DOCUMENT RESUME

ED 248 746 HE 017 604

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TITLE Dental Education and Supply of Dentists: Policy Issues of the Eighties.
INSTITUTION Southern Regional Education Board, Atlanta, Ga.
PUB DATE 84
NOTE 44p.
AVAILABLE FROM Southern Regional Education Board, 1340 Spring Street, N.W., Atlanta, GA 30309 ($3.00).
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Demand Occupations; Dental Students; *Dentistry; *Educational Policy; *Enrollment Trends; *Geographic Distribution; Geographic Regions; Higher Education; *Labor Market; Labor Supply; Minority Groups; Population Trends; Professional Education; Tuition
IDENTIFIERS *United States (South)

ABSTRACT

Recent trends in dental education and the supply of dentists for the South are examined to assist state policymakers and school officials. The supply of dentists has increased faster than the population over the past decade and will continue to increase through 1990; in the south the rate of growth exceeded the national rate. At the same time, the demand for dental services has declined, primarily due to a slowing in population growth, a depressed economy, and reduced dental disease for some groups. The ratios of dentists to the population vary significantly among states and within states, and shortages of dentists in inner-city and rural areas have been documented. Changes in the population and economic base of the state influence the demand for dental services. The scope and number of public dental service programs and the availability of dental insurance also affect demand. The current decline in dental school enrollments and the increase in tuition will have an adverse effect on access to dental education for minorities. Recommendations are offered concerning opportunities for minorities who want to study dentistry, educational supply and demand in dental schools, the distribution of dentists to underserved areas, the efficiency of state-supported dental schools, and general practice residency positions. (SW)

Dental Education and Supply of Dentists: Policy Issues of the Eighties

Southern Regional Education Board

DENTAL EDUCATION AND SUPPLY OF DENTISTS: POLICY ISSUES OF THE EIGHTIES

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1340 Spring Street N.W.
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$3.00

1984

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FOREWORD

One of the long-term concerns of the Southern Regional Education Board has been health professions education. Until recently, the South has been short of both practitioners and professional schools in which to train new practitioners. In addition, there was a drain of new practitioners who left the region for specialty training and better work opportunities in other parts of the nation.

The 14 Southern states have created many new professional schools and increased enrollments in existing schools so that the training capacity of the region has nearly doubled in the past 20 years. This picture was documented in SREB's 1983 report, Health Professionals for the South: Supply and Cost Issues Needing State Attention.

Dentistry is one of the major health professions that is experiencing problems as a result of the expansion of training capacity and supply of practitioners. Changes in the need and demand for dentists have now created the picture of a potential oversupply of practitioners and declining enrollments in dental schools. While there are still many unmet needs in certain rural areas and for work in the area of periodontal disease, dentists, perhaps, more than any other health professionals, are influenced by the economics of demand rather than by the realities of need in their choice of practice type and location. Few efforts have been made to influence these choices of dentists. This is a matter of special concern to policymakers of the South because the region has a higher proportion of publicly supported dental schools than other parts of the nation. Dental schools in the South also tend to be smaller, newer, and more costly per student than those in other regions.

This report examines the recent trends in dental education and the supply of dentists for the South. It is intended for policymakers in state government, leaders in academic health centers, and deans and other officials of dental schools.

Harold L. McPheeters
Director, Commission on Health
and Human Services

INTRODUCTION

Changing social, demographic, and economic factors during the decades of the Fifties and Sixties set in motion sharp increases in the production of health professionals. For the dental profession, this trend reversed a long-term decline in the dentist-to-population ratio in the United States. Dentistry is now the fourth largest health profession, following nursing, medicine, and pharmacy.

The Southern states led the nation during the Sixties and Seventies in efforts to increase the supply of dentists and to provide educational opportunities for young people who desired to enter the profession. Southern public officials were committed to overcoming past effects of regional underproduction and net out-migration of dentists from the region.[1] By 1980, the number of dental schools in the South represented 30 percent of all dental schools in the United States. The extent of the South's contribution to dental education is evidenced by the proportion of state-supported dental schools; 15 of the 18 dental schools in the South are public.[2] These 15 schools represent 43 percent of the public dental schools in the nation.

Factors that influenced the expansion efforts during the Sixties and early Seventies have changed substantially. Nationally the growth rate of dentists has greatly exceeded that of the population. The reputation for growth in the "Sunbelt South" is attracting more dentists from other parts of the nation and is decreasing out-migration of the region's own dental school graduates. Advances in preventive dentistry and fluoridation of public drinking water have drastically reduced dental disease. These factors, along with a depressed economy and a decline in the demand for dental services, present new problems for policymakers. In some states individual dentists and state dental organizations are calling for substantial reductions in dental school enrollments.[3]

Thus, the time has come to evaluate the effect of past expansion efforts. Just how much growth has occurred? What changes have taken place in the demand for dental education? What has been the effect of the expansion of dental education on the supply and demand relationships in the U.S. and within the region? Has the expansion of dental education affected historically underserved areas? These are the issues that are examined in this paper.

A review of the financing of dental education is limited to an examination of the differences between expenditures for public and private dental education, overall expenditures for dental education, and estimates of cost of dental education. Although not precise measurements, they do illustrate the relative financial impact of dental manpower production decisions.

In addition, the impact that current methods of financing dental services have on the demand for dental care is reviewed. Supply and demand balances are evaluated based on actual trends. "Effective demand" rather than "needs" is the basis for assessing the requirements for dentists. While this approach may appear to be overly pragmatic, or even callous, it recognizes the reality of a world of limited resources that has for the most part relegated access to dental services to the vicissitudes of the market place.

HOW MUCH GROWTH HAS OCCURRED?

The major impetus for expansion of dental education in the United States and in the region can be attributed to an overall public awareness of the importance of health care which, in turn, influenced federal and state policy decisions. In 1963, the federal government enacted the Health Professions Act, which was designed to increase the production and supply of a variety of health professionals including dentists. Specifically, the Act provided for student assistance programs and funds to expand existing

and/or build new dental schools. Subsequent federal legislation provided direct assistance to dental schools in the form of capitation funds that were awarded contingent upon dental schools' ability to increase enrollments.[4]

Federal policy decisions to increase the supply and distribution of dentists were embraced and supplemented by similar or complementary programs in many states. The number of new dental schools in the United States increased by 15 between 1960 and 1980; 8 of these were opened after 1970. Since 1960, 7 new dental schools have opened in the South--46 percent of all new dental schools in the nation and over half of all new public dental schools.[5]

The success of dental education expansion efforts can be seen in Table 1. The region's share of first-year dental education enrollments increased from 23.2 percent in 1960 to 27.5 percent in 1980; the current share is 26 percent. The region's share of dental school graduates continued to increase, reaching 27.8 percent in 1982.

A much larger proportion of the increase in total first-year enrollments in the South was accounted for by the creation of new dental schools (60.7 percent) than by expansion of existing schools (39.3 percent); for the nation as a whole, new schools accounted for only 37.9 percent of the expansion. The South's share of first-year dental spaces that resulted from building new dental schools between 1960 and 1980 amounted to over half of the nation's total (57.2 percent). In contrast, during the same period, its share of first-year spaces due to expansion of existing schools was considerably lower (22.5 percent) (see Table 2).

Perhaps the most striking contrast between the United States and the region is in the proportion of dental education in the public sector. As shown in Table 3, 82.1 percent of the region's dental students are enrolled in public dental schools versus 54.9 percent for the nation. Moreover, public dental schools in the region enroll 40.6 percent

Table 1

FIRST-YEAR ENROLLMENTS AND GRADUATES OF DENTAL SCHOOLS
UNITED STATES AND SREB STATES
1960, 1970, 1980, AND 1982

					Percent Change			
	1960	1970	1980	1982	1960-1970	1970-1980	1980-1982	1960-1982
First Year Enrollments								
United States	3,516	4,565	6,030	5,498	29.8	32.1	-8.8	56.3
SREB States	814	1,134	1,658	1,431	39.3	46.2	-13.7	75.8
South as Percent of U. S.	23.2	24.8	27.5	26.0	--	--	--	--
Graduates								
United States	3,235	3,672	5,256	5,371	13.5	43.1	2.2	66.0
SREB States	735	886	1,416	1,494	20.5	59.8	5.5	103.2
South as Percent of U. S.	22.7	24.1	26.9	27.8	--	--	--	--

Sources: American Dental Association, Trend Analysis: Supplement 11 to the Annual Report Dental Education, 1981-82 and 1982-83.

Table 2

INCREASES IN FIRST-YEAR DENTAL SCHOOL SPACES DUE TO EXPANSION OF EXISTING SCHOOLS AND THE DEVELOPMENT OF NEW SCHOOLS
UNITED STATES AND SREB STATES
1960 TO 1980

	Increase in First-Year Spaces			Percent of Increase	
	Expansion of Existing Schools	Development of New Schools	Total Increase 1960-1980	Due to Expansion of Existing Schools	Due to New Schools
United States	1,574	959	2,533	62.1	37.9
SREB States	354	546	900	39.3	60.7
South as Percent of U. S.	22.5	57.2	35.5	--	--

Sources: American Dental Association, Trend Analysis: Supplement 11 to the Annual Report Dental Education, 1981-82 and 1982-83.

of all the nation's dental students who are enrolled in public dental schools, compared to 10.8 percent of those enrolled in private dental schools.

Overall the region's quantitative gain from 1960 to 1982 in first-year spaces and graduates was much greater than that of the U.S. First-year spaces increased 75.8 percent versus 56.3 percent nationally, while the number of graduates in the region increased 103 percent compared to 66 percent for the nation as a whole. The effect of a slight decline in first-year enrollments between 1980 and 1982 will be a slight decrease in the number of graduates by 1985. U.S. dental schools have projected that the number of first-year spaces will stabilize at about 5,350 through 1983, a 3 percent decline over the 1982 level. However, first-year spaces in the region are projected to remain

Table 3

TOTAL ENROLLMENTS IN PRIVATE AND PUBLIC DENTAL SCHOOLS
UNITED STATES AND SREB STATES
1982-83

	Enrollments				Number of Schools			
	Private	Public	Total All Schools	Percent Public	Private	Public	Total	Percent Public
United States	10,018	12,217	22,235	54.9	25	35	60	58.3
SREB States	1,083	4,965	6,048	82.1	3	15	18	83.3
South as Percent of U. S.	10.8	40.6	27.2	--	12	42.9	30	--

Sources: American Dental Association, Trend Analysis: Supplement 11 to the Annual Report Dental Education, 1981-82 and 1982-83.

at the 1982 levels.[6] If these projections are accurate, the regional share of first-year spaces and graduates will continue to rise, and during the decade of the Eighties the region would be expected to produce over 14,000 new dentists.

Clearly, the states of the South have made a substantial commitment to public dental education. The effect of the increased production on the supply of dentists in the region is reviewed later in conjunction with an evaluation of supply and demand.

WHAT CHANGES HAVE TAKEN PLACE IN THE DEMAND FOR DENTAL EDUCATION?

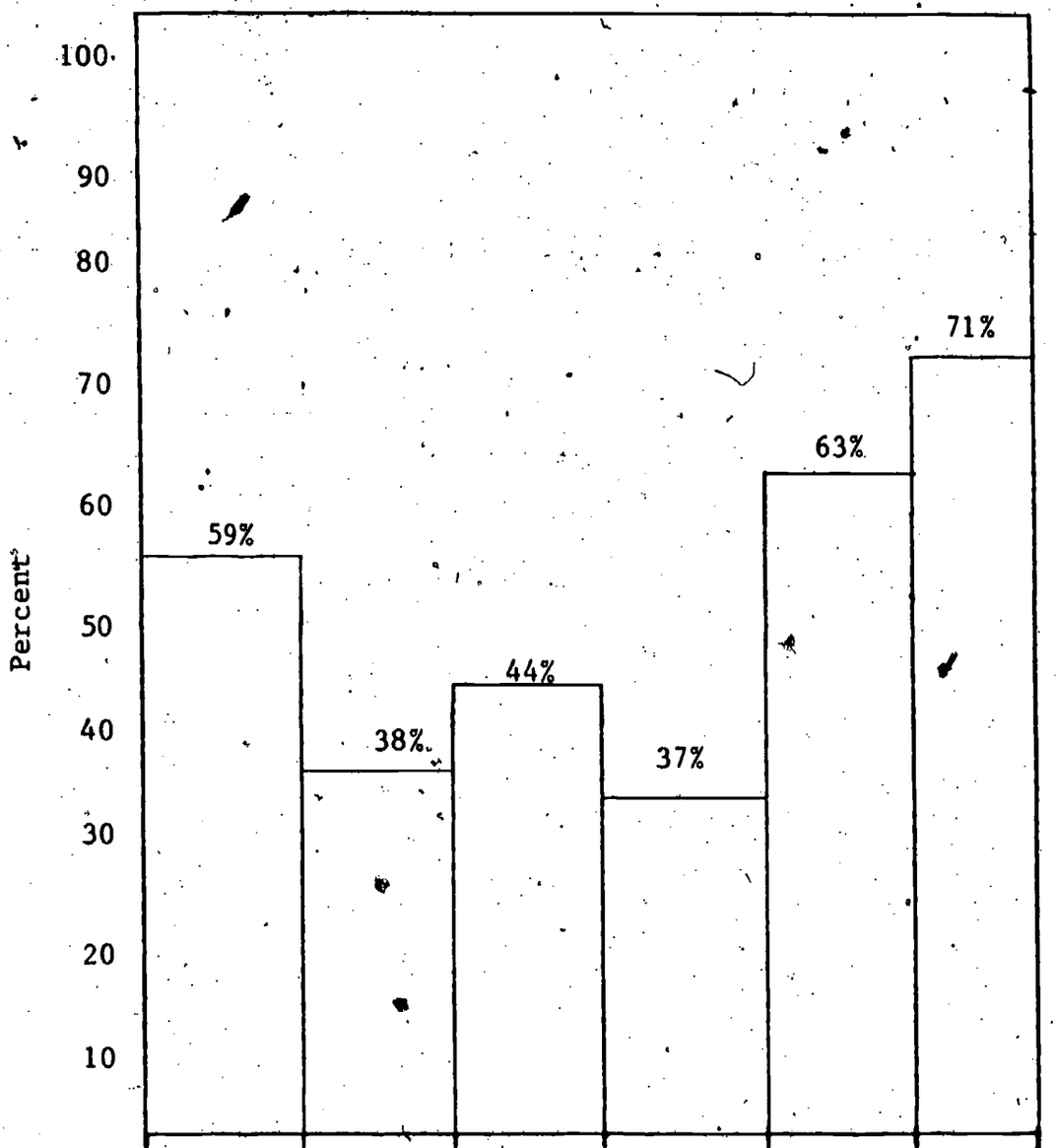
Access to dental education, like that of medical education, has always been on a competitive basis. Only those applicants meeting rigid standards are accepted. Historically, first-year enrollment totals have not been affected by the number of applicants because qualified applicants have always exceeded first-year spaces available. The proportion of the applicant pool that is admitted to dental schools each year illustrates the degree of competiveness for a dental education; significant variations suggest that social and/or economic factors have influenced the demand for dental education.

For the past few years the number of dental school applicants have declined significantly, while the number of first-year spaces has remained relatively stable. As the number of applicants approaches the number of first-year spaces, this will affect the first-year enrollment total as well as the quality and characteristics of the first-year class.

As shown in Figure 1, there have been extreme fluctuations in the demand for dental education over the past two decades. In 1960, 59 of every 100 applicants gained admission to a dental school. By 1975, there were 2.7 applicants for every available first-year space; only 37 percent of all applicants could be accepted. Since 1975, there has been a steady decline in the number of applicants to dental schools and by 1980,

Figure 1

PERCENT OF DENTAL SCHOOL APPLICANTS ENROLLED IN U.S. DENTAL SCHOOLS AND RATIO OF THE NUMBER OF APPLICANTS TO FIRST-YEAR ENROLLMENTS, SELECTED YEARS



	1960	1965	1970	1975	1980	1982
Ratio of Number of Applicants to First-Year Enrollments	1.7:1	2.6:1	2.3:1	2.7:1	1.6:1	1.4:1

Sources: American Dental Association, Trend Analysis: Supplement 11 to the Annual Report Dental Education, 1982-83; and U.S. Department of Health and Human Services, Third Report to the President and Congress on the Status of Health Professions Personnel in the United States, January 1982.

the ratio of the number of applicants to first-year enrollments dropped below the 1960 level of 1.7:1. In 1982, even with a decrease in the number of first-year spaces available, this ratio declined to 1.4:1. With 71 of every 100 dental school applicants gaining admission to a dental school in 1982, clearly, fewer young people are seeking dental education.

Proponents of contractions in dental school enrollments maintain that an oversupply of dentists caused the declining number of dental school applicants. Opponents argue that the decline is more closely related to reduced student loans and scholarships and to increased indebtedness of graduates. Both arguments have merit. The depressed economy and reduced student aid have influenced career plans of high school graduates. Evidence does exist supporting a positive relationship between career attractiveness and the economic rewards of a career. The "pool" of applicants seeking to enter any education program has been seen as a "career barometer." In selecting an education program leading to a professional career, students are usually aware of the expected social and economic returns on their investment of both time and money. For many, the career itself is the single factor influencing their decision. For others, the economic return on their investment provides the margin of difference in career selection.[7] The average net income for dentists in constant dollars has declined over the past 5 years while the average indebtedness of dental school graduates has increased.[8] This and the increased job opportunities and rewards in fields such as engineering and business can be assumed to have influenced the decline in the number of dental school applicants.

Unfortunately, there are no acceptable standards that would permit policymakers to increase or decrease first-year dental spaces based on some ideal applicant-to-space ratio. And, decreased numbers of applicants raise other concerns. Since a decline in enrollments decreases the revenues of dental schools, some fear that dental schools may be tempted to compromise quality by accepting less qualified students. There is no evidence that this has occurred. In fact, the 1982 analysis of attrition from dental

schools reveals that more dental students dropped out for personal reasons than for academic reasons. The leading personal reasons were career change decisions and economics.[9] As less federal and state funds are allocated for dental education loans and scholarships, more students can be expected to drop out for economic reasons and select alternative careers that require fewer years of education. If the number of dental school applicants continues to decline, dental schools will be competing among themselves and other career fields to attract and enroll well qualified applicants.

Minorities and Women

Dental schools define minorities as black Americans, Hispanics, American Indians, and Asians. Minorities as a percent of total enrollments increased from 5 percent in 1970 to 12.6 percent in 1981 while minorities as a percent of first-year enrollments increased from 6.7 to 15 percent; however, the proportion of black Americans was only 5.2 percent. During the same period, women, as a percent of total enrollments, increased from 1.4 percent to 18.7 percent; among first-year enrollments the percent of women increased from 2 percent to 21.7 percent.

In 1981, first-year minority enrollments in the region comprised 14.4 percent of the total, only slightly less than the nation's 14.9 percent; however, the proportion of black Americans accepted by dental schools in the region was 6.8 percent--compared to 5.1 percent for the nation as a whole.[10]

The decline in the total number of dental school applicants seems to have increased the number of minorities and women who are admitted to dental schools. While the number of first-year dental students declined by 416 between 1978 and 1981, the number of first-year minority dental students increased by 195 and first-year women dental students increased by 268.[11] This trend is likely to be reversed if substantial contractions in dental school enrollments and further reduction in financial aid occur. It is germane to note that in 1981 women comprised 39 percent of the black Americans

enrolled in dental schools and 31 percent of all minority dental students. Thus, factors that affect minority enrollments will doubly affect women, since over a fifth of the women admitted to dental schools in 1981 were minority students.

Graduate Dental Education*

There are eight areas of dental specialty practice recognized by the American Dental Association: (1) endodontics; (2) oral pathology; (3) oral maxillo facial surgery; (4) orthodontia; (5) pedodontics; (6) periodontics; (7) prosthodontics; and (8) public health. A licensed dentist who completes one of these eight graduate dental education programs is eligible for board certification as a specialist in the respective specialty. The length of time required to complete a graduate dental education program ranges from two to four years, depending on the specialty.

Most dental school graduates begin practice as general practitioners immediately after graduation and licensure. However, there has been an increase in the number of new dental school graduates seeking to enter one-year general practice residency programs prior to entry into general practice. In 1982, the proportion that could be accommodated by existing programs in the United States was just over 17 percent.

Graduate dental specialty education programs are offered by dental schools and hospitals. Dental schools enroll over 76 percent of the graduate dental students who are in one of the eight specialty dental programs, while 89 percent of the graduate dental students in general practice residency programs are enrolled in non-dental school programs. In 1981, all dental schools in the nation enrolled 2,188 graduate dental students compared

*Graduate dental education in this report refers to education of a dentist beyond the Doctor of Dental Surgery (DDS) or Doctor of Dental Medicine (DMD) degree. Graduate dental education is in a structured program that provides advanced education in general practice dentistry or leads to eligibility for certification in one of the eight dental specialty fields. Other terms often used to describe this level of dental education are postdoctoral and advanced.

to 621 in SREB dental schools. The average enrollment of all U.S. dental schools' graduate programs was only 36, compared to an average undergraduate* enrollment of 377. Ten schools had 10 or fewer graduate students; only one school enrolled over 100.[13]

A 1980 Task Force on Advanced Dental Education of the American Association of Dental Schools recommended that general practice dental residency programs should be expanded to accommodate half of all dental school graduates, and that the total number of first-year specialty positons be decreased, particularly in those specialties that have experienced substantial enrollment increases in the past decade.[14] Since 1980, the number of first-year graduate students in dental specialty programs declined less than one percent; the number in general practice residency programs declined at about the same rate.[15]

Increasing the number of general practice residency programs offered by dental schools in the region could help offset the effect of declining enrollments in dental schools and may improve the distribution of dentists in the region. The dearth of available general practice residency positions in dental schools is thought to influence the maldistribution of dentists, since few new dental school graduates feel confident to enter practice in remote areas with the limited experience they have had as students. Most prefer to practice nearer other dentists where access to collegial consultation is more readily available.

It is doubtful that decreasing undergraduate enrollments and increasing general practice residency graduate enrollments would reduce the amount of funds needed for dental education. Few graduate dental education programs generate sufficient revenues to support their costs. These programs are generally supported by a variety of sources that can include service fees, state and federal funds, and student tuition.

*The term undergraduate dental education is used in this report to denote an educational program offered by dental schools which leads to a DDS or DMD degree. In the literature this level of dental education is often referred to as predoctoral or first professional.

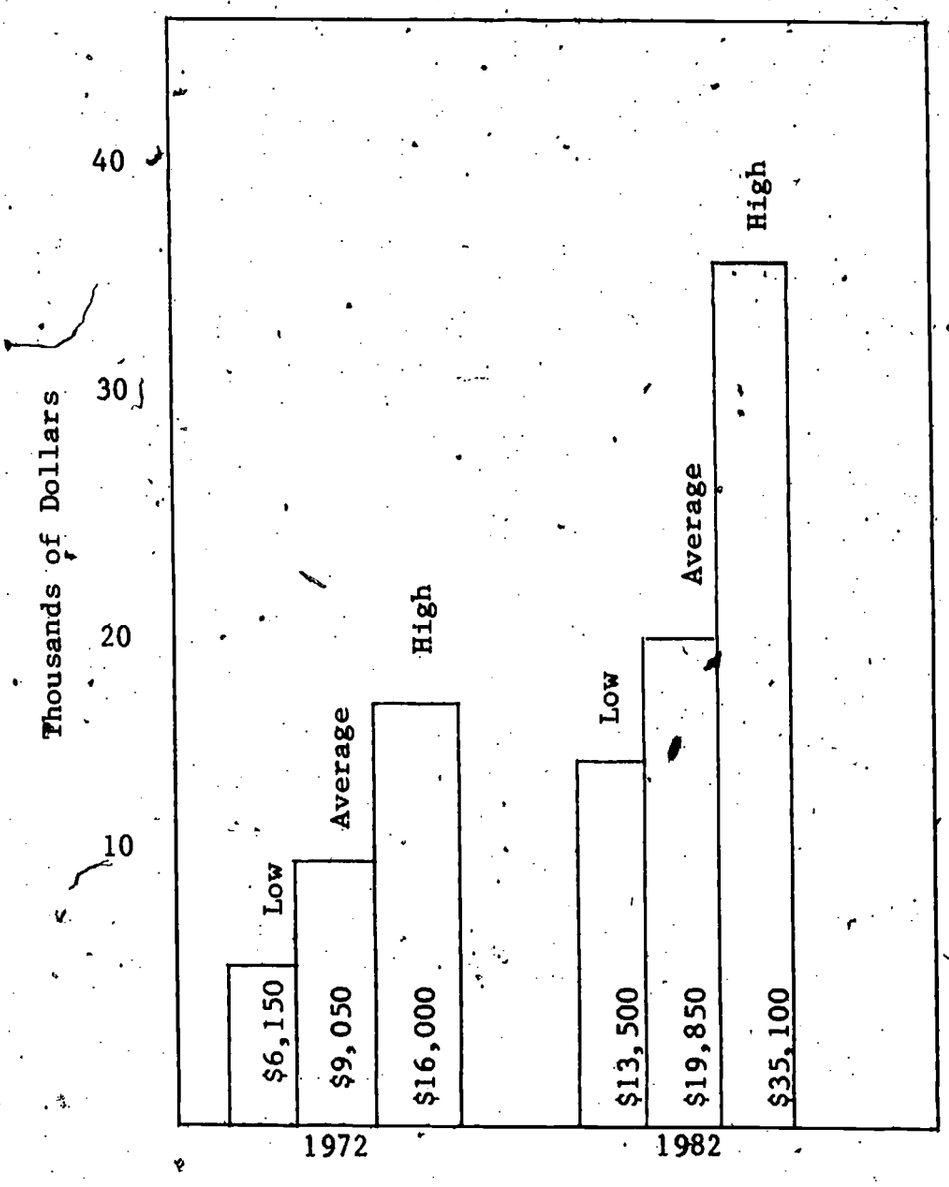
WHAT ARE THE FINANCIAL RESOURCES REQUIRED TO SUPPORT DENTAL EDUCATION?

The 1972-73 Institute of Medicine's study of the cost of health professions education found the average cost per student per year for undergraduate dental education to be $9,050, with a range from $6,150 to $16,000. By 1982, the average cost per student is estimated to have increased to $19,850, ranging from $13,500 to $35,100 (see Figure 2).

How much of the cost of dental education is born by the student? As shown in Table 4, tuition and fees varied considerably by school ownership and residency status of students. Most Southern dental schools fall among those schools in the U. S. with the lowest tuitions and fees charged for both residents and non-residents. In 1983-84, 11 of the 15 public dental schools in the region charged tuition and fees below the $2,598 national public school median for residents and below the $5,824 for non-residents. It is apparent that the Southern states have provided greater access to dental education for their residents, both by increased first-year spaces and by lower tuition and student fees. Some states are beginning to question the wisdom of low non-resident tuition and fees in state-supported dental schools. Colorado, for example, leads the nation by charging $20,282 first-year tuition and fees to non-residents. In the region, the University of Mississippi charged the highest non-resident tuition and fees ($9,039) among the public dental schools (see Table 5). Most dental schools in the South, public and private, charge lower resident and non-resident tuition and fees than the national median. Based on the proportion of the estimated cost of dental education paid by the student, public dental education in the region is a real bargain; tuitions are estimated to cover from as little as 5 percent for residents to a maximum of 45 percent for non-residents. Since the average expenditure per student for public dental schools in the region is higher than the U.S. average, it is reasonable to assume that an even smaller proportion of the total costs are paid by the student.

Figure 2

COMPARISON OF AVERAGE COST PER UNDERGRADUATE DENTAL STUDENT PER YEAR, AND RANGE, UNITED STATES 1972 AND 1982



Sources: American Dental Association, Trend Analysis: Supplement 11 to the Annual Report Dental Education, 1981-82; and National Academy of Sciences, Report of a Study of Costs of Education in the Health Professions, Parts I and II, U.S. Department of Health, Education, and Welfare, January 1974; and U.S. Department of Labor, Bureau of Labor Statistics.

Table 4

AVERAGE, MEDIAN, AND RANGE OF FIRST-YEAR TUITION AND FEES AT PUBLIC AND PRIVATE DENTAL SCHOOLS, BY RESIDENCY STATUS
UNITED STATES AND SREB STATES
1983-84

	United States		SREB States	
	Private	Public	Private	Public
Number of Schools	25	35	3	15
Average:				
Resident	$ 10,728	$ 3,024	$ 6,707	$ 2,369
Non-Resident	11,435	6,234	7,657	5,180
Median:				
Resident	11,225	2,598	8,778	2,453+
Non-Resident	12,141	5,824	8,778	4,878+
Range:				
Resident	772-18,313	454- 7,025	772-10,570	454-4,134
Non-Resident	3,380-18,313	1,082-20,382	3,622-10,570	1,082-9,039

+Eleven of the 15 public dental schools in SREB states report tuition and fees that are below the median for all public schools.

Source: American Dental Association, Dental School Tuition, Supplement 13 to the Annual Report Dental Education, 1983-84.

Table 5

DENTAL SCHOOLS RANK ORDERED BY FIRST-YEAR TUITION AND FEES
RESIDENTS AND NON-RESIDENTS
SREB STATES
1983-84

School	Rank	Residents	Rank	Non-Residents
University of Texas-Houston	1	$ 454	2	$ 1,254
University of Texas-San Antonio	2	482	1	1,082
Baylor College of Medicine*	3	772	3	3,622
University of North Carolina	4	1,659	5	4,582
University of Florida	5	2,122	8	4,848
Louisiana State University	6	2,200	11	5,200
University of Kentucky	7	2,392	6	4,592
Medical College of Georgia	8	2,412	13	7,131
University of Louisville	9	2,453	7	4,653
University of West Virginia	10	2,502	12	5,714
University of Alabama	11	2,528	4	3,728
Medical University of South Carolina	12	2,542	10	5,016
University of Tennessee	13	2,598	9	4,878
University of Mississippi	14	3,039	17	9,039
Virginia Commonwealth University	15	4,012	14	7,862
University of Maryland *	16	4,134	15	8,122
Meharry Medical College*	17	8,778	16	8,778
Emory University*	18	10,570	18	10,570

*Private dental schools

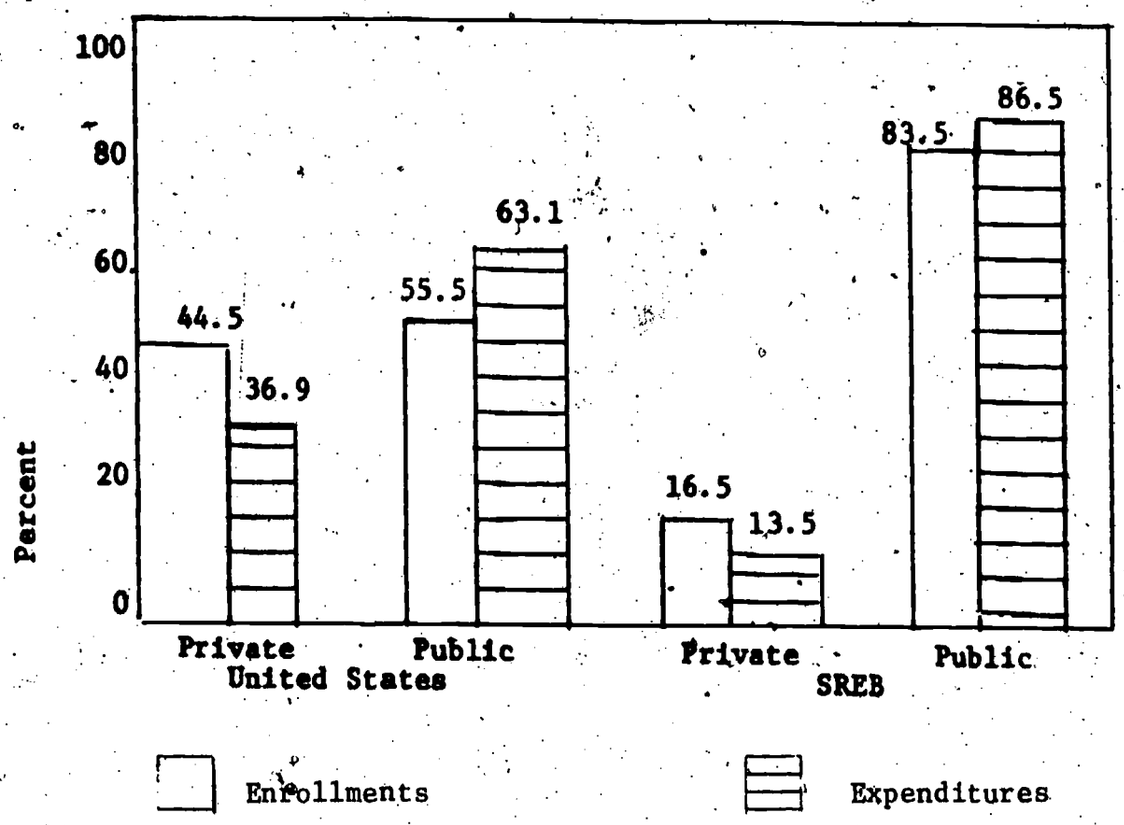
Source: American Dental Association, Dental School Tuition, Supplement 13 to the Annual Report Dental Education, 1983-84.

Generally, tuitions are higher and costs are less in private dental schools than in public dental schools. Many other factors contribute to the wide variations in cost per student and total expenditures that are found among all dental schools. These are: (1) size of school (enrollments); (2) types of graduate dental programs and number of graduate students; (3) research and service missions of dental schools; (4) shared or independent basic science faculty (some medical and dental schools share a common basic science faculty); (5) tenure of faculty; (6) use of part-time and full-time faculty; and (7) operational efficiency. The impact of some of these factors is illustrated in Figure 3 which provides a comparison of the percent of enrollments and expenditures in private and public dental schools in the United States and in the SREB states. In the nation, public dental schools enroll just over half of all undergraduate dental students (55 percent); yet, these schools account for nearly two-thirds (63 percent) of all dental school expenditures. In the region, public dental schools enroll 83.5 percent of all undergraduate dental students and account for 86.5 percent of the total expenditures. When compared by expenditures per undergraduate student, dental schools' expenditures in SREB states were considerably higher than in non-SREB states ($32,635 versus $26,605), and they exceeded the average expenditure per student ($28,257) of all dental schools. This is most likely associated with the larger proportion of public dental schools (83 percent) in SREB states compared to non-SREB states (48 percent) and to the United States as a whole (58.3 percent). Also, dental schools in the region tend to be smaller, with average undergraduate enrollments of 344 compared to 391 for non-SREB schools and 377 for all U.S. schools (see Table 6).

A recent cost study of dental education for New York suggests that dental schools having fewer than 240 undergraduate students are, in all probability, operating inefficiently. Some schools with smaller undergraduate enrollments overcome this by more

Figure 3

PERCENT OF TOTAL UNDERGRADUATE ENROLLMENTS AND TOTAL EXPENDITURES
FOR PRIVATE AND PUBLIC DENTAL SCHOOLS
UNITED STATES AND SREB STATES
1980-81



Sources: American Dental Association, Financial Report Fiscal Year Ending June 30, 1981; Profile of Dental Education Programs; Trend Analysis: Supplements 4,9, and 11 to the Annual Report Dental Education, 1981-82.

Table 6

EXPENDITURES PER UNDERGRADUATE DENTAL STUDENT AND AVERAGE UNDERGRADUATE ENROLLMENTS, SREB SCHOOLS, NON-SREB SCHOOLS, AND ALL SCHOOLS FY 1981

	Expenditures per Undergraduate	Percent of Dental Schools that are Public	Average Undergraduate Enrollments
SREB Schools	$32,635	83.3	344
Non-SREB Schools	26,605	48.0	391
All Schools	28,257	58.3	377

Source: American Dental Association, Profile of Dental Educational Programs: Supplement 7 to the Annual Report Dental Education, 1981-82.

efficient use of full-time faculty, using part-time faculty, and/or through assigning faculty time to graduate dental education. In contrast, the studies illustrated that having large undergraduate enrollments does not necessarily guarantee efficiency.[16]

As noted, multiple factors influence total expenditures and prohibit exact comparisons of schools on the basis of expenditures per undergraduate student. However, dental schools maintain a data base that can be used to assess the actual cost of dental education. As states face increasingly limited financial resources for all of education, those states having dental schools with small and declining enrollments should assess the efficiency of their dental schools to determine if continued operation is the best way to meet dental education needs.

WHAT HAS BEEN THE EFFECT OF THE EXPANSION OF DENTAL EDUCATION ON THE SUPPLY AND DEMAND RELATIONSHIP IN THE U.S. AND THE REGION?

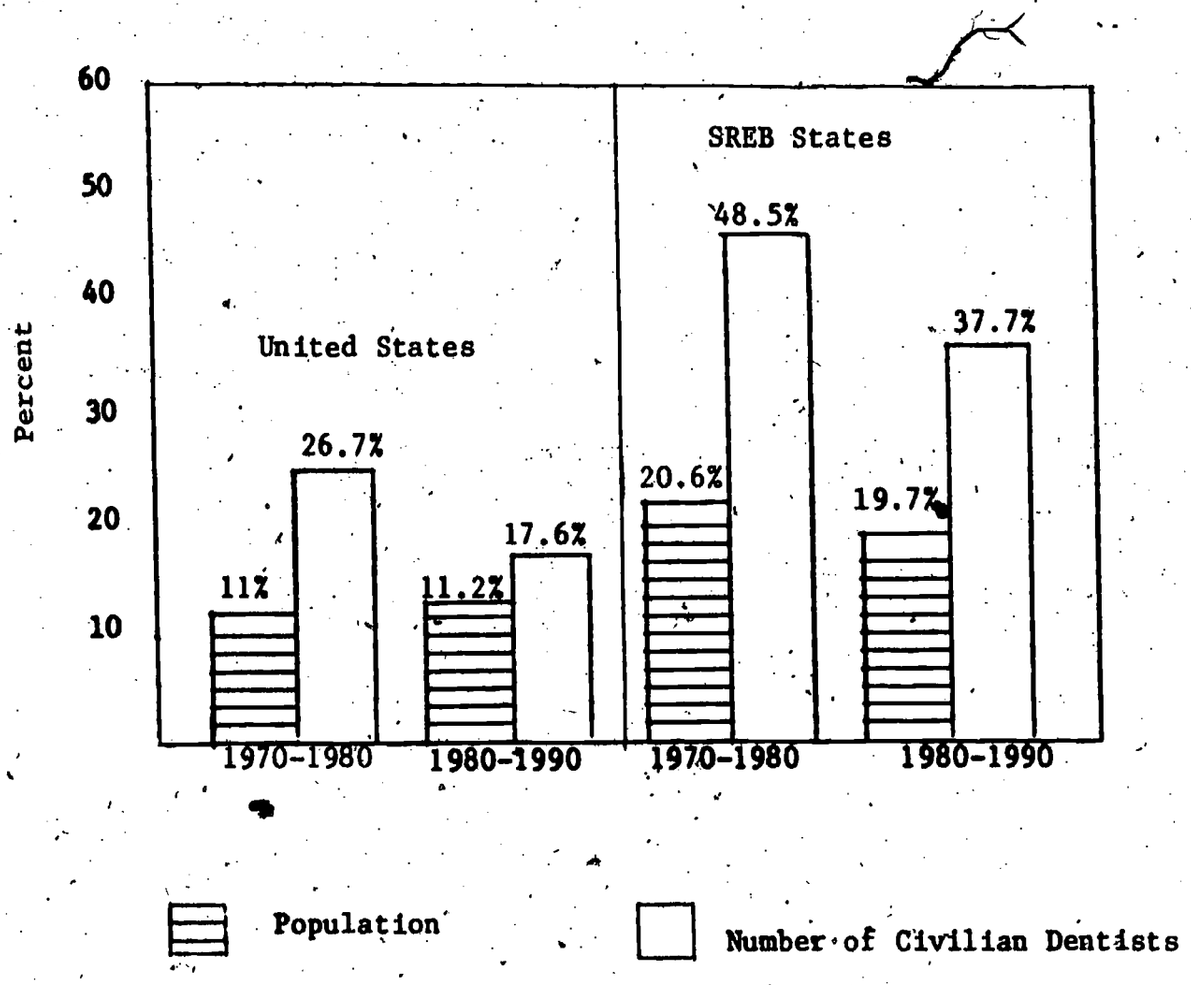
In 1950 there were 51.5 active dentists per 100,000 population in the United States. By 1965, the ratio had declined to 46.5, and by 1970, there were 47.1 dentists per 100,000 population. This marked the end of a 20-year decline in the supply of dentists.[17]

By 1973, the Bureau of Economic Research and Statistics of the American Dental Association found that the declining dentist-to-population ratio had solidly reversed its direction, due both to increased numbers of dental school graduates and to a decline in the population growth rate.[18] By 1980, the number of active civilian dentists per 100,000 population reached 53.5 in the nation. For the region, the ratio increased from 34.3 dentists per 100,000 population in 1970 to 42.1 in 1980. The effect of this can be seen in Figure 4. Between 1970 and 1980, the number of active civilian dentists in the United States increased 26.7 percent while the population increased only 11 percent. For the region, growth in the number of active civilian dentists was more than twice as much (48.5 percent) as growth in the population (20.6 percent) during the same period. Projections for the decade of the Eighties reveal similar patterns. The U. S. population is expected to increase by 11 percent by 1990, while the number of active civilian dentists will increase by 17.6 percent. For the region, growth in both the population and the number of dentists is expected to exceed that of the nation, with the population expected to increase by 19.7 percent and the number of active civilian dentists by 37.7 percent.

Although, the number of dentists per 100,000 population in the region is still behind that of the United States, the supply will continue to increase faster due to the large numbers of dental school graduates, increased retention of these graduates, and in-migration of graduates from other states. Nationwide the supply of dentists will also be affected by a steadily decreasing average age of active dentists, thereby decreasing attrition due to death and retirements.

Figure 4

PERCENT INCREASES TOTAL POPULATION AND ACTIVE CIVILIAN DENTISTS
UNITED STATES AND SREB STATES
1970-1980 AND 1980-1990*



*Estimated

Sources: U. S. Department of Health and Human Services, Third Report to the President and Congress on the Status of Health Professions Personnel in the United States, January 1982; U. S. Bureau of Census, Current Population Reports, Series p-20, No. 363, "Population Profile of the United States: 1980" (Washington, DC, U.S. Government Printing Office, 1981); Masnick, George and Pitkin, John. The Changing Population of States and Regions, Analysis and Projections, 1970-2000, Joint Center for Urban Studies of MIT and Harvard, August 1982.

The effect of production of dentists on supply can be seen in Table 7. Between 1975 and 1980, U. S. dental schools graduated 31,486 new dentists; an overall increase of 14,500 active civilian dentists. The increase represented 46.1 percent of the number of dental school graduates. For the region, the increase in the number of active civilian dentists as a percent of dental school graduates was significantly higher at 80.3 percent. Moreover, the effect of increased retention and in-migration for the region between 1975 and 1980 is seen by the region's 45.9 percent share of the increase in active civilian dentists compared to its 26.3 percent share in the number of dental school graduates. If this pattern continues, the supply of dentists in the region could easily surpass the projections for 1990.

Table 7

NUMBER OF DENTAL SCHOOL GRADUATES; INCREASE IN NUMBER OF ACTIVE CIVILIAN DENTISTS; AND INCREASE IN NUMBER OF DENTISTS AS A PERCENT OF DENTAL SCHOOL GRADUATES
UNITED STATES AND SREB STATES
1975 - 1980

	Number of Dental School Graduates	Increase in Number of Active Civilian Dentists	Increase in Number of Dentists as a Percent of Dental School Graduates
United States	31,486	14,500	46.1
SREB States	8,278	6,661	80.3
South as Percent of U. S.	26.3	45.9	--

Sources: American Dental Association, Trend Analysis: Supplement 11 to the Annual Report Dental Education, 1982-83; and Department of Health and Human Services, Third Report to the President and Congress on the Status of Health Professions Personnel in the United States, 1982.

In spite of the overall growth in the supply of dentists, dentist-to-population ratios vary considerably by region, state, and population density within states. The regions with the highest ratios are the Northeast and West, while the South has the lowest. Among the states in 1980, Washington state had more dentists-per-100,000 population than all other states (74.2), while Mississippi had the least (32.6). Within states, urban counties have higher dentist-to-population ratios than do rural counties. However, more dentists are now establishing practices in the most populated rural counties--those with a central city of 10,000 or more. The less populated counties continue to have serious shortages of dental manpower. For these counties, the dentist-to-population ratios average about half that of the urban counties. In some states the disparity is even more pronounced. Georgia, for example, had 54 dentists per 100,000 population in its urban counties in 1980, compared to 18.7 in the more rural counties.[19] This pattern is typical for the largely rural South and partially accounts for the South having the lowest ranking in dentist-to-population among the regions of the U.S.

Dentists are no different than the rest of the population; most prefer to live in urban areas. State and federal programs have attempted to improve the distribution of dentists in rural areas. These efforts include recruitment of rural residents into state dental schools, loans or scholarships (often limited to rural residents and often with practice in a rural area as a payback requirement), and preceptorships for dental students with rural dentists. There has been a gradual, but slight, improvement in the distribution over the past decade. Further improvement will be determined by the factors that influence the supply of dentists, the demand for dental services, and fully operational programs designed specifically to improve distribution.

Factors that Affect Supply and Demand

Nationally, the declared shortage of dentists in the Sixties was based on a recognition that the dentists-to-population ratio was declining. The solution was to produce more dentists. The increased number of dentists has led to much debate as to what constitutes an adequate supply of dentists. Even the term "supply of dentists" is open to question. Is the supply based on the number of dentists or on the amount of dental services that dentists can provide? Both are found described in the literature. There is a fair amount of consensus that the factors affecting the supply of dental services include: 1) the training capacity of dental schools, 2) number of full-time equivalent dentists, 3) age of dentists, 4) dentist mortality and migration patterns, 5) practice type and location, 6) use of technological advances, and 7) number of full-time equivalent auxiliaries (by type).

Using the number of full-time equivalent active dentists to measure availability of dental services oversimplifies a complex issue, because how dentists practice can greatly alter the amount of dental care available. For example, a general dentist who practices full-time in an urban group practice, uses the latest techniques, has multiple operatories (dental chairs), and employs dental assistants, expanded duty dental assistants, dental hygienists, and dental technologists can provide more dental services more frequently than can the dentist who practices alone, has only one dental chair, and does not employ dental auxiliaries. Since dentists' practice patterns vary widely from independent solo practices to large group practices--a determination of the potential productivity of all dentists would be a formidable task.

Superimposed on the issue of supply of dentists and availability of dental services are the concepts of: a) need, b) demand, and c) effective demand for dental care. Dental health needs are theoretically a predictor of the volume of dental services that will

be requested by a population. There is ample evidence that the amount of treatable dental disease among the population, especially periodontal disease, would keep all the dentists that this nation could produce quite busy for at least two decades. However, need for dental services cannot be equated with demand. Many people with treatable dental disease cannot or will not seek dental care. Many persons do not routinely see a dentist. For example, in 1980, roughly half the population had not seen a dentist in the past year, and the proportion of poor who had seen a dentist was even less--about 36 percent.

The factors that affect demand are no less complex than those that affect supply. They include dental health status (need), dental "I.Q.," age, sex, race, education, income, fluoridation, dental insurance, price of dental services, and population growth and migration. For example, preventive dentistry programs, particularly fluoridated water, have greatly reduced dental caries in children. Also, studies show that the more education and income a family has, the greater their use of dental services. All of these factors are interrelated in their effect on demand for dental care, and they influence the translation of dental health needs into dental service requirements and use of dental services.[20,21]

Use of dental services is considerably less than dental need would suggest. While many people avoid seeking a dentist's services because of their beliefs and attitudes about dental care, the fees of dental services pose a considerable barrier for a significant portion of the population. Most people have insurance to cover major medical expenses that is partially or totally paid as an employee benefit; in contrast, the majority of dental care is an out-of-pocket expense because dental insurance, as an employee benefit, is not widely available. In 1981, private insurance accounted for only 21 percent of dental care expenditures, while out-of-pocket payments accounted for 75 percent and government programs for 4 percent. Some studies have shown that even where dental insurance is available, utilization of dental services is less than need would suggest.[22]

Thus, cultural, social, demographic, and psychological factors as well as financial barriers are all involved in translating need and demand into "effective demand" for dental services. Effective demand for dental care is defined as all dental care sought by and delivered to consumers. The wide gap between need for dental care and the effective demand for dental services is a complicated phenomenon that creates a health manpower planning nemesis. Should projections for dental manpower be based on need for dental care or demand for dental services or both? Some maintain that projections should be based entirely on effective demand, others propose that the most thorough analysis would include dental manpower supply, need and demand for dental care, productivity of dental manpower, productive capacity of the dental care system, percent of underutilization, population growth, and effect of fluoridation.[23]

Few states have the resources to definitively assess dental manpower requirements. Need has been estimated in some states based on the prevalence of dental disease in a sample population. Demand for dental services has been estimated based on demographic and socioeconomic data. Effective demand is often measured by the number of days a patient must wait to obtain a dental appointment, dentists' perception of their "busyness," and per capita expenditures for dental services. Since 1977, there has been a decline in patient waiting time and dentists' perception of how busy they are. Yet, between 1965 and 1978, the inflation adjusted per capita expenditures for dental services rose from $14.20 to $27.60.[24] Unfortunately, this doubling of expenditures per capita does not mean that twice as many people received dental care; rather, it represents only a slight increase in the number of people who received an increased amount of care from an increased number of dentists. Overall, the recent decline in the economy has decreased the effective demand for dental services. The decreased demand for dental care and the increased supply of dentists has resulted in a decline

in the constant dollar income of dentists and changes in their practice patterns. Fewer young dentists are establishing independent practices because borrowing money to equip a modern dental office would be prohibitive for many new dentists in view of high interest rates plus the indebtedness incurred for their education. Consequently, more dentists are accepting employment in franchized dental operations or they seek group practice arrangements. Store front dentistry practices are now common in urban areas--dental services are as accessible as the Sears store in many communities. Thus far, however, the increased supply of dentists has not reduced the price of dental services.[25]

The complicated and interrelated issues of supply of dentists, need for dental care, and demand for dental services have resulted in varying dental manpower projections. The most common projections for dentists' requirements are based on some desirable dentist-to-population ratio. Projections based on need have been made, but are less common and, generally, are thought to be unrealistic at a time when cutbacks are being instituted in most public programs. The projections that are based on effective demand for dental services are viewed as the most creditable. This method uses estimates of both population and economic growth to project requirements for dentists. Population and economic projections have been known to be less than precise. However, the validity of projections for dentists' requirements that take into account the influence of economic factors on the demand for dental services can be seen by the way dentists tend to distribute themselves among states.

Impact of Demand on Distribution

When all 50 states and the District of Columbia were ranked by dentist-to-population ratios for 1970 and 1980, their ranking remained relatively constant (see Table 8).

Table 8

RANKING OF STATES BY DENTIST PER 100,000 POPULATION
AND PER CAPITA INCOME
UNITED STATES
1970 AND 1980

	1970				1980			
	Dentist Per 100,000		Per Capita Income		Dentist Per 100,000		Per Capita Income	
States	Rank	Number	Rank	$	Rank	Number	Rank	$
District of Columbia	1	88.3	1	5,333	1	82.8	2	11,883
New York	2	68.9	3	4,714	5	71.6	12	10,143
Oregon	3	65.2	28	3,694	4	72.9	21	9,400
Hawaii*	4	63.8	6	4,562	8	67.6	17	9,787
Connecticut	5	61.0	2	4,871	3	73.1	3	11,445
Minnesota	6	58.1	18	3,848	11	64.1	18	9,519
California	7	57.4	9	4,467	10	64.7	4	10,856
New Jersey	8	57.3	4	4,635	9	64.9	5	10,755
Washington	9	57.0	14	4,022	2	74.2	9	10,363
Nebraska	10	55.0	22	3,794	13	61.9	31	8,914
Utah*	11	54.8	39	3,228	6	69.5	47	7,485
Massachusetts	12	52.9	11	4,340	7	68.2	13	9,992
Colorado	13	51.9	20	3,839	12	62.5	14	9,964
Pennsylvania	14	51.6	16	3,943	18	55.9	23	9,294
Illinois	15	50.0	7	4,492	21	55.2	7	10,658
Wisconsin	16	49.6	22	3,794	14	59.8	24	9,234
Michigan	17	48.1	13	4,156	23	54.7	16	9,847
Rhode Island*	18	46.9	17	3,941	24	54.4	25	9,250
Iowa	19	46.7	26	3,749	27	51.6	26	9,178
Wyoming*	20	46.2	21	3,796	19	55.8	6	10,692
Idaho*	21	44.9	37	3,280	26	53.5	37	8,126
Montana*	22	44.3	33	3,498	16	59.3	35	8,445
Missouri	23	42.3	24	3,768	29	49.6	32	8,846
Kansas*	24	41.6	19	3,841	34	47.6	15	9,958
New Hampshire*	25	41.5	27	3,745	20	55.5	29	8,980
Ohio	25	41.5	15	3,992	29	49.6	22	9,398
Nevada*	27	41.4	10	4,452	25	54.0	8	10,458
Maryland	28	40.3	12	4,281	17	57.8	10	10,322
Virginia	29	39.4	30	3,653	31	49.0	20	9,435
Indiana	30	39.2	25	3,752	41	44.0	30	8,978
Delaware*	31	38.6	8	4,483	42	43.7	11	10,195
Vermont*	32	38.5	36	3,311	15	59.4	41	7,839
Florida	33	38.2	29	3,692	33	48.0	28	8,987
Arizona*	34	38.1	31	3,631	35	47.5	33	8,649
North Dakota*	35	38.0	42	3,120	32	48.9	34	8,556
Texas	36	37.4	32	3,576	40	44.7	19	9,513
Oklahoma	37	36.6	34	3,350	42	43.7	27	9,081
New Mexico*	38	36.4	43	3,117	37	45.1	39	7,956
Maine*	39	36.2	38	3,272	36	45.4	44	7,734
Tennessee	40	36.0	45	3,082	28	49.7	43	7,786
Kentucky	41	35.2	44	3,104	39	44.9	45	7,718
Louisiana	42	34.8	46	3,068	44	42.7	36	8,282
South Dakota*	42	34.8	41	3,214	38	45.0	49	7,452
West Virginia	44	34.0	47	3,047	45	40.7	42	7,831
Arkansas*	45	31.4	50	2,869	50	35.7	50	7,180
North Carolina	46	29.8	40	3,218	47	38.6	40	7,852
Alabama	47	29.4	49	2,913	48	36.7	48	7,484
Georgia	47	29.4	35	3,318	45	40.7	38	8,000
Alaska*	49	28.1	5	4,603	22	54.9	1	12,406
Mississippi	50	27.9	51	2,596	51	32.6	51	6,508
South Carolina	51	25.4	48	2,963	49	36.6	46	7,519

*States with no dental schools

SREB States

Sources: U S. Department of Health and Human Services, Third Report to the President and Congress on the Status of Health Professions Personnel in the United States, 1982; U. S. Department of Commerce, Series F, pp.297-348 and Survey of Current Business, 1981.

Only three states moved from the lower to the upper half. While five states moved from the upper to the lower half, for most of these states the change was not significant. Alaska, however, presented an interesting exception. In spite of a robust economy, Alaska has traditionally experienced shortages of all health professionals. For example, in 1970, Alaska ranked 5 in per capita income and 49 in dentist-to-population. By 1980, however, Alaska ranked 1 in per capita income and 22 in dentist-to-population--the most dramatic change of any state. This change typifies the influence of the increasing supply of dentists in the United States.

Ironically, seven of the states that ranked in the top half in 1970 and 1980 do not have dental schools, while many other states with one or more dental schools remained in the lower half. The relative stability of states' ranking in dentist-to-population ratios was inconsistent with the variations found among states in the number of dental school graduates.[26]

But when the states were ranked on the basis of per capita income, a pattern emerges. In 1980, over 80 percent of the states ranked the same or similarly in dentist-to-population ratios and per capita income. It would appear that dentists tend to distribute themselves among the states on the basis of demand for dental services; that is, those states with the highest per capita income tended to have the highest dentist-to-population ratios. Only eight states deviated significantly from this pattern with their per capita income and dentist-to-population rank varying by 15 or more. The isolated extremes were Utah and Vermont, ranking 6 and 15, respectively, in the number of dentists per 100,000 population and 47 and 41 in per capita income; Delaware and Texas ranked 43 and 40 respectively in dentists-to-population and 11 and 19 in per capita income. In 1980, 11 of the 14 SREB states ranked in the lower half in both dentist-to-population ratios and per capita income; Maryland ranked in the upper half in both categories and income ranking was in the upper half for Texas and Virginia.

Although dental school graduates tend to establish their practices in the state or the same region as their school of graduation,[27] the number of dental school graduates is not the primary influence that affects the number of dentists practicing in a state. A state's relative position among all states in terms of dentist-to-population ratio does not appear to be significantly influenced by the number of graduates from the state's dental schools. Two classic examples of this are Florida and Kentucky. Between December 1975 and December 1980, the number of active civilian dentists in Florida increased by 1,348; the dental school in Florida graduated 199 new dentists. For Kentucky, the number of dentists increased by 321; yet, Kentucky's two dental schools graduated 826 new dentists. In two states, New York and Pennsylvania, and in the District of Columbia, the number of active civilian dentists actually declined during the same period, in spite of large numbers of dental school graduates. Each was above the national average in dentist-to-population ratio.[28] This suggests that the effective demand for dental services was insufficient to support the increased supply of dentists.

Moreover, it tends to confirm that defined market areas have a market threshold for dental services that is sensitive to changes in the population and economic base of the area. A stable or declining dentist-to-population ratio in a state may signal market saturation in the demand for dental services. Conversely, an increasing dentist-to-population ratio implies that the effective demand for dental services exceeds the supply of dentists.

The distribution of dentists within states can vary so much that there can be a perception of oversupply as well as declining dentist-to-population ratios in states that contain federally designated dental manpower shortage areas. This was the case for New York, Pennsylvania, and the District of Columbia as recently as August 1983.[29] Interestingly, New York and Pennsylvania rank in the top 10 percent among all states

in number of dental school graduates. Clearly, increasing the number of dentists will not, by itself, eliminate maldistribution of dentists. This is particularly relevant for the South, because the number of dentists will continue to grow for two reasons: 1) the population and the economy in the sunbelt states are predicted to steadily increase, thereby increasing the demand for dental services; and 2) there will be more dentists migrating into Southern states from states where the demand has declined or the market for dental services has been saturated. Also, there will be increased retention of dental school graduates within Southern states. Past practice patterns of dentists suggest that such growth in supply will have only a marginal impact on geographic maldistribution to poor rural areas. Programs designed specifically to improve the distribution of dentists to areas of special need will continue to be necessary.

SUMMARY

The supply of dentists has increased faster than the population over the past decade and will continue to increase through 1990; in the South the rate of growth exceeded the national rate. At the same time, the demand for dental services has declined, primarily due to a slowing in population growth, a depressed economy, and reduced dental disease among segments of the population. There is a perception of an oversupply of dentists; yet, the dentist-to-population ratios vary significantly among states and within states, and shortages of dentists in inner-city and rural areas have been documented.

The supply of dentists in a state is related more to population and economic factors than to the number of dentists produced by a state or the need for dental services. Therefore, changes in the population and economic base of the state influence the

demand for dental services. The scope and number of public dental service programs and the availability of dental insurance also affect demand.

The number of dental school applicants has steadily declined, while the cost of dental education has continued to escalate. A perceived oversupply of dentists and a decline in the number of dental school applicants have precipitated modest reductions in the number of new entrants to most public and many private dental schools. The number of applicants will continue to decline and dental schools will compete with other career fields and among themselves to attract and enroll well-qualified students. Reduced enrollments and increased dental school tuitions will have an adverse effect on access to dental education for minorities unless special efforts are made to maintain the gains that have occurred over the past decade.

The current debate over the supply of dentists will most likely continue until there is a substantial improvement in the general economy. Whether individual dental schools in the region should further reduce enrollments or whether individual dental schools should be closed will continue to be troublesome public policy questions. Decisions should be based on a thorough analysis of both the current and future demand for dental care as well as the relative contribution each dental school makes to a state's overall higher education mission. While the purpose of this report was to review the issues, recognizing that dental education needs as well as the supply and demand for dental services will vary considerably by state, the following recommendations address a number of common issues that may warrant state attention.

RECOMMENDATIONS

Implement or continue programs designed to improve the distribution of dentists to underserved areas.

The South has many rural and some inner-city areas that do not have adequate dental manpower. Carefully planned activities to influence students to choose to locate in the areas of need have been successful. It must be remembered, however, that in some remote rural areas the demand for dental services may be insufficient to support a dentist. Alternatives such as satellite clinics operated by dentists in neighboring communities have been useful in improving the availability of dental services in those areas that are persistently underserved.

Increase the number of general practice residency positions to at least 50 percent of the number of dental school graduates.

The need for increased access to general practice training is well documented. Dentists who have completed general practice residency training would be more likely to practice in remote areas. Although increasing the number of general practice residency positions in public dental schools will not reduce the cost of dental education, it will improve the overall quality of dental education and, ultimately, the quality of dental care. With declining enrollments in undergraduate programs, increasing the number of general practice residency positions could be accommodated with existing dental school faculties.

Allow enrollment levels of dental students to decline to reflect the demand for dental education.

Nationwide first-year dental school enrollments are likely to decline to approximately 4,500 from the current level of 5,300. Public dental schools in states that have restrictions on out-of-state enrollments may find first-year enrollments reaching critically low levels. These schools should be permitted to accept more out-of-state students

at increased tuition rates or to make increased use of interstate contract arrangements which would permit those dental schools to accept students from states with no dental schools or limited spaces. The sending states gain access to dental education for their citizens generally at less expense than would be involved in supporting a dental school.

Continue programs to attract and retain increased numbers of minorities in dental education.

Recent gains in minority enrollments in dental schools will be reversed as dental school enrollments continue to decline and there are further reductions in student loans and scholarships. Black Americans are likely to be the most affected by these changes. With black Americans comprising less than four percent of all practicing dentists, continued activities to insure access to dental education for black Americans will be necessary.

Assess the operational efficiency of state-supported dental schools.

Generally dental schools with low total undergraduate enrollments are more costly to operate; however, large enrollments do not assure operational efficiency. Many factors contribute to the total expenditures of dental schools, such as faculty time spent in teaching, the use of part-time faculty, the number and type of graduate programs, dental auxiliary programs, shared or independent basic science programs, and the schools' research and service programs. Each dental school maintains a data base that will permit an analysis of expenditures which can differentiate the costs of undergraduate and graduate dental education as well as the research and service programs. Using the results of such assessments, states would be in a better position to determine the best way to meet their dental manpower needs.

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