified according to specialty, inactive, or whose address was unknown jumped from 5.4 percent of all FMGs in 1970 to 16.2 percent in 1977, with physicians not classified according to specialty accounting for nearly all of the difference. However, these aggregate statistics somewhat obscure the role FMGs play in the provision of special services. According to a recent study of graduate medical education training positions in hospitals, certain States, specialties, and types of hospitals are more reliant upon FMGs than others, although this overall reliance dropped slightly between 1976 and 1977. 2/ States in the Northeast and North Central Regions have either 20 percent of their hospital staffs or 20 percent of their GME programs, or both, with very high concentrations of FMGs, i.e. a 76-100 percent concentration. New York, New Jersey, and 8 other States in these areas contained 44 percent of the total number of residents and almost 75 percent of the number of FMGs in residency programs. In addition, New York City has more than 40 percent concentration of FMGs in hospital based practice; Baltimore and some other cities in the same regions have from 30 to 40 percent FMGs.

Other more detailed studies of FMGs in particular populations, two in Maryland, 3/, and one in New York State, 4/, compared FMGs to U.S. graduates and found that FMGs: (1) played a much larger role in the delivery of Medicaid-financed services, (2) were more evenly distributed relative to population, and (3) were more heavily relied upon for office

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2/ Jensen, Lynn E. "The Role of Foreign Medical Graduates in Graduate Medical Education Programs." Preliminary draft, American Medical Association, November 1977.

3/ Politzer, R. M. et al. "Foreign-Trained Physicians in American Medicine: A Case Study." Medical Care. September 1978.

4/ Swearingen, C.M. and Perrin, J.M. "Foreign Medical Graduates in Rural Primary Care: The Case of Western New York State." Medical Care. 15:331, 1977.

based primary care services in rural areas than their U.S. trained counterparts.

As the Nation's health care system continues to evolve and change, it will become essential to evaluate continuously the role of foreign medical graduates. The unprecedented growth in their numbers during the last decade, tapering off only in the last few years, resulted, in part, from the availability of graduate training positions and the rising demand for medical services.

The use of the National Board of Medical Examinations (NBME) Parts I and II (or an equivalent test) as the screening examination for the Exchange Visitor Program, the requirement for competency in written and oral English, and other restrictions established under P.L. 94-484 and P.L. 95-83 are expected to restrict future entry of FMGs. This may cause shortages in some specialties and specialty service areas formerly served by FMGs, such as those in mental hospitals and in Medicaid-financed programs, thus requiring continued monitoring and possible corrective action. Moreover, the reduction in the numbers of new entrant J-visa aliens prior to enforcement of P.L. 94-484 coupled with possible future reduction in new entrant permanent immigrants for which no waiver exists necessitates continued examination and evaluation of Federal policy toward restrictions of future new entrant FMGs.

Supply of Dentists. In 1950 there were 75,000 active civilian dentists, a ratio of 49.8 dentists per 100,000 population. Although the supply of dentists has increased steadily since then, the dentist-to-population ratio declined to a low of 46.5 dentists in 1965. In the next year, however, the ratio slowly began to rise. In 1970 the number of dentists was 102,000, and the ratio was 47.1. In the next seven years the number of dentists increased by 15 percent, to 117,900, and the ratio in 1977 was 52.0. Increases in supply over the past decade have been due primarily to the impetus from Federal Legislation.

Types of Dental Practice. Approximately 88 percent of all active dentists were practicing full-time or part-time in a solo, non-institutional setting in 1977. However, group and other types of dental practice have been increasing in recent years, and continued growth is expected in these forms of dental practice.

Foreign Dental Graduates (FDGs). Graduates of foreign dental schools have never been a significant factor in the Nation's supply of dentists. In earlier years, FDGs were required by every jurisdiction to obtain a degree from a dental school in the United States before they could apply for a license to practice dentistry in this country. Although this requirement has been eased, only a small number of FDGs enter practice annually in the U.S. At present, only 13 States and the District of Columbia have any legal provisions to recognize dental degrees earned

outside the United States and Canada. An estimated 959 FDGs were licensed to practice in the United States between 1970 and 1977, and the overwhelming majority of the licenses were awarded by two States--California (44 percent) and New York (33 percent). Among the other jurisdictions with special legal provisions for FDGs, Florida, Illinois, Massachusetts, Maryland, and Pennsylvania have the greatest numbers of FDGs licensed.

Supply of Other Health Professionals. Primarily due to the impetus from Federal legislation, additions to supply in the professions of optometry, pharmacy, podiatry, and veterinary medicine (the VOPP professions) have generally been substantial since 1970.

Between 1970 and 1978, the estimated number of active optometrists increased by one-seventh, from 18,400 to 21,200. However, this increase barely kept pace with increases in population; the ratio of active optometrists to population increased only from 9.0 per 100,000 in 1970 to 9.7 per 100,000 in 1978.

In contrast to optometry, both the number of active pharmacists and the ratio of practitioners to population have continued to increase substantially in the last few years, with the increase for females far greater than that for males. Between 1970 and 1978, the estimated number of active pharmacists increased by 23 percent, from 109,600 to 124,600, while the ratio of active practitioners to population rose from 53.9 per 100,000 to 61.5 (14 percent).

The number of podiatry school graduates was barely sufficient to offset the number of podiatrists leaving the profession during the early 1970s. Small but steady increases in the number of graduates in the mid-1970s brought the estimated supply of active practitioners to 8,100 in 1978, well above the 1970 level of 7,100. However, the ratio of active podiatrists to resident population rose only slightly over the eight-year period--from 3.5 per 100,000 population in 1970 to an estimated 3.7 100,000 in 1978.

The number of active veterinarians has risen by a third since 1970, going from an estimated 25,900 in that year to 34,200 in December 1978. Significant changes have also occurred in the specialty distribution of veterinarians. The percentage engaged in companion animal (noneconomic) practice has increased from 43.5 percent in 1970 5/ to approximately 47.0

5/ New Horizons in Veterinary Medicine, National Research Council, Committee on Veterinary Medical Research and Education, National Academy of Sciences, Washington, D.C., 1972.

percent in 1977 6/, while the percentage engaged in farm animal (economic) practice declined from 24.8 percent to 20.9 percent. However, the current health manpower legislation (P.L. 94-484) places special emphasis on the training of veterinarians for practice in the "food and fiber" (economic) areas.

Women and Minorities in Health Professions. Although the representation of women and minorities in the health professions is not well documented for most of the disciplines, it is known that the proportionate representation of both groups in the health professions and in most health professions schools has been far less than their proportion in the civilian population. The enactment of Federal legislation establishing programs of financial support for health professions students and institutions provided a strong stimulus to the enrollment of minority persons and females in health professions schools (Table 1-3). Consequently, the number of practitioners in these groups should increase in the coming years.

Minority Persons in Health Professions. Members of racial-ethnic ethnic minority groups accounted for 17 percent of the U.S. population in 1970 but were only 6.9 percent of the physician population at that time. (Appendix Table A1-13).

Six of every 10 minority physicians in 1970 were Black (2.1 percent of all physicians) or Filipino (2.0 percent of all physicians). 7/ In spite of large increases in the number of minority graduates from medical and osteopathic schools since 1970, the percentage of minority physicians has increased only slightly because of the substantial increases in the overall supply of physicians since that time. Only about 2.2 percent of all physicians in 1978 were Black.

In 1970 the percentage of minority physicians was greater than the percentage of minority professionals in any other discipline except nursing; however, because of the large increases in total enrollments since 1970, it is unlikely that increases in minority enrollment have substantially raised the percentage of minority practitioners in the other disciplines. In 1970, members of racial-ethnic minority groups were 4.0 percent of all dentists, 1.7 percent of all optometrists, 4.3 percent of all pharmacists and an equal percentage of all podiatrists, and 0.9 percent of all veterinarians. In each discipline except

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6/ Based on tabulations from the membership file of the American Veterinary Medical Association.

7/ U.S. Bureau of the Census. United States Census of Population: 1970, PC(2)-7(A). U.S. Government Printing Office. June 1973.

Table 1-3. Numbers of minority persons and females enrolled in health professions schools, 1971-72 and 1977-78 academic years, and percent increase in numbers enrolled, 1971-1978

Discipline	Minority enrollment			Female enrollment		
	1971-72	1978-79	Percent increase	1971-72	1978-79	Percent increase
Allopathic medicine...	3,072	8,046	162	4,755	15,102	218
Osteopathic medicine..	63	161 1/	156	61	439 1/	620
Dentistry.....	1,081	2,265	110	334	3,112	832
Optometry.....	181	298 1/	65	112	542 1/	384
Pharmacy.....	1,645	2,192 2/	27	4,187	9,902 2/	136
Podiatry.....	40	135 1/	238	16	157 1/	881
Veterinary medicine...	133	302	127	592	2,471	317

1/ Data are for 1976-77.
2/ Data are for 1977-78.

Source: Datagram. U.S. Medical Student Enrollment 1968-69 through 1972-73. Journal of Medical Education 48:293-297, March 1973.
Datagram. Medical Student Enrollment, 1974-75 through 1978-79. Journal of Medical Education. Vol. 54, May 1979.
1976 Osteopathic Medical manpower Information Project. American Association of Colleges of Osteopathic Medicine., Bethesda, Maryland.
Annual Operating Reports, Bureau of Health Manpower, Health Resources Administration, DHEW.
American Dental Association, Council on Dental Education, Division of Educational Measurements.
Annual Report 1978-79. Also prior annual reports.
Association of Schools and Colleges of Optometry. Unpublished data.
Enrollment Report on Professional Degree Programs in Pharmacy, Fall 1977. American Journal of Pharmaceutical Education. Vol. 42, No. 2, May 1978.
American Association of Colleges of Podiatric Medicine. Journal of Podiatric Medical Education. Vol. 8, No. 1, Spring 1977.
Association of American Veterinary Medical Colleges. Unpublished data.

optometry, Black practitioners were the largest minority group, and the percentages of Black practitioners ranged from 0.3 percent of all optometrists to 3.6 percent of all podiatrists.

College enrollment of Blacks has increased sharply since 1970. Of the 16-to-34 year-old population enrolled in college then, 7.0 percent was Black; 8/ in 1977, the comparable percentage was 10.8. 9/ The percentage of Black high school graduates 18-to-24 years-old enrolled in college rose fom 23.3 in 1967 to 31.5 in 1977, exceeding the percentage of white high school graduates enrolled in college then by 2.3 percentage points. These increases should increase the pool of Black students interested in and eligible for admission to health professions schools.

As shown in Appendix Tables A1-14 to A1-16, the number and percentage of minority persons in all stages of medical education has increased since 1968. Blacks, the largest minority group in the U.S. population, are also the largest minority group in all of the health professions schools except optometry where Asian-Americans are the largest minority group.

The number of Black first-year medical (M.D.) students increased from 266 in academic year 1968-69 to 1,061 in 1978-79. However, the percentage of Black first-year medical students, which rose from 2.7 percent of all first-year students in 1968-69 to a peak of 7.5 percent in 1974-75, has since decreased to its present level of 6.4 percent. For American Indians, the number of first-year medical students climbed from 3 to 47 over the period from 1968 to 1978, raising their percentage representation from less than 0.05 percent to 0.3 percent. Changes in the definitions of the racial-ethnic categories complicate direct comparison of the 1968 and 1978 data for Hispanics, but the representation of this group has increased dramatically.

The percentage of all minorities enrolled in U.S. medical schools rose from 3.6 percent of all enrollees in 1968 to 12.3 percent in 1978. The percentage of Black students enrolled reached a peak of 6.3 percent in 1974-75, falling to 5.7 percent of all medical students in 1978-79. For each of the other racial-ethnic minority groups, representation among all medical students has continued to rise or has stabilized over this period.

8/ U.S. Bureau of the Census. Current Population Reports, Population Characteristics, Educational Attainment, March 1970. Series P-20, No. 270, November 30, 1970.

9/ U.S. Bureau of the Census. Current Population Reports, School Enrollment - Social and Economic Characteristics of Students, October 1977. Series P-20, No. 333. February 1979.

Minority representation among U.S. medical school graduates rose steadily from 1968-69 through 1975-76. Blacks made up 1.8 percent of all U.S. medical school graduates in 1968-69 but 5.5 percent of all graduates in 1975-76, 1976-77, and 1977-78. In 1978-79, however, Blacks made up 5.0 percent of senior-year medical students. Data are not available on the percentage of other underrepresented minority groups (American Indians, Mexican Americans, and Mainland Puerto Ricans) among U.S. medical school graduates before 1971-72, but from 1972-73 to 1976-77, their combined representation ranged from 1.0 percent to 1.6 percent of all graduates. In 1977-78, Asians or Pacific Islanders constituted 2.2 percent of all medical school graduates, Mexican Americans and Mainland Puerto Ricans were 1.2 percent each, other Hispanic were 0.6 percent, and American Indians were 0.3 percent of all graduates. (Appendix Table A1-17).

Minority representation among first-year osteopathic students increased from 3.0 percent in 1971-72 to 5.5 percent in 1976-77. Minority representation among all students enrolled in osteopathic colleges decreased slightly from 1971-72 to 1973-74, when only one of every 40 osteopathic students was a minority person. There was an increase in the percentage of minority students in osteopathic schools in each year from 1974-75 to 1976-77, when 4.4 percent of all osteopathic students were minorities.

In 1970, 4.0 percent of all dentists were racial-ethnic minority group members. More than 60 percent of all minority dentists were Black, and just over 29 percent were Japanese or Chinese. 10/ Among first-year dental students, the percentage of minority students ranged from 8.8 percent in 1971 to 11.2 percent in 1975, but has decreased slightly in each year since 1975 to a low of 10.8 percent in 1978. One of every 11 dental school graduates in 1978 was a minority person.

There were 185 Blacks among first year dental students in 1970, 4.1 percent of all first-year students. The number of Blacks in first-year dental school classes jumped to 245 in 1971, and has ranged from 266 to 296 since that time. The percentage of Blacks in first-year dental school classes was highest in 1971 and 1975, when it was 5.2 percent.

In 1978-79, 4.4 percent of all first-year dental students were Black, the lowest percentage since the 1970-71 school year. Black representation in total dental student enrollment reflects their representation among first-year students. Among dental school graduates, the percentage of Black graduates, which was only 1.5 percent of the total in 1970, increased steadily until 1976 when it was 4.2

10/ U.S. Bureau of the Census. United States Census of Population: 1970, PC(2)-7(A) U.S. Government Printing Office, June 1973.

percent. Only 3.8 percent of all dentist graduates in 1977 were Black Americans.

The number of American Indians among first-year dental students increased from 4 in 1971-72 to 16 in 1978-79, while the number enrolled increased from 8 to 64 over this period. Twelve American Indians were graduated from dental schools in 1978-79.

The former categories of Mexican-American and Puerto Rican were redefined under a Hispanic category and the former "Other minority" category was eliminated in 1977-78. There were 110 Hispanic first-year dental students in 1977-78 and 122 in 1978-79, accounting for about 2.0 percent of all first-year students in each of those years. However, the percentage of Hispanic graduates increased from 1.3 percent of all graduates in 1977 to 1.7 percent in 1978.

Only 1 out of every 60 optometrists in 1970 was a member of a racial-ethnic minority group, one-half of them Blacks and one-half Asian Americans. 11/ Six percent of all optometry students in 1971 were members of racial-ethnic minority groups. This percentage rose to 9.0 percent in the 1974-75 school year, but decreased by 1 percentage point in 1975-76 and again in 1976-77. While the proportion of Black students enrolled in optometry schools increased from 18 percent of all minority students in 1971 to 30 percent in 1976, more than one-half of all minority students over this period have been Asian Americans.

In 1970, 4.3 percent of all pharmacists were racial-ethnic minority group members. 12/ By 1973, the latest year for which data are available, that percentage had edged down to 4.2. Minority enrollment in pharmacy schools, in contrast to most health professions schools, also decreased from 1971 to 1974, from 10.1 percent to 7.6 percent. In 1975 and 1976, however, minority enrollment had climbed to 8.9 percent.

One out of every 23 podiatrists in 1970 was a minority group member, and 4 out of every 5 minority podiatrists were Blacks. Although racial-ethnic minority enrollment in podiatry schools has increased since 1970, it represented just over 6.0 percent of total enrollment in 1976-77. There were only 13 racial-ethnic minority graduates out of 497 graduates from podiatry schools in 1976, but the number of minority graduates is expected to more than triple by 1980.

11/ Ibid

12/ Ibid.

According to the 1970 Census of Population, less than 1 percent of all veterinarians were minority persons, of whom one-half were Blacks and slightly less than one-half were persons of Spanish heritage. Current information on the race (and sex) of veterinarians is not available. Minority students accounted for 4.6 percent of students admitted to U.S. veterinary medical schools in 1978 and 5.1 percent of the graduates in that year. 13/

In summary, increases in minority representation among physicians and dentists are expected to continue for about 3 more years because of the substantial increases in minority enrollment in those disciplines in the first 5 years of this decade. In the remaining disciplines, where the increases in minority enrollment were less substantial or negligible, little or no change in the proportionate representation of minorities is anticipated.

Women in Health Professions. In 1970, the proportion of women employed in the health professions varied widely, ranging from 11.9 percent of all pharmacists to 3.4 percent of all dentists. Among physicians, 1 out of every 11 employed physicians in 1970 was female, whereas 1 out of 12 dentists, 1 out of 8 pharmacists, 1 out of 13 podiatrists, 1 out of 20 veterinarians, and 1 out of 25 optometrists were female. 14/ Since that time women have enrolled in and graduated from health professions schools in ever-increasing numbers, and it is anticipated that they will constitute a significant segment of the health professions work force in the future.

Women trained in the professions apparently are increasing their participation in the labor force. According to a study by Marilyn Heins, et. al., in the June 6, 1977, issue of the Journal of the American Medical Association, women physicians--reported as recently as 1975 as working only two-fifths as much as men--were reported in 1977 to be working nine-tenths as much. Even this figure may be an underestimate, say the authors, who found the hours worked by males overstated. A "majority" of the 26.1 percent of males who stated they worked more than 70 hours per week were including their hours on call as well as those actually worked.

"Women understated their medical work by restricting it to formal appointment or practice situations, whereas a great deal was being done informally without monetary reward."

13/ Unpublished preliminary data from the Association of American Veterinary Medical Colleges.

14/ U.S. Bureau of the Census. 1970 Occupation by Industry, 1970 Census of Population, Special Report PC(2)-7C. U.S. Department of Commerce, Washington, D.C., 1972. (Based on 20 percent sample.)

According to data from the American Medical Association, there were 32,283 active female M.D.s as of December 31, 1977, 8.9 percent of all professionally active M.D.s. These data, although not strictly comparable with data from the 1970 Census, indicate little change in the percentage of women among active physicians. There is some evidence of a slight shift in the specialty choices of women physicians between 1976 and 1977, with the percentage of women physicians in general practice decreasing from 10.6 percent to 9.9 percent while the percentage in the residual category of "other" specialties increased from 34.4 percent to 35.2 percent (Appendix Table A1-19).

The percentage of women among first-year students rose from 9.0 percent in 1968 to 25.2 percent in 1977 in allopathic medical schools and from 4.0 percent in 1968 to 14.5 percent in 1976 in osteopathic schools. The percentage of women among all students rose from 8.8 percent in 1968 to 24.3 percent in 1978 in allopathic medical schools and from 2.8 percent in 1968 to 11.7 percent in 1976 in osteopathic schools.

In 1976, women represented 1.4 percent of practicing dentists, but this percentage is expected to rise because of the increasing female enrollment in dental schools. Between 1968-69 and 1978-79, the percentage of women among first-year dental students went from 0.9 to 15.9 percent and among all dental students, from 1.1 to 14.0 percent.

The geographic and specialty distribution of female dentists are uneven. More than one-third of all women dentists are concentrated in 3 States--California, New York, and Illinois, and 24 States each had fewer than 10 women dentists in 1976. Women account for approximately 1 percent of all active dental specialists, and 93 percent of all female dental specialists are in 3 of the 8 dental specialists, viz., orthodontics, pedodontics, and periodontics.

Only 1 out of every 50 optometrists employed in the United States in 1973 was female. However, the proportion of women among students enrolled in schools of optometry jumped from 1 out of every 20 students in academic year 1972-73 to 1 out of every 7 students in academic year 1976-77.

Historically, the percentage of women pharmacists has been greater than the percentage of women in any health profession except nursing. In 1970, 1 out of every 8 employed pharmacists was a woman. 15/ In the 1968-69 school year, 20.1 percent of all third-to-last year pharmacy students and 18.2 percent of all pharmacy students were women. Both of these percentages were practically doubled by the 1976-77 school year, when women were 39.5 percent of third-to-last

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15/ Pharmacy Manpower Information Project, American Association of Colleges of Pharmacy, 1973-74. Bethesda, Maryland

Table 1-4. Numbers and percent of female students in dental schools, by class year: academic year 1977-78

	All classes	1st year	2nd year	3rd year	4th year
All students.....	21,510	5,954	5,807	4,577	5,172
Female students.....	2,796	880	780	542	594
Percent of all students.....	13.0	14.8	13.4	11.8	11.5
Percent of female students.....	100.0	31.5	27.9	19.4	21.2

Source: Annual Report on Dental Education; 1978-79. American Dental Association, Council on Dental Education.

year pharmacy students and 36.8 percent of total enrollment in pharmacy schools. In 1974, the latest year for which data on the number of active pharmacists are available, 11.0 percent of all active pharmacists were women.

Between 1969-70 and 1976-77, the proportion of women enrolled in schools of podiatry increased from less than 1 percent to just over 7 percent. However, nearly one-third of all female podiatry students were enrolled in 1 of the 5 podiatry schools, and one-fourth were enrolled in a second school.

The enrollment of women in U.S. schools of veterinary medicine increased sharply between 1968-69 and 1978-79. Among first-year students, the number of females increased from 120 to 766, from 9.0 to nearly 37 percent. As of Fall 1978, about one-third of all veterinary medicine (DVM) students were women. 16/

In summary, continuing increases in enrollment of women in schools for all of the health professions mean a significant rise in female representation among practitioners. This should be monitored for its impact on areas such as patterns of employment and income.

16/ Preliminary unpublished data from Association of American Veterinary Medical Colleges.

Recent national attention has been focused on the accessibility of the population to professional health care, the current geographic distribution of health care professionals, the increasing specialization of practitioners, and the definition and identification of geographic areas experiencing manpower shortages.

Accessibility to Professional Health Care. A major concern at all levels of government as well as of providers and consumers of health care is accessibility of services. Economic barriers limit access to care as much as do lack of providers, geographic barriers, travel time to providers' offices or other care settings, or long waiting times for appointments.

However, the findings from two recently released studies allow some optimism about physician accessibility. Preliminary findings from the first study, a national survey of access to medical care, are published in a special report by the Robert Wood Johnson Foundation. The survey, based on a sample of 7,787 persons, was conducted by the Center for Health Administration Studies of the University of Chicago between September 1975 and February 1976. The second study, conducted by the National Center for Health Statistics (NCHS) of the U.S. Public Health Service, is based upon findings obtained from a one-third subsample of respondents to the 1974 Health Interview Survey.

When compared with similar studies conducted by the Center for Health Administration Studies in 1963 and in 1970, the findings of the 1976 Johnson Foundation report indicate that access to medical care improved between 1963 and 1976 for the entire U.S. population, as well as for every subpopulation group studied. For example, the percent of the Black population seeing a physician increased greatly. Also, the gap in physician utilization between persons in different racial-ethnic groups appears to have narrowed dramatically since 1970. The largest gains in utilization were made in the central cities, where obstacles to medical care access have long been pervasive.

Data from these surveys also show a narrowing of the gaps in utilization of physician services by persons of different income groups. In contrast to medical services, the differences between the proportions of people in various income groups seeing a dentist continue to be large. The greater accessibility of physicians to all income groups as compared with dentists is probably related to the widespread availability of medical insurance as contrasted with the very limited availability of dental insurance.

The Johnson Foundation's survey found that 88 percent of the total U.S. population have a regular source of medical care. Among

sociodemographic groups the probability of having a regular source of care ranged from a high of 95 percent for children to a low of 83 percent for persons of Spanish heritage residing in the Southwest.

Similarly, in the 1974 NCHS study, it was found that 85 percent of the population had a regular source of medical care. Of the 14.9 percent of the population who did not have a regular source of care, more than one-half responded that, as far as they could determine, they did not need a regular source of care. An additional 7.6 percent of those without a regular source of care stated that they were unable to find the right doctor, and loss of access to a previous doctor was the reason cited by another 7.5 percent. Only 1.1 percent of the group without a regular source of care cited the high cost of medical care. The remaining 17.8 percent was classified as being without a regular source of care because they saw different doctors according to their various health needs. Fewer than 3 out of 10 persons described as not having a regular source of care attributed this lack to access problems, a finding that may be largely explained by the increasing use of emergency room resources for primary health care.

A significant part of the Johnson Foundation study was devoted to an examination of such factors as travel time to a doctor and waiting time in a physician's office. About one-half of the population travels less than 15 minutes to their physicians. Waiting time in the physician's office is less than 30 minutes for close to two-thirds of the population; however, the percentage of particular population segments with waits of 30 minutes or less ranged from 44 percent for rural Southern Blacks to upwards of 75 percent for children, those with high income, and suburban residents.

It was also estimated from the University of Chicago survey that 3 of every 4 persons in the U.S. population saw a physician during 1976, the survey period. Among the sociodemographic groups listed in the report, the percentages of persons seeing a physician ranged from 65 percent for rural Southern Blacks and Spanish heritage persons in the Southwest to 87 percent of children aged one to five. The mean number of annual visits for those who saw a physician totalled 5.4 for the U.S. population, ranging from 4.0 for farm residents to 7.6 for those aged 65 and older.

The Chicago study probed into whether patients were satisfied or dissatisfied with the medical care they received. Among those who had seen a physician in the preceding 12 months, close to 9 of every 10 were generally satisfied with the overall visit. According to the 1974 NCHS HIS report, 94 percent of the population felt that they were getting as much medical care as they should; of the remaining 6 percent, one-half indicated that cost was a factor.

Despite this apparently high level of satisfaction, as well as the improved access to the medical care system for nearly all socio-demographic groups in the U.S. population, 61 percent of those responding agreed with the statement, "There is a crisis in health care today in the United States", and only 13 percent disagreed with it. Similarly, 51 percent agreed with the statement "There is a big shortage of family doctors around here", and only 23 percent disagreed. Differences in perceptions and expectations may account in part for the paradox. People may want to feel that the care they are getting is appropriate, but they may still feel concern about the quality, adequacy, and impact on their well-being of the care received. This concern based upon uncertainty may allow a feeling of crisis to coexist with a general feeling of assurance about care. However, the apparently high level of satisfaction and improved access should not obscure the fact that approximately 30 million persons lack access to primary health care manpower, and over 60 million persons live in medically underserved areas. National totals and other large aggregations tend to mask the very real problems that still remain, particularly in small areas and among some population subgroups.

An encouraging sign for the future is that of the 15 medical schools currently either in the planning stages or with provisional accreditation, at least one-half have as objectives: (1) to improve access to health care for medically underserved rural and minority segments of society; and/or (2) to increase the supply of students from those communities. Since these objectives are to some degree goals for other medical and other health professions schools, the anticipated increases in the overall supply of physicians and other health professionals and changes in the sex and racial-ethnic composition of health professions personnel are likely to stimulate future improvements in the accessibility of practitioners in areas currently underserved.

One of the major considerations with respect to access to dental care is the manner in which the dental care delivery system functions.

Within the private sector, the principal mode for care delivery is the dentist in a solo, private practice. Access to that system is almost totally based on out-of-pocket means with much less prepayment through health insurance plans than in medical care. Approximately 60 million people may be covered under a prepaid dental care program by 1980, although only 35 million people had some form of third party coverage for dental care in 1977. In other dental care systems (e.g., dental schools, Veterans Administration), access is based largely on whether or not the specific needs of the patient fit the requirements of the system. As with other health professional care, determinants of access are largely economic, although other variables which influence access to either dental care system are distribution of practitioners, type of manpower resources, transportation, and level of consumer education.

Certain segments of the Nation's population have limited access to any dental care delivery system due to cultural and socioeconomic factors. However, dental students are now being taught to deal with those factors, and this training may facilitate access to primary dental care for more of the people who currently are underserved.

As with medical care, access to dental care has also improved for minority groups in recent years, as evidenced by an increase in the number of dental visits per minority member per year from 0.8 in 1964 to 1.1 in 1976. However, this increase has not been sufficient to bring the level of minority dental visits up to the 1.8 visits per year level of the nonminorities.

A change in the largest element of the dental care delivery system, the private practice system, has been the introduction of advertising resulting from recent decisions of the Federal Trade Commission. Although the long-term effects are unknown, the Federal Trade Commission initiatives are based on the belief that the increased competition resulting from advertising, by holding down costs, will make access to the system easier. Although precise figures are not available, printed media advertising by dentists has increased.

Another recent change in the dental health care system has been an increase in the potential manpower resources available to the National Health Service Corps through increases in the Corps scholarship program and the loan repayment program. Since National Health Service Corps practitioners are placed in designated manpower shortage areas, the resultant impact on improving access to dental care in underserved areas could be significant.

Among the developments that have had a marked effect on the practice of optometry and the position of optometrists in the health care system is the public's increased acceptance of the optometrist's skills as a community resource and the related movement by optometrists toward providing community and environmental health services. Optometrists are being utilized in many practical ways, such as planning of highway lighting, helping motor vehicle departments to devise mechanisms for determining proper vision necessary for driving, and working with officials in public schools systems to determine the relationship between proper vision and the ability to read and otherwise perform well in school.

Another important movement in optometry is the development in existing optometry schools of clinical training resources necessary to produce primary care optometrists. Clinical outreach programs have served to move students out of the optometry school setting for at least part of their training. Increasingly, the academic health center is being regarded as the optimum environment for the study of optometry, since

this setting provides essential resources such as available patient population, and clinical, administrative, or research resources.

The passage of legislation which authorizes optometrists to use drugs for both diagnostic and therapeutic purposes in West Virginia and North Carolina is another significant development in optometry. Twenty other States permit optometrists to use drugs for diagnostic purposes only. The West Virginia and North Carolina legislation may indicate further trends toward an overlap in specific vision services to be provided by optometrists or ophthalmologists in the future.

Pharmacy had first been a community oriented profession but then became one in which the traditional practices were combined with mass merchandising of both drug and nondrug items. Now it seems to be moving back to its earlier community orientation. Increasing emphasis is being placed upon a clinical orientation in the practice of pharmacy. Massive expansion of third party payments for drugs by health insurance plans, Medicaid, and union insurance programs have significantly affected the way the profession is practiced today. However, there is evidence that the pharmacist is moving, slowly, toward a greater role in overall health care delivery, including an expanded role beyond the mere preparation and delivery of medication. For example, in addition to developing patient drug profiles, pharmacists in some hospitals are making rounds with physicians and other health professionals and participating with the physician in determining effective drug therapy. Also, similar pharmacist-physician relationships have developed between community-based health professionals.

Podiatry has changed in recent years too. Recent graduates from schools of podiatric medicine differ from their older counterparts in that they are more likely to have received their clinical training in settings external to the main outpatient podiatry clinic of the school, to practice their profession in multiple-practitioner relationships, and to have a podiatric specialty (such as surgery) as their primary clinical activity rather than general practice. As members of the modern health care team, podiatrists have assumed an important role in the provision of foot care, part of which includes a diversification in both the number and type of foot care services they provide. While it is generally known that podiatrists make significant contributions to the care of the feet of the diabetic, the patient with peripheral vascular disease, and the arthritic patient, the podiatrist's role in the prevention, diagnosis, and medical-surgical care of patients subject to acute and chronic primary and secondary foot pathology is often not recognized by the public.

The role of the veterinarian in the human health care delivery system remains a subject of continuing debate. Although the contributions of veterinarians in areas such as zoonoses prevention, food protection and public health are widely accepted as contributing directly to human health, other areas, like the mental and emotional health of

owners of companion animals, are less widely accepted. The overall supply of veterinarians appears adequate at present; however, some problems of geographic "maldistribution" continue to exist, particularly for farm animal practitioners in scattered rural areas. Comparative medical research in veterinary medicine is expected to receive greater emphasis as restrictions increase on the use of human subjects for medical research.

Current Geographic Distribution of Health Care Professionals

The uneven geographic distribution of health care professionals between urban/ rural or metropolitan/nonmetropolitan areas is a major problem of the health care delivery system. However "head counts" of health professionals by geographic or geo-political areas do not fully describe the availability of professional services. An examination of the geographic distribution of M.D.s reveals that in nonmetropolitan areas and in Standard Metropolitan Statistical Areas (SMSAs) of less than 1,000,000 population, the numbers of full-time equivalent physicians (FTEs) exceed "head count" numbers by varying margins. However, in SMSAs of about five million, head counts and FTEs were about equal. In SMSAs of more than five million, the reverse occurred. In an effort to relate "head counts" to full-time equivalent (FTE) manpower, the American Medical Association (AMA) performed a FTE study of the 1976 M.D. supply. 17/ In this study, th average number of hours worked per week by all active M.D.s (60) was used as a standard for calculating each FTE. (This is actually higher than other estimates of work weeks for physicians which range around 50 hours.) In the less urbanized centers, physicians generally work longer hours and see more patients than physicians in the more urbanized areas, although there are deviations from this within individual census regions. This finding is supported by Mathematica, Inc. for the Bureau of Health Manpower. 18/

Analyses of the geographic distribution of physicians are usually conducted on 1 of 3 levels: the State, county, or health service area (HSA). None of these three levels can be considered totally adequate because people often cross State, HSA, or county lines to obtain medical service, and none of these are medical service areas in any real sense. Thus, the quantitative analysis of physician distribution, using these geopolitical units, can be

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17/ Final report, Contract No. 106-74-121, submitted to National Center for Health Statistics, DHEW, June 1976.

18/ Final report on the "Telephone Resurvey of Physician Capacity Utilization." Prepared under contract for the Manpower Analysis Branch, (now the Division of Manpower Analysis) BHM, HRA, March 1977.

misleading as the physician-to-population ratios in similar units may not be truly compatible with each other. Other methods for doing analyses of physician-to-population ratios have been attempted in small studies covering economic trade areas, census tracts, or zip code areas, but data at these levels are seldom available and little improvement in the analyses has resulted from use of these geographic units.

The most used analysis of physician distribution is at the county level. Changes that occurred in the county level distributions of active, non-Federal physicians in the 1960-1976 period are shown in Table 1-5. This table contrasts the changes in non-Federal M.D. distributions between SMSA, urban, and rural counties. At the most general level, it is apparent that both the urban counties and the subcomponent SMSA counties increased their physician supplies rapidly over the entire time period. The gap between urban and rural counties in terms of physician/population ratios widened also, with rural counties having 42 percent of the urban ratio in 1960 and 28 percent of the urban ratio in 1976. Yet a slightly more promising outlook is obtained when the more detailed changes within the time period are examined. Between 1960 and 1970, rural areas experienced a slight decline in population and a 12 percent decrease in the number of physicians and in their physician/population ratio. In contrast, rural counties had a 9 percent increase in population in the 1970 to 1976 period and had a 16 percent increase in their physician supplies. This resulted in an increase of about 7 percent in rural counties' physician/population ratios compared to the prior 12 percent loss. Moreover, a comparison with similar earlier analyses indicates that most of the favorable change took place between 1974 and 1976.

One result of this change is that the number of rural counties with at least 100 physicians per 100,000 population increased sharply after 1970. On the other hand, there was an increase in the number of rural counties showing a reduction in their physician population ratio in the 1970s. As the major effects of expansion of medical school capacity only began to become apparent in the mid-1970s, (because with construction, 4 years undergraduate and 3 years residency training, and 3 years cumulative effects a total of 10 to 12 years are required for medical school expansion to show an observable impact on supplies), analysis of the effects of this expansion on manpower distribution will be very important as more data for the mid and late 1970s become available. The first indications, based upon data through 1976, are not clear but do contain some suggestion that rural supplies may improve somewhat in the near future. The amount and breadth of such improvement should be closely tracked, however, as it is quite possible that even substantial improvement for rural areas as a whole may not contain improvement for the more underserved rural areas of the Nation.

Table 1-5. Trends in urban/rural county distribution of active non-federal M.D.'s: 1960-1970, 1970-76

	Counties by type		Physician manpower						Population (000's)					
	No.	% change	1960	1970	% change	1970	1976	% change	1960	1970	% change	1970	1976	% change
All counties....	3,078	+100.0	209,429	279,135	+33.3	279,135	347,770	+24.6	178,352	203,140	+13.9	203,140	214,666	+5.7
SMSA counties...	644	+ 20.9	173,799	241,088	+38.7	241,088	301,669	+25.1	126,674	149,898	+18.3	149,898	157,165	+4.8
Urban counties..	1,963	+ 63.8	202,693	273,237	+34.8	273,237	340,927	+24.8	165,162	190,151	+15.1	190,151	200,482	+5.4
Rural counties..	1,115	+ 36.2	6,736	5,898	-12.4	5,898	6,843	+16.0	13,190	12,989	- 1.5	12,989	14,184	+9.2

	Physicians/100,000 pop.						Number of counties with 100 physicians per 100,000 pop.			Number of counties			
										1960 to 1970		1970 to 1976	
	1960	1970	% change	1970	1976	% change	1960	1970	1976	Loss of phys.	Lower ratio of phy/pop	Loss of phys.	Lower ratio of phy/pop
All counties....	117	137	+17.1	137	162	+18.2	387	448	612	38	71	90	39
SMSA counties...	137	161	+17.5	161	192	+19.3	207	246	306	29	46	54	15
Urban counties..	123	144	+17.1	144	170	+18.1	352	413	555	40	0	23	50
Rural counties..	51	45	-11.8	45	48	+ 6.7	35	35	57	98	71	67	89

Index of relative physician-population ratios of all States

Counties: 1960, 1970, and 1976

(Index = Rural Ratio / Urban Ratio)

1960 Index = 0.415
1970 Index = 0.313
1976 Index = 0.282

(Index = SMSA Ratio / Urban Ratio)

1960 Index = 1.114
1970 Index = 1.118
1976 Index = 1.118

Note: Urban counties include SMSA counties.
Rural counties are those which: (1) are not an SMSA county and (2) have 25% or less urban population.

Source: Unpublished data from the Division of Manpower Analysis, BHM, HRA.

A comparison of the physician-to-population ratios at the county level is cumbersome, given that there are more than 3,000 counties, and, as pointed out in the caveats at the start of this section, county boundaries do not often coincide with the boundaries of a rational health service area. The population of a county normally has access to either more or fewer physicians than just the pool of physicians with a practice location in that county. Also, the county rarely has the ability to mobilize its administrative structures to develop linkages to those organizational units which can help in attracting needed resources if it has less that its share of health care resources.

Analyses of HSAs, unlike those of counties, offer a different and possibly more realistic approach to service areas. In addition, HSAs have the mandate to deal with the problems of physician distribution under Public Law 93-641 and are more likely to have the required administrative linkages. These 204 designated units are believed to constitute somewhat more rational health service areas than the counties, and their smaller number makes them far easier to analyze. However, HSAs are still often too large for some types of analysis, especially those related to primary care.

For both primary care physicians and surgeons, the number of HSAs short of those professionals (142 for primary care, 147 for surgeons) is more than double the number of HSAs with an excess of those professionals (61 for primary care, 58 for surgeons).

In dentistry, perhaps more so than in medicine, economic and social factors determine the location of dental practices. In metropolitan areas, there is generally a greater effective demand for dental services and a greater ability to pay for them than in most nonmetropolitan counties. Consequently, many dentists settle in or close to urban areas in order to be near centers of professional, social, recreational and cultural activities.

The average number of dentists per 100,000 population for the Nation was 53 in 1977. The average number of dentists was 59 per 100,000 population for metropolitan areas, but ratios in the inner-cities were much lower. For nonmetropolitan counties the average was 36 dentists per 100,000 population. Also, in the nonmetropolitan counties, there is a steady decline in the concentration of dentists when these counties are grouped by decreasing size of the central city. For the nonmetropolitan counties with the largest central cities (25,000 population and over), the average number of dentists is 45 per 100,000 population, still substantially lower than the average figure for metropolitan areas. The ratio of dentists to population continues to diminish with the decreasing size of the central city, until there is an average of only 27 dentists per 100,000 population in counties with a central city of less than 5,000.

Persons per dentist ratios have long been used in rating the availability of dental manpower, even though many deem this method less than fully satisfactory. The 3,114 counties and independent cities of the United States show a very great variation in such ratios (Table 1-6). In 1976, there were 267 counties with no dentist at all and 710 counties with the unfavorable ratio of 5,000 or more inhabitants per dentist. At the other extreme, there were only 373 counties with persons per dentist ratios less than 2,000 persons per dentist, chiefly because of the greater concentration of dentists in metropolitan areas.

The Northeast region, which had the lowest persons per dentist ratio in 1977, also fared best as measured both in average number of dental visits (1.9) per person per year and in the percent of persons in the region who visited a dentist within a year (51.2 percent) (Table 1-7). As a region's persons per dentist ratio increases, the population averages fewer dental visits, with the population in the South having only 1.2 dental visits per year and only 40.5 percent of the population having a dental visit within a year.

The same progression prevails when metropolitan and nonmetropolitan areas are compared. Metropolitan areas with the lower persons per dentist ratios also have the higher dental visit records, with an average of 1.8 dental visits per person per year and 49.4 percent of the population with a dental visit within a year. At the other extreme are the rural areas, with only 41.9 percent of persons with dental visits within a year and less than one dental visit per person per year.

The same relationship is shown in Table 1-8, which places the States in four groups according to their persons per dentist ratios. The group with the lowest ratio (under 1,800) had both the highest average number of dental visits (1.7) and the highest percent of persons with a dental visit within a year (49.2). These figures decreased with each successive State group which had higher persons per dentist ratios. For the group of States with 2,500 or more persons per dentist, dental visits per person per year were only 1.1, and the persons who received dental services within a year constituted 40.8 percent of the population.

The ratio of optometrists to population is the same for both metropolitan and nonmetropolitan counties. There are 9 optometrists per 100,000 population in the most densely populated counties (one million population or more), and also in the nonmetropolitan counties (under 50,000 population). However, in counties with under 5,000 population the ratio is 6 optometrists per 100,000 population.

Although the median U.S. county has between 8,001 and 11,000 persons per optometrist, there are 807 counties with fewer than 1,800 persons per optometrist and 840 counties with no optometrist.

Table 1-6. Distribution of counties according to ratio of persons per active civilian dentist, by State: December 1976

State	All counties	Number of counties by persons-per-dentist ratios					
		Without any dentist	5,000 and over	4,000 to 4,999	3,000 to 3,999	2,000 to 2,999	Under 2,000
United States	3,114 1/	267	710	397	594	773	373
Alabama	67	2	40	9	8	8	0
Alaska	1	0	0	0	1	0	0
Arizona	14	0	3	4	2	4	1
Arkansas	75	6	24	14	17	12	2
California	58	1	1	2	2	17	35
Colorado	63	12	5	3	6	18	19
Connecticut	8	0	0	0	1	2	5
Delaware	3	0	0	1	1	1	0
District of Columbia	1	0	0	0	0	0	1
Florida	67	4	20	12	10	16	5
Georgia	159	33	63	18	25	17	3
Hawaii	4	0	0	0	0	1	3
Idaho	44	3	6	3	12	10	10
Illinois	102	5	14	13	34	30	6
Indiana	92	3	16	19	26	26	2
Iowa	99	1	11	17	19	41	10
Kansas	105	13	5	18	23	36	10
Kentucky	120	3	48	21	29	17	2
Louisiana	64	2	34	10	7	10	1
Maine	16	0	1	1	4	7	3
Maryland	24	0	4	3	5	7	5
Massachusetts	14	0	0	0	0	4	10
Michigan	83	1	6	11	16	33	16
Minnesota	87	0	8	5	16	39	19
Mississippi	82	4	42	11	16	8	1
Missouri	115	6	38	16	27	22	6
Montana	56	12	12	19	7	2	4
Nebraska	93	16	3	5	20	28	21
Nevada	17	6	3	0	1	6	1
New Hampshire	10	0	0	0	1	4	5
New Jersey	21	0	0	1	1	10	9
New Mexico	32	6	10	3	8	3	2
New York	62	0	4	1	17	22	18
North Carolina	100	7	39	11	20	20	3
North Dakota	53	11	7	3	11	12	9
Ohio	88	1	17	10	26	32	2
Oklahoma	77	5	25	15	18	11	3
Oregon	36	3	1	1	2	18	11
Pennsylvania	67	1	6	3	17	33	7
Rhode Island	5	0	0	0	1	2	2
South Carolina	46	1	19	11	10	5	0
South Dakota	67	18	10	2	7	20	5
Tennessee	95	6	33	10	15	19	9
Texas	254	43	60	45	53	44	8
Utah	29	5	1	2	7	4	10
Vermont	14	2	1	0	1	4	6
Virginia	136	21	40	17	13	21	24
Washington	39	2	3	0	5	14	15
West Virginia	55	0	21	10	12	9	3
Wisconsin	72	2	3	3	13	33	18
Wyoming	23	0	3	1	1	11	7

1/ Count of counties includes 40 independent cities, of which 38 are in Virginia, one is in Maryland, and one is in Missouri.

Source: Based on data from Distribution of Dentists in the United States, by State, Region, District, and County, 1976. American Dental Association, Bureau of Economic Research and Statistics.

Table 1-7. Persons-per-dentist ratios, by geographic region and place of residence, related to dental visits

Geographic area	Average persons-per-dentist ratio in 1977	Dental visits: 1969-71	
		Average number of dental visits per person per year	Percent of persons with dental visits within a year
United States	1,905	1.5	46.3
Geographic region			
Northeast	1,562	1.9	51.2
West	1,595	1.8	48.1
North Central	2,053	1.4	47.4
South	2,396	1.2	40.5
Place of residence			
Metropolitan areas	1,701	1.8	49.4
Non-metropolitan areas:			
Non-farm	2,575	1.2	43.1
Rural	3,664	0.9	41.9

Source: Based on data from State Estimates of Disability and Utilization of Medical Services: United States, 1969-71. National Center for Health Statistics, and on unpublished 1977 data from the American Dental Association, Bureau of Economic Research and Statistics.

The number of optometrists per 100,000 population by HSAs shows substantial variation, but less than is shown among counties. The lowest ratio is found for a HSA in Alabama with 2 optometrists per 100,000 population; the highest ratio is found for a HSA in Massachusetts, with 16 per 100,000. For all HSAs, the median number is around 11 optometrists per 100,000.

In comparison to other health professions, the distribution of pharmacists is relatively even between metropolitan and nonmetropolitan counties. The number of pharmacists per 100,000 population in 1974 was 48 in metropolitan counties and 43 in nonmetropolitan counties. The largest standard metropolitan counties (one million or more population) averaged 51 pharmacists per 100,000 population. Even in the most sparsely populated counties--those with less than 5,000 population, there were 38 pharmacists per 100,000 population.

In terms of persons per pharmacist ratios, 1,507 counties, or almost one-half of the 3,078 counties in the United States, had fewer than 2,401 persons per pharmacist in 1974. Another 725 counties had between 2,401 and 3,200 persons per pharmacist. The number of counties without a pharmacist was 133, considerably lower than for other health professions.

The HSA ratios of pharmacists per 100,000 population are mixed, ranging from a low of 24 for the entire State of Hawaii to a high of 80 in HSA #3 in Colorado. Within individual States there are some substantial differences. In California the HSA range is from 33 to 64; and in Pennsylvania, from 32 to 62.

The number of podiatrists per 100,000 population in metropolitan counties of 1 million or more population averages 4; but for the counties with 250,000 to 500,000 population, the ratio falls to 2. The nonmetropolitan counties with less than 50,000 population have, on the average, one podiatrist per 100,000 population; and for the least densely populated counties (less than 10,000 population), the average is near zero.

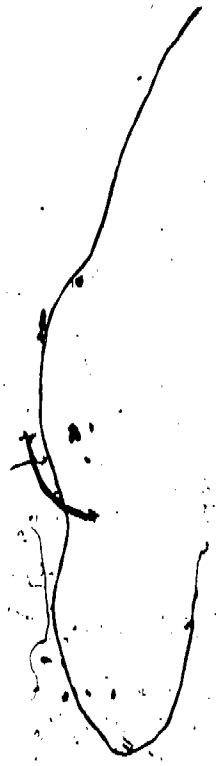
There are about 2,238 counties in the United States without a podiatrist. Another 212 of the total of 3,084 counties have 49,000 or more persons per podiatrist. In the more favorable range, there are 222 counties with 21,000 to 32,000 persons per podiatrist and 197 counties with fewer than 21,000 persons per podiatrist.

An examination of health service areas (HSAs) also shows considerable variation in the number of podiatrists per 100,000 population. Although a number of HSAs in the South (in Mississippi, Alabama, South Carolina, and Tennessee) show ratios near zero, the number of podiatrists per 100,000 population is as high as 8 or 9 in areas of California, Pennsylvania, and New York.

Table 1-8. Persons-per-dentist ratios, by State groups, related to dental visits

State group, determined by persons-per-dentist ratio	Number of States in group	Average persons-per-dentist ratio in 1977	Dental visits: 1969-71	
			Average number of dental visits per person per year	Percent of persons with dental visits within a year
United States.....	50	1,905	1.5	46.3
Under 1,800.....	13	1,513	1.7	49.2
1,800-2,099.....	13	1,936	1.5	48.0
2,100-2,499.....	13	2,217	1.2	44.7
2,500 and over.....	11	2,741	1.1	40.8

Source: Based on data from State Estimates of Disability and Utilization of Medical Services: United States, 1969-71. National Center for Health Statistics, and unpublished 1977 data from the American Dental Association, Bureau of Economic Research and Statistics.



Reversing the pattern for most health professionals, and not unexpectedly, more veterinarians are located in nonmetropolitan counties than in metropolitan. There was an average of 10 veterinarians per 100,000 population in the Standard Metropolitan Counties and 17 per 100,000 population in nonmetropolitan counties; 509 counties were without a veterinarian.

For veterinarians, there is also wide variation in the number of practitioners per 100,000 population by HSA, ranging from 4 in a HSA in Pennsylvania to 43 in a HSA in Nebraska. However, care must be taken in utilizing these numbers, since most veterinarians are practicing on companion and/or farm animal populations.

Increasing Specialization of Practitioners

Although some specialization exists in each of the health professions, the extent of specialization and the rate of specialty growth vary widely. Among the VOPP professions, veterinary medicine has had the most movement in this area, with a trend toward companion animal practice. Dentistry has experienced only a slight increase in specialization, while specialization in medicine has grown substantially over the past 15 years.

Since 1963, the earliest year for which comparable data on the allopathic physician specialty distribution are available, the most significant trend has been the decline in the number of physicians in general practice and the subsequent emergence of the new specialty, family practice. The popularity of this specialty, established to meet the Nation's need for primary care, has started to offset the decline in general practice, as have the recent increases in numbers of physicians in general internal medicine. If these trends continue, the primary care specialties (which include general practice, family practice, internal medicine, and pediatrics) will undoubtedly increase as a proportion of all specialties.

Trend data on osteopathic physicians are difficult to compile and evaluate, primarily due to differing definitions of specialties, noncomparability of data sets from year to year, and the lack of a consistent data base over time. Between 1957 and 1976, two years for which reasonably comparable specialty data are available, the total number of active non-Federal D.O.s increased from 9,600 to nearly 14,000, a 45 percent increase. At the same time, however, the number and proportion of D.O.s in primary care specialties declined in relation to the total supply. These osteopathic specialties (including manipulative therapy as well as general and family practice, internal medicine and pediatrics) decreased from 92.7 percent of all D.O.s in 1957 to 61.5 percent in 1976, while the number of osteopathic physicians in surgical and other specialties

increased significantly during the same period. However, the proportion of D.O.s in primary care is expected to increase slightly by 1990.

Primary care is frequently defined in terms of physician services provided: "The primary care physician provides the initial contact or point of entry to the health care system for the patient, assumes longitudinal responsibility for the patient regardless of the presence or absence of disease and provides a broad integrating function vis-a-vis other health resources involved in the physical, psychological and social aspects of the patient's care." 19/ On the basis of these criteria, family and general practitioners and physicians specializing in general pediatrics or general internal medicine are generally considered to be practicing primary care medicine. In other areas such as obstetrics or gynecology and psychiatry, there is less agreement as to the extent to which practitioners in these fields provide primary care. A goal of 50 percent of all medical school graduates entering the primary care fields has been suggested to meet the Nation's needs for primary medical services. 20/

Significant problems exist in translating available classification schemes of physician head counts and physician visits (diagnoses rendered, referral status and prior cost status) into quantifiable measures of primary care. The ongoing practice profile study at the University of Southern California, mentioned earlier in this report, categorizes patient care as: (1) first encounters; (2) episodic encounters; (3) principal care encounters; (4) consultation encounters; (5) specialized care; and (6) continuous unlimited care encounters. This will facilitate understanding of the nature and quantity of primary care services actually being delivered in a large number of different specialties.

Seven specialties (general internal medicine, obstetrics and gynecology, gastroenterology, dermatology, otolaryngology, pulmonary disease, and allergy) have been examined in depth in this study, and the results are summarized in a series of reports. 21/ Based on the study's definition of primary care, practitioners with a specialty in general internal

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19/ J. Alpert and E. Charney, The Education of Physicians for Primary Care, DHEW Publication No. (HRA) 76-1772, 1976.

20/ National Academy of Sciences. A Manpower Policy for Primary Health Care; Report of a Study. National Academy of Sciences, Institute of Medicine; Division of Health Manpower and Resources Development, Washington, D.C., May 1978.

21/ R. Mendenhall, Individual Specialty Reports, University of Southern California, 1976, 1977, and 1978.

medicine or obstetrics and gynecology are recorded as devoting the highest proportion of their time (over three-fifths) to primary or principal medical care. An approximation of the physician's time spent providing nonprimary patient care may be obtained by adding all consultation and specialized care encounters. Based upon this summation, the study data indicate that allergists and dermatologists spend the highest proportion of their time (57 and 49 percent, respectively) in such activities, while practitioners in general internal medicine or obstetrics and gynecology devote the least (less than 20 percent).

This Johnson Foundation study has been the subject of considerable debate. In part, the debate centers on the definition of primary care and the subsequent allocation of physicians' time spent in providing primary care. Also, as the Johnson Foundation study team recognizes, the survey and findings do not deal with three significant questions--each relevant to public policy:

- What is the long-term impact of a heavily specialized physician mix on the overall cost of our health care system?
- What is the short-term and long term impact of a heavily specialized physician mix on geographic distribution of health professionals?
- Is the quality of general care affected by whether it is rendered by generalists or specialists?

Preliminary evidence indicates that primary care/principal care provided by nonprimary care specialists is not costeffective.

- Internists charge 50 percent more than generalists for a periodic examination. 22/
- Internists charge 50 percent more than generalists for a follow-up office visit. 22/
- All specialists (with the exception of pediatricians) charge higher fees for follow-up hospital visits than general practitioners.

Also, studies indicate that general practitioners and family physicians tend to locate in rural and underserved areas; unlike internists or specialists who locate in metropolitan areas.

22/ Eleventh Periodic Survey of Physicians. November 1976. Center for Health Services Research and Development, American Medical Association.

When one compares proportionate distributions for the primary care specialties as a group between 1963 and 1976, the change is relatively small (from 42 percent of all specialties to 39 percent). There was rapid growth in the surgical specialties during the sixties which subsequently leveled off during the seventies, in part, due to widespread concern about potential oversupply and consequent overutilization of surgical services. Physicians in the surgical specialties were 28 percent of all specialists in 1976 as compared to 26 percent in 1963.

The great majority of dentists are general practitioners who provide total dental care to their patients, and considerable emphasis is placed on general practice, even in graduate dental programs.

The American Dental Association (ADA) formally recognizes 8 areas of dental practice as constituting specialty practice, although the definition of a dental specialist has varied somewhat over the years. As currently defined by the ADA, a dental specialist (1) is a diplomate of 1 of the 8 national specialty boards; or (2) is licensed as a specialist by a State dental board; or (3) has completed 2 or more years of advanced education in a dental specialty. However, a dentist eligible to be a specialist is likely to be omitted from the ADA's count of specialists unless the ADA receives a formal notice from the dentist of his eligibility. There are probably dentists who fully meet specialist eligibility requirements but who have never so notified the ADA. Furthermore, there are undoubtedly dentists who still limit their practice to a recognized specialty but do not meet ADA requirements for specialty designation.

The number of dental specialists increased almost 4 times from 1960 to 1977, going from 4,170 to 15,465, and resulting in a much higher proportional increase than that for all dentists (Table 1-9). 23/ Nevertheless, the dental specialists practicing in 1977 constitute only 14 percent of the Nation's active civilian dentists. In 1977, two-fifths of all dental specialists, or over 6,000, limited their practice to orthodontics. The next largest group, some 3,600, specialized in oral surgery.

23/ The number of specialists shown in the tables are the estimates by the Bureau of Economic Research and Statistics of the American Dental Association. In 1976, the ADA instituted a verification procedure which resulted in a count of specialists in 1977 which was greater than would have been produced by the former procedures. Even with the improved reporting methods, it is believed that the reported number of active specialists is an underestimate. The 1977 tabulations exclude specialists on the faculty of dental schools and practitioners employed by Federal or State government agencies. Estimates are particularly understated for oral pathology and public health dentistry, specialties which usually involve practice in some institutional setting.

Table 1-9. Number of dental specialists, 1960, 1970, and 1977

Specialist	1960	1970	1977
All specialists	4,170	10,315	15,465
Orthodontists	2,097	4,335	6,185
Oral surgeons	1,183	2,406	3,628
Periodontists	307	1,003	1,946
Pedodontists	229	1,159	1,836
Endodontists	1/	497	920
Prosthodontists	278	715	774
Oral pathologists	42	97	91
Public health dentists	34	103	85

1/ Endodontics was not recognized as a dental specialty in 1960.

Source: Facts about States for the Dentist Seeking a Location, 1961. (Same publication 1971.) American Dental Association, Bureau of Economic Research and Statistics. Unpublished 1977 data.

Periodontists were the third largest specialty group with some 1,900 dentists, followed very closely by pedodontists with over 1,800. (The practice of pedodontics, recognized as a specialty by the ADA, is a primary care practice in terms of P.L. 94-484.) Dentists in the other 4 specialties--endodontics, prosthodontics, oral pathology, and public health dentistry--number 1,870, or about 13 percent of all specialists.

In 1977, the United States had 7.2 active dental specialists per 100,000 civilian population (Table 1-10). By geographic division, the Pacific States and New England were essentially equal in having the largest supply of dental specialists, with 9.8 and 9.7 specialists per 100,000 population, respectively. The East South Central division had the lowest ratio, with 5.0 specialists per 100,000 population.

Among the individual States, Connecticut had the highest ratio of 11.0 per 100,000, followed in order by Massachusetts, Maryland, Washington, California and Colorado, each with a ratio of more than 10.0 specialists per 100,000 population. At the other end of the spectrum, 4 States had a ratio of less than 4.0 dental specialists per 100,000 population. This variation is, to some extent, accounted for by the tendency of specialists to locate in large metropolitan areas.

From 1973 to 1977, there has been a noteworthy increase in the number of graduates from general practice dental residency programs. ADA defines a general practice residency program as: "a one- or two-year sequential hospital training program covering two or more major areas of dental practice." Prior to 1973, such programs were called rotating or mixed internships; in that year, they were renamed "general practice residencies." These training programs give the graduate dentist advanced clinical experience and include rotations through some of the hospital medical services and also may provide additional training in basic sciences.

The number of graduates from specialty programs still considerably exceeds those from general practice residencies (Table 1-11). However, the number of graduates from such specialty programs has remained relatively constant, declining slightly from 1,272 in 1973 to 1,224 in 1977. In contrast, the increase in graduates of general practice residencies, from 530 in 1973 to 695 in 1977, represents a gain of 31 percent. Current Federal support for dental general practice residencies is expected to produce from 50 to 90 additional general practice graduates per year.

In 1977, there were 3,524 students in certain types of advanced dental education beyond the initial dental degree. The first-year enrollment in all such programs was 1,963, of whom 753 students were in general practice residencies and 1,210 were in training programs for dental specialties. Of the first-year dental specialty students enrolled in

Table 1-10. Number of dental specialists for each specialty, and specialist-to-population ratios, by region, division, and State: December 31, 1977

Geographic area	Number of specialists				
	Orthodontists	Oral surgeons	Periodontists	Pedodontists	Endodontists
United States	6,185	3,628	1,946	1,836	920
Northeast	1,640	1,124	607	353	321
New England	447	308	196	113	67
Connecticut	141	83	60	27	18
Maine	25	17	5	2	3
Massachusetts	214	167	109	71	40
New Hampshire	23	15	6	3	1
Rhode Island	31	21	11	8	4
Vermont	13	5	5	2	1
Middle Atlantic	1,193	816	411	240	254
New Jersey	280	194	84	64	62
New York	644	390	241	99	140
Pennsylvania	269	232	86	77	52
North Central	1,444	802	349	438	188
East North Central	1,015	600	264	291	159
Illinois	305	179	88	80	52
Indiana	110	81	28	51	15
Michigan	245	136	56	60	58
Ohio	282	144	61	63	28
Wisconsin	103	60	31	37	6
West North Central	429	202	85	147	29
Iowa	75	41	14	35	1
Kansas	57	32	16	23	7
Minnesota	110	41	24	27	8
Missouri	124	65	22	38	13
Nebraska	39	16	6	21	--
North Dakota	12	4	1	1	--
South Dakota	12	3	2	2	--
South	1,603	990	580	540	216
South Atlantic	833	558	383	260	137
Delaware	14	9	6	4	1
District of Columbia	17	20	13	8	2
Florida	240	160	128	79	55
Georgia	107	70	39	46	21
Maryland	138	95	69	32	31
North Carolina	108	56	40	38	11
South Carolina	57	30	29	19	5
Virginia	121	86	56	28	11
West Virginia	31	32	3	6	--
East South Central	259	173	67	111	35
Alabama	65	41	18	37	6
Kentucky	66	50	22	31	11
Mississippi	32	18	5	6	1
Tennessee	96	64	22	37	17
West South Central	511	259	130	169	44
Arkansas	35	17	8	14	2
Louisiana	80	52	15	40	4
Oklahoma	59	33	12	22	6
Texas	337	157	95	93	32
West	1,498	712	410	505	195
Mountain	329	144	85	97	22
Arizona	62	36	27	20	7
Colorado	105	55	36	41	7
Idaho	26	9	2	4	--
Montana	19	7	3	7	--
Nevada	19	5	5	9	2
New Mexico	30	16	7	9	2
Utah	58	12	4	6	4
Wyoming	10	4	1	1	--
Pacific	1,169	568	325	408	173
Alaska	8	8	3	--	1
California	902	452	243	324	135
Hawaii	31	8	1	6	6
Oregon	73	33	22	21	9
Washington	155	67	46	57	22

Table 1-18. Number of dental specialists for each specialty, and specialist-to-population ratios, by region, division, and State: December 31, 1977 (cont)

Geographic area	Number of specialists				Specialists per 100,000 civilian population
	Prosthodontists	Oral pathologists	Public health dentists	All specialists	
United States	774	91	85	15,465	7.2
Northeast	182	13	15	4,255	8.7
New England	43	--	3	1,177	9.7
Connecticut	10	--	1	340	11.8
Maine	1	--	--	53	4.9
Massachusetts	28	--	2	631	10.9
New Hampshire	--	--	--	48	5.7
Rhode Island	3	--	--	78	8.4
Vermont	1	--	--	27	5.6
Middle Atlantic	139	13	12	3,078	8.3
New Jersey	31	2	2	717	9.8
New York	84	11	7	1,616	9.0
Pennsylvania	24	2	3	745	6.3
North Central	133	16	15	3,385	5.9
East North Central	82	13	13	2,437	5.9
Illinois	25	7	1	735	6.6
Indiana	7	--	--	292	5.5
Michigan	20	4	8	587	6.4
Ohio	17	2	3	570	5.3
Wisconsin	15	--	1	253	5.4
West North Central	51	3	2	948	5.6
Iowa	6	--	--	172	6.0
Kansas	9	1	--	145	6.3
Minnesota	8	--	1	219	5.5
Missouri	18	--	--	280	5.9
Nebraska	7	1	--	90	5.8
North Dakota	3	1	--	22	3.4
South Dakota	--	--	1	20	2.9
South	267	52	33	4,281	6.2
South Atlantic	165	35	24	2,395	7.1
Delaware	6	--	--	40	6.9
District of Columbia	9	8	--	77	11.3
Florida	39	2	1	704	8.4
Georgia	26	3	5	317	6.4
Maryland	38	13	14	430	10.5
North Carolina	11	3	2	269	5.0
South Carolina	11	1	1	153	5.5
Virginia	22	4	1	329	6.6
West Virginia	3	1	--	76	4.1
East South Central	31	8	4	688	5.0
Alabama	6	3	2	178	4.9
Kentucky	6	1	1	188	5.5
Mississippi	8	2	1	73	3.1
Tennessee	11	2	--	249	5.8
West South Central	71	9	5	1,198	5.6
Arkansas	5	--	--	81	3.8
Louisiana	3	--	--	194	5.0
Oklahoma	10	1	1	144	5.2
Texas	53	8	4	779	6.1
West	192	10	22	3,544	9.2
Mountain	29	1	11	718	7.2
Arizona	4	--	3	159	7.0
Colorado	15	1	3	263	8.2
Idaho	2	--	--	43	5.0
Montana	2	--	1	39	5.2
Nevada	2	--	--	42	6.7
New Mexico	3	--	3	70	6.0
Utah	1	--	1	86	6.8
Wyoming	--	--	--	16	4.0
Pacific	163	9	11	2,826	9.8
Alaska	2	--	--	22	5.8
California	127	7	7	2,197	10.2
Hawaii	6	--	--	68	8.1
Oregon	4	1	1	163	6.9
Washington	24	2	3	376	10.4

Source: American Dental Association, Bureau of Economic Research and Statistics. Unpublished 1977 data.

Table 1-11. Number of graduates of dental general practice residencies and dental specialty programs: 1973-77

	Year of graduation				
	1973	1974	1975	1976	1977
All graduates.....	1,802	1,869	1,886	1,930	1,919
General practice graduates.....	530	590	641	721	695
Specialty graduates: total.....	1,272	1,279	1,245	1,209	1,224
Orthodontics.....	348	360	356	313	287
Oral surgery.....	233	230	216	222	217
Periodontics.....	196	186	192	183	206
Endodontics.....	130	131	134	146	144
Prosthodontics.....	143	166	141	151	161
Oral pathology.....	19	24	17	19	21
Public health dentistry.....	24	18	17	24	19

Source: American Dental Association, Council on Dental Education. Preliminary 1977 data compiled for Annual Report on Advanced Dental Education, 1977-78. Also prior annual issues for 1973 through 1976.

dental schools, the largest number were in orthodontics and periodontics. The largest enrollment in specialty programs in nondental school institutions was in oral surgery. In 1977, a total of 1,919 students were graduated from general practice and specialty programs.

Health Manpower Shortage Areas-- Identification and Program Developments

As concerns over aggregate shortages of health personnel began to be alleviated in the mid-1970s by the sharply expanding number of health professionals graduating from the Nation's educational institutions, resolution of the problems of geographic maldistribution became an even higher national manpower priority than it had been before.

A variety of new Federal programs aimed primarily at providing manpower and services to those areas most in need were developed and existing programs were expanded.

One of the most important components of Federal programs designed to alleviate geographic maldistribution is the identification of areas in need of health personnel. Lists of such shortage areas were originally developed for 2 types of programs: (1) placement of health manpower by the National Health Service Corps (under section 329(b) of the Public Health Service Act); and (2) cancellation or repayment of the educational loans of health professionals who serve in shortage areas, including physicians, dentists, nurses, optometrists, podiatrists, pharmacists, and veterinarians (under sections 741(f) and 836(h) of the Public Health Service Act). A third major type of program later using such shortage area lists was the Scholarship programs (under sections 225 and 784) which call for obligated service by recipients in areas designated by the Secretary, Department of Health, Education, and Welfare, as manpower shortage areas.

The History of Shortage Area Designation and Criteria. The earliest health manpower shortage area designations were mandated by 1965 legislation (P.L. 89-290, Health Professions Educational Assistance Act Amendments) creating section 741(f) of the Public Health Service Act. This legislation provided for forgiveness or cancellation of portions of outstanding Health Professional Student Loans obtained by students in schools of allopathic or osteopathic medicine, dentistry, or optometry in return for their service after graduation in areas short of physicians, dentists, or optometrists. Under this legislation, shortage areas were to be determined by the State health authorities in accordance with regulations provided by the Secretary of DHEW.

Legislation enacted in 1971 provided that an agreement committing an individual to serve in a shortage area must be signed before that individual could receive benefits for such service, and allowed for repayment of educational loans other than those made by the Federal Government. The criteria used for this new loan repayment program were essentially the same as those previously used for loan cancellation, but shortage area designation was to be done by the Secretary. The legislation also extended the loan repayment program to include podiatrists, pharmacists, and veterinarians. The first shortage area lists were published in the Federal Register in February 1974.

At the same time that criteria were being developed for loan repayment, other criteria were being developed for the National Health Service Corps placement program. Because this program operated only in "critical" health manpower shortage areas, more stringent criteria were selected, and the availability of health centers within certain distances was considered.

In developing the National Health Service Corps designations, the Comprehensive Health Planning agencies were asked to review all areas proposed for designation and provide data that could be evaluated to determine which areas should be designated. The first list of such areas was published in the Federal Register in October 1974, and revised in February 1975 and July 1976. The July 1976 publication also expanded the criteria to allow consideration of mitigating circumstances in evaluating requests for designation of areas that did not meet the specific physician- or dentist-to-population ratio criteria. It further included information on the appropriate methods for definition of service areas against which to apply the criteria.

The nursing student loan cancellation program, established in 1968, provided for cancellation of nursing student loans in return for service in public or nonprofit hospitals determined by the Secretary to have substantial shortages of nurses. A list of such hospitals was developed and issued in October 1969, and subsequently revised in January 1972, and January 1975. These lists included all those hospitals in which the number of registered nursing hours per patient day was lower than the national median per hospital of the same type (i.e., general, psychiatric, tuberculosis, chronic, convalescent and others). These lists remain effective for cancellation of Federal Nursing Student Loans obtained before November 18, 1971.

The Nurse Training Act of 1971 replaced the loan cancellation program with a nursing loan repayment program similar to the health professions student loan repayment program and authorized lists of nursing shortage areas to be developed by the Secretary in consultation with State health authorities. After considerable

research and statistical analyses, a list of nursing shortage areas was developed in the summer of 1975, based on a comparison of estimated nursing requirements in various health care settings in each county with the appropriate supply of nurses in that county. Each county's aggregate requirement for nurses was then compared with the supply of nurses in the county to determine whether or not a shortage existed.

In 1973 the Health Maintenance Organization Act required that funding priorities be given to Health Maintenance Organizations (HMOs) serving "medically underserved populations." The concept of medical underservice was a larger one than health manpower shortage, encompassing all populations not receiving adequate health care for whatever reason, whereas health manpower shortage designation was aimed at only that portion of the underservice due to lack of health personnel. The criteria used to identify medical underservice were: (1) primary care physician to population ratio; (2) infant mortality rate; (3) percent of the population below the poverty level; and (4) the percent of the population over age 65. Termed the "Index of Medical Underservice," the criteria were evaluated for all counties of the United States, and counties with values below the median were designated as Medically Underserved Areas. The first list of such areas was published in the Federal Register on September 2, 1975, together with a description of the methodology used. Several updated lists have since been published. This Index and the list of areas have also been adopted for use in defining Medically Underserved Areas for purposes of the Community Health Centers legislation (section 330 of the PHS Act) and other service programs. 24/

On October 12, 1976, Public Law 94-484, the Health Professions Educational Assistance Act of 1976 added section 332, entitled "Designation of Health Manpower Shortage Areas" to the Public Health Service Act. This section required that the Secretary establish, by regulation, new criteria for the designation of health professions personnel shortage areas. Under this law the designation of population groups, medical facilities, and other public facilities as well as as areas with health personnel shortages was permitted for the first time.

The Act set down specific requirements for the criteria and for the process of designating shortage areas, which represented significant departures from previously established procedures.

24/ Currently, all health manpower shortage areas designated under P.L. 94-484 automatically become Medically Underserved Areas.

First, the term "health manpower shortage area" was defined to include (a) rational areas for delivery of health services, which have health personnel shortages; (b) population groups having health personnel shortages; and (c) public or nonprofit private medical facilities (and other public facilities) having health personnel shortages.

Second, criteria for designation of shortage areas were required to take into consideration: (a) the ratio of available health manpower to the number of individuals in the area or population group served by the facility under consideration for designation; (b) indicators of need for health services, with special consideration to be given to indicators of infant mortality, access to health services, and health status; and (c) the percentage of physicians in hospitals who are graduates of foreign medical schools.

Third, the Secretary of DHEW was to consult with the appropriate Health Systems Agency (HSA) or, in the absence of a designated HSA, the appropriate State Health Planning and Development Agency (SHPDA); and to consider the recommendations of those agencies and of the State Governor in determining whether to make a particular designation.

Fourth, in listing the types of areas to be included within the definition of health manpower shortage, the legislation specifically mentioned "urban and rural areas," emphasizing the need for increased urban shortage area identification and designation.

Fifth, criteria for all shortage-related health manpower programs were to be the same, with the list of health manpower shortage areas designated under section 332 constituting the official list of eligible service areas for NHSC placement, for the loan repayment program, and for the scholarship program.

Sixth, priority listings of areas were to be developed. A new section 333(c) of the Public Health Service Act required that the Secretary give priority to applications for placement of NHSC personnel in areas with the "greatest health manpower shortage", as determined under criteria established under section 332. This provision required that the criteria identify those areas with the "greatest" health manpower shortage as distinct from other areas.

Reflecting both the Congressional objectives and the specific requirements mentioned within the law itself, new criteria were developed and published (as Interim-Final Regulations) on January 10, 1978. Some of the basic characteristics of the approach used to meet the new legislative requirements are:

1. Separate criteria for each type of health manpower are used. The criteria for health manpower shortage areas have been divided into 8 groups (a) areas with a shortage of primary care manpower,

including primary care physicians (physicians in general and family practice, pediatrics, general internal medicine, and obstetrics and gynecology), nurse practitioners, and physicians' assistants; (b) areas with shortages of psychiatrists and other practitioners providing mental health and related services (including services for alcohol and drug abuse); (c) areas with shortages of dentists and dental auxiliaries; (d) areas with shortages of optometrists or ophthalmologists providing vision care services; (e) areas with shortages of podiatrists and other practitioners providing foot care services; (f) areas with shortages of pharmacists; (g) areas with shortages of veterinarians; and (h) areas with shortages of nurses.

2. A variety of additional factors are now included in the criteria for manpower shortage in geographic areas. For each type of care, a modified and disaggregated population-to-practitioner ratio is used, with the population adjusted as appropriate to reflect the varying care needs and/or utilization of different population components, and the number of practitioners adjusted to reflect differential productivity based on such factors as age, type of practice, hours of work, and, where possible, the effect of auxiliaries. This new population-to-practitioner ratio for a given area is then compared with the "shortage" level, a criterion developed by examining the distributions of population-to-practitioner ratios by county for the whole U.S., and selection of either the lower end of the county distribution, or the level below that prevailing in "adequately-served" counties.

In the case of primary medical care, allowance is made for those areas with high fertility rates and/or high infant mortality rates and/or other high-need indicators. Contiguous area resources are examined, but are discounted if there are significant barriers to the population in need having access to them. Similarly, for other types of care, need factors analogous to those considered for medical care are taken into account. (For veterinary care, the criteria uses various types of animal populations.) For each type of manpower, the criteria include methods for defining appropriate service areas and for defining travel time considered excessive for obtaining that type of care.

3. Particular population groups may be designated as "shortage areas." Native Americans and migrants are identified as population groups for which the Federal Government has special responsibilities or which have special health care or access problems. Provisions are also included for identifying other population groups within geographic areas that, because of special access problems due to language, cultural, or economic barriers, have a shortage even though the entire geographic area in which they reside does not.

4. Facilities with a shortage of manpower can be designated under certain circumstances. Special criteria are included for shortages of health manpower serving prisons and other correctional institutions and for shortages of health manpower serving state mental hospitals. In addition, the criteria include general provisions for designating other facilities having health manpower shortages where these facilities are to provide services to a designated shortage area or to a designated underserved population and have insufficient capacity to meet health care needs.

5. The criteria include factors to determine which areas have the greatest degree of health manpower shortage for purposes of determining priorities for placement. In general, for primary medical care, dental, mental health, and vision care shortage areas, the priorities mainly reflect the degree of shortage and the level of health care need.

6. The review and comment procedures used involve HSAs, SHPDAs, Governors and others. After the criteria are applied to the best and most recent data available on the various factors included in the criteria, the resulting listing is sent to the HSAs for review, comment, and recommendations. Copies of tentative designations and requests are also sent to the HSAs, SHPDAs and to the State Governors. Additions and deletions to the list can be done on an individual basis, as submitted by HSAs, other agencies, or by individuals, although consultation takes place with appropriate HSAs before such requests are approved. All designations will be reviewed at least annually.

Designations of Health Manpower Shortage Areas. Designations of shortage areas under these new provisions began following publication of the criteria for designation. By the end of 1978, over 4,450 separate designations had been made for the 7 types of health professional personnel. Of the total, approximately 1,240 were primary medical care and 630 were dental designations--the 2 areas of principal interest to the National Health Service Corps program. The designations for the 5 other types of health personnel are used primarily for determining eligibility for health professions loan repayment. Since the loan repayment program began in 1973, 2,651 health professionals have signed agreements to practice in shortage areas in return for Federal repayment of their educational loans. The total consisted of 915 allopathic and osteopathic physicians, 884 dentists, 338 podiatrists, 201 veterinarians, 132 optometrists, and 105 pharmacists. Seventy-six nurses have participated in a nursing loan repayment program authorized under a different legislative authority. Of the loan repayment recipients, 506 served in the NHSC, 402 in the Indian Health Service, and 1,743 in non-Federal practices.

The designations encompass a broad range of different types of areas. Tables 1-12 and 1-13 provide summary figures on designations made during the first year the revised criteria were in effect, while Figure 1-1 provides a graphic summary of the areas designated. The majority are rural (nonmetropolitan) in nature and located some distance from major cities or alternative resources. They include places like Northern Yuma County in Arizona, an area with 19,000 residents, a large seasonal population, and no full-time primary care physicians; Marshall County in Mississippi, where 2 primary care physicians serve a very poor (52 percent poverty), high-need population of 24,000; and Benson County in North Dakota, where there is only 1 physician to serve 8,400 people.

The urban shortage areas comprise a small portion of all designated areas, but they contain about half the shortage area population. These areas are frequently located within the midst of plentiful resources, but their populations tend to rely heavily on clinics and emergency rooms for routine services. Despite the large number of practitioners in these areas, waiting times of 3 to 4 hours before receiving care are frequently cited. Many of the designated urban areas would be familiar to persons interested in other aspects of the urban environment, as the designations include such places as the Fort Apache section of the South Bronx, Bedford-Stuyvesant, Central Harlem, East Los Angeles, Watts, Southside Atlanta, and the Southside of Chicago. The Anacostia section of Washington, D.C., with fewer than 4 full-time physicians to serve a population of 220,000, has one of the largest shortages.

The urban designations also include smaller neighborhood communities and sections of smaller cities. Charter Oaks in Hartford and O'Donnell Heights in Baltimore are examples of areas with highly concentrated populations living in isolated housing projects. Downtown sections of such cities as Paterson and Trenton, New Jersey; Decatur and Champaign-Urbana, Illinois; Louisville, Kentucky; and Jackson, Mississippi are representative of designations from some of the smaller cities. The general diversity in the designations is well reflected in the variety of areas designated within the Boston metropolitan area: in addition to such mixed communities as Allston, Jamaica Plains and South Boston, the list includes such places as Revere, a working class community with limited access to the city's resources; the Chinese population in the South End; and the Italian North End.

American Indians, Spanish-speaking, and medically indigent population groups have been designated under the special provisions for the designation of population groups located within areas where no overall shortage of manpower exists. State and county jails in Florida, Arkansas, Illinois, and Washington and State mental hospitals in California and South Dakota are among the facilities that have satisfied the criteria for designation as facilities with shortages of psychiatric manpower.

As of December 31, 1978, approximately 1,050 sites were approved for placement of NHSC personnel. About two-thirds (703) of the sites were staffed, with a total NHSC field strength of 1,402 assignees. These included 734 physicians, 227 dentists, 189 nurse practitioners, 96 physician assistants, and 156 other support personnel (such as

Table 1-12. Number of health manpower shortage areas designated through December 31, 1978

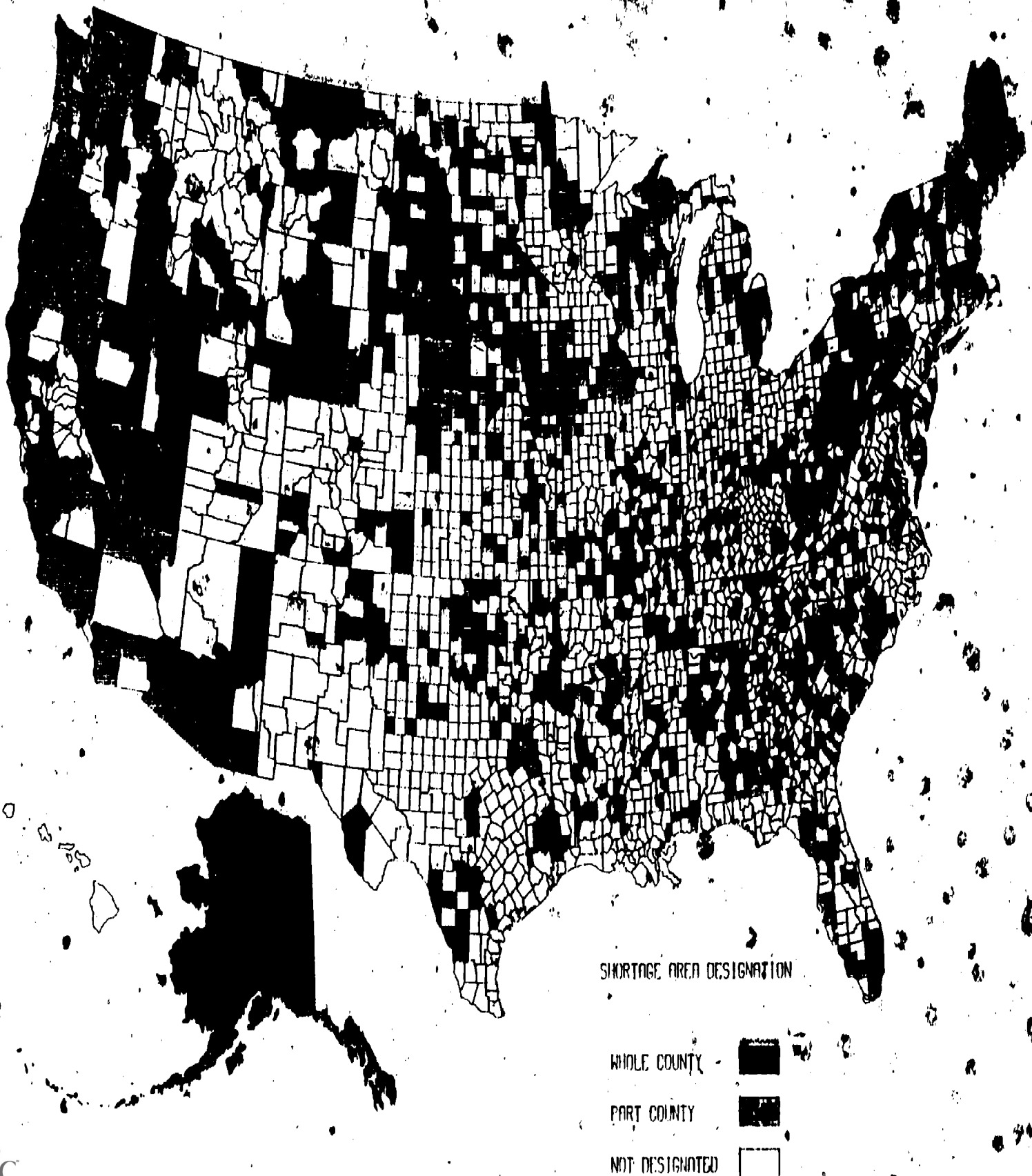
	Number of designated shortage areas	Population of designated shortage areas	Number of practitioners needed
Primary Medical.....	1,242	27,350,000	8,219
Urban.....	(350)	(14,050,000)	(4,379)
Rural.....	(892)	(13,300,000)	(3,840)
Dental.....	631	12,860,000	2,101
Urban.....	(98)	(5,360,000)	(934)
Rural.....	(533)	(7,500,000)	(1,167)
Psychiatric 1/.....	90	--	--
Vision Care.....	210	8,020,000	255
Podiatric.....	1,396	85,450,000	1,196
Pharmacy.....	128	1,200,000	149
Veterinary.....	760	17,400,000	318
Food Animal.....	(628)	(12,340,000)	(287)
Companion Animal.....	(132)	(5,060,000)	(31)

1/ Because a comprehensive review of the potential shortage areas had not been completed for psychiatric manpower, the figures for psychiatric areas are substantially understated.

Table 1-13. Number of designated primary care manpower shortage areas as of December 31, 1978

	Total number of areas	Number of urban areas	Number of rural areas	Total population of areas	Total number of physicians needed
Total.....	1,241	350	891	27,333,042	8,216
Region I.....	62	33	29	1,330,924	407
Connecticut....	10	9	1	285,714	92
Maine.....	13	0	13	102,498	32
Massachusetts..	24	21	3	774,553	228
New Hampshire..	3	0	3	23,689	8
Rhode Island...	4	3	1	96,380	32
Vermont.....	8	0	8	48,105	15
Region II.....	74	47	27	2,814,310	776
New Jersey.....	18	16	2	820,389	188
New York.....	49	31	18	1,738,311	496
Puerto Rico....	6	0	6	239,910	85
Virgin Islands.	1	0	1	15,700	7
Region III.....	162	44	118	3,184,380	1,024
Delaware.....	4	2	2	56,357	17
Dist. of Col...	1	1	0	219,121	106
Maryland.....	20	11	9	488,598	145
Pennsylvania...	55	20	35	962,786	303
Virginia.....	41	4	37	764,904	222
West Virginia..	41	6	35	692,614	231
Region IV.....	258	49	209	5,891,247	1,692
Alabama.....	40	9	31	963,194	283
Florida.....	19	6	13	550,522	167
Georgia.....	65	13	52	1,039,252	203
Kentucky.....	27	2	25	461,441	143
Mississippi....	20	4	16	557,808	156
North Carolina.	31	8	23	1,050,967	253
South Carolina.	23	4	19	667,019	232
Tennessee.....	33	3	30	601,041	155
Region V.....	168	69	99	5,535,070	1,657
Illinois.....	45	22	23	1,867,395	578
Indisna.....	28	9	19	806,020	245
Michigan.....	28	14	14	1,106,948	363
Minnesota.....	13	5	8	139,149	44
Ohio.....	25	13	12	1,089,108	308
Wisconsin.....	29	6	23	526,450	119
Region VI.....	112	36	76	2,741,443	820
Arkansas.....	23	6	17	368,122	110
Louisisna.....	10	4	6	297,436	115
New Mexico.....	2	0	2	20,593	6
Oklahoma.....	28	8	20	734,972	204
Texss.....	49	18	31	1,320,320	385
Region VII.....	118	9	109	2,269,648	664
Iowa.....	35	0	35	446,863	130
Kansas.....	17	3	14	168,992	45
Missouri.....	41	5	36	1,445,771	427
Nebrsska.....	25	1	24	208,022	62
Region VIII.....	112	3	109	740,104	236
Colorado.....	13	2	11	98,095	25
Montana.....	14	0	14	92,467	30
North Dskota...	23	0	23	133,585	47
South Dakota...	45	0	45	259,162	91
Utah.....	5	1	4	30,068	10
Wyoming.....	12	0	12	126,727	33
Region IX.....	97	45	52	2,105,796	696
Americsn Samoa.	2	0	2	30,625	9
Arizona.....	13	3	10	310,429	98
California.....	51	28	23	1,505,034	490
Hawaii.....	0	0	0	0	0
Nevsda.....	26	14	12	167,882	65
Trust Terr.....	5	0	5	91,826	34
Region X.....	78	15	63	720,115	244
Alasks.....	15	0	15	100,426	37
Idsho.....	8	0	8	55,959	21
Oregon.....	27	6	21	294,990	102
Washington.....	28	9	19	268,740	84

Figure 1-1. Primary care health manpower shortage areas by county: December 30, 1978



social workers, nurses, pharmacists, dental hygienists, and speech pathologists).

Although the presence of NHSC staff to serve area needs is important, the continuation of NHSC staffing in these areas is perhaps even more critical. The ability of the Corps to alleviate geographic shortages over the long run is controlled heavily by the attrition rate of NHSC practitioners in underserved areas. Despite the fact that the NHSC has only limited experience on which to base an evaluation of their attrition and retention, early indications are that approximately one-half of NHSC personnel in shortage areas are extending their tour of duty (beyond the 2 years required) or remaining in the area on a private basis. Although these figures may very well change as the Corps expands its number through the enlarged NHSC scholarship program, the relatively high retention rates give rise to hope that the problems of shortage areas may be alleviated more quickly than originally envisioned.

Planned and Needed Improvements in Criteria, Data Bases, and Designation Procedures. Although the recent changes in criteria and designation procedures resulted in considerable improvement to the criteria and to the entire designation process, there are, nevertheless, additional efforts that should be undertaken to improve the process even more. The work that is needed covers a vast array of topics and extends from basic data collection, through basic research on and analysis of the demand and need for services, to procedures for enhanced cooperation with the many participants in and beneficiaries of the programs.

Perhaps the most critical need is for criteria that go beyond population-to-practitioner ratios. Efforts have been undertaken to identify surrogate variables (perhaps available from census data or other common data sources) to represent factors that would better identify health manpower shortage areas and to develop sets of designation criteria using them, but early results are too inconclusive to permit changes in the criteria.

Research has been undertaken to find better ways of identifying service areas, using such factors as commuting patterns, natality and mortality data. Comprehensive and cooperative efforts involving the HSAs are needed to develop feasible procedures for defining service areas, using consistent national guidelines and local input and conditions.

The data base needs to be improved substantially. Currently, data bases are being improved moderately through information from the professional health manpower organizations and the Cooperative Health Statistics System, but these are scattered, inconsistent, and not generally available or not completely current. Completion of the

health professions data activities mandated by P.L. 94-484 would be of some assistance. There are also a large number of variables important to the identification of shortage areas for which data are not now available, and efforts need to be made to find ways that such data might be collected by HSAs and made available for shortage designation purposes.

Recent procedural changes have resulted in a more efficient process of consultation with the HSAs, SHPDAs, and other agencies. Nevertheless, even more constructive work should be devoted to this effort. In particular, more meetings should be convened at regional levels with officials of HSAs and SHPDAs to obtain insights into ways in which local knowledge and statistics can be incorporated into the process.

Scholarship awards and other provisions of current legislation also require shortage area designation for nurses as well as physicians and dentists. Nursing shortage areas are being designated under section 332 as well as under section 836(h). There is a need for major changes and improvement in criteria to improve the methodology now in effect for such designations. Specifically, more research needs to be done into more appropriate measures of nursing shortage and into more appropriate applications of available data. Methods of designating nursing shortage areas should take into account interactions with the nursing resources and nursing needs of contiguous counties, methods for designating subcounty areas with nursing shortages need to be developed to deal with special cases, and possible designation of facilities with nursing shortages should also be examined.

RECENT DEVELOPMENTS IN HEALTH PROFESSIONS EDUCATION

Trends in Enrollments, Student Characteristics, Graduates, and Outlooks

Increases in professional school enrollments and graduations between academic year 1966-67 and 1978-79 exceeded the 9 percent increase in the resident population of the U.S. during the same period. Schools of pharmacy were the sole exceptions to the general trend of rising enrollments.

The number and capacity of the Nation's allopathic and osteopathic medical schools have risen markedly over the last 15 years and show little sign of leveling off. The number of allopathic medical schools has increased by one-third, while the number of osteopathic schools has increased by 50 percent. Since 1976, 8 schools granting the M.D. degree and 4 schools granting the D.O. degree have opened, and a number of new schools are expected to open in the next few years. First-year enrollments (FYEs) in schools of medicine continued to rise in 1977 and 1978. In allopathic medical schools, first-year enrollment was 16,501 in 1978-79, nearly twice the level of 15 years ago, whereas first-year enrollment in schools of osteopathy more than doubled to about 1,000 in 1976-77.

Allopathic medical school graduates totalled about 14,400 in 1977-78, and the number of graduates projected for osteopathic schools was more than 800. However, both allopathic and osteopathic medical schools anticipate a reduced rate of growth from the accelerated rate of the past decade.

New medical schools in various stages of planning but which have been reviewed by the Liaison Committee on Medical Education (LCME), a joint body composed of representatives from the American Medical Association, the Association of American Medical Colleges, the Association of Canadian Medical Colleges, the Federal government, medical students, trustees, and the public, include Oral Roberts University, Tulsa, Oklahoma; Mercer University, Macon, Georgia; and the University of Wyoming, Laramie, Wyoming. The opening of the Medical School of Morehouse (Atlanta, Georgia) in 1978 is expected to offer minorities an increased opportunity to enter medicine.

From 1950 to 1978 the number of dental schools increased from 42 to 60, and total enrollment rose from 11,891 to 22,179 students, or about 83 percent. From the mid-1960s on, increases in the number of dental schools and in dental school enrollments are, in large part, attributable to provisions of the Health Professions Educational Assistance (HPEA) Act of 1963 and its various amendments, including provisions for constructing new schools and for expanding the capacity of existing schools. Although 2 dental schools closed in the early

1970s, the opening of new schools has provided a net increase of 11 schools since 1965.

During the first 15 years of the 25-year period from 1950 to 1975, total dental school enrollments showed a rather modest increase of some 2,000 students, reaching a total of 14,020 in 1965. After 1965, the impact of the HPEA act began to be evident, and by 1978, total enrollments had increased by about 8,160, 58 percent above the 1965 level of 14,020. There is, of course, a similar contrast between the earlier and later periods relative to first-year enrollments, which totalled 3,800 in 1965, or only 600 more than in 1950. By 1978, first-year enrollments totalled 6,301, a number only 6 percent larger than the total in 1977, but 66 percent greater than the total in 1965.

During most of the 1960s, the number of dental school graduates remained fairly steady, ranging from about 3,200 to about 3,400 a year. By the end of the 1960s, the number began to rise noticeably, with 3,749 dentists graduating in 1970. Thereafter, the increase in the number of graduates accelerated. There were 5,324 graduates in 1978, an increase of 42 percent over the 1970 level.

During the 1970s, a number of dental schools changed their curricula to compress the traditional 4 academic year-4 calendar year (4-4) program into a 4 academic year-3 calendar year (4-3) program to accelerate the production of dental personnel. This situation resulted in the doubling of graduating classes by some schools, while other schools skipped a graduating class. There is now a clear trend back to the 4-4 arrangement.

Student enrollments and the number of dental graduates in the immediate future are expected to increase less rapidly than during the last several years. The increases in recent years are due largely to Federal support for dental school expansion and new school construction; with the decline in such support, the upward trend of both schools and students is not expected to continue. There are no known plans for increasing the number of dental schools beyond the present total of 60.

Assuming no departure from present plans, current dental student enrollment projections for the next decade indicate that the number of students will be very close to recent levels. First-year enrollment is projected to decrease from the 6,301 in 1978-79 to about 5,900 in 1979-80. Subsequent first-year enrollments are projected to continue at about that level, resulting in stabilization of the number of graduates at about 5,400 by 1981-82.

Among the VOPP professional schools (veterinary medicine, optometry, pharmacy, and podiatry), enrollment has increased rapidly and consistently over the past decade except in schools of pharmacy.

Total enrollment in the 12 accredited schools of optometry increased to 4,300 students in academic year 1978-79, nearly 180 percent over the total enrollment 14 years earlier. First-year enrollment during the same period increased to 1,115, or nearly 90 percent. The number of graduates rose to more than 1,000 in 1979, more than two and one half times the number 14 years earlier. However, it should be noted that additional schools opened during this period and are responsible, in part, for these increases in enrollments and graduations. In terms of enrollments, the Southern and Pennsylvania Colleges of Optometry continue to have the largest number of students, with first-year enrollments of 157 and 151 students, respectively, in 1977. Several optometry schools--Pacific University, Southern California College of Optometry, and Southern College--are truly national resources in that students from the vast majority of States in the Nation are enrolled in these institutions.

In contrast to enrollments in schools for other health professions, enrollments in the final 3 years of professional education in the 72 schools of pharmacy have declined. Although the 1978-79 enrollment of 23,600 students is more than twice the total enrollment 15 years earlier, it represents a decrease of 230 students, or 1.0 percent from the 1977-78 level and a decrease of 770 students, or 3.0 percent from 1975-76.

Although the American Pharmaceutical Association at its 1977 Annual Meeting endorsed a single professional degree and a program leading only to the doctoral degree in pharmacy, considerable debate within the profession exists as to whether the present two-tier system should continue to exist, or whether additional educational requirements should be imposed on practicing pharmacists for licensure maintenance.

In academic year 1978-79, enrollments in and graduations from schools of podiatric medicine were at their highest levels in history, after several decades of very low levels. Total enrollments for the 5 schools of podiatry reached 2,415 students in academic year 1978-79, and 540 students received the degree of Doctor of Podiatric Medicine in 1978. Similarly, the number of first-year students has increased from 177 in academic year 1964-65 (the first full academic year after implementation of the Health Professions Educational Assistance Act of 1963) to 672 first-year students in academic year 1978-79.

In the early days of podiatric medical training in the United States, the student was generally limited to learning palliative care of superficial skin lesions (commonly called corns and calluses), paring nails, and dispensing various types of arch supports. Today's podiatry student acquires these skills, and, in addition, learns to prescribe and administer drugs and other medicines, to perform surgery on the bones and soft tissues of the patient's foot, and to use X-Rays and other sophisticated techniques.

The number of veterinary programs increased sharply, from 18 in 1973 to 23 in 1978, causing a shortage of experienced faculty. A new program at Tufts University in Massachusetts, established to to serve the 6 New England States that do not have a school of veterinary medicine, is expected to open in 1979, and a school is also being planned at Virginia Polytechnic Institute and State University with a scheduled opening date of 1981.

Between 1970-71 and 1978-79, first-year enrollments in schools of veterinar medicine increased from 1,430 to 2,041 and total enrollments increased from 5,006 to 7,294. Enrollments are expected to continue to increase through the early 1980s as recently established schools expand to capacity and several new schools are opened. Because there is growing concern that further increases in the number of schools will lead to an excess supply of of veterinarians, other proposals for new veterinary programs probably will meet growing opposition.

Institutions, Programs and Curricula

The past 15 years of increasing enrollments in health professions schools have also seen the design and implementation of a number of programs and curriculum changes to divert or influence the development of schools and students in each discipline. The major new development in medical education relates to the new emphasis in graduate medical education in section 784 in Title VII of the Public Health Service Act as amended by Public Law 94-484, which calls for a program of grants to allopathic and osteopathic medical schools for the planning, development, and operation of residency training programs in general internal medicine and general pediatrics and for financial assistance to residents in these programs.

The residents supported by the primary care grant program are, in many instances, in specific primary care tracks of much larger internal medicine and pediatric training programs. The National Intern and Resident Matching Program (NIRMP) has agreed to list, by separate number, each of the general internal medicine and pediatric tracks or programs which are supported by this legislation for the 1979-80 academic year. This should enable physicians interested in such programs to obtain more information about them and facilitate the matching of residents to these training opportunities.

The curriculum of these tracks or programs will emphasize subjects pertaining to ambulatory care, such as continuity of care, total patient management, and the recognition and treatment of common but important ailments and chronic illness. Development of psychosocial skills and other topics will be included in the curriculum, covering such areas as family dynamics and diagnosis and therapy for mental problems. Stress will also be placed on such nonclinical skills as

economics of the health care system, office management, and practical aspects of epidemiology.

The hope is that such training will encourage internists and pediatricians to remain in primary care practice in these specialties. Also, because one of the funding preferences for these grants is location of a substantial proportion of the training in a designated health manpower shortage area, experience in rural or inner-city ambulatory practice may result in a greater proportion of these physicians locating in such areas when their training is completed.

Dental education has undergone a variety of changes over the past 10 years, reflecting the continuing need to incorporate the technological advances within the discipline, and apply current learning theories and teaching methodologies to the dental curriculum. In addition, the professional body of knowledge has been expanded to include areas of the social and behavioral sciences, practice management, utilization of dental auxiliaries, and research methods. Federal incentives have also focused attention on efficient curricular time frames, experimental curricular designs, faculty training, and the role of education in achieving a more equitable distribution of practitioners.

Future changes of curriculum will more likely involve the scope and content of dental knowledge, skills and clinical experiences. The future curriculum probably will be more oriented toward primary care practice, resulting in a graduate who is a general practitioner capable of delivering many services now provided by today's specialists. Consideration will be given to providing clinical experiences involving a variety of practice sites, alternative modes of practice, and a wider range of population groups. Emphasis on productivity management, including the use of dental auxiliaries, will be continued. In addition, the curriculum will provide the student with interdisciplinary care experiences so that graduates can better function within the total health care delivery system.

The changes necessary to implement a primary dental care curriculum cut across well defined predental, dental, and dental specialty curricula. It will be necessary to determine the scope of skills, services, and responsibilities that should characterize a primary care dentist, establish curriculum essentials for training, and resequence areas of instruction throughout the dental education continuum. Change will evolve by design; and dental schools will need support. The past efforts in health professions education have enabled dental education to meet projected dental manpower requirements, while maintaining the quality of dental education. From this base and under the Health Professions Educational Assistance Act of 1976 (P.L. 94-484) the dental educational community is more effectively prepared to

respond to the issues of primary care providers and the geographic distribution of dental personnel.

Along with curricular changes related to primary care will be greater emphasis in preventive dentistry which must develop from a strong base in the philosophy and methods of prevention. Curricular emphasis will focus on an efficient and successful preventive practice, with the therapeutic role incorporated into a preventive role, role, instead of vice-versa. In addition, the future curriculum will provide extramural training programs in preventive dentistry and dental health promotion designed to encourage community involvement and service to underserved population groups.

Another major effort in dental education emphasizes more thorough diagnosis and treatment of chronic inflammatory periodontal disease, placing greater emphasis on early detection and treatment of gingivitis in the dental office and sensitizing the public to the symptoms and outcomes of periodontal disease and methods of prevention.

Quality assurance for dental care has recently received attention. The role and functions of the dental practitioner in the quality assurance system are yet to be defined and characterized. Once they are, the principles, concepts and elements of dental quality assurance, and the provision of learning experiences that will encourage greater participation in the quality assurance system should be incorporated into the curriculum.

At this time continuing education is not generally addressed in the dental curriculum, although it is acknowledged that graduates should understand the responsibility for continually improving their knowledge and skills through participation in continuing education courses. Therefore, continung education must be integrated into the continuum of dental education. Curricular opportunities that prepare the practitioner for continued learning should be developed.

In conclusion, dental education and curriculum design have passed through a period of process analysis and are entering a stage of change directed more toward an assessment and realignment of knowledge content, clinical skills and clinical learning experiences. The graduate will be a general practitioner who competently provides a more comprehensive range of services, in a variety of practice modes, to a wider range of population groups. These educational and curricular changes for dental manpower development will have significant impact on the accessibility, availability and quality of primary care.

Bureau of Health Manpower Programs of Student and Institutional Support

Health manpower and the schools and institutions that provide education and training for health care professions and occupations are widely regarded as key elements in the effort to achieve the national goal of quality health care. Consequently, the Federal strategy to improve the population's access to such care has focused on improving the availability of health professions personnel by providing for the establishment of programs of financial support to health professions schools and institutions and the students who attend them. This strategy is clearly embodied in the Health Professions Educational Assistance Act (P.L. 94-484), as amended, which is designed primarily to produce more primary care practitioners and to improve health services in areas short of health personnel. In addition, the legislative strategy reflects the goal of an increased number of persons from previously underrepresented groups in the health professions and in health professions schools and institutions.

The Bureau of Health Manpower (BHM) has been the principal agency responsible for the development, implementation, and administration of the financial support programs for both schools and students. Funds awarded by BHM totaled $526.7 million in fiscal year 1977 and $521.6 million in fiscal year 1978 (Table 2-1). The relative amounts awarded by discipline in fiscal year 1978 are shown in Figure 2-1. A graphic summary of funds awarded for selected health manpower programs between fiscal year 1965 and fiscal year 1978 is shown in Figure 2-2. Several programs are described below, with some indication of their scope and impact, wherever possible.

The Health Professions Student Loan Program was originally authorized by the Health Professions Educational Assistance Act of 1963 (P.L. 88-129, September 24, 1963). This Act permitted the Federal Government to "enter into an agreement for the establishment and operation of a student loan fund...with any public or other nonprofit school of medicine, osteopathy, or dentistry." Subsequent legislation provided for support of loan funds for pharmacy, podiatry, optometry and veterinary medicine schools. Between academic years 1965 and 1978, 15 award cycles were conducted under this program.

The total obligation for the 15 award cycles was $370,403,500, which provided loans to over 340,000 health professions students with financial need.

In October 1976, the Public Health Service Act was amended by P.L. 94-484. Under this legislation, the Health Professions Student Loan Program allocated $19,800,000 for academic year 1978-79 to assist approximately 16,000 health professions students.

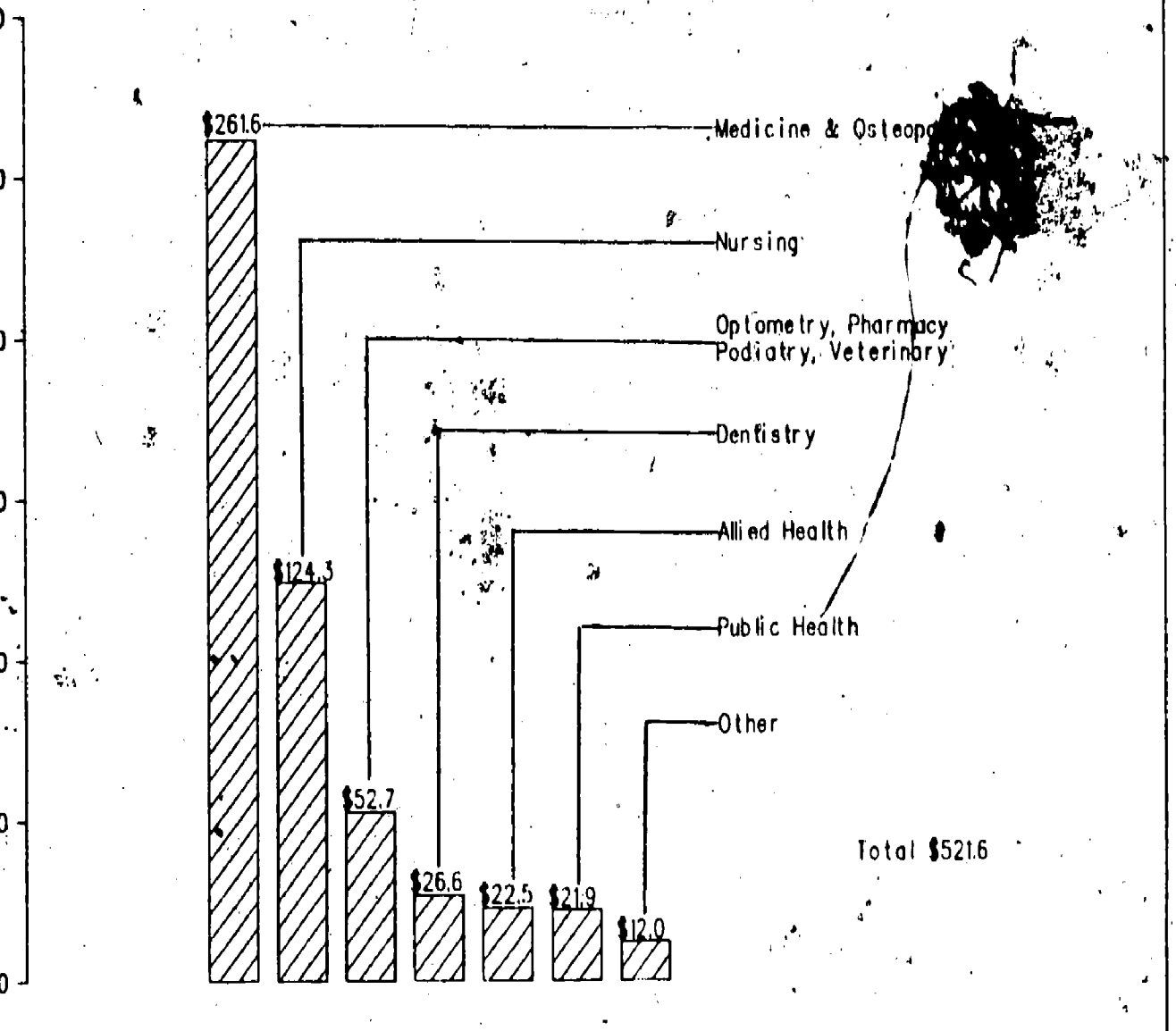
Table 2-1. Funds awarded by the Bureau of Health Manpower: FY 1977 and FY 1978

Programs	FY 77	FY 78
Total	$526.7	$521.6
Health Professions:		
Capitation	117.9	142.6
Construction Grants	26.0 (9.1)*	5.0
Construction Interest Subsidies	0 (2.0)*	2.0 (1.6)*
Start-up & Conversion	6.5	2.0
Family Medicine	38.6	41.6
Financial Distress	4.5	5.0
Gen. Int. Med, Gen. Pediatrics	13.4	14.5
Physician Assistants	8.4	8.7
Special Projects	20.0	0
PH/NHSC Scholarships	39.6	59.5
Student Loans	23.8	19.8
Student Loan Repayments	3.4	3.6
Scholarships for 1st-Year Students	0	5.0
Dental Health:		
Dental Extenders	1.9	2.3
Dental Team Practice	4.5	4.1
Educ. Develop & Continuing Ed	2.1	0.3
General Dentistry	0	3.4
Nursing:		
Advanced Training	8.1	11.2
Capitation	39.6	29.7
Construction Grants	0 (1.5)*	3.5 (1.3)*
Nurse Practitioners	8.9	12.8
Research Projects	5.0	5.0
Special Projects	14.8	14.8
Fellowships	0.8	1.0
Scholarships	6.4	8.9
Student Loans	22.2	22.3
Student Loan Repayments	0.6	0.4
Traineeships	12.9	12.9
Allied Health:		
Special Improvement	8.9	0
Special Projects	12.0	16.9
Disadvantaged Assistance	0	0.5
Traineeships	3.0	2.4
Public Health:		
Formula Grants	5.8	0
Special Projects	5.4	5.0
Traineeships	9.0	6.9
Special Programs:		
Area Health Education Centers	14.0	16.8
Disadvantaged Assistance	9.9	14.5
Emergency Med. Services Training	5.9	5.9
Foreign Med. Student Transfers	0.6	1.0
Grad. Med. Ed. Nat. Advy. Comm. (GMENAC)	0.9	1.0
Interdisciplinary Training, Curriculum Development	0	3.4
Manpower Initiatives	10.0	0
Manpower Supply & Dist. Reports	0.9	1.0
Other Activities	10.5	0

* Carryover Funds

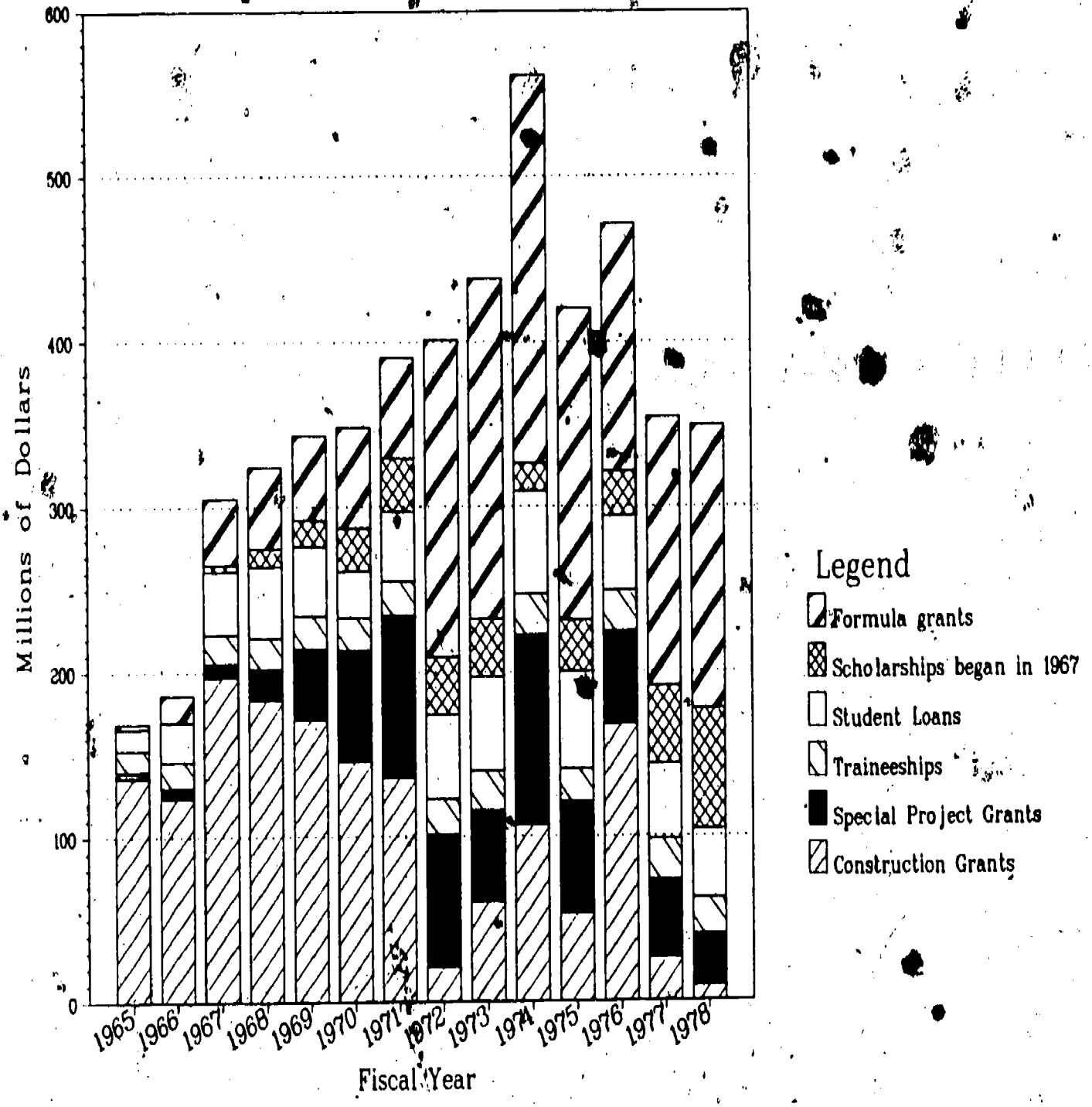
Source: Unpublished data for Annual Report, Fiscal 1978. Bureau of Health Manpower.

Figure 2-1: Funds Awarded by Bureau of Health Manpower by Discipline for FY 1978



Source: Bureau of Health Manpower Unpublished Data

Figure 2-2. Funds Awarded by Bureau of Health Manpower for Selected Programs FY'65-78



ource. Bureau of Health Manpower, Figures through 1976 published in, Trends in BHM Program Statistics. Grants, Awards, Loans FY 1957-76; 1977-78 figures from unpublished data.

The Public Health and National Health Service Corps Scholarship Training Program was authorized by P.L. 92-585 on October 27, 1972, to "obtain trained physicians, dentists, nurses, and other health-related specialists for the National Health Service Corps and other units of the Service." Five award cycles were conducted (for the academic years 1973-78) under this Program before it was repealed, effective September 30, 1977, by P.L. 94-484. Recipients of scholarships under the National Health Service Corps Scholarship Program, authorized by sections 751 through 756 of the Public Health Service Act as amended by P.L. 94-484, were selected for the first time during the spring and summer of 1978 for the 1978-79 academic year. The total Congressional appropriation for the 6 fiscal years of the Program's operation was $170.5 million, of which $63.1 million was obligated for payments to health professions schools for tuition and fees of scholarship recipients.

As of September 30, 1978, 19,532 applicants, primarily students of allopathic medicine, osteopathic medicine, or dentistry, sought awards during the 6 application cycles of the Program. As a result, 16,351 new and continuing awards were granted to 9,065 students, distributed by discipline as shown below:

Total award recipients.....	9,065
Allopathic medicine.....	7,099
Osteopathic medicine.....	969
Dentistry	585
Other M.A. and B.A.	412

The service obligation incurred to date by all PHS scholarship recipients, based upon the years of scholarship support they have already received, totals at least 18,130 work-years of future health care delivery.

The Health Education Assistance Loan (HEAL) Program was also operational for the 1978-79 academic year. This program was authorized under sections 727 through 739 of the Public Health Service Act, as amended by the Health Professions Educational Assistance Act of 1976 (P.L. 94-484), and subsequent laws (42 U.S.C. 294-294Z). The HEAL Program is an insured loan program patterned after the existing Guaranteed Student Loan Program but is designed to make funds available to students in schools of allopathic or osteopathic medicine, dentistry, optometry, pharmacy, podiatry, public health, and veterinary medicine. Implementation of the program was assigned to the Office of Education by former Health, Education, and Welfare Secretary Joseph Califano on March 9, 1977.

Support for health professions institutions consists of an interrelated set of programs to support general operational needs of selected health professional educational institutions. The Federal strategy has two objectives: (1) continue the capacity of health

professions schools to maintain quality and the number of places, and (2) increase the number of primary care practitioners--particularly in family medicine--produced with that capacity.

A combination of capitation, start-up, financial distress, and construction completion awards has been utilized to bring the first objective almost to completion. These efforts have prevented the abrupt loss of Federal support for health professions schools and provided them with the opportunity to seek other funding sources for assistance with operating deficits and to complete construction projects for which PHS has made prior committment. Some $1.4 billion in construction grants was awarded under health professions and nurse training authorities between fiscal year 1965 and fiscal year 1977. About $1,244 million was awarded to 202 health professions schools for construction of teaching facilities. Of this amount, schools of allopathic and osteopathic medicine received $830.2 million (66.7 percent) and schools of dentistry $246.9 million (19.8 percent). These funds have assisted in construction of 42 new schools and in the expansion, renovation, or remodeling of 159 existing schools. Upon completion of the construction, 8,978 new first-year student places will have been maintained through renovation and replacement of obsolete facilities, including 7,711 places in schools of allopathic and osteopathic medicine and 2,873 places in schools of dentistry. Funding to alleviate financial distress is authorized at $5 million per year for the next 2 years.

The Area Health Education Centers (AHEC) Program provides funds to allopathic and osteopathic medical schools for the purpose of decentralizing medical and other health professions into rural and medically underserved areas. The program links the resources and training programs of health sciences centers to community hospitals and to local health manpower needs of the communities. The program emphasizes primary care training and provides graduate and undergraduate training in medicine, nursing, dentistry, allied and other health professions. The AHEC approach attempts to remedy the problems of overspecialization and geographic maldistribution through changes in the pattern of education and educational environment. It is based on the assumption that changes in educational programs and processes can provide effective incentives to encourage practitioners to locate and work in the areas that have inadequate services.

Program funds do not represent a usual type of institutional support, but flow to the community AHEC center to meet locally defined health manpower training needs. By the end of Fiscal Year 1978, the AHEC program is expected to provide $17.0 million to support the planning and development operation of 56 centers, serving all or portions of 17 States. The AHEC programs have been successful in obtaining local financial support for programs. During its first five year history, contracts were cost-shared 5 to 40 percent while

"contributory" efforts beyond the negotiated cost-shared rate exceeded an estimated $40.0 million in funds from the States involved. Current legislative requirements call for a minimum of 25 percent cost-sharing. In fiscal year 1978, the AHEC program will provide all or a portion of the training of an estimated 8,000 students, including more than 700 medical and dental residents. In addition, more than 50,000 days of continuing education programs for physicians, nurses, dentists, pharmacists, and other health professionals who practice in rural areas will be provided.

The following institutions received 1 year awards in 1978:

I. Competitive

A. Howard University - Planning
B. University of Maryland - Planning
C. University of Colorado - Planning
D. University of Pittsburgh - Planning

II. Noncompetitive

A. Tufts University
B. West Virginia University
C. University of North Carolina at Chapel Hill
D. Medical University of South Carolina
E. University of Illinois
F. University of Minnesota
G. University of Texas Medical Branch at Galveston
H. University of New Mexico
I. University of Missouri - Kansas City
J. University of North Dakota
K. University of California - San Francisco

Section 783 of the Public Health Service Act as amended by Public Law 94-484 allows the Secretary to enter into contracts with or make grants to schools of medicine and other public or private groups to plan, develop, and operate or maintain programs for the training of physician assistants. These programs have as their objective the education of individuals who will, when their training is completed, be qualified to provide health care under a physician's supervision. These training programs must enroll not less than 8 students and last for at least 1 academic year and consist of supervised clinical practice and at least 4 aggregate months of classroom instruction directed towards delivering health care. Physician assistant training programs encompassed 39 approved programs in fiscal year 1977 with the number of trainees totalling 2,570. (On grant applications where the number of trainees was not given, the stated maximum capacity of the program was tabulated.)

Forty-seven separate projects in schools of allopathic medicine and osteopathy have been given grants by the Secretary under section 784 of Public Law 94-484 for the purposes of planning, developing and operating approved residency training programs in internal medicine or pediatrics. There were an estimated 740 residents in these programs in fiscal year 1977, 410 in general internal medicine and 330 in general pediatrics. It is anticipated that these grant funds will ultimately affect the training of a substantial number of additional residents in the larger specialty programs within which the programs operate.

Section 786 of P.L. 94-484 authorizes the Secretary to enter into contracts with and make grants to public or private nonprofit hospitals, schools of allopathic and osteopathic medicine, or other public or nonprofit private entities capable of carrying out a graduate training program in family medicine. The programs for graduate family medicine programs are for the purpose of planning, developing, and operating an approved professional training program. These programs include continuing education programs and approved intern and residency programs in family medicine. The grant authority also allows the programs to provide financial assistance to medical and osteopathic students. The legislation also authorizes the award of grants and contracts for the purpose of developing programs to train physicians who plan to teach in a family medicine program and to provide financial assistance to these trainees. In fiscal year 1977 there were 215 of these programs with approximately 4,156 trainees, including those trainees in programs receiving continuation awards. The number of trainees counted in programs receiving supplemental awards have been deducted from the continuation total to prevent double counting.

The Emergency Medical Services Amendment of 1976 (Public Law 94-573) amends Title VII of the Public Health Service Act by extending the section 776 authorizing Grants for Training in Emergency Medical Services. Section 776 was redesignated section 789 by the Health Professions Educational Assistance Act of 1976 (Public Law 94-484). Grants under section 789 assist in meeting the cost of training programs in the techniques and methods of providing emergency medical services, including the skills required in providing ambulance services. The legislation also allows grants to be made to assist in meeting the cost of establishing programs and training physicians in emergency medicine. Besides the training of physicians, the grant program is designed to include the training of dentists, nurses, allied health personnel, and other health workers including emergency medical technicians. In fiscal year 1977, 49 programs were recommended for funding by the National Advisory Council on Health Professions Education. It was calculated from exact data and staff estimates from individual grant applications that approximately 21,000 persons, at all levels of training, would receive training through these programs.

The Comprehensive Health Manpower Training Act of 1971 (Public Law 92-157) provided for a variety of institutional support grants to dental schools in an effort to improve the supply and distribution of dental practitioners, to maintain the viability and stability of existing dental schools, to support the development of new schools, and to improve the quality of dental education.

During the 6-year period from 1972 to 1977 approximately $190.5 million were provided to 58 dental schools through capitation grants. Forty-one schools received $48.7 million in grants for construction and renovation of physical facilities. Start-up grants totaling $2.1 million were awarded to 3 new schools, and 11 schools received $12.7 million in financial distress grants.

Special Project Grants of approximately $27.4 million were also awarded to 25 dental schools between fiscal years 1972 and 1977. The initiatives included: enrollment and retention of minority, women and low income students; primary care programs; remote site training experiences; faculty training; training in dental team practice; and curriculum development.

Legislators and the public have shown increasing interest and concern over the past 15 years in the cost of education to students attending health professions schools and the ways that students meet those costs. Rapidly rising costs have generated increasing alarm that health professional careers may become accessible to only the most affluent students. Congress has enacted the Health Professions Educational Assistance Act of 1963 (P.L. 88-129) and subsequent related legislation, the latest being the Health Professions Educational Assistance Act of 1976 (P.L. 94-484). The financial assistance provided to schools and students through programs developed and implemented under provisions of these laws has contributed substantially to the unprecedented increases in the numbers of students who have entered and graduated from health professions schools, and to the increased number of persons from previously underrepresented groups in the schools and professions.

Since 1963, the Public Health Service has conducted periodic national surveys to obtain information on patterns of expenses of students and on the sources from which students obtain their income, including any indebtedness incurred to finance their education. Information has also been obtained on students' characteristics such as sex and family income. In spite of increased emphasis in recent years on facilitating the entry of students from less affluent families into health professions schools, the results have been inconclusive. The most recent surveys in the series were conducted during the 1970-71 and 1976-77 academic years. 1/

The family income distribution of students is compared with that of all families in the United States with a family head between 35 and 65 years old, since most health professions students come from families headed by a person in that age group. From 1971 to 1975 (the latest year for which data was available), the proportion of these families with incomes of $25,000 or more increased substantially (Table 2-2). In each discipline, the percentage of all students in each family income group was generally fairly close to the percentage of all families with a family head

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1/ Students in schools of allopathic medicine were surveyed separately during the 1974-75 school year, and, consequently, were not included in the 1976-77 survey. Average expenditures reported by allopathic medical students in 1974-75 were generally lower (even after adjusting for inflation) than expenditures reported by students in other health professions schools in 1976-77. However, they reported higher average amounts of income from their own earnings and savings, and from gifts than students in the other disciplines. Detailed findings have been published in "Survey of How Medical Students Finance Their Education, 1974-75", DHEW Publication No. (HRA) 76-94.

Table 2-2. Percent distribution of health professions students and of all U.S. families with head 35 to 65 years old, by family income: academic years 1976-77 and 1970-71

Family income	All U.S. families, head 35-65 years old	Discipline						
		Allopathic medicine 1/	Osteopathic medicine	Dentistry	Optometry	Pharmacy	Podiatry	Veterinary medicine
	1976-77							
All students 2/,3/..	100% 4/	100%	100%	100%	100%	100%	100%	100%
Less than $5,000.....	7	6	6	5	4	7	8	5
$5,000 - $9,999.....	14	11	16	12	10	14	13	12
$10,000 - $14,999.....	18	18	19	17	19	21	18	21
$15,000 - $19,999.....	20	15	15	16	19	18	20	16
$20,000 - $24,999.....	16	13	14	19	20	17	18	17
$25,000 or more.....	25	37	30	30	27	23	23	28
Mean income	$19,635	$20,249 5/	$22,240	$22,530	$22,340	$18,990	$20,810	$22,000
	1970-71							
All students 2/,3/..	100%	100%	100%	100%	100%	100%	100%	100%
Less than $5,000.....	12	7	12	7	10	17	11	12
$5,000 - $9,999.....	26	20	25	22	26	32	25	28
$10,000 - $14,999.....	29	25	28	30	29	29	28	30
$15,000 - $19,999.....	6/	15	13	16	14	13	15	14
$20,000 - $24,999.....	25 6/	11	7	11	10	5	10	8
$25,000 or more.....	8	22	14	14	12	5	11	9
Median income.....	$12,070 5/	$14,627 5/	$12,232 5/	$13,500 5/	$12,400 5/	$9,949 5/	$12,500 5/	$10,500 5/

1/ Information about students in schools of allopathic medicine is for academic year 1974-75.
2/ Individual income percentages may not add to totals due to independent rounding.
3/ Based on data reported by students who had a living parent and who supplied data on family income.
4/ Data are for 1976.
5/ Estimated median income.
6/ Not reported separately.

Source: How Medical Students Finance Their Education, 1974-75, DHEW Publication No. (HRA) 76-94.
How Medical Students Finance Their Education, DHEW Publication No. 75-13.
Money Income in 1976 of Families and Persons in the United States, Bureau of the Census, Series P-60, No. 114, July 1978.
Money Income in 1971 of Families and Persons in the United States, Bureau of the Census, Series P-60, No. 85, December 1972.
Preliminary data from 1976-77 survey of students in health professions schools (except allopathic medicine).

between 35 and 65 years old in that income group, except in the $25,000 and over income category. In 1970-71, the percentage of students' families with incomes of $25,000 or more was greater than the percentage of all families in that income group for all disciplines except pharmacy, and the differences between the percentages ranged from 1 percentage point (veterinary medicine) to 14 percentage points (allopathic medicine). In 1976-77, the percentage of students' families in that income group was always greater than the comparable percentage of all families, and the differences ranged from 3 percentage points (pharmacy and podiatry) to 17 percentage points (allopathic medicine). The parallel between the distribution of all families by family income and age of family head held true also for Black students (Table 2-3).

In every discipline except osteopathy, the percentage of women students who came from families with incomes of $25,000 or more was somewhat greater than that for male students in 1976 (Table 2-4).

Students in schools of podiatric medicine reported higher average expenses ($13,091) during the 1976-77 school year than students in any other discipline, and an amount more than double the average reported for the 1970-71 year. The higher average expenses of these students may reflect the fact that all podiatry schools are free-standing institutions with fewer sources of funding than either public or private schools for the other disciplines.

Average expenses of osteopathic students were $11,126 in 1976, an increase of 66 percent over average expenses of $6,710 in 1970. Dental students' expenses averaged $10,747, up from $6,231 in 1970. The highest average expenses reported for the 1970-71 school year also were reported by students of osteopathic medicine, podiatry, and dentistry. Pharmacy students reported the lowest average expenses in both school years, averaging $3,739 for the 1970-71 school year and $6,375 in 1976-77. The low average expenses of pharmacy students may partly account for the large proportion of Blacks and women enrolled in these schools.

Marital status has consistently been the single most important determinant of both expenses and incomes of students in health professions schools (Table 2-5). Consequently, it is not surprising that the highest proportions of married students were reported in schools of osteopathic medicine (56 percent), podiatry (52 percent), and dentistry (46 percent)--the same disciplines in which students reported the highest average expenses (Table 2-6). (The proportion of married students in schools of allopathic medicine was only 38 percent, 18 percentage points lower than for students in schools of osteopathic medicine). However, the rankings of the proportions of married students and of average amounts of expense were not identical across disciplines.

Table 2-3. Family income of Black health professions students and of all black families with head 35 to 65 years old: academic year 1976-77

Family income	All U.S. Black families, head 35-65 yrs. old	Discipline					
		Osteopathic medicine	Dentistry	Optometry	Pharmacy	Podiatry	Veterinary medicine
All income levels.....	100%	100%	100%	100%	100%	100%	100%
Less than $5,000.....	22	19	19	32	28	25	28
$5,000 - $9,999.....	26	28	31	31	24	30	24
$10,000 - $14,999.....	22	19	26	11	22	18	29
$15,000 - $19,999.....	15	18	3	6	11	18	13
$20,000 - $24,999.....	8	16	10	11	8	*	6
$25,000 or more.....	7	*	11	8	7	9	*

* Less than 0.5%.

Source: Money Income in 1975 of Families and Persons in the United States. Bureau of the Census, Series P-60, No. 105, June 1977.
Unpublished data from 1976-77 survey of students in health professions schools.

Although variation in the average amounts spent by health professions students was not consistently related to family size, the very considerable difference between the average expenses of married students and of single students in all disciplines can be seen in Table 2-5.

Between 1970 and 1976, the largest proportionate increases in students' average expenses occurred in school expenses (tuition, books, instruments, etc.). Percentage increases in the average amounts of school expense ranged from 56 percent for students in schools of veterinary medicine to nearly 200 percent for podiatry and dental students. These increases reflect both the inflationary spiral of all costs and the growing requirement for students to bear a larger share of the costs of their education for careers as health professionals.

School expenses for podiatry students averaged $5,796 in 1976, up from $1,938 in 1970. Students in schools of dentistry averaged $4,592 in school expenses during the 1976-77 school year, compared to $1,615 in 1970-71. Instruments and equipment, which represent only a small proportion of the amounts spent by students in other disciplines, accounted for approximately 29 percent of dental students' school expenses (Table 2-7).

Expenses classified as "noneducational"--lodging and maintenance of living quarters, food, transportation, taxes, insurance--account for from 56 percent to 73 percent of health professions students' average total expenses. Average amounts spent in 1976 ranged from $4,352 for pharmacy students to almost $7,300 for podiatry students. The increases in the amounts spent on items in this category generally reflect increases in the Consumer Price Index (CPI) between 1970 and 1976.

Students in podiatry schools and in the colleges of osteopathic medicine, where more than one-half of the students were married, spent, on the average, $7,295 and $7,080 respectively on noneducational items in 1976, as compared to an average of $4,352 spent by pharmacy students on items in this category.

Health professions students' expenses for lodging, maintenance of living quarters, and food averaged from one and one-third to one and one-half times greater in 1976 than in 1970. In pharmacy schools, where more than 7 of every 10 students were single, students spent an average of $2,103 on these items in 1976, 37 percent more than in 1970. Podiatry students, only 48 percent of whom were single, spent an average of $3,910 on these items, a 52 percent increase over the 1970 average.

Table 2-4. Family income of male and female health professions students and of all U.S. families, academic year 1976-77

Source of income	All U.S. families 1975	Discipline											
		Osteopathic medicine		Dentistry		Optometry		Pharmacy		Podiatry		Veterinary medicine	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
All income groups....	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Less than $5,000.....	12	6	6	5	7	4	6	7	6	9	14	6	2
$5,000 - $9,999.....	21	16	12	11	15	10	12	15	13	13	14	12	11
$10,000 - $14,999.....	22	19	21	17	18	14	19	22	19	18	17	22	19
$15,000 - $19,999.....	19	15	15	17	12	20	10	19	17	20	17	17	14
$20,000 - $24,999.....	12	14	16	20	16	21	20	17	17	19	7	17	17
$25,000 or more.....	14	30	29	30	32	26	33	27	27	23	31	26	37

Note: Percents may not add to totals due to independent rounding.

Source: Money Income in 1975 of Families and Persons in the United States. Bureau of the Census, Series P-60, No. 105, June 1977.
Unpublished data from 1976-77 survey of students in health professions schools.

Table 2-5. Average expenses of health professions students by marital status, sex, and racial/ethnic identity: academic year 1976-77

Marital status, sex, racial/ethnic identity	Discipline					
	Osteopathic medicine	Dentistry	Optometry	Pharmacy	Podiatry	Veterinary medicine
All students	$11,126	$10,747	$ 9,197	$6,262	$13,091	$ 7,273
Marital status:						
Single	8,670	8,238	7,181	5,102	9,967	5,505
Married:						
No children	12,211	13,128	11,962	9,385	15,257	9,485
One child	13,941	14,107	11,653	8,807	17,846	8,456
Two or more children	14,906	16,986	13,183	9,497	17,684	10,769
Sex:						
Male	11,189	10,783	9,274	6,667	13,011	7,502
Female	10,655	10,488	8,729	5,605	14,182	6,631
Racial/ethnic identity:						
White	11,079	10,971	9,367	6,325	13,114	7,254
Black	12,388	9,430	8,662	5,131	10,401	8,010
Hispanic	1/	9,722	7,626	5,100	1/	1/
Other	11,375	9,349	7,103	6,667	15,176	6,648

1/ Included in "Other" category because of small number of students responding.

Source: Unpublished data from 1976-77 survey of students in health professions schools.

Table 2-6. Distribution of health professions students by marital status: academic years 1976-77 and 1970-71

Marital status	Discipline						
	Allopathic medicine 1/	Osteopathic medicine	Dentistry	Optometry	Pharmacy	Podiatry	Veterinary medicine
	1976-77						
All students 2/.....	100%	100%	100%	100%	100%	100%	100%
Single.....	62	44	54	59	72	48	56
Married:							
No children.....	29	34	33	31	20	38	32
One child.....	6	10	7	6	4	8	8
Two or more children....	3	12	6	4	4	5	5
	1970-71						
All students	100%	100%	100%	100%	100%	100%	100%
Single.....	53	40	45	56	69	46	51
Married:							
No children.....	34	35	37	32	18	37	31
One child.....	10	14	12	8	9	11	12
Two or more children....	3	11	6	4	4	6	6

1/ Information about students in schools of allopathic medicine is for academic year 1974-75.
2/ Individual percentages may not add to totals due to independent rounding.

Source: U.S. Department of Health, Education, and Welfare, Survey of How Medical Students Finance Their Education, 1974-75. DHEW Publication No. (HRA) 76-94.
U.S. Department of Health, Education, and Welfare, How Health Professions Students Finance Their Education. DHEW Publication No. (HRA) 74-13.
Unpublished data from 1976-77 survey of students in health professions schools.

Table 2-7. Average expenses of health professions students for selected items: academic year 1976-77

	Discipline					
	Osteopathy	Dentistry	Optometry	Pharmacy	Podiatry	Veterinary medicine
Average expenses	$11,126	$10,747	$9,197	$6,262	$13,091	$7,273
Education	4,046	4,592	3,412	1,910	5,796	1,997
Tuition	3,352	2,799	2,680	1,608	4,988	1,350
Books	388	449	342	246	395	334
Instruments & equipment	222	1,314	354	33	293	260
Other	95	30	36	30	143	56
Other	7,080	6,155	5,785	4,352	7,295	5,276
Lodging	1,952	1,877	1,744	1,207	2,453	1,428
Food	1,357	1,189	1,107	896	1,457	1,026
Other 1/	3,771	3,089	2,934	2,249	3,385	2,822

1/ Includes major purchases such as house, furniture, transportation, insurance, taxes, etc.

Source: Unpublished data from 1976-77 survey of students in health professions schools.

Average expenditures of students of veterinary medicine and podiatry for noneducational expenses classified as "Other," i.e., transportation, insurance, major purchases (house, car, etc.) more than doubled from 1970 to 1976, although for these students the average amounts of expenses in this category were smaller in both years than for students in any of the other disciplines. Students in all disciplines spent more, on the average, for items in this "other" category during the 1976-77 school year than for lodging and food, a reversal of the pattern for students in the 1970-71 school year.

Health professions students utilize a variety of sources to meet their expenses (Table 2-8). The proportion of their income that was derived from nonrefundable funds (their own earnings, spouse's earnings, family contributions, grants and scholarships, etc.) ranged from 67 percent for podiatry students to 80 percent for students of veterinary medicine in 1976. In 1970, students in all of the disciplines reported receiving from 81 percent to 85 percent of their income from nonrefundable funds, except dentistry and osteopathic students who received 79 and 74 percent, respectively, from such funds. The figures mean that students in 1976 relied more heavily on loan sources (refundable funds) than did students in 1970.

For students in schools of dentistry, optometry, and osteopathy, the average amount received from their families in 1976 ($1,545, $1,488, and $1,365, respectively) was greater than the amount received from any source except spouse's earnings. Students in schools of podiatry, pharmacy, and veterinary medicine averaged slightly larger amounts of income from their own earnings ($1,855, $1,784, and $1,354, respectively) than from family contributions.

Although income from earnings was the most frequently reported source of income by students in all disciplines in 1970 and in 1976, the proportions of students with such income varied considerably. There were sharp decreases over this period in the proportions of students in osteopathic or dental schools who reported income from their own earnings. For osteopathic students the proportion of students with such income dropped from 69 percent to 47 percent, and for dental students the decrease was from 72 percent to 53 percent. The proportion of podiatry students with such income decreased also, but less sharply, dropping from 75 percent to 67 percent. For students in schools of veterinary medicine, the proportion decreased by only 1 percentage point, and there was no change in the proportion of optometry students (77 percent) with income from this source. For pharmacy students, the proportion of students with income from earnings increased from 1970 to 1976, from 73 percent to 81 percent.

For students in schools of veterinary medicine, income from their own earnings averaged $1,354 and represented 18 percent of their total income in 1976. Students in schools of osteopathic medicine reported

Table 2-8. Average amount of income from selected sources reported by health professions students and proportion of students receiving such income: academic year 1976-77

Source of income	Discipline					
	Osteopathic medicine		Dentistry		Optometry	
	Average amount	Proportion of students receiving	Average amount	Proportion of students receiving	Average amount	Proportion of students receiving
All sources: total	$11,252		$10,775		$9,130	
Nonrefundable funds: total	8,532		7,568		6,905	
Earnings from own employment	910	47	1,080	53	1,299	77
Armed forces pay	363	10	169	5	119	4
Spouse's earnings 1/	2,955	40	3,013	35	2,645	33
Savings, trusts, etc	604	44	571	41	389	50
Gifts	77	17	68	17	67	18
Own family	1,365	31	1,545	50	1,488	54
Spouse's family	78	6	93	7	63	7
Grants and scholarships	1,989	2/	899	2/	782	2/
Refundable funds: total	2,806		3,207		2,225	
Federal Health Professions	289	21	514	25	345	25
Guaranteed student loan (GSL)	910	38	915	34	752	34
Guaranteed school loan	151	7	272	10	62	4
Other school loan	139	4			34	2
Private bank	233	17	151	4	135	5
Family	588	16	626	17	434	14
Other	499	21	564	2/	238	2/

Table 2-8. Average amount of income from selected sources reported by health professions students and proportion of students receiving such income: academic year 1976-77 (cont)

Source of income	Discipline: Pharmacy		Podiatry		Veterinary medicine	
	Average amount	Proportion of students receiving	Average amount	Proportion of students receiving	Average amount	Proportion of students receiving
All sources: total	$ 9,046		$12,984		$7,503	
Nonrefundable funds: total	7,050		8,757		6,012	
Earnings from own employment	1,784	81	1,855	67	1,354	80
Armed forces pay	147	2	31	2	130	3
Spouse's earnings 1/	5,650	23	3,866	43	2,170	34
Savings, trusts, etc	414	39	439	49	467	51
Gifts	212	18	102	19	78	22
Own family	1,392	61	1,579	48	1,087	55
Spouse's family	186	8	345	23	67	8
Grants and scholarships	1,599	21	512	2/	612	2/
Refundable funds: total	1,996		4,227		1,491	
Federal Health Professions	276	18	352	30	302	22
Guaranteed student loan (GSL)	314	14	2,241	60	364	18
Guaranteed school loan	125	3	111	5	109	6
Other school loan	110	2	76	4	99	5
Private bank	133	3	136	5	90	5
Family	237	7	722	18	337	18
Other	669	2/	465	2/	122	2/

1/ Computations based on data for married students only.

2/ An unduplicated count of students who reported funds from the multiple sources in this category was not available.

Source: Unpublished data from 1976-77 survey of students in health professions schools.

the lowest average amount of income from earnings ($910), only 8 percent of their total income.

The major source of income for married students in all health professions schools was spouse's earnings, which ranged from $2,170 for students of vetinary medicine to $5,650 for pharmacy students (relatively few of whom were married).

The largest amount of income in 1976 from grants and scholarships ($1,989) was reported by students of osteopathic medicine, whose average was boosted by amounts from Public Health Service Scholarships and Armed Forces Health Professional Scholarships. Pharmacy students reported the second highest average amount from grants and scholarships ($1,599), with funds from Basic Educational Opportunity Grants (BEOG) and the Tuition Assistance Plan (TAP) contributing the largest average amounts. Few, if any, students in the other disciplines received money from BEOG or TAP funds, and the average amounts reported from these sources were negligible. For students in dentistry, optometry, podiatry, and veterinary medicine, the average income from grants and scholarships ranged from $512 for podiatry students to $899 for dental students.

In 1970 only students in osteopathic and dental schools derived as much as 20 percent of their income from loans, but in 1976 that was a minimum percentage for students in all disciplines, with loans ranging from 20 percent of income for veterinary students to 33 percent for podiatry students. Guaranteed Student Bank Loans (GSL) were the most frequently reported loan source by students in all disciplines except pharmacy and veterinary medicine in 1976; however, the proportions of students reporting these loans varied considerably. The GSL program provided loans, averaging $2,241, to 3 out of 5 podiatry students. Among students in osteopathic, dental, and optometry schools, the proportions of students utilizing GSL funds were 38 percent, 35 percent and 34 percent, respectively, while 14 percent of pharmacy students and 18 percent of veterinary students reported loans from this source. For students of podiatry, pharmacy and veterinary medicine, the proportions reporting Federal Health Professions (FHP) Loans in 1976 were very similar to the comparable proportions in 1970. For students in osteopathy, dentistry, and optometry, GSL appears to have supplanted FHP as a loan source.

Average indebtedness reported by health professions students was much larger in 1976 than in 1970 in all disciplines except pharmacy. Osteopathic students reported debts averaging $8,864 in 1976, the highest amount reported by students in any discipline and nearly 50 percent higher than in 1970 (Table 2-9). Podiatry students reported debts averaging $8,644 in 1976, more than double the average of $4,115 reported by students in 1970. The proportionate increases in average indebtedness from 1970 to 1976 ranged from 72 percent for optometry students to 44 percent for students in veterinary medicine. Average

Table 2-9. Average amount of current debt and proportion of health professions reporting by marital status, sex, and racial/ethnic category: academic year 1976-77

Marital status, sex, and racial/ethnic group	Discipline: Osteopathic medicine — Average debt amount	Osteopathic medicine — Proportion of students reporting	Dentistry — Average debt amount	Dentistry — Proportion of students reporting	Optometry — Average debt amount	Optometry — Proportion of students reporting
All students	$ 8,864	75%	$ 7,675	72%	$ 6,109	69%
Marital status:						
Single	5,740	67	5,542	64	4,217	62
Married, no children	9,376	78	9,212	79	7,902	78
Married, 1 child	12,280	83	11,448	83	8,661	71
Married, 2 or more children	16,174	87	14,479	88	16,202	91
Sex:						
Male	8,909	75	7,421	72	6,326	70
Female	8,573	73	9,541	70	4,807	60
Racial/ethnic category:						
White	8,847	74	7,473	70	6,247	69
Black	8,816	81	8,395	82	7,646	87
Hispanic	1/	1/	9,319	77	6,823	77
Other	8,671	76	9,039	81	3,808	65

Table 2-9. Average amount of current debt and proportion of health professions reporting by marital status, sex, and racial/ethnic category: academic year 1976-77 (cont)

Marital status, sex, and racial/ethnic group	Discipline: Pharmacy — Average debt amount	Pharmacy — Proportion of students reporting	Podiatry — Average debt amount	Podiatry — Proportion of students reporting	Veterinary medicine — Average debt amount	Veterinary medicine — Proportion of students reporting
All students	$ 2,369	52%	$ 8,644	79%	$ 5,088	65%
Marital status:						
Single	1,633	46	5,340	72	3,460	56
Maried, no children	3,666	68	7,049	83	6,037	71
Married, 1 child	5,813	72	11,764	88	7,678	88
Married, 2 or more children	6,107	73	9,675	90	13,777	94
Sex:						
Male	2,788	57	8,031	79	5,190	67
Female	1,704	44	8,217	70	4,803	54
Racial/ethnic category:						
White	2,372	53	8,016	79	5,144	65
Black	2,399	65	9,883	87	2,737	71
Hispanic	1,712	46	6,192	79	1/	1/
Other	2,577	50	10,682	76	3,431	65

1/ Included in "Other."

Source: Unpublished data from 1976-77 survey of students in health professions schools.

indebtedness reported by pharmacy students decreased by 4 percent over this period. The proportion of podiatry students reporting indebtedness increased from 70 percent to 79 percent, but there was a maximum increase of only 4 percentage points in the proportion of students with debts in all of the other disciplines.

In conclusion, there is currently no evidence to prove that the present cost of health professions education or the prospect of future cost increases has served as a deterrent to students aspiring to careers in the health professions. For most disciplines there was a steady increase in the number of applicants from 1961 to 1975. Since 1975, the number of applicants to medical and dental schools has decreased, and preliminary analyses indicate a significant decline in applicants from the socio-economic lower middle class. One effect of the rising costs, however, is the increased acceptability of the service committment in exchange for financial support to many students. And a question is whether scholarship and loan programs will enable the schools to maintain and perhaps even broaden their present economic and sociodemographic mix of students.

3

RECENT DATA AND ANALYTICAL DEVELOPMENTS

Section 708 of the Public Health Service Act as amended by P.L. 94-484 requires the Secretary of Health, Education, and Welfare to "...establish a program including a uniform health professions data reporting system to collect, compile, and analyze data on health professions personnel" and to "...develop analytic and descriptive studies of the health professions, including evaluation and projections of the supply of, and requirements for, the health professions by specialty and geographic location". Authority for implementation of this section of the law has been assigned jointly to the National Center for Health Statistics (NCHS) and the Bureau of Health Manpower (BHM). The National Center for Health Statistics has the responsibility for establishment of the uniform health professions data reporting system and the Bureau of Health Manpower for the analytic and descriptive studies.

The uniform health professions data reporting system is being developed by NCHS through the Cooperative Health Statistics System (CHSS), which provides Federal contract support to States for ongoing data collection on, among other things, health personnel and facilities. The health manpower component consists of inventories for selected licensed health occupations, which currently include allopathic physicians, osteopathic physicians, dentists, dental hygienists, registered nurses, licensed practical nurses, pharmacists, chiropractors, veterinarians, physicial therapists, optometrists, podiatrists, and nursing home administrators. The CHSS inventories provide data on training, licensure status, place of practice, professional specialty, practice characteristics, and selected demographic characteristics of health professions personnel.

At the present time, 36 States are developing or implementing CHSS components for health manpower data collection. The goal of reaching all 52 States and jurisdictions was not reached because NCHS funding levels were not high enough in fiscal year 1978. Also, 10 States were new in the System in fiscal year 1978 and accordingly will not be producing data on all occupations until later in 1979. In the other 26 States, surveys of practitioners were being collected through State licensure boards, with detailed information gathered on the practitioner's basic demographic, educational, and practice characteristics. Some State licensure boards have not agreed to participate with the State CHSS contractors, and surveys are being conducted apart from the licensure mechanisms.

To complete the uniform health professions reporting system and make it fully operational, all remaining States must be brought into the system. Among the States without CHSS manpower components are New York and California. Because both have significant numbers of health professionals, they must be brought into the system if it is to be implemented effectively and national estimates developed. An

estimated $2 million is needed to complete the manpower component in all States.

Another aspect of an effective health personnel information system picture is the collection of detailed inventory data on nonlicensed personnel, employed largely in health care settings such as nursing homes, hospitals, and other inpatient health facilities. The CHSS facilities component has been set up to collect facility data and also basic "head counts". Because the CHSS facility component is operational in only 36 States, here, too, the need is to complete the component in all States in order to have national data through the Cooperative Health Statistics System. However, national data are being produced every other year for health personnel employed in inpatient health facilities by the National Center for Health Statistics. This is accomplished by a centralized collection of the same data in States not in the CHSS through the Master Facility Inventory.

Because of the time and financial resources needed to complete the CHSS in all States and to fully implement the data system called for by the law, an interim plan for the provision of the required national data inventory is being implemented for a number of professions. This interim plan, developed jointly by the Bureau of Health Manpower and the National Center for Health Statistics, calls for immediate but phased data collection on selected occupations in those States that currently are not participants in the CHSS, with the separately collected data to be merged with the CHSS data into a single national total. Supplementary inventories have been completed or are underway for registered nurses, optometrists, and pharmacists, and plans are being developed for a similar supplementary inventory of licensed practical nurses. In addition to the primary data collection currently planned and underway, BHM is working out arrangements with a number of health professional associations to purchase data files that they have developed as part of their own continuing information systems. Among these associations are the American Medical Association, American Dental Association, American Association of Dental Examiners and the National League for Nursing. In all cases, data have been evaluated by the Department and found to be technically sound and objective. Availability of these data will permit analytical activities relating to physicians, dentists and newly licensed nurses which would otherwise have been impossible.

Since the development of a complete 50-State CHSS system will provide only part of the data needed to respond to the mandates of Section 708, other statistical efforts must be undertaken. More important, a variety of analytical activities are called for by Section 708 which require studies, reports, and analyses that are different in nature from the data collection of the type mentioned previously. A few of the analyses, studies, and reports needed to address the specific analytical objectives in Public Law 94-484 are described in the following pages.

as is the progress being made along these fronts. Reflecting the extraordinarily complex issues facing the health care system and the personnel in that system, and the critical importance of addressing these topics, the Bureau of Health Manpower's analytical program comprises studies related to utilization, education and practice characteristics, productivity, practice behavior, and determinants of practice location choice for the health professions, as well as further work on development of projections of health personnel supply and requirements and their impact on costs, education, access to health care, and geographic distribution.

In fiscal year 1978, the Bureau began development of a study of practitioners and students in osteopathic medicine, a discipline for which there is a very weak data base. Other studies are being planned on student characteristics, financing and indebtedness, medical specialty task analysis, and the relationships between health personnel and the cost of care. In addition, analyses of determinants of care expenditures are under consideration to improve estimates of demand for services and family care utilization.

Although these activities sometimes include data collection, their primary thrust will be analytical. An important aspect of this program will be the development of "models" and analytical procedures to describe the operation of the current system and to forecast the possible directions that the system may take in the future, with alternative assumptions based on policy concerns and issues. Especially important will be the development of studies to analyze and forecast requirements for practitioner services, the supply of active personnel, and the geographic distribution of health personnel.

While present capabilities are less than optimum, the analysis planned to meet the requirements of section 708 (and other sections) of the Public Health Service Act as amended by P.L. 94-484 currently involves:

1. Planning and implementation of a strategy for development, compilation, or collection of necessary data on health personnel and on those aspects of health care delivery which involve such personnel, as a base for statistical and analytical efforts, and in coordination with the National Center for Health Statistics.

2. Analysis of data (developed as above) and development of improved and refined methodologies for forecasting the supply of and requirements for various types of health personnel.

3. Analysis of data (developed as above) and development of methodologies for more adequately assessing the geographic distribution of health personnel, its accessibility, and its services provided to various components of the population.

4. The use of the results of such analyses in the designation of personnel shortage areas as required by legislation for various programmatic purposes, including placement of National Health Service Corps personnel.

5. The design and conduct of a long-term program of analytic research to improve understanding of the complex causes of changes in health personnel supply and requirements and in health care delivery modes.

6. The provision of technical assistance and data support to planning activities of the Bureau of Health Planning (BHP) and to Health Systems Agencies (HSAs), State Health Development Agencies, and other planning organizations. This includes adaptation of completed national analytic results to local requirements and supply forecasting, and provision of area-oriented data both through the Bureau's Area Resource File, a computerized, county-based data file currently being widely used for a variety of analyses, and the State agencies conducting the CHSS manpower and facilities components.

7. The monitoring of changes in health personnel educational programs and the characteristics and finances of their students.

8. The application of the results of such analyses to the preparation of Congressional, Departmental, and other reports which evaluate the status and prospects for the Nation's health personnel and assess alternative policy options in a clear, timely, objective and authoritative manner.

The Area Resource File (ARF) system has been expanded, and restructuring of it is underway to make it more useful to the State Health Planning Department Areas (SHPDAs), Health Service Areas (HSAs), and other local entities, universities, Federal agencies, and private organizations, who have employed it widely in recent years. The Area Resource File system of computerized data now has nearly 100 separate files and thousands of data elements linked into a single system, including such files as the AMA microdata, student finances data, nurse wage data, primary care M.D. data on market tightness and practice characteristics. Additional updated personnel

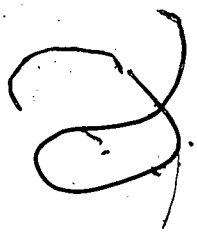
and education data have been entered into the ARF system, as has Medicare utilization data, detailed mortality figures, and environmental quality measures. Detailed descriptive tabulations and State and HSA rankings from the ARF were recently provided to health planners and made publicly available in 52 State and national volumes.

The analytic research currently being undertaken by BHM will lead to the development of more accurate models of personnel supply, improved models of requirements for personnel and prototype models of personnel distribution forecasting and the graduate medical education process, as well as several models of how the supply and demand for health care and health personnel come into balance. For example, a utilization-type model of the requirements for all types of health personnel is in the final stages of completion after several years of development, and evaluations of several complex "equilibrating" models of dental and nursing care have been completed. A national equilibrating model for dental personnel requirements estimation has been developed at BHM and new efforts underway include the development of a microsimulation model of dental care.

Supply forecasting was improved by the introduction of occupation-specific data and requirement rates, medical specialty age-specific distribution, separate estimates of female and minority supplies, and new FMG estimates reflecting the provisions of P.L. 94-484 and subsequent legislation.

Some gains were also realized in analyzing distributional problems and shortage area designation methods. Major accomplishments were the complete revision of all designation criteria and processes to meet the provisions of P.L. 94-484, and development of a new more refined listing of such areas. Analysis of recent data on RN wages in hospitals has begun, in order to measure the effects of RN labor market on distribution, and a preliminary model for forecasting physician shortage areas has been completed in cooperation with the Office of Planning, Evaluation, and Legislation, Health Services Administration, (OPEL/HSA). Finally, several of the legislatively mandated Reports to the President and the Congress have been completed, and the first annual report, the Status of Health Professions Personnel in the U.S., a comprehensive presentation of important information about health practitioners, health professions students, and schools, has been submitted to Congress.

PROJECTED REQUIREMENTS FOR HEALTH PROFESSIONS



This chapter presents projected estimates of requirements for physicians and other health practitioners. These forecasts are derived from a model of health services utilization which combines elements of several modelling approaches. A brief description of this model is given later in this section. As an orientation to the modelling methodology used in the development of the requirements projections, it is worthwhile to summarize the approaches to modelling requirements that most models follow, keeping in mind that no single modelling method has been found entirely satisfactory, and most models in use are variants of several types.

Approaches to Estimating Health Manpower Requirements

There are several widely used approaches to health practitioner requirements forecasting. 1/ The most prevalent type relies on practitioner-to-population ratios. In its simplest form, this approach takes a manpower-to-population ratio as its future standard and implicitly assumes that future conditions will sufficiently resemble those on which the ratio standard is based. This approach ignores uncertainties about the future and fails to recognize that factors other than manpower and population enter into requirements estimates.

Utilization models are closely related to practitioner to population ratio standards. However, utilization models disaggregate the population into groups relevant to the provision of care, and forecast the population, utilization, and requirements for each group. In practice, such models forecast population components--age, sex, income--and maintain present practitioner-to-population ratios for each component. While this takes the population's changing composition into account, the implicit assumption is that present conditions will continue with no allowance for possible changes in the population's care demand or practitioners' productivity. A variant of this approach involves the substitution of professional judgment of health care needs for observed utilization rates. This approach assumes that future conditions will permit the provision of all needed services. However, because studies based on professional judgment are seldom accompanied by a statement of the assumptions, persons other than the developers of the estimates cannot fully understand and evaluate these assumptions.

Another approach to forecasting practitioner requirements is based upon the projection of important past trends which have affected both health care demands and the productivity of practitioners.

1/ For a more extensive discussion, see Review of Health Manpower Population Requirements Standards: Bureau of Health Manpower/HRA, 1976: DHEW Publication No. (HRA) 77-22.

There is a basic conceptual problem which tends to negate this approach. Typically, past utilization is used as a proxy both for past practitioner output and for past consumer demand. Past utilization represents the adjustment of actual demand and supply to each other in a "market" context. When the same measure is used as a proxy for both demand and supply, the result is essentially a projection of the past trend in the practitioner to population ratio. Thus, trends in health care demand and productivity of practitioners are not captured after all. 2/ Unfortunately, many health manpower studies unintentionally contain this error.

A far more complex approach to forecasting practitioner requirements consists of "equilibrating" models of the health care system which attempt to explain how the many forces affecting supply and demand for care come into balance or equilibrium. While this approach is far more comprehensive than the others, in actuality the information and theoretical understanding required by equilibrating models generally far surpass present capabilities of conceptualization and quantification.

In summary, the present array of efforts to forecast health practitioner requirements offers no entirely satisfactory approach. Nevertheless, the forecasts presented in this report can provide some preliminary insights into the future status of health professionals. In the meantime, work is proceeding on the development of improved and refined models; these will be discussed in future reports.

2/ If the trend in "demand" is estimated as the trend in utilization divided by the trend in population and the "productivity" is the same utilization trend divided by the trend in providers, the equation yielding the future provider requirement from these factors and the projected population is:

Future Requirements = Projected Population * (Utilization Trend/Population Trend)/ (Utilization Trend/Productivity Trend)

Which can be simplified to:

Future Requirements = Projected Population * Productivity Trend/Population Trend

The BHM General Requirements Model

The health personnel requirements projections presented in this chapter have been made using the general requirements model developed by the Division of Manpower Analysis (DMA), Bureau of Health Manpower. The following section provides a technical overview of the modelling methodology and a brief evaluation of the model; the presentation and discussion of results from the model follow these sections.

Structure of the Model

The personnel requirements model currently used by DMA represents an initial BHM effort to assess requirements for all types of health personnel within a single modelling framework, and since its inception has been used in a variety of policy analyses and program studies. 3/ The model was conceived to respond to the question "how much manpower will be required by the future health care system under certain specific conditions?" This is fundamentally a utilization model having the capability to adjust for trends in per capita utilization of care and for certain major potential departures from mainstream trends such as the increased employment of expanded function aides, HMO growth, and National Health Insurance.

Figure 4-1 gives an overview of the model. The first step of the model operates by forecasting utilization levels in 1980, 1985, and 1990 from 1975 utilization rates, and projections of the U.S. population by age, sex, and family income (in constant dollars). Because the Bureau of the Census does not project estimates of the population by age, sex, and family income, the population matrices used for the model were derived by controlling the projected populations by age and sex from census data, and separate projections of the total population by family income, to an internal distribution of the 1970 population by age, sex, and family income. Using the population distribution by age, sex, and total money income from the 1970 decennial census, the internal distribution for the projection years 1980, 1985, and 1990 was estimated. This mathematical technique maintains the closest possible relationship between the 1970 population by age, sex, and income and the same components in a target year, controlling to the projected

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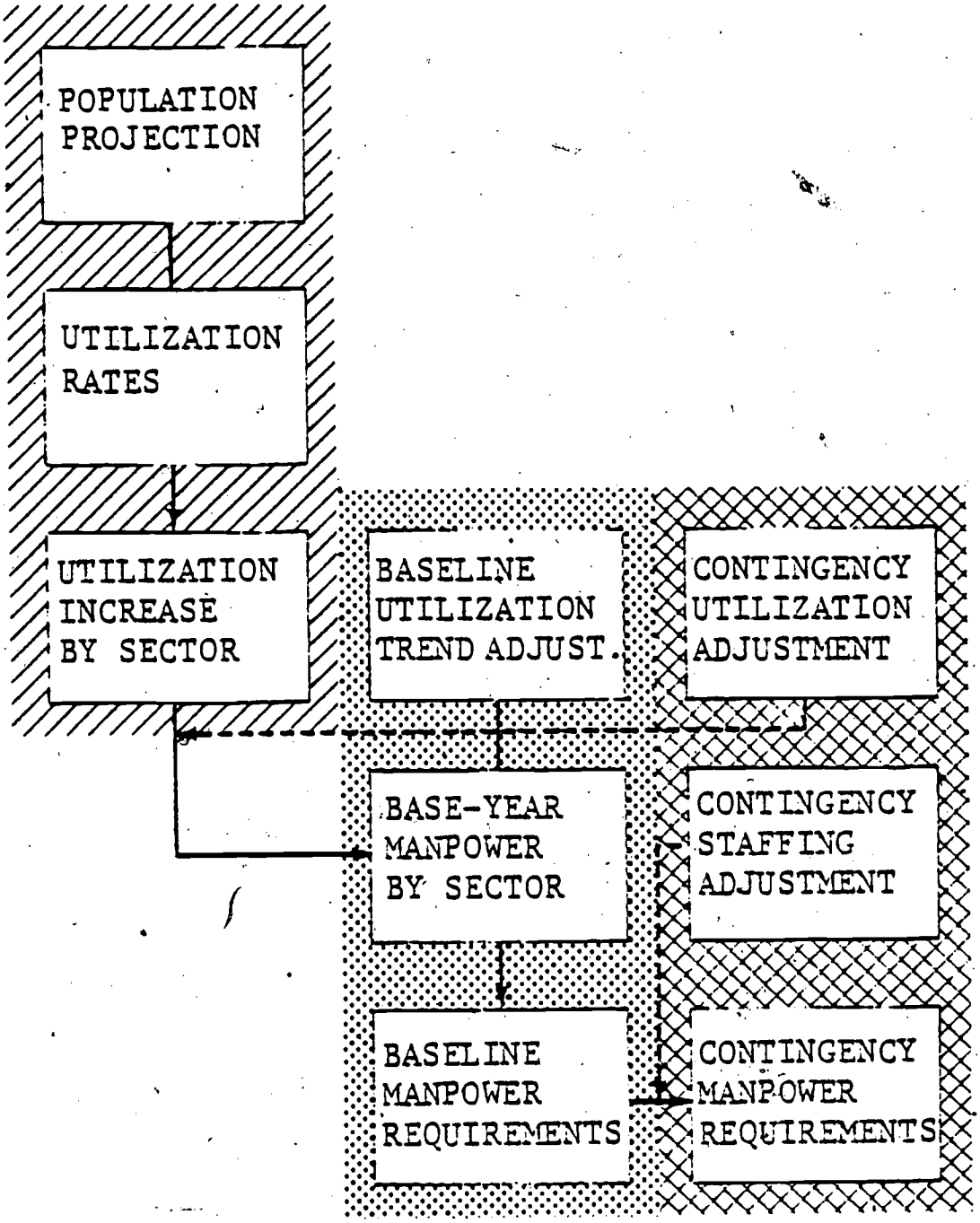
3/ The initial version of this model was developed in 1971 and 1972 as part of Project SOAR (Supply Output and Requirements) to assess supply and requirements within a single coordinated program. The Division of Manpower Analysis, BHM/HRA, has recently awarded a contract to thoroughly test, evaluate, and document the general requirements model. The final report from this contract should be available by Spring 1979.

FIGURE 4-1

SOAR REQUIREMENTS MODEL OVERVIEW



age and sex marginal subtotals, the projected total population, and separate estimates of income growth.

For population projections, the Bureau of Census "Series III" projections were chosen, reflecting an ultimate completed cohort fertility rate of 1.7 births per woman. This was used, rather than a "replacement rate" series set at 2.1 births per woman, because total fertility rates have been regularly declining since 1960 and evidence of a long-term reversal of the trend is scanty at this point.

Utilization rates for each of 20 health service categories (e.g., general medical office services, inpatient hospital services, dental and pharmacy services) were estimated from recent data (primarily from the 1975 Health Interview Survey) for each of the population subgroups. These utilization data are in terms of visits to physicians' and dentists' offices; discharges from short term hospitals specified for surgical and obstetric care, medical (nonsurgical) services, and outpatient visits; numbers of prescription acquisitions for pharmacy services; and estimated resident patients in psychiatric and other long term care facilities. A projection of the total population's utilization of specific types of care in 1980, 1985, and 1990 was then obtained by multiplying the projected size of each population subgroup by its associated utilization rates. The model does not include age/sex/income-specific utilization rates for nonpsychiatric long-term hospital care, veterinary medicine services and laboratory services. Several categories, such as long-term psychiatric and nursing home services, do not recognize income specificity due to data limitations although it is acknowledged that these categories would be sensitive to income differences. Because the total matrix of utilization rates is nearly 800 cells, the display of these is omitted from the report.

The second step of the model adjusts for past trends that are believed to cause future per capita utilization to differ from present utilization, thereby altering the level of requirements. These trends in per capita utilization of care are divided into economic and noneconomic trends. Long-term economic trends in health service utilization take into account provider price levels, insurance coverage and copayments, and assumptions about the sensitivity of demand to net consumer price. The responsiveness of consumer demand to prices, termed the price

elasticity of demand (4/), varies by type of service. In general, one expects consumers to be more sensitive to the price of elective services, such as dental care, than to less deferrable care such as that obtained in short-term hospitals. The removal of price effects from past utilization trends results in a remainder which represents the noneconomic or nonprice component of utilization; that is, represents the combined effect of many unmeasured nonprice determinants (e.g., education, consumer tastes and preferences, health resource constraints and care availability, travel and waiting times to obtain services, etc.).

Both price and nonprice effects are projected into the future in order to adjust the utilization rates for the various health service categories, as detailed below.

These modifications to the model were computed by first making linear extrapolations of the nonprice utilization trends for particular health services. Specifically, a "nondollar" adjustment was computed for each health service setting considered in the model by removing the effects of changes in consumer price from throughout the historic per-capita utilization trend. 5,6/ Consumer price is defined as the

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4/ For example, an elasticity of -0.14 for physicians' office services says that a 10 percent increase in physicians' fees is assumed to result in a 1.4 percent decrease in demand for services. The alternate elasticity coefficients used in the model are: -0.14 and -0.30 for medical office services; -0.08 and -0.20 for short-term hospital services; -0.16 and -1.00 for dental office services; -0.07 and -0.15 for pharmacy services. These elasticity rates were taken from the health economics literature and represent the range of values thought to be reasonable.

5/ The historic per capita utilization trends for medical services were limited to the years after 1967 in order to avoid projecting the surges in health care utilization that came about through the introduction of Medicare and Medicaid in 1966 and would therefore not be expected to recur in the coming 12 years.

6/ The primary equation for obtaining the "nondollar" trend line is a constant price elasticity demand curve model expressed as:

Nonprice utilization = Utilization/Price*Coinsurance)**B

Future utilization is thus computed as:

Future Utilization = Nonprice Utilization * (Projected Price * Projected Coinsurance)**B

Where B, the exponent, = price elasticity of demand, which is always negative.

product of average coinsurance for a particular health service category, and the Consumer Price Index (CPI) for that health service divided by the CPI for all items. This "nondollar" per capita utilization trend was then projected, using linear regression techniques, to each of the target years 1980, 1985, and 1990. The adjusted CPI and average coinsurance were independently projected as linear extrapolations, and future average per capita utilization rates were computed for each of the target years. Alternative requirements estimates represent different choices of price elasticity of demand coefficients; that is, alternative rates of consumer responsiveness to price change for a given personal health service. The reader should be aware, however, that the alternate requirements estimates were not necessarily developed to represent the extreme values that the model's parameters might assume. The values chosen for elasticities are inclined to be conservative, and no deviations from recent price trends are assumed, except in the instance where price is deliberately held constant for purposes of analysis. The parameter values used were chosen to represent a consensus of estimates from recent studies from the health econometrics literature and the most recently available data from Social Security Administration, National Center for Health Statistics, Bureau of Labor Statistics and other sources.

The model also has the capability of assuming less sensitivity to price as price approaches zero; a linear function and a "semilogarithmic" function. In view of the fairly narrow price ranges experienced in the simulations, and its relative simplicity, a constant elasticity model has been preferred for the published forecasts.

The "nondollar" utilization trend represents a component of utilization which measures all determinants of utilization not accounted for by price. The trend is not necessarily a pure or even a predominant measure of any single influence. Although no effort was undertaken to statistically factor the trends into their constituent parts, it is expected that such factors as morbidity, health status, education, regional and environmental differences, and availability of health facilities and resources, to name but a few, would be underlying determinants. While any inhibition of demand because of supply constraints could not be determined (which, if controlled for, would more closely identify demand defined as the consumer's willingness and ability to purchase care), the model can partially gauge the probable effects of demand suppression through price rationing by assuming a constant provider price throughout the projection period.

In the third step, to convert estimates of total utilization of health services into requirements for health personnel the model takes the personnel observed to be associated with each of the 20 care types in the 1975 base year and multiplies the number of practitioners by the ratio of estimated utilization in a given target year to the

utilization observed in 1975. By including the price trend adjustments, the desired projections of basic health personnel requirements emerge.

Specific Assumptions and Trends Underlying Projections Made With the BHM General Requirements Model

The baseline projections of health personnel requirements were calculated by solving the general model under the following assumptions: (1) the population will increase at an annual rate of about 0.7 percent per year from 1975 to 236 million persons by 1990, based on U.S. Bureau of the Census projections; (2) the age and sex distribution of the population will remain the same relative to family income as in 1970 (as noted above), although the real income of the overall population will increase; (3) the average coinsurance rates for health services will decline; (4) provider prices for health services will follow recent trends, with hospital prices showing the sharpest increases. In addition, the estimates assume: supply and requirements were in balance in 1975; price elasticity remains constant; trends in nondollar determinants of health care utilization do not substantially change between 1975 and 1990; no care or manpower substitutions occur between manpower types or care categories; and physician productivity does not substantially change between 1975 and 1990.

Results from the BHM General Requirements Model

I. Physician Projections

The requirements estimates tabulated reflect changes in the demographic structure of the population, and adjustments for changes in per capita utilization of the respective health services (Tables 4-1, 4-2). These estimates occupy a fairly narrow range; there is scarcely more than 7 percent difference between any of the 1990 high and low series estimates. Therefore, the mid-points of the ranges are generally highlighted even though this is not intended to imply a single "best guess" as to actual requirements.

In the absence of any major changes in the health system and assuming that supply and requirements were in balance in the base year 1975, total requirements for physicians are expected to increase by 46 to 58 percent between 1975 and 1990 to a projected maximum requirement of 596,000 physicians in 1990 (Table 4-1).

The projections from the general model indicate that requirements for total physicians are forecast to stay about 4 percent below the supply during the coming 12 years. Although that percentage difference is small, in numerical terms the difference is several thousand physicians. The midpoint of the range of 1990 physician requirements estimates is about 575,000 physicians; roughly 24,000 physicians below the estimated 1990 supply.

Table 4-1. Requirements for physicians by specialty: 1975 and projected to 1990
(Estimates assume no changes in the allocation of utilization among physician specialties)

Specialty	Requirements (in thousands)				
	1975 supply	Range of estimates			1975-1990 percent increase range
		1980	1985	1990	
All physicians	378.4	429.1-438.8	488.4-511.3	553.4-596.2	46-48
M.D.'s	364.3	413.1-422.5	470.1-492.1	532.6-573.6	46-58
Primary care	169.2	191.6-196.0	218.4-229.1	248.6-268.8	47-59
General medicine 1/	122.2	138.0-141.2	157.0-164.7	178.5-192.9	46-58
Pediatricians	24.1	26.2-26.8	29.3-30.7	33.3 36.0	38-49
Obstetricians and gynecologists	23.0	27.4-28.1	32.1-33.8	36.8-40.0	60-74
Ophthalmologists	11.8	14.1-14.4	16.8-17.6	19.8-21.5	68-83
Psychiatrists	28.6	32.1-32.6	37.1-38.5	42.3-45.0	48-58
Surgeons 2/	80.6	93.2-95.8	106.8-112.6	121.4-131.5	51-63
Secondary care	74.2	82.1-83.6	90.9-94.3	100.5-106.8	35-44
Secondary specialists 3/	48.5	54.6-55.7	61.7-64.4	69.5-74.7	43-54
Non-care specialists 4/	25.8	27.5-27.8	29.2-29.9	31.0-32.1	25-25
D.O.'s	14.1	16.0-16.3	18.3-19.2	20.9-22.6	48-61

1/ Includes general and family practice, internal medicine, and specialty unspecified which are assumed to predominately provide primary care.

2/ Includes general surgery, neurological surgery, orthopedic surgery, otolaryngology, plastic surgery, colon and rectal surgery, thoracic surgery, urology, and anesthesiology.

3/ Includes allergy, cardiovascular diseases, dermatology, gastroenterology, pediatric allergy, pediatric cardiology, pulmonary diseases, radiology, diagnostic radiology, therapeutic radiology, neurology, physical medicine and rehabilitation, and "other specialties."

4/ Includes occupational medicine, general preventive medicine, public health, aerospace medicine, forensic pathology, and pathology.

Note: The estimates assume that supply and requirements were in balance in 1975; that price elasticity remains constant; that the trends in non-dollar determinants of health care utilization do not substantially change between 1975 and 1990; and that no care or manpower substitutions occur between manpower types or care categories.

Table 4-2. Requirements for physicians by predominant practice setting: 1975 and projected to 1990 (estimates assume no changes in the allocation of utilization among health service categories)

Predominant practice setting	1975 supply	Requirements (in thousands) Range of estimates 1980	1985	1990	1975-1990 percent increase range
All sectors	378.4	429.1-438.8	488.4-514.3	553.4-596.2	46-58
Medical office sector	205.2	238.0-243.2	278.4-292.6	323.6-352.0	58-72
General care	59.4	68.4-69.6	79.2-83.2	91.4-99.4	54-67
Pediatric care	23.3	25.1-25.6	28.5-29.9	33.2-36.1	43-55
Obstetrics and gynecological care	17.2	21.2-21.6	25.3-26.5	29.3-31.8	70-85
Psychiatric care	16.2	19.2-19.7	23.8-25.0	28.6-31.1	76-92
Vision care	9.3	11.4-11.6	13.7-14.4	16.3-17.7	75-90
Other care	79.7	92.7-94.8	108.0-113.5	124.9-135.8	57-70
Short term hospital sector 1/	117.6	134.2-138.7	151.8-160.6	170.5-185.0	45-57
Long term hospital sector 2/	14.2	15.1	16.0	16.8	19
Other 3/	41.4	41.8	42.1	42.5	3

1/ Includes outpatient care and medical and surgical inpatient care.

2/ Includes psychiatric hospital care, and "other" long term care (see text).

3/ Includes noncare activities (teaching, research, administration, and noncare civilian government employment not elsewhere classified), birth control clinics, and neighborhood health centers, and similar community health clinics.

Note: The estimates assume that supply and requirements were in balance in 1975; that price elasticity remains constant; that the trends in nondollar determinants of health care utilization do not substantially change between 1975 and 1990; and that no care or manpower substitutions occur between manpower types or care categories.

Requirements for primary care physicians, including OBGs, will increase about 52 percent between 1975 and 1990, to 259,000 physicians. The model's primary care requirements estimates are 2 percent less than estimated supply for 1980, 8 percent under the supply estimate for 1985, and 9 percent less than the supply estimate for 1990.

Physician Requirements Projections by Specialty and by Sector. The largest 1975-1990 increases are foreseen for ophthalmologists, with requirements rising by 68 to 83 percent to around 20,000 by 1990; and obstetrician/gynecologists (OBGs), with requirements increasing by about 60-74 percent to about 38,000 OBGs in 1990. The large increase in ophthalmologist requirements reflects increases in the age 65 and over population and population growth in the higher income groups which have relatively high rates of vision care utilization. OBG requirements are conditioned on large increases in the female population between 25 and 44 years old between 1975 and 1990 and assume no major increase in delegation to allied health manpower, which in the case of OBGs could result in a substantial reduction in requirements growth. (Because several of the utilization rates for these care types in 1975 are below acceptable standards, the reliability of these particular estimates must be somewhat discounted.) Requirements for pediatricians show the smallest increase among the specialties--to 35,000 in 1990, about 44 percent more than the 1975 supply. Requirements for psychiatrists are forecast to increase from 28,600 in 1975 to about 44,000 in 1990, roughly 50 percent, primarily because of growth in the 25 to 44-year-old population where the highest rates of utilization occur. Requirements for osteopathic physicians are estimated to increase to about 22,200 in 1990; a 55 percent increase from 1975.

Requirements for surgical specialists would increase to about 126,000 by 1990, roughly 57 percent over the 1975 base. Although adjustments for trends in per capita utilization have been made and thus utilization rates are not static in the model, there is no allowance for shifts in utilization patterns across the physician specialties represented in the model. If policies are enacted to increase utilization of primary care physicians, for example through National Health Insurance incentives, then the predicted growth in requirements for surgeons could be sizably overstated.

Overall requirements for physicians predominately based in the medical office are foreseen to increase from 205,000 in 1975 to about 338,000 by 1990, or 65 percent. Although the number of physicians required in short-term hospitals is projected to increase by 45 to 57 percent, to around 178,000 in 1990, the proportion of total physicians required for hospitals is projected to drop slightly (Table 4-2).

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Requirements for physicians serving in long-term hospitals and nursing homes are expected to increase to 16,800 by 1990. This represents an increase of 18 percent over the 1975 supply. Requirements for this category are dominated by psychiatric hospitals, and less than 5 percent of the physicians included in this sector are employed by nursing homes. However, data on availability of physician services received by nursing home patients are limited, and the model does not take into account long-term care services provided by physicians in office-based practice. Such services are particularly important to people aged 65 years and over. By the end of the century, the number of persons in this age category is projected to increase by about 9 million, or from 10.7 percent of the population to 12.2 percent. Since these persons utilize more health services than younger people, the requirements projections for the long-term hospital sector likely understate this group's growing demand for physician services.

The "other" sector includes physicians engaged in nonpatient care activities such as teaching, administration and research, and physicians providing certain clinical services, for example in family planning clinics and neighborhood health centers. In line with recent trends, requirements for physicians in these "other" service areas are expected to remain relatively unchanged. Estimated requirements are for around 42,000 physicians by 1990; an increase of only 1,000 or 2.5 percent more than the 1975 base.

II. Requirements for Other Types of Health Professionals

In the baseline estimates, made without adjustment for factors such as National Health Insurance, the general model estimates that around 148,000 dentists will be required in 1990, or 32 percent more than the 1975 supply. This estimate and the dentist requirements for earlier years assume an annual 1 percent per year increase in dental productivity, mainly realized through more effective employment of aides and technological advances. As Table 4-3 shows, requirements for dentists are predicted to be roughly in balance with supply throughout the projection period.

Projected dentist requirements, however, are somewhat lower than the figures given in the August 1978 version of this report. This reflects revised expectations regarding the demand for dental services as well as a change in the projection methodology.

Requirements for optometrists are estimated by taking into consideration changes in population structure and an adjustment for change in per capita utilization. No separate price-related adjustment was attempted. About 23,000 optometrists are forecast to be required by 1990 or 16 percent more than the 1975 supply. The estimates for optometrists are based on the utilization figures

Table 4-3. Comparison of supply and requirements for selected manpower: 1975 supply and projected to 1980, 1985, and 1990 (in thousands) 1/

Profession	Actual 1975 supply	Projections 1980		1985		1990		1975-90 percent increase	
		Supply	Requirements	Supply	Requirements	Supply	Requirements	Supply	Requirements
BHM General Model:									
Physicians (M.D.s & D.O.s) 2/..	378.4	447.8	434.0	523.7	499.8	598.2	574.8	58	52
Dentists 3/.....	112.0	126.2	121.4	140.7	134.1	154.5	147.6	38	32
Pharmacists.....	122.5	142.6	131.3	162.5	143.4	184.8	158.7	65	30
Optometrists.....	21.1	22.2	22.3	24.5	24.2	26.5	26.0	33	29
Podiatrists.....	7.3	8.9	9.9	10.7	12.8	12.5	16.1	71	121

1/ Where alternate projection series were made the basic or "expected" series has been tabulated.
2/ Physician requirements estimates reflect the average of the "high" and "low" alternate projection series.
3/ Dentist requirements estimates assume a 1 percent annual productivity increase.

gathered in the NCHS Health Interview Surveys. Since it is difficult to determine whether consumers see an optometrist or an ophthalmologist, the utilization estimates may be subject to error.

Using a similar methodology for podiatry, 16,100 podiatrists will be required in 1990, 121 percent more than the 1975 supply. In view of the possible cross-substitution between podiatrists and physicians, particularly orthopedic surgeons, this estimate may be overstated. The estimated requirements for podiatrists are based on a continuation of the growth rate in utilization between the years 1963-64 and 1974. An alternative approach is to use the growth rate in utilization based on weekly visit data reported in the 1970 and 1974 Censuses of Podiatrists, also conducted by NCHS. 7/ This approach results in a somewhat lower projection of 14,600 podiatrists in 1990. Neither of these projections should be regarded with great confidence since they are based on rough approximations of increases in per capita utilization. A thorough study concerning consumers who use podiatric services and their substitution for orthopedic surgeons would be a useful first step in generating more refined projections.

The pharmacist requirements forecast of 159,000 pharmacists for 1990 is considerably lower than corresponding supply estimates. Additionally, a large fraction of the tasks done by community pharmacists are considered delegable, nearly 30 percent by one estimate (8/), and an increased shift toward greater delegation to pharmacy aides could lessen even this requirement figure. The 159,000 figure for 1990 is substantially lower than the previous BHM estimate because it reflects the recent downward trend in consumption of pharmaceuticals. However, the pharmacist requirements estimates should be treated with caution because the various data sources on pharmaceuticals give different trends.

Analysis of Constraints on the Supply of Hospital Beds. The National Health Planning and Resources Development Act of 1974 (P.L. 93-641) requires the Secretary, DHEW, to issue, by regulation, national guidelines for health planning, including standards pertaining to the supply, distribution, and organization of health resources. The BHM model was used in a special analysis to simulate the effects of

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7/ U.S. National Center for Health Statistics, DHEW. Trends in the Podiatric Profession: A Comparative Study of the 1970 and 1974 Survey Data. Vital and Health Statistics: Series 14, Data on National Health Resources, DHEW publication No. (PHS) 79-1816, November 1978.

8/ Rodowskas, C. A. and Gagnon, J. P. Personnel Activities in Prescription Departments of Community Pharmacies. Journal of the American Pharmaceutical Association, NS12, No. 8, pp. 407-411, August 1972.

a standard that would set a target supply of non-Federal short-term hospital beds at 4 beds per 1,000 persons on a nationwide basis. This standard was tested in the model by fixing the average annual occupancy rate for short-term hospital care at 80 percent, as established in the guidelines, and assuming an average stay length of 7.7 days per hospital admission. Since in this situation the single factor operating to determine utilization would be population growth, price adjustments for short-term hospital care were dropped altogether. According to the general model, if the bed-to-population ratio were limited to 4 beds/1,000 persons in 1980, there would be a 19 percent reduction in short-term hospital utilization, as compared with the baseline 1980 estimates. This reduction would be 24 percent between the 1985 baseline estimate and the adjusted level. If this bed-to-population ratio were carried to 1990, hospital utilization would be approximately 30 percent below the 1990 baseline estimate of hospital utilization. Consequently, physician requirements would decrease to about 90 percent of the baseline 1990 maximum requirements forecast-a reduction of about 57,000 physicians. However, it is likely that restricting bed supply to such an extent could displace hospital demand and thereby add an additional burden on physician office services and other outpatient medical facilities. The national guidelines issued March 28, 1978, included an expectation that future bed supply targets will be reduced to 3.7 beds per 1,000 population. However, the simulation does not assume that the demand for medical ambulatory services increases or the demand for hospital services decreases in response to a reduction in hospital beds. These results are subject to revision as the methodology and particularly the model's hospital staffing patterns are more carefully examined.

Major Contingencies Affecting Manpower Requirements.
There are a number of potential developments that could materially alter the requirements forecasts made in this report. National Health Insurance, expanded roles for midlevel health practitioners (nurse practitioners, physician assistants, and expanded function dental auxiliaries), Health Maintenance Organizations, and technological advances are major sources of future changes in the health care system. Of these, probably the most critical are impending changes in the financial structuring of the health care system through enactment of some form of National Health Insurance. The essential elements in any NHI proposal are the range of services provided, the level of cost-sharing imposed on enrollees, the care providers whose services would be reimbursable, and the time at which the program would take effect. The analysis assumes that National Health Insurance would not be effective by 1980, and estimates are for 1985 and 1990 only. It is emphasized that the coinsurance rates used in the baseline projections decline substantially over time, as can be seen in the Table below. This implies that there will be smaller differences between the baseline projections and the NHI simulations in 1990 than in earlier years.

Estimated Average Coinsurance Rates by Health Service Category: 1975 and Baseline Projections to 1990

Year	Health Service Category			
	Medical Office	Short-term Hospital	Dental Office	Community Pharmacy
1975....	0.39	0.09	0.86	0.84
1985....	0.21	0.05	0.65	0.75
1990....	0.15	0.04	0.57	0.70

Source: 1975 coinsurance estimates obtained through personal correspondence from Office of Research and Statistics, Social Security Administration. The 1985 and 1990 estimates are DMA projections.

For analytical purposes, three archtypal NHI plans were considered. The archtypal plans were formulated to cover medical office services, short-term hospital medical, surgical and outpatient benefits, and pharmacy services. 9/ The following estimates are very rough approximations made without any refinements for the multitude of other variables--such as utilization control programs--which would act to temper health manpower requirements in the event of National Health Insurance; actual National Health Insurance plans, currently under consideration by the Congress, have not been assimilated into the model.

The approximations are offered merely to point out the extent of differences in the requirements estimates that could occur through the reduced net cost to the consumer from NHI. 10/

9/ There appears to be great uncertainty about the extent to which dental services would be covered under National Health Insurance. For the purposes of this analysis a single possibility was tested, namely that dental reimbursement would be confined to services for children under age 14 and that enrollees would pay 25 percent of incurred expenses. Under such conditions requirements for dentists in 1985 would increase about 30 percent above the 1985 baseline estimate. If NHI were not effective until 1990 a plan with these provisions would boost requirements about 25 percent above the 1990 baseline estimate.

10/ An explanation of the NHI demand models and methodologies in part employed for these estimates is found in Cultice, James H. and Cole, Roger B. The Impact of Comprehensive National Health Insurance on Demand for Health Manpower. Bureau of Health Manpower, HRA, DHEW., DHEW Publication No. (HRA) 77-102, November 1977.

With average coinsurance set at 10 percent (Plan A), a NHI plan instituted in 1985 could increase overall requirements for physicians in that year by about 14 percent over requirements without NHI--an increase of about 72,000 physicians. If such a plan were implemented in 1990, physician requirements would be about 8 percent above the baseline 1990 estimate. This result is based on the assumption that no reduction in short-term hospital utilization would occur because of increases in average coinsurance. Requirements for pharmacists would rise by an estimated 12 percent above both the 1985 and 1990 baseline estimates, or increases of 17,000 and 18,000 pharmacists above the respective 1985 and 1990 baseline estimates.

If average coinsurance in the NHI archtypal plan is set at 15 percent (Plan B), there would be an increase of around 6 percent in physician requirements over that otherwise forecast in 1985 in the absence of NHI. This would be a difference of about 31,000 physicians. Were a NHI plan specifying a coinsurance level averaging 15 percent implemented in 1990, practically no increase in physician requirements over that forecast without NHI in 1990 is foreseen. Pharmacist requirements are estimated to increase by about 9 percent both in 1985 and in 1990 under such a NHI plan--numeric increases would be about 14,500 pharmacists in both years over the respective baseline estimates.

A very liberal NHI plan with little or no cost-sharing requirements could engender large-scale increases in requirements for health manpower. Since it is reasonable to expect that some nonreimbursable services would be obtained under any NHI program, an average coinsurance rate of 5 percent was assumed for "Plan C." Copayment at this low rate could raise requirements for physicians in 1985 by about 30 percent or 154,000 physicians above the baseline forecast. If such a plan were not implemented until 1990, physician requirements could still increase 20-25 percent above the baseline 1990 forecast despite a predicted narrowing of the difference between average coinsurance levels before and after NHI because of continued growth in third party payment sources. This is a numeric increase of about 132,000 physicians above the 1990 baseline estimate. Requirements for pharmacists could increase by around 17 percent above the 1985 baseline estimate--an increase of 24,000 pharmacists, and 16 percent or 25,000 pharmacists above the 1990 baseline estimate.

Preliminary analyses have also been undertaken to assess the effects of future employment of expanded function aides. The result of this analysis indicates nearly negligible effects on physician requirements--decreased by 1990 on the order of 3 or 4 percent. This result is a function of the limited supply of aides which has been forecast; it does not imply that there are no significant positive returns in increased productivity through employment of aides, only

that so few aides are expected to be available to a proportionately large number of physicians. It should also be noted that the contribution of nurse practitioners to physician productivity has not been taken into account since difficulties occurred in obtaining credible forecasts of the future supply of nurse practitioners. A rough approximation would be that the supply of nurse practitioners would be growing at the rate of 2,000 per year, resulting in an active supply estimated to be about 36,000 in 1990. Adding this to estimates of physician assistants and MEDEX personnel would revise the estimated decrease in physician requirements to around 8 percent below the 1990 baseline forecast.

Finally, growth in Health Maintenance Organization (HMO) coverage has been considered. 11/ Assuming that HMO enrollments grow by about 12 percent per year, resulting in 13 percent of the population being enrolled in HMOs in 1990, overall requirements for physicians would diminish by 6 percent. That is, the model predicts maximum requirements to be 560,000 instead of 596,200 physicians. A more conservative HMO growth assumption is that 6 percent of the 1990 population would be enrolled in HMOs. Even this is roughly twice the current fraction of the population obtaining care through HMOs, and represents an annual growth rate of 6.8 percent. Under this assumption, requirements in 1990 would be a maximum of 580,500 physicians. Delegation to physician extenders, excluding nurse practitioners as discussed above, coupled with the assumption that 6 percent of the 1990 population will receive health care through HMOs, would reduce the 1990 requirements estimate to 567,600 physicians.

When the assumptions about growth in HMO coverage and delegation to expanded function aides are brought together with the NHI possibilities discussed, a considerable array of eventualities emerges.

11/ Data on HMO baseline per capita utilization and projected enrollment rates were derived from "HMO's: Their Potential Impact on Health Manpower Requirements." Prepared under contract with BHM by Geomet, Inc., reprinted May 1973. The growth in HMO enrollments assumed in this report were chosen following discussions with the Office of Health Health Maintenance Organizations, DHEW. HMO Manpower Staffing data were derived from the Geomet study and "Special Report on Prepaid Group Practice Plans," prepared under contract with BHM by John T. Gorby and Associates, 1973. The 1975 distribution of HMO enrollees is primarily based on data from National Center for Health Statistics/DHEW, 1975 Health Interview Survey (unpublished special tabulations) and estimates of 1975 total HMO enrollments from the Office of HMOs.

Assuming the aforementioned projection of annual growth in HMO coverage at 6.8 percent per year, a NHI plan introduced in 1985 with average coinsurance set at 15 percent would make practically no difference in requirements for physicians between 1985 and 1990.

A NHI plan with average coinsurance set at 10 percent is estimated to raise baseline physician requirements 11 percent. This is about 54,000 more physicians than would be required in 1985 were there no NHI, with HMO enrollment remaining at the 1975 level, and the minor contribution to overall physician productivity made by aides not occurring. A NHI plan with such cost-sharing features, if introduced in 1990, would not appreciably change the baseline 1990 physician requirements estimate, given continued growth in HMO enrollment at the above rate, and expanded task delegation to assistants. Requirements for pharmacists under these conditions would increase 10 percent or 14,000 from the 1985 baseline, and 8 percent or 13,000 pharmacists from the 1990 baseline estimates.

On the other hand, a NHI plan with little cost-sharing imposed, as in the 5 percent average coinsurance example, would still increase physician requirements 26 percent or 133,000 physicians over the baseline 1985 estimate even though the above HMO growth and task delegation assumptions were realized. The estimate for 1990 would be a 17 percent increase or 100,000 physicians over the baseline figure. Requirements for pharmacists would rise by 14 percent or 20,000 pharmacists over the 1985 baseline, and 12 percent (11,000 pharmacists) over the 1990 baseline figure.

Though less likely to occur, growth in HMO enrollment at 11 percent per year (resulting in 13 percent of the 1990 population being enrolled in HMOs) would still not make major differences in the net effect of NHI on manpower requirements. Given this assumption, advances in productivity by way of task delegation, a NHI plan specifying a 10 percent average coinsurance rate would raise physician requirements about 8 percent above the 1985 baseline estimate. This is a difference of 41,000 physicians. If not implemented until 1990, such an average coinsurance rate under NHI would cause little or no change in physician requirements from the baseline estimate. Pharmacist requirements would increase about 6 percent or 9,000 pharamcists over the 1985 baseline estimate. No significant increase would be expected in 1990 under these conditions.

A NHI plan with 15 percent average coinsurance would not appreciably affect physician requirements in 1985 but could decrease requirements by an estimated 8 percent or 45,000 physicians if not implemented until 1990, assuming the higher growth rate in HMO enrollment, and the maximum foreseeable delegation to expanded function aides (excluding nurse practitioners). Requirements for pharmacists would

be little or no different from the baseline 1985 and 1990 estimates. NHI at 5 percent average coinsurance under these conditions could still raise physician requirements by an estimated 23 percent or 117,000 physicians if implemented in 1985, and by 12 percent or 71,000 physicians if not implemented until 1990. Requirements for pharmacists would increase by about 11 percent or 15,000 over the 1985 baseline estimate, and 7 percent or 10,000 pharmacists over the 1990 baseline.

III. Limitations of the Projections

Specialty projections should be viewed with caution, since the model assumes that the 1975 manpower staffing patterns will remain constant in the future and no allowance is made for shifts in utilization across the health service categories. Even though the price, insurance, and nondollar trend adjustments affect the total demand for physicians, they do not affect the distribution of physicians by specialty. Greater demand for primary care physicians versus other specialists cannot be adequately predicted by the model in its present form. Similarly, no substitutions are assumed between sectors. That is, the model assumes health service substitution patterns which prevailed in 1975. No additional substitution of physician services for hospital services takes place in the model.

Also, assumptions about productivity critically affect the manpower requirements projections. We have assumed constant productivity. This assumption is reasonable for physicians since the available data indicate essentially no change in patient visits per physician in recent years. On the other hand, dramatic increases in dentist productivity occurred in response to the introduction of the high speed drill. However, we are assuming that further innovations of this sort will not occur. Our assumptions of constant productivity may overstate requirements for certain occupations, such as pharmacists, if increased use of aides and other delivery system changes of this sort take place. An assumption of a negative productivity trend for nurses may be appropriate since recent technological innovations have increased nurse staffing more than hospital output. A more realistic representation of productivity trends could be accomplished if improved health services output measures were available.

APPENDIX

Table A1-1. Trend in number of active physicians (M.D.), by specialty: 1963-1977

Specialty 1/	1963	1964	1965	1966	1967	1968	1969
Total active M.D.'s 1/	261,728	269,552	277,575	285,857	294,072	296,312	302,966
Primary care	110,071	111,573	113,090	114,157	115,581	116,760	114,275
General practice 2/	66,875	65,861	64,943	63,903	62,717	61,578	58,919
Internal medicine	30,434	32,230	33,892	35,315	37,077	38,532	38,258
Pediatrics	12,762	13,482	14,255	14,939	15,787	16,650	17,098
Other medical specialties	12,291	12,753	13,288	14,045	14,770	15,762	16,530
Allergy	1,414	1,473	1,541	1,598	1,629	1,661	1,706
Cardiovascular disease	3,928	4,128	4,311	4,643	5,132	5,602	5,970
Dermatology	3,156	3,279	3,407	3,538	3,656	3,775	3,870
Gastroenterology	1,198	1,247	1,344	1,489	1,591	1,748	1,916
Pediatric allergy	240	283	270	299	299	398	372
Pediatric cardiology	234	249	311	366	373	441	456
Pulmonary diseases	2,121	2,094	2,104	2,112	2,090	2,137	2,240
Surgical specialties	67,745	70,415	73,185	76,178	79,025	81,820	82,912
General surgery	23,607	24,564	25,643	26,628	27,490	28,433	28,603
Neurological surgery	1,818	1,933	2,041	2,185	2,310	2,419	2,484
Obstetrics/gynecology	15,296	15,866	16,379	16,973	17,479	18,017	18,084
Ophthalmology	7,833	8,092	8,380	8,718	9,065	9,368	9,578
Orthopedic surgery	6,827	7,207	7,557	7,990	8,434	8,869	9,227
Otolaryngology	4,724	4,776	4,851	4,946	5,086	5,195	5,272
Plastic surgery	1,023	1,090	1,167	1,243	1,342	1,414	1,503
Colon and rectal surgery	740	728	715	712	708	707	666
Thoracic surgery	1,296	1,374	1,473	1,622	1,720	1,822	1,847
Urology	4,581	4,785	4,979	5,161	5,391	5,576	5,638
Other specialties	71,621	74,811	78,012	81,477	84,696	81,970	89,249
Aerospace medicine	1,554	1,619	1,603	1,652	1,611	1,456	1,319
Anesthesiology	7,593	8,124	8,592	9,055	9,572	10,112	10,434
Child psychiatry	751	980	1,154	1,353	1,525	1,702	1,898
Neurology	1,822	2,037	2,198	2,320	2,493	2,675	2,850
Occupational medicine	2,911	2,867	2,801	2,772	2,738	2,702	2,746
Pathology 3/	7,127	7,676	8,233	8,694	9,232	9,696	10,023
Physical medicine and rehabilatation	999	1,096	1,162	1,222	1,295	1,407	1,415
Psychiatry	15,551	16,377	17,333	18,290	19,137	19,907	20,328
Public health 4/	3,884	3,980	3,988	3,994	3,919	3,871	3,894
Radiology 5/	8,786	9,175	9,686	10,230	10,921	11,718	12,367
Other and unspecified	20,643	20,880	21,262	21,895	22,253	16,724	21,975

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Table A1-1. Trend in number of active physicians (M.D.), by specialty: 1963-1977 (cont)

Specialty	1970	1971	1972	1973	1974	1975	1976	1977
Total active M.D.'s 1/	301,845	318,699	320,903	324,367	330,266	340,280	348,543	363,619
Primary care	117,761	121,599	122,952	123,776	126,431	130,634	135,881	140,948
General practice 2/	57,948	56,358	55,348	53,946	53,997	54,557	55,479	55,159
Internal medicine	41,872	46,202	47,994	49,899	51,752	54,331	57,911	61,830
Pediatrics	17,941	19,039	19,610	19,931	20,682	21,746	22,491	23,959
Other medical specialties	17,401	16,685	16,549	17,034	17,485	19,010	18,955	19,909
Allergy	1,719	1,641	1,638	1,640	1,857	1,716	1,704	1,681
Cardiovascular disease	6,476	6,016	5,883	6,159	6,229	6,933	6,769	7,190
Dermatology	4,003	4,149	4,227	4,340	4,479	4,661	4,817	4,907
Gastroenterology	2,010	1,857	1,839	1,983	2,063	2,381	2,374	2,620
Pediatric allergy	391	387	383	409	429	446	477	492
Pediatric cardiology	487	492	514	509	534	538	548	575
Pulmonary disease	2,315	2,143	2,065	2,054	2,094	2,335	2,266	2,444
Surgical specialties	86,042	89,779	91,058	91,549	93,386	96,015	98,667	101,153
General surgery	29,761	30,897	30,989	30,857	31,085	31,562	32,292	32,340
Neurological surgery	2,578	2,721	2,753	2,809	2,859	2,926	2,985	3,071
Obstetrics/gynecology	18,876	19,770	20,202	20,494	20,987	21,731	22,294	23,376
Ophthalmology	9,927	10,252	10,443	10,496	10,741	11,129	11,455	11,606
Orthopedic surgery	9,620	10,121	10,356	10,587	10,985	11,379	11,814	12,323
Otolaryngology	5,109	5,592	5,662	5,484	5,588	5,745	5,864	5,980
Plastic surgery	1,600	1,688	1,786	1,991	2,088	2,236	2,391	2,522
Colon and rectal surgery	667	654	649	658	662	661	673	657
Thoracic surgery	1,809	1,928	1,927	1,875	1,925	1,979	2,036	2,145
Urology	5,795	6,156	6,291	6,298	6,466	6,667	6,903	7,130
Other specialties	89,641	90,636	90,344	91,948	92,964	94,621	94,940	101,609
Aerospace medicine	1,188	1,046	921	779	708	684	660	647
Anesthesiology	10,860	11,557	11,853	12,196	12,484	12,861	13,182	13,918
Child psychiatry	2,090	2,171	2,268	2,362	2,411	2,581	2,644	2,902
Neurology	3,074	3,317	3,494	3,741	3,839	4,131	4,425	4,628
Occupational medicine	2,713	2,624	2,506	2,374	2,365	2,355	2,322	2,149
Pathology 3/	10,483	11,103	11,218	11,498	11,591	11,910	12,126	12,567
Physical medicine and rehabilitation	1,479	1,563	1,551	1,569	1,610	1,664	1,715	1,792
Psychiatry	21,146	22,279	22,570	22,701	23,302	23,922	24,432	24,894
Public health 4/	3,833	3,801	3,746	3,506	3,453	3,454	3,408	3,037
Radiology 5/	13,360	14,339	14,917	15,345	15,753	16,240	16,769	17,727
Other and unspecified	19,415	16,836	15,300	15,877	15,448	14,819	13,257	17,348

Table A1-1. Trend in number of active physicians (M.D.), by specialty: 1963-1977 (cont)

1/ Excludes physicians not classified: 1970--858, 1971--3,529, 1972--12,356, 1973--13,744, 1974--20,343, 1975--26,145, 1976--30,129, 1977--18,350.
2/ Includes family practice 1970-77.
3/ Includes forensic pathology.
4/ Includes general preventive medicine.
5/ Includes diagnostic and therapeutic radiology.

Source: Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association.

Note: Due to a change in the AMA classification procedure in 1968, there exists a discontinuity in the figures published by the AMA between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association, 1971.

Table A1-2. Trend in number of active physicians (M.D.) per 100,000 population, by specialty: 1963-1977

Specialty	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Phys/pop total active M.D.'s 1/..	134.8	136.9	139.3	141.8	144.4	144.0	145.8	148.3	150.6	150.7	151.2	152.7	156.1	158.6	164.2
Primary care.....	56.7	56.6	56.8	56.6	56.7	56.7	55.0	56.2	57.5	57.7	57.6	58.5	59.9	61.9	63.7
General practice 2/.....	34.4	33.5	32.6	31.7	30.8	29.9	28.3	27.7	26.6	26.0	25.1	25.0	25.0	25.3	24.9
Internal medicine.....	15.7	16.4	17.0	17.5	18.2	18.7	18.4	20.0	21.8	22.5	23.3	23,9	24.9	26.4	27.9
Pediatrics.....	6.6	6.8	7.2	7.4	7.8	8.1	8.2	8.6	9.0	9.2	9.3	9.6	10.0	10.2	10.8
Other medical specialties..	6.3	6.5	6.7	7.0	7.3	7.7	8.0	8.3	7.9	7.8	8.0	8.1	8.7	8.6	9.0
Allergy.....	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cardiovascular disease...	2.0	2.1	2.2	2.3	2.5	2.7	2.9	3.1	2.8	2.8	2.9	2.9	3.2	3.1	3.2
Dermatology.....	1.6	1.7	1.7	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.0	2.1	2.1	2.2	2.2
Gastroenterology.....	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	0.9	0.9	0.9	1.0	1.0	1.1	1.2
Pediatric allergy.....	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pediatric cardiology.....	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3
Pulmonary diseases.....	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.1
Surgical specialties.....	34.9	35.8	36.7	37.8	38.8	39.8	39.9	41.1	42.4	42.8	42.7	43.2	44.0	44.9	45.7
General surgery.....	12.2	12.5	12.9	13.2	13.5	13.8	13.8	14.2	14.6	14.6	14.4	14.4	14.5	14.7	14.6
Neurological surgery.....	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4
Obstetrics/gynecology....	7.9	8.1	8.2	8.4	8.6	8.8	8.7	9.0	9.3	9.5	9.6	9.7	10.0	10.1	10.6
Ophthalmology.....	4.0	4.1	4.2	4.3	4.5	4.6	4.6	4.7	4.8	4.9	4.9	5.0	5.1	5.2	5.2
Orthopedic surgery.....	3.5	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.8	4.9	4.9	5.1	5.2	5.4	5.6
Otolaryngology.....	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.6	2.6	2.6	2.7	2.7
Plastic surgery.....	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.9	1.0	1.0	1.1	1.1
Colon and rectal surgery.	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Thoracic surgery.....	0.7	0.7	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0
Urology.....	2.4	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.0	2.9	3.0	3.1	3.1	3.2
Other specialties.....	36.9	38.0	39.1	40.4	41.6	39.8	42.9	42.8	42.8	42.4	42.9	43.0	43.4	43.2	45.9
Aerospace medicine.....	0.8	0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.3
Anesthesiology.....	3.9	4.1	4.3	4.5	4.7	4.9	5.0	5.2	5.5	5.6	5.7	5.8	5.9	6.0	6.3
Child psychiatry.....	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.3
Neurology.....	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.0	2.1
Occupational medicine....	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.1	1.0
Pathology 3/.....	3.7	3.9	4.1	4.3	4.5	4.7	4.8	5.0	5.2	5.3	5.4	5.4	5.5	5.5	5.7
Phys med & rehab.....	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8
Psychiatry.....	8.0	8.3	8.7	9.1	9.4	9.7	9.8	10.1	10.5	10.6	10.6	10.8	11.0	11.1	11.2
Public health 4/.....	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.6	1.6	1.6	1.6	1.4
Radiology 5/.....	4.5	4.7	4.9	5.1	5.4	5.7	5.9	6.4	6.8	7.0	7.2	7.3	7.4	7.6	8.0
Other and unspecified....	10.6	10.6	10.7	10.9	10.9	8.1	10.6	9.3	8.0	7.2	7.4	7.2	6.8	6.8	7.8

Table A1-2. Trend in number of active physicians (M.D.) per 100,000 population, by specialty: 1963-1977 (cont)

1/ Excludes physicians not classified: 1970--358, 1971--3,529, 1972--12,356, 1973--13,744, 1974--20,343, 1975--26,145, 1976--30,129, 1977--18,350.
2/ Includes family practice 1970-77.
3/ Includes forensic pathology.
4/ Includes general preventive medicine.
5/ Includes diagnostic and therapeutic radiology.

Source: Computed from numbers in Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association. Populations used include resident population in 50 States, D.C., Puerto Rico, and outlying areas and armed forces overseas as follows: 1963--194,169; 1964--196,858; 1965--199,278; 1966--201,585; 1967--203,704; 1968--205,758; 1969--207,863; 1970--209,539; 1971--211,578; 1972--212,971; 1973--214,573; 1974--216,282; 1975--217,991; 1976--219,673; 1977--221,419.

Note: Due to a change in the AMA classification procedure in 1968, there exists a discontinuity in the figures published by the AMA between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association, 1971.

Table A1-3. Trend in the percent distribution of active physicians (M.D.), by specialty: 1963-1977

Specialty	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Total active M.D.'s 1/..	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary care.....	42.1	41.4	40.7	40.0	39.3	39.4	37.6	37.9	38.2	38.3	38.1	38.3	38.3	39.0	38.8
General practice 2/.....	25.6	24.4	23.4	22.4	21.3	20.8	19.4	18.6	17.7	17.2	16.6	16.3	16.0	15.9	15.2
Internal medicine.....	11.6	12.0	12.2	12.4	12.6	13.0	12.6	13.5	14.5	15.0	15.4	15.7	15.9	16.6	17.0
Pediatrics.....	4.9	5.0	5.1	5.2	5.4	5.6	5.6	5.8	6.0	6.1	6.1	6.3	6.4	6.5	6.6
Other medical specialties....	4.7	4.7	4.8	4.9	5.0	5.3	5.5	5.6	5.2	5.2	5.3	5.3	5.9	5.4	5.5
Allergy.....	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Cardiovascular disease.....	1.5	1.5	1.6	1.6	1.7	1.9	2.0	2.1	1.9	1.8	1.9	1.9	2.0	1.9	2.0
Dermatology.....	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.3
Gastroenterology.....	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Pediatric allergy.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Pediatric cardiology.....	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pulmonary disease.....	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.9	0.6	0.7
Surgical specialties.....	25.9	26.2	26.2	26.5	26.8	27.7	27.3	27.7	28.2	28.6	28.2	28.4	28.1	28.3	27.8
General surgery.....	9.0	9.1	9.2	9.3	9.3	9.6	9.4	9.6	9.7	9.7	9.5	9.4	9.2	9.3	8.9
Neurological surgery.....	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Obstetrics/gynecology.....	5.8	5.9	5.9	5.9	5.9	6.1	6.0	6.1	6.2	6.3	6.3	6.4	6.4	6.4	6.4
Ophthalmology.....	3.0	3.0	3.0	3.0	3.1	3.2	3.2	3.2	3.2	3.3	3.2	3.3	3.3	3.3	3.2
Orthopedic surgery.....	2.6	2.7	2.7	2.8	2.9	3.0	3.0	3.1	3.2	3.2	3.3	3.3	3.3	3.4	3.4
Otolaryngology.....	1.8	1.8	1.7	1.7	1.7	1.8	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.7	1.6
Plastic surgery.....	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7
Colon and rectal surgery.....	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Thoracic surgery.....	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Urology.....	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0	2.0
Other specialties.....	27.4	27.8	28.1	28.5	28.8	27.7	29.5	28.8	28.4	28.2	28.3	28.1	27.7	27.3	27.8
Aerospace medicine.....	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Anesthesiology.....	2.9	3.0	3.1	3.2	3.3	3.4	3.4	3.5	3.6	3.7	3.8	3.8	3.8	3.7	3.8
Child psychiatry.....	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
Neurology.....	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	0.3	1.2	1.3	1.3
Occupational medicine.....	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.6
Pathology 3/.....	2.7	2.8	3.0	3.0	3.1	3.3	3.3	3.4	3.5	3.5	3.5	3.5	3.4	3.5	3.5
Phys med & rehab.....	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Psychiatry.....	5.9	6.1	6.2	6.4	6.5	6.7	6.7	6.8	7.0	7.0	7.3	7.1	7.0	7.0	6.9
Public health 4/.....	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.0	1.0	1.0	0.8
Radiology 5/.....	3.4	3.4	3.5	3.6	3.7	4.0	4.1	4.3	4.5	4.6	4.7	4.8	4.8	4.8	4.9
Other and unspecified.....	7.9	7.7	7.7	7.7	7.5	5.6	17.3	6.2	5.3	4.8	4.9	4.7	4.3	3.8	4.8

Table A1-3. Trend in the percent distribution of active physicians (M.D.), by specialty: 1963-1977 (cont.)

1/ Excludes physicians not classified: 1970--358, 1971--3,529, 1972--12,356, 1973--13,744, 1974--20,343, 1975--26,145, 1976--30,129.
2/ Includes family practice 1970-76.
3/ Includes forensic pathology.
4/ Includes general preventive medicine.
5/ Includes diagnostic and therapeutic radiology.

Source: Computed from numbers in Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association.

Note: Due to a change in the AMA classification procedure in 1968, there exists a discontinuity in the figures published by the AMA between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association, 1971.

Table A1-4. Number of medical and basic science schools, students, and graduates: selected academic years 1950-51 through 1977-78

Academic year	Number of schools	Number of students		Number of graduates
		Total	First-year	
1950-51.....	79	26,186	7,177	6,135
1955-56.....	82	28,639	7,686	6,845
1960-61.....	86	30,288	8,298	6,994
1961-62.....	87	31,078	8,483	7,168
1962-63.....	87	31,491	8,642	7,264
1963-64.....	87	32,001	8,772	7,336
1964-65.....	88	32,428	8,856	7,409
1965-66.....	88	32,835	8,759	7,574
1966-67.....	89	33,423	8,964	7,743
1967-68.....	94	34,536	9,479	7,973
1968-69.....	99	35,833	9,863	8,059
1969-70.....	101	37,669	10,401	8,367
1970-71.....	103	40,487	11,348	8,974
1971-72.....	108	43,650	12,361	9,551
1972-73.....	112	47,546	13,726	10,391
1973-74.....	114	50,886	14,185	11,613
1974-75.....	114	54,074	14,963	12,714
1975-76.....	114	56,244	15,351	13,561
1976-77.....	116	58,266	15,667	13,607
1977-78.....	122	60,456	16,134	14,393

Source: Journal of the American Medical Association, December 22/29, 1978, Vol. 240, No. 26.

Table A1-5. Number of active dentists and dentist-to-population ratio: selected years, December 31, 1950-1978 1/

Year	Total active dentists	Active civilian dentists	Civilian population (thousands)	Active civilian dentists per 100,000 civilian population
0	79,190	75,310	151,238	49.8
5	84,370	78,270	164,597	47.6
0	90,120	84,500	179,780	47.0
5	95,990	89,640	192,951	46.5
0	102,220	95,680	203,109	47.1
1	103,350	97,210	205,496	47.3
2	105,400	98,860	207,306	47.7
3	107,280	100,780	208,951	48.2
4	109,430	103,030	210,555	48.9
5	112,020	106,740	212,296	50.3
6	115,000	110,000	213,865	51.4
7	117,890	112,720	215,620	52.3
8	120,620	114,430	217,389	52.6

1/ Includes military dentists.

Sources: Health Resources Administration, Bureau of Health Manpower, Division of Manpower Analysis, ed on data from the American Dental Association, Bureau of Economic Research and Statistics.
U.S. Bureau of the Census. Current Population Reports P-25, Nos. 439 and 793.

Table A1-6. Number of dental schools, students, and graduates: selected academic years 1950-51 through 1978-79

Academic year	Number of schools	Number of students		Number of graduates
		Total	First-year	
1950-51	42	11,891	3,226	2,830
1955-56	43	12,730	3,445	3,038
1960-61	47	13,580	3,616	3,290
1961-62	47	13,513	3,605	3,207
1962-63	48	13,576	3,680	3,233
1963-64	48	13,691	3,770	3,213
1964-65	49	13,876	3,836	3,181
1965-66	49	14,020	3,806	3,198
1966-67	49	14,421	3,942	3,360
1967-68	50	14,955	4,200	3,457
1968-69	52	15,408	4,203	3,433
1969-70	53	16,008	4,355	3,749
1970-71	53	16,553	4,565	3,775
1971-72	52	17,305	4,745	3,961
1972-73	56	18,376	5,337	4,230
1973-74	58	19,369	5,445	4,515
1974-75	58	20,146	5,617	4,969
1975-76	59	20,767	5,763	5,336
1976-77	59	21,013	5,935	5,177
1977-78	59	21,510	5,954	5,324
1978-79	60	22,179	6,301	1/

1/. Data are not available at this time.

Source: American Dental Association, Council on Dental Education. Dental Students' Register for each selected academic year from 1950-51 through 1966-67. Annual Report on Dental Education for all subsequent academic years.

Table A1-7. Number of active pharmacists by sex and place of practice: 1973

Place of practice	Total active pharmacists	Percent	Total active males	Percent	Total active females	Percent
Total	116,562	100.0	103,732	100.0	12,830	100.0
Independent community pharmacy	54,884	47.0	50,418	48.6	4,466	34.8
Small chain community pharmacy	13,144	11.3	11,915	11.5	1,229	9.6
Large chain community pharmacy	17,929	15.4	16,331	15.7	1,598	12.5
Clinic or medical building pharmacy	4,438	[illegible]	3,746	3.6	692	5.4
Nursing home	498	[illegible].4	364	0.4	134	1.0
Private hospital	10,798	[illegible].3	7,756	7.5	3,042	23.7
Government non-federal hospitals	3,622	[illegible].1	2,794	2.7	828	6.5
Other State and local government	1,300	1.1	1,052	1.0	248	1.9
Government federal hospital (including military)	2,100	1.8	1,903	1.8	197	1.5
Other federal government	340	0.3	310	0.3	30	0.2
Pharmaceutical manufacturer	5,119	4.4	4,990	4.8	129	1.0
Pharmaceutical wholesaler	443	0.4	418	0.4	25	0.2
College of pharmacy	1,418	1.2	1,265	1.2	153	1.2
Other	533	0.5	474	0.5	59	0.5

Source: Pharmacy Manpower Information Project: American Association of Colleges of Pharmacy, 1973. NIH Contract No. 71-4178.

Table A1-8. Trend in number of schools, enrollments, and graduates for pharmacy schools: academic years 1965-66 through 1977-79

Academic year	Number of schools	Enrollment in final three years			Enrollment third-to-last year			Graduates		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1965-66	74	12,495	10,683	1,812	4,647	3,954	693	3,704	3,139	565
1966-67	74	13,221	11,152	1,916	5,234	4,474	760	3,782	3,252	530
1967-68	74	14,274	11,788	2,334	5,616	4,578	1,038	4,035	3,394	641
1968-69	74	14,932	12,069	2,684	5,469	4,385	1,084	4,291	3,565	726
1969-70	74	15,323	12,104	[illegible]	5,532	4,276	1,256	4,758	3,856	902
1970-71	74	15,626	11,956	3,370	5,864	4,515	1,349	4,747	3,749	998
1971-72	74	16,808	12,621	4,187	6,532	4,849	1,683	4,788	3,656	1,132
1972-73	73	18,956	13,936	5,020	7,546	5,452	2,094	5,184	3,858	1,326
1973-74	73	21,289	15,258	6,029	8,342	5,834	2,508	5,957	4,309	1,648
1974-75	73	23,235	16,168	7,067	8,734	5,910	2,824	6,712	4,825	1,887
1975-76	73	24,416	16,303	8,113	8,710	5,601	3,109	7,757	5,352	2,405
1976-77	72	24,082	15,226	8,856	8,208	4,969	3,239	7,649	5,108	2,541
1977-78	72	23,884	14,538	9,346	8,461	5,035	3,426	7,430	4,715	2,715
1978-79	72	23,649	13,747	9,902	8,621	4,694	3,627	1/	1/	1/

1/ Data are not available.

Source: Enrollment Report on Professional Degree Programs in Pharmacy, Fall 1978. American Association of Colleges of Pharmacy. Also prior annual editions.

Note: Enrollment figures are for the 3 professional years; third-to-last year figures represent the first year of the final three years.
Data for the University of Puerto Rico are excluded from enrollment and graduate figures for 1963-64.

Table A1-9. Trend in number of active podiatrists and ratios to population by geographic region: 1970 and 1974

Region	Number of active podiatrists			Ratio per 100,000 population		
	1970	1974	Change 1970 to 1974 (percent)	1970	1974	Change 1970 to 1974 (percent)
U.S. Total.....	7,078 1/	7,085 1/	0.1	3.5	3.4	-2.8
Northeast.....	2,992	2,877	-3.8	6.1	5.8	-4.9
North Central.....	2,059	1,968	-4.4	3.6	3.4	-5.6
South.....	989	1,135	14.8	1.6	1.7	6.2
West.....	1,038	1,105	6.5	3.0	3.0	0.0

1/ Excludes 35 podiatrists, active in podiatric-related activities, who do not provide patient care.

Source: 1970 and 1974 NCHS Surveys of Podiatrists, Podiatry Manpower Series 14, No. 11, HRA 74-1806, March 1974.

Table A1-10. Number of colleges of podiatric medicine, students, and graduates: selected years, 1960-61 through 1978-79

Academic year	Colleges	Students		Graduates
		Total	First-year	
1960-61	5	478	107	116
1962-63	4	496	151	114
1964-65	5	622	177	122
1966-67	5	838	283	165
1967-68	5	924	291	162
1968-69	5	1,061	331	204
1969-70	5	1,097	293	251
1970-71	5	1,148	351	242
1971-72	5	1,267	399	286
1972-73	5	1,401	473	269
1973-74	5	1,631	551	305
1974-75	5	1,837	561	352
1975-76	5	2,085	642	496
1976-77	5	2,295	650	487
1977-78	5	2,388	673	540
1978-79	5	2,495	672	585

Source: American Association of Colleges of Podiatric, 1960-61 through 1976-77. Bureau of Health Manpower Capitation Reports 1977-78 and 1978-79.

Table A1-11. Schools of optometry and number of students and graduates: selected years, 1964-65 through 1978-79

Academic year	Schools	Students 1/		Graduates
		Total	First-year	
1965-66	10	1,745	643	413
1966-67	10	1,882	669	481
1967-68	10	1,962	649	477
1968-69	10	2,203	771	441
1969-70	11	2,488	786	445
1970-71	11	2,831	884	528
1971-72	12	3,094	906	683
1972-73	12	3,328	984	691
1973-74	12	3,529	988	684
1974-75	12	3,704	1,024	806
1975-76	13	3,931	1,100	905
1976-77 2/	13	4,074	1,129	920
1977-78 2/	13	4,209	1,140	980
1978-79 2/	13	4,311	1,115	1,026

1/ Fall enrollment of undergraduate students.
2/ Enrollment excluded for one school.

Source: American Optometric Association, 1965-66 through 1975-76. Bureau of Health Manpower Capitation Reports, 1976-77 through 1978-79.

Table A1-12. Schools of veterinary medicine and number of students and graduates: 1964-65 through 1978-79

Academic year	Schools	Students		Graduates
		Total	First-year	
1965-66	18	4,119	1,242	910
1966-67	18	4,388	1,305	963
1967-68	18	4,623	1,315	1,064
1968-69	18	4,779	1,311	1,129
1969-70	18	4,876	1,339	1,165
1970-71	18	5,006	1,430	1,239
1971-72	18	5,149	1,453	1,258
1972-73	18	5,439	1,580	1,280
1973-74	19	5,720	1,630	1,388
1974-75	19	6,005	1,682	1,408
1975-76	19	6,274	1,702	1,523
1976-77	21	6,571	1,856	1,599
1977-78	22	6,899	1,976	1,644
1978-79	22	7,294	2,041	1,716

Source: Journal of the American Veterinary Medicine Association, 1965-66 through 1976-77. Bureau of Health Manpower Capitation Reports, 1977-78 and 1978-79.

Table A1-13 Number and percent of persons employed in selected health occupations in the United States, by racial/ethnic category: 1970

Occupation	Total employed 1/	Racial/ethnic category: Total minority 1/	Black	American Indian	Japanese/ Chinese	Filipino	White
	Number of persons employed						
Physicians (M.D./D.O.)	279,658	19,411	6,002	175	4,262	5,658	260,247
Dentists	42,563	3,739	2,363	63	1,147	116	38,824
Optometrists	17,490	294	148	0	122	24	17,196
Pharmacists	110,331	4,757	2,782	127	1,621	140	105,574
Podiatrists	5,956	255	215	0	40	0	5,701
Veterinarians	19,041	167	104	20	22	0	18,874
	Percent						
Physicians (M.D./D.O.)	100.0	6.9	2.1	0.1	1.5	2.0	93.1
Dentists	100.0	4.0	2.6	0.1	1.2	0.1	96.0
Optometrists	100.0	1.7	0.3	--	0.7	0.1	98.3
Pharmacists	100.0	4.3	2.5	0.1	1.5	0.1	95.7
Podiatrists	100.0	4.3	3.6	--	0.7	--	95.7
Veterinarians	100.0	0.9	0.5	0.1	0.1	--	99.1

1/ Includes other races, not shown separately.

Source: U.S. Bureau of the Census. United States Census of Population: 1970. PC(2)-7(A). U.S. Government Printing Office, June 1973.

Table A1-14 Minority representation among U.S. medical school graduates: academic years 1968-69 through 1977-78

Academic year	Total graduates	All underrepresented groups 1/		Racial/ethnic category			
				Black American		American Indian	
		Number	Percent of all graduates	Number	Percent of all graduates	Number	Percent of all graduates
68-69	8,059	142	1.8	142	1.8	NA	NA
69-70	8,367	165	2.0	165	2.0	NA	NA
70-71	8,974	180	2.0	180	2.0	NA	NA
71-72	9,551	229	2.4	229	2.4	NA	NA
72-73	10,391	398	3.8	341	3.3	NA	NA
73-74	11,613	612	5.3	511	4.5	NA	NA
74-75	12,714	798	6.3	638	5.0	28	0.2
75-76	13,561	927	6.9	743	5.5	27	0.2
76-77	13,607	963	7.1	752	5.5	29	0.2
77-78	14,393	1,601	11.1	793	5.5	47	0.3

Table A1-14 Minority representation among U.S. medical school graduates: academic years 1968-69 through 1977-78 (cont)

Academic year	Racial/ethnic category							
	Mexican American		Mainland Puerto Rican		Other Hispanic		Asian or Pacific Islander	
	Number	Percent of all graduates	Number	Percent of all graduates	Number	Percent of all graduates	Number	Percent of all graduates
1968-69.....	NA	NA	NA	NA	NA	NA	NA	NA
1969-70.....	NA	NA	NA	NA	NA	NA	NA	NA
1970-71.....	NA	NA	NA	NA	NA	NA	NA	NA
1971-72.....	NA	NA	NA	NA	NA	NA	NA	NA
1972-73.....	NA	NA	NA	NA	NA	NA	NA	NA
1973-74.....	NA	NA	NA	NA	NA	NA	NA	NA
1974-75.....	110	0.9	28	0.2	NA	NA	NA	NA
1975-76.....	130	0.9	29	0.2	NA	NA	NA	NA
1976-77.....	144	1.1	38	0.3	NA	NA	NA	NA
1977-78.....	172	1.2	176 2/	1.2 2/	94	0.6	319	2.2

1/ Includes Black American, American Indians, Mexican American, and Mainland Puerto Ricans, 1968-69 to 1976-77. Includes other specified groups in 1977-78.

2/ Includes students enrolled in the University of Puerto Rico, not included in data for prior years.

Source: Medical Education in the United States, 1977-78. Journal of the American Medical Association. December 22/29, 1978. Also prior issues.

NOTE: NA=Information not available.

Table A1-15 First-year enrollments in medical schools in the United States, by racial/ethnic category: academic years 1968-69 through 1978-79

Academic year	Total first year enrollment	Racial/ethnic category							
		Total U.S. minority	Black American	American Indian	Mexican American	Mainland Puerto Rican	American Oriental	Other minority	White
	Number of students								
1968-69	9,863	413	266	3	20	3	121	--	9,450
1969-70	10,422	641	440	7	44	10	140	--	9,781
1970-71	11,348	998	697	11	73	27	190	--	10,350
1971-72	12,361	1,280	882	23	118	40	217	--	11,081
1972-73	13,677	1,437	957	34	137	44	231	34	12,240
1973-74	14,159	1,631	1,027	44	174	56	259	71	12,528
1974-75	14,763 1/	1,839	1,106	71	406*	*	275	91	12,924
1975-76	15,295 1/	1,787	1,036	60	461*	*	282	73	13,508
1976-77	15,613 1/	1,891	1,040	43	512*	*	348	81	13,722
1977-78	16,136 1/	2,146	1,085	51	615*	*	395	--	13,990
1978-79	16,501 1/	2,225	1,061	47	665*	*	452	--	14,276
	Percent								
1968-69	100.0	4.2	2.7	2/	0.2	2/	--	--	95.8
1969-70	100.0	6.2	4.2	0.1	0.4	0.1	--	--	93.8
1970-71	100.0	8.8	6.1	0.1	0.6	0.2	--	--	91.2
1971-72	100.0	10.4	7.1	0.2	1.0	0.3	--	--	89.6
1972-73	100.0	10.5	7.0	0.2	1.0	0.3	1.7	0.2	89.5
1973-74	100.0	11.5	7.2	0.3	1.2	0.4	1.8	0.5	88.5
1974-75	100.0 1/	12.5	7.5	0.5	2.8*	*	1.9	0.6	85.3
1975-76	100.0 1/	11.7	6.8	0.4	3.0*	*	1.8	0.5	86.0
1976-77	100.0 1/	12.1	6.7	0.3	3.3*	*	2.2	0.5	85.7
1977-78	100.0 1/	13.3	6.7	0.3	3.8*	*	2.4	*	85.1
1978-79	100.0 1/	13.5	6.4	0.3	4.0*	*	2.7	*	85.7

1/ Includes also all foreign students.
2/ Less than 0.05 percent.

* For 1974-75, the Hispanic category includes only Puerto Ricans who were residents on the U.S. mainland, Puerto Ricans enrolled at the University of Puerto Rico, and Mexican-Americans. For 1975-76 and 1976-77, Hispanics includes these 3 groups and students classified as Cuban. For these 4 years, any other Hispanics were most likely assigned to the "Other" category. Beginning in 1977-78, the full enrollment questionnaire was revised to reflect DHEW suggested racial/ethnic classifications. The general "Other" category was dropped, and a Hispanic classification was added, which is defined to include any person of Spanish culture or origin, regardless of race.

Source: Datagram. U.S. Medical Student Enrollment 1968-69 through 1972-73. Journal of Medical Education, 48: 293-297, March 1973.
Datagram. Medical Student Enrollment, 1974-75 through 1978-79. Journal of Medical Education, Vol. 54, May 1979. Also prior issues.

Table A1-16. Total enrollment in schools of medicine in the United States, by racial/ethnic category: academic years 1968-69 through 1978-79

Academic year	Total enrollment	Racial/ethnic category: Total U.S. minority	Black American	American Indian	Mexican American	Mainland Puerto Rican	American Oriental	Other minority	White
	Number of students								
1968-69	35,833	1,275	783	9	59	3	421	--	34,558 1/
1969-70	37,690	1,630	1,042	18	92	26	452	--	36,060 1/
1970-71	40,238	2,294	1,509	18	148	48	571	--	37,944 1/
1971-72	43,650	3,072	2,055	42	252	76	647	--	40,578 1/
1972-73	47,366	3,918	2,582	69	361	90	718	98	43,448 1/
1973-74	50,751	4,840	3,049	97	496	123	883	192	45,911 1/
1974-75	53,554 1/	5,560	3,355	159	1,224*	*	959	277	46,761
1975-76	55,818 1/	5,928	3,456	172	1,473*	*	1,022	238	48,564
1976-77	57,765 1/	6,319	3,517	186	1,645*	*	1,177	262	50,233
1977-78 2/	60,039 1/	7,260	3,587	201	2,050*	*	1,422	--	51,974
1978-79	62,213 1/	8,046	3,537	202	2,265*	*	1,592	--	53,720
	Percent								
1968-69	100.0	3.6	2.2	3/	0.2	3/	1.2	--	96.4 1/
1969-70	100.0	4.3	2.8	3/	0.2	0.1	1.2	--	95.7 1/
1970-71	100.0	5.7	3.8	3/	0.4	0.1	1.4	--	94.3 1/
1971-72	100.0	7.0	4.7	0.1	0.6	0.2	1.5	--	93.0 1/
1972-73	100.0	8.3	5.5	0.1	0.8	0.2	1.5	0.2	91.7 1/
1973-74	100.0	9.5	6.0	0.2	1.0	0.2	1.7	0.4	90.5 1/
1974-75	100.0 1/	10.4	6.3	0.3	2.3*	*	1.8	0.5	87.3
1975-76	100.0 1/	10.6	6.2	0.3	2.6*	*	1.8	0.4	87.2
1976-77	100.0 1/	11.0	6.1	0.3	2.8*	*	2.0	0.5	87.0
1977-78	100.0 1/	12.1	6.0	0.3	3.4*	*	2.4	*	86.6
1978-79	100.0 1/	12.9	5.7	0.3	3.6*	*	2.6	*	86.3

1/ Includes also all foreign students.

2/ Excludes Marshall University in West Virginia and the Catholic University of Puerto Rico, which admitted their first students in January 1978 with a combined total enrollment of 50 freshmen.

3/ Less than 0.05 percent.

* For 1974-75, the Hispanic category includes only Puerto Ricans who were residents on the U.S. mainland, Puerto Ricans enrolled at the University of Puerto Rico, and Mexican-Americans. For 1975-76 and 1976-77, Hispanics includes these 3 groups and students classified as Cuban. For these 4 years, any other Hispanics were most likely assigned to the "Other" category. Beginning in 1977-78, the full enrollment questionnaire was revised to reflect DHEW suggested racial/ethnic classifications. The general "Other" category was dropped, and a Hispanic classification was added, which is defined to include any person of Spanish culture or origin, regardless of race.

Source: Datagram. U.S. Medical Student Enrollment 1968-69 through 1972-73. Journal of Medical Education, 48: 293-297, March 1973.

Datagram. Medical Student Enrollment, 1974-75 through 1978-79. Journal of Medical Education, Vol. 54, May 1979. Also prior issues.

Table A-17 Black dental students and graduates, by school year: 1970-1971 through 1978-79

School year	First-year class		Total dental student enrollment		Dentist graduates	
	Black students	Percent of all students	Black students	Percent of all students	Black graduates	Percent of all graduates
1970-71.....	185	4.1	453	2.7	55	1.5
1971-72.....	245	5.2	597	3.5	74	2.0
1972-73.....	266	5.0	765	4.2	110	2.8
1973-74.....	273	5.0	872	4.5	154	3.4
1974-75.....	279	5.0	945	4.7	187	3.8
1975-76.....	298	5.2	977	5.2	213	4.0
1976-77.....	291	4.9	955	4.5	215	4.2
1977-78.....	296	5.0	968	4.5	203	3.8
1978-79.....	280	4.4	977	4.4	NA	NA

Source: Annual Report on Dental Education, 1978-1979. Council on Dental Education, American Dental Association, Chicago. Also prior annual issues.

NOTE: NA=Not available.

Table A1-18 Minority students in first year of dental school: academic years 1971-72 through 1978-79 1/

Academic year	Total first year students	Racial/ethnic category							Percent minority of total first-year students
		Total minority	Black	American Indian	Mexican American	Puerto Rican	Oriental	Other minority	
1971-72	4,705	412	245	4	27	13	112	11	8.8
1972-73	5,287	475	266	5	53	3	138	10	9.0
1973-74	5,389	529	273	12	64	5	141	34	9.8
1974-75	5,555	551	279	12	68	7	142	43	9.9
1975-76	5,697	637	298	22	64	11	186	56	11.2
1976-77	5,869	650	291	21	81	15	174	68	11.1
1977-78	5,890	641	296	10	2/	2/	225	2/	10.9
1978-79	6,301	681	280	16	2/	2/	263	2/	10.8

1/ Excludes University of Puerto Rico.

2/ The data for 1977-78 differ from earlier years because of changes in racial/ethnic categories used for data collection. In 1977-78 there were 110 first-year students under a new category "Hispanic." Also, the former category of "Other minority" was eliminated.

Source: Minority Student Enrollment and Opportunities in U.S. Dental Schools, for 1971-72 and for 1972-73. Minority Report; Supplement of Annual Report on Dental Education 1973-74. Council on Dental Education, American Dental Association. Also reports for subsequent academic years.

Table A1-19. Active women physicians (M.D.) in the United States, by specialty: selected years, 1970-1977

Specialty	1970	1971	1976	1977
Total active physicians	310,845	318,699	348,443	363,619
Total active women physicians	21,318	22,563	28,966	32,283*
	/ Percent of active women physicians			
Total	100.0	100.0	100.0	100.0 1/
Primary care: Total	41.2	42.0	45.3	41.5
General practice	11.7	10.9	10.9	9.6
Internal medicine	11.2	12.3	15.5	15.0
Pediatrics 2/	18.3	18.8	18.9	16.9
Surgery and surgical specialties: Total	10.0	10.1	11.6	10.6
General surgery	1.5	1.5	2.6	2.2
Obstetrics/gynecology	6.3	6.3	6.5	6.3
Ophthalmology	1.4	1.4	1.5	1.3
Other 3/	0.8	0.8	0.9	0.8
Other specialties: Total	48.8	47.9	43.1	47.9
Anesthesiology	7.1	7.3	6.3	5.6
Dermatology	1.3	1.3	1.4	1.3
Neurology	1.0	1.1	1.3	1.1
Pathology	6.0	6.4	6.0	5.4
Physical medicine & rehabil	1.1	1.2	1.1	1.0
Psychiatry 5/	13.8	14.2	14.0	10.0
Public health	2.6	2.5	1.8	1.4
Radiology 6/	3.2	3.3	3.8	2.3
Other and unspecified 7/	12.7	10.6	7.4	19.8

1/ Percentages are based on a total of 34,845 active women physicians, which includes 2,562 Address Unknown and 564 Temporary Foreign who were not allocated by specialty.

2/ Includes pediatric allergy and pediatric cardiology.

3/ Includes neurological surgery, colon and rectal surgery, other pediatric surgery, otolaryngology, plastic surgery, thoracic surgery, and urology.

4/ Includes forensic pathology.

5/ Includes child psychiatry.

6/ Includes diagnostic and therapeutic radiology.

7/ Includes specialties with less than 1.0 percent of active women physicians.

* Excludes 3,739 inactive; 2,875 not classified; 2,562 address unknown; and 564 temporary foreign.

Source: Physician Distribution and Medical Licensure in the U.S., 1977. Center for Health Services Research and Development, American Medical Association. Monroe, Wisconsin, 1979. A1so 1977 issue.

Pennell, Maryland Y. and Renshaw, Josephine E. Distribution of Women Physicians, 1970 and 1971.

Table A1-20. Women in U.S. medical (M.D.) schools: academic years 1968-69 through 1978-79

Academic year	Women in entering class		Total women enrolled		Women graduates	
	Number	Percent	Number	Percent	Number	Percent
1968-69	887	9.0	3,136	8.8	607	7.5
1969-70	952	9.2	3,390	9.0	700	8.4
1970-71	1,256	11.1	3,894	9.6	827	9.2
1971-72	1,693	13.7	4,755	10.9	860	9.0
1972-73	2,315	16.9	6,099	12.8	924	8.9
1973-74	2,743	19.6	7,731*	15.4*	1,264	11.1
1974-75 1/	3,275	22.2	9,661	18.0	1,706	13.4
1975-76	3,641	23.8	11,417	20.5	2,200	16.2
1976-77	3,858	24.7	12,954	22.4	2,611	19.2
1977-78 2/	4,130	25.6	14,218	23.7	3,086	21.4
1978-79	4,162	25.2	15,102	24.3	NA	NA

1/ Data do not include an additional first-year class of 157 students admitted to New York Medical College in the spring of 1975.

2/ Excludes Marshall University in West Virginia and the Catholic University of Puerto Rico, which admitted their first students in January 1978, with a combined total enrollment of 50 freshmen.

* One school did not provide enrollment figures.

Source: Medical Education in 1977-78. Journal of the American Medical Association, Dec. 22/29, 1978, Vol. 240, No. 26.
Datagram. Medical School Enrollment, 1974-75 through 1978-79. Journal of Medical Education. Vol. 54, May 1979.

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