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Graduate School of Business
Center for Health Administration Studies (CHAS)
1101 East 58th Street, Walker 111
Chicago, Illinois 60637
(312) 702-7753

WORKSHOP IN HEALTH ADMINISTRATION STUDIES

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CHESTER DOUGLASS, D.M.D., PH.D.
Professor and Chairman
Department of Dental Care Administration
Harvard School of Dental Medicine

"Trends in the Market for Dental Services"

WORKSHOP PAPER

for

Thursday, October 20, 1988

Rosenwald 405

3:30 to 5:00 p.m.

Two additional articles by Dr. Douglass are available for those who are interested. Please See Annette Twells in Walker 111 for copies.

BALANCING DENTAL SERVICE REQUIREMENTS AND SUPPLIES: THE FUTURE REVISITED

by Antonio Furino, Ph.D. and Chester W. Douglass, D.D.S., Ph.D.

Introduction and Conceptual Approach

Major demographic, epidemiologic, and economic changes are having a dramatic impact on the dental profession, yet the discussion on the future of dentistry and, particularly, on the number of dentists needed in the twenty-first century, is often dominated by the experiences of dental professionals during the late seventies and early eighties. Then, the future is viewed as an extension of individual dentists' opinions and reports about the caries decline, economic fear, and the increased number of dentists during the past twenty years. With these partial views and short-term interpretations, trends paint a dim view of the dental sector.

In counterpoint to this view, we have extracted from the demographic, economic, and epidemiologic evidence, a contrasting picture of the twenty-first century. This exercise identifies the implications of dental care market trends for practitioners, educators, and policy makers. It also calls for greater cooperation among researchers in relating future dental care needs and demands to the number of dentists entering dental schools across the nation.

This paper posits that dental services requirements are determined by (1) the population at risk, (2) the incidence and prevalence of dental disease, (3) accepted standards of care, (4) attitudes and expectations toward dental health by the public, (5) consumer incomes, (6) availability of dental insurance, and (7) the availability of

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Dr. Furino is director and professor, Center for Studies in Health Economics, The University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, San Antonio, TX 78284-7907. Dr. Douglass is chairman and associate professor, Department of Dental Care Administration, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, MA 02115.

public assistance for lower income groups. Population and epidemiological trends are discussed in detail. We will assume no changes in number three -- accepted standards of care -- and report briefly on numbers four through seven, consumers' expectations, ability to pay, and third-party coverage. In the process of addressing dental service requirements, the supply of dental services is determined by (1) the quantity and quality of dentists and auxiliaries available, and (2) their productivity (that is, number of service units produced per hour of human and physical capital utilized) as determined by (a) the state of technology, (b) investments in physical capital such as dental office equipment, instruments and facilities, (c) the type of dental practice, and (d) the attitudes of dentists toward the income/leisure trade off. The number of dentists is the result of the number of graduating dentists, the number of retiring dentists, and trends in each of these two factors within present and future generations.

Consideration of the qualitative and quantitative similarities and differences in units of dental care likely to be offered by providers versus those demanded by consumers has been taken as an interacting single process, thus, avoiding the discussion of dental human resources and dental needs and demands independently. This viewpoint allows for an integrated theory regarding the matching of the quality and quantity of dental services offered with those needed and demanded by the public.[1] Short-term mismatches between the mix of services demanded and supplied (for example, the demand for fewer fillings in children and more periodontal treatment in adults) may present adjustment problems on the part of dental care providers, but these problems are of a different nature than those posed by the familiar issue of an oversupply of dentists.

The Perceived Oversupply

The issues receiving most publicity in discussions about the future of dentistry are those created by a perceived oversupply of dentists. Forbes magazine on August 13, 1984, suggested that "What's Good for America Isn't Necessarily Good for the Dentists." The article, based mostly on data and forecasts available in the early 80's and on telephone interviews with relatively few dentists, reduces the future of the profession and the quality of dental services to a "too-many-dentist," "too-little-decay" and, therefore, "delivery-of-unnecessary-services" formula.[2] As it is often the case, the general public perception of dentistry as a declining profession lingers in spite of more recent and optimistic views.[3]

The concern over a surplus of dentists is based on the observation that the number of active civilian dentists per 100,000 civilian population has increased twenty percent in fifteen years, from 46.9 in 1969 to 56.3 in 1984, and the fear that the rate would continue to increase to the point of disrupting the economic viability of the profession. This unattractive perspective is usually explained by citing reports of decreasing business and dentists' net income during the late 70's and early 80's and extrapolating the near and distant future from those data.[4] Another damaging perception is that the shrinkage of the pool of applicants to dental schools is mostly the result of the higher cost of dental education combined with the allegedly less attractive future of the dental profession. The decrease is then related to a possible deterioration in the quality of dental students and future dentists.

Demographic and epidemiologic changes are discussed only briefly in these reports, presumably because their effect on the demand for dental care is considered insufficient to balance present and future excess productive capacity created by the perceived oversupply of dental human resources. In our view, this line of thinking

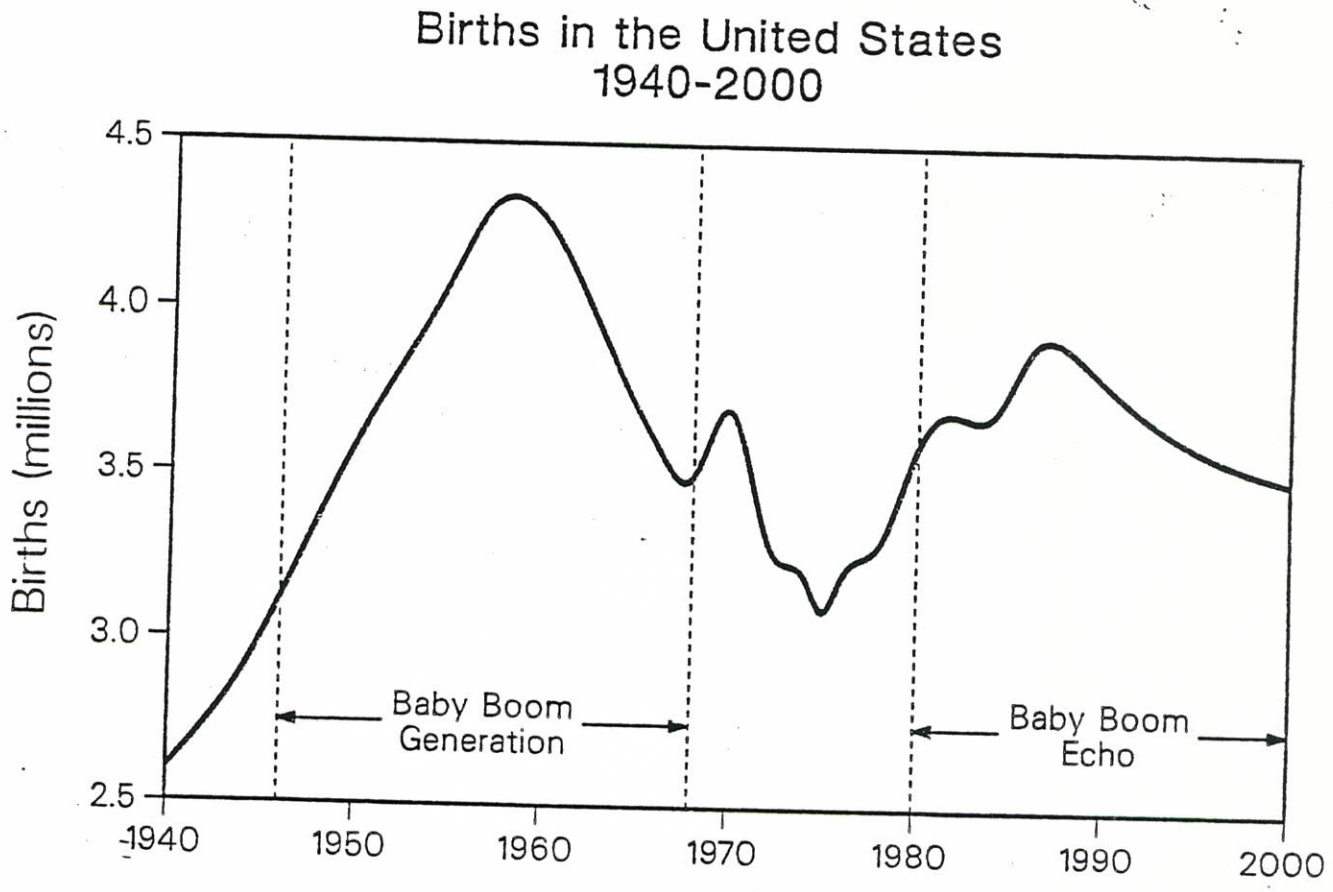
has been fallacious in part and misleading in general. Consider the following combination of factors and reasoning.

The Population at Risk

Two trends will account for dramatic changes in the structure of the nation's population over the next forty years. They are the increasing longevity of older adults and the maturing of an unusually large population group, commonly known as the "baby-boom generation," made of persons born between the years 1946 and 1964 following World War II. The "baby-boom generation" has captured national attention and continues to command adjustments in the allocation of economic resources as the needs of its members, progressing through life, change. Consequences of this phenomenon are the exceptional pressures on our educational facilities of the fifties and sixties, on the job and housing markets of the seventies and eighties and, finally, on the Social Security System of the twenty-first century. The "echo effect" of the baby-boomers, that is, the population group representing their offspring, has not been as large as anticipated because of lower birth rates during the late sixties and early seventies. However, births are on the rise again and, in strict numerical terms, there will likely be as many newly born in the late eighties than there were in the mid fifties (Figure 1). The second wave of the baby-boom phenomenon not only prolongs the expansion of dental needs, but will have a positive impact on the pool of dental school applicants.

Figure 2 shows the changes in five population groups or age cohorts from the year 1940 to the year 2020 and contrasts the relative importance of each cohort at the beginning and the end of the time period. The shift in relative importance of the population groups is clear. The younger cohorts are decreasing in importance (if not in absolute size) and the older population groups are increasing both in relative

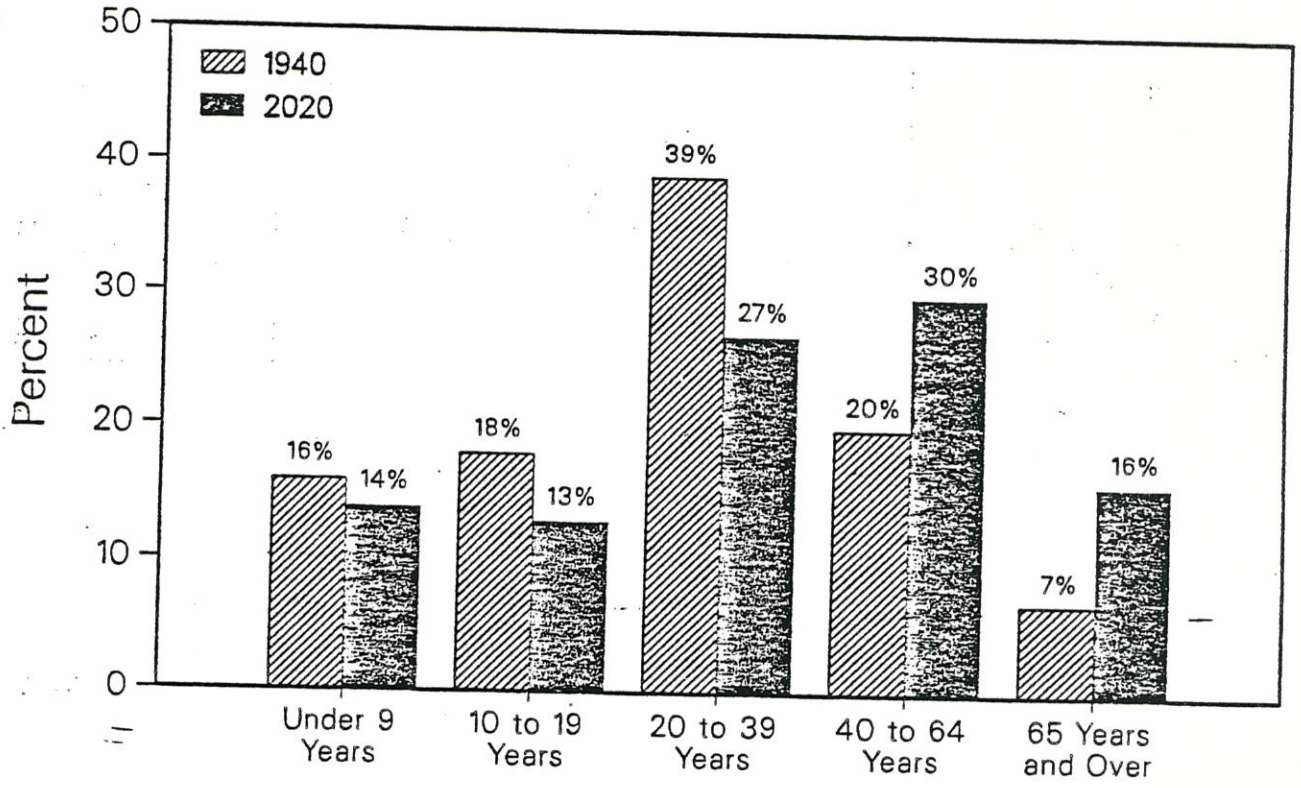
FIGURE 1



Source: U.S. Bureau of the Census, *Statistical Abstract of the United States: 1987*, pp. 15, 58.

FIGURE 2

Comparison of Selected Age Cohorts as a Percent of Total U.S. Population for the Years 1940 and 2020



Source: Bureau of the Census, *Decennial Census and Current Population Reports*. P-25 (SeriesII).

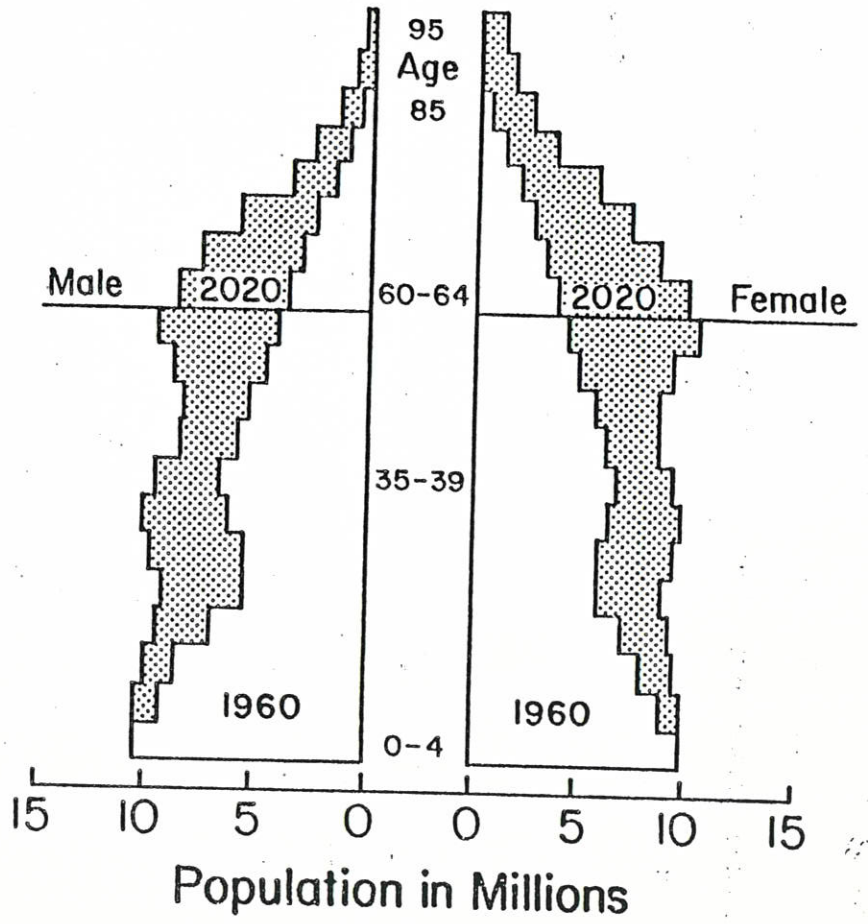
Pa-lao 193

and absolute terms.[5] The U.S. population is changing from a profile that looks like a pyramid, with the largest components made of the younger-age cohorts at its base, to a profile that looks more like a parallelogram with approximately the same proportion of people in the younger and older age groups. The graphic portrait of the age structure of the U.S. population in the year 1960 has been superimposed, in Figure 3, over a corresponding one for the year 2020. The shaded area depicts the estimated additional population at risk to dental diseases in that future year. These demographic changes have dramatic economic, political, and social consequences and affect the size and the composition of the universe of dental needs and of the market for dental care.

Changes in Disease Prevalence

Table 1 lists recent estimates of disease prevalence among the population at risk and their significance in terms of present and future need and demand for dental services. Recent children and adult epidemiologic studies indicate a decrease in fillings and simple extractions for children and the youngest adults. On the other hand, due to the growing number of older adults with teeth, unprecedented increases are expected in the demand for diagnostic services and preventive dentistry, the treatment of caries in adults, advanced periodontal disease, maxillofacial surgery, fixed prosthodontics, orthodontics, and endodontics. These projected changes combine epidemiologic findings with demographic estimates to show the market potential of dental services. Not only are the middle and older adult populations retaining more of their teeth, they are harboring higher expectations for good oral health. For example, between 1978 and 1983, the number of dental visits by persons sixty-five years of age and older increased by more than forty percent, and the number of older persons who visited a dentist within the year preceding the survey

Differences in the Age Structure of the U.S. Population 1960 and 2020



Sources : U.S. Bureau of the Census

FIGURE 3

TABLE I

PRESENT AND PROJECTED CHANGES IN THE EPIDEMIOLOGY OF DENTAL DISEASE AND THEIR IMPACT ON DENTAL SERVICES

DENTAL SERVICE	EPIDEMIOLOGIC CHANGES AND IMPACT ON DEMAND RATIONALE	DIRECTION OF CHANGE
DIAGNOSTIC	Insurance and PPO's will pay for diagnostic services in order to increase prevention and contain costs. In the year 2000, there will be approximately 50 million more people with teeth than in 1975 and more diagnostic services will be demanded.[6]	increase
PREVENTIVE	The demand for services aimed at preventing dental disease (use of prophylactics, fluoride, and sealants) will increase on the part of the general public and will be induced by third-party payers. There exist a growing interdisciplinary health promotion and disease prevention activities linking oral diseases to other health hazards (e.g. tobacco, nutritional counseling, diabetes).[7]	increase
CHILDREN AND TEENAGERS	Targeting of the caries-prone one-third of children and teenagers most at risk for intensive prevention will later decrease treatment needs but increase level of preventive care given earlier. More caries preventive programs targeting to teenagers and oral cancer programs targeted to high-risk elders are likely.	increase
SENIORS	Preventive programs in nursing homes[8] and general increasing use of services by the young elderly.[9]	increase
RESTORATIVE	A marked increase in the esthetic requirement and in the oral expectations of the public has increased the demand for restorative dentistry.[10] Attempts will be made to reduce the number of replacement restorations.	

Treatment of Coronal Caries		
CHILDREN AND YOUNG ADULTS	Dramatic decrease in the incidence of coronal caries among 5 to 17 year old persons.[11] However, the decrease has been mostly in untreated caries as the number of filled teeth stayed at constant level between 1971-74 and 1979-80 surveys.[12]	decrease
ADULTS	Decayed, missing, and filled teeth (DMFT) is similar in 1960-62 and in 1971-74.[13] While the decreased prevalence of enamel caries will reduce the need for both simple and complex restorations, as population groups increase in age and as more people retain their teeth, the need for root surface restorations and replacement fillings can be expected to rise.[14] 16.2% of filled surfaces have marginal caries in need of replacement restorations.[15] 40-50 year olds have the highest number of decayed and filled teeth of any age group.[16] Estimated 36-million hours of net increase in restorative dentistry between 1985 and the year 2000, producing a growth area in the profession.[17]	increase (in older adults)
Treatment of Root Caries		
ADULTS	A common disease among older adults. At least one root caries lesion in half of dental patients may be expected.[18] Demand for treatment of root caries will continue to increase as the older population groups become larger.	increase
ORTHODONTICS	Generally, demand has risen steadily during recent decades.[19] The growing esthetic expectations of the public will continue to reinforce this trend. Adult orthodontics will provide substantial new patient demands.[20]	increase
PERIODONTAL		
TREATMENT OF GINGIVITIS	Decrease in gingivitis between 1962 and 1986[21] due to better oral hygiene and preventative practices. Microbiological investigations have discovered different types of periodontal diseases requiring improved detection methods and treatment.[22]	no change

TREATMENT OF ADVANCED PERIODONTAL DISEASE	Roughly 20 percent of the entire population is likely to have some type of advanced periodontal disease.[23] In the near future, dentists are expected to spend proportionally more of their time in treating periodontal disease, and periodontal surgery is likely to stay steady or increase as the number of older adults with teeth increases.[24]	no change increase
OTHER		
FULL DENTURES	While the need per person is decreasing due to the higher percentage of dentulous adults, the dramatic increase in the number of older persons will sustain the demand for full dentures in the near future. In the longer term, the demand for full dentures will decline.[25]	decrease
ORAL SURGERY	Simple extractions will decline due to improved oral health. Extractions of third molars will not change. Maxillofacial surgery and implantology will be increasing.	decrease no change increase
REMOVABLE PARTIAL DENTURES	Likely to remain unchanged for a few decades and eventually decline in the early 21st century.	no change then decline
FIXED PROSTHODONTICS	The 45-64 age group will have a large increase in population. Retention of posterior teeth will increase the number of cases amenable to fixed prosthodontic treatment.	increase
ENDODONTICS	The increase in restorative and fixed prosthodontic treatment is likely to produce increased need in endodontic treatment because of the possible damage to the pulp chamber produced by the trauma the teeth must sustain. Also, endodontic treatment is an elective procedure in making overdentures.	increase
TEMPOROMANDIBULAR DISORDERS	Five percent of the 20 to 50 age population currently seek care for acute or chronic pain conditions affecting the temporomandibular joint and/or jaw muscles. Although the number of patients is small, the manpower requirements are great because of the complexity of these conditions. There is an increase in research and training directed at these problems. The numbers of patients seeking care is expected to rise.[26]	increase
RADIOLOGY	As new receptors are developed to decrease the patient exposure to radiation, and as the demand for diagnostic services increase, there will be greater use of radiography for both the diagnosis and treatment of dental disease.[27]	increase

expanded at almost the same rate.[28] To measure more accurately the magnitude of the combined impact on the dental professions of the demographic and the epidemiologic changes, Reinhardt and Douglass have recently estimated the number of teeth at risk to dental diseases over the next forty years.[29] Using the 1971-74 NCHS data on teeth per person and Bureau of Census population estimates, they calculate that there were 2.8 billion teeth present and at risk to dental disease in 1980. Then, using the 1985-86 NIDR national adult survey, which shows a substantial increase in the number of retained teeth by older adults, and the Bureau of Census population projections for the years 2000 and 2030, Reinhardt and Douglass found that there will be 4.4 billion teeth in the year 2000 and between 5.0 and 6.0 billion teeth by 2030. These projections may be conservative. The population estimate of 300,000,000 used for the year 2030 is likely to be low because the three components of population change -- national fertility rates, net immigration, and life expectancy -- have all been showing a tendency to increase.[30] If one compares the number of dentists per 100,000 civilian population with the number of dentists per 1,000,000 teeth at risk in the years 1980 and 2000, the revealing result, shown in Table 2, is that while the dentist-to-population ratio for the year 2000 (59.0) is still higher than the one in the year 1980 (53.5), the opposite is true for the dentist-to-teeth-at-risk ratio (43.3 in the year 1980 and 35.5 in the year 2000). The population growth combined with higher teeth retention simply overwhelms the increase in the number of dentists. This "amplified effect" of the population increase is not a passing phenomenon but a new trend that will affect dentistry and dental education for many years to come.

Economic Considerations

Since dental needs must be supported by buying power and matched with appropriate providers' skills in order to produce a patient/doctor encounter

TABLE 2

DENTIST-TO-POPULATION AND DENTIST-TO-TEETH-AT-RISK RATIOS
1980-2000

	1980	2000
Population	226,545,805 (1)	265,000,000 (2)
Active Civilian Dentists	121,200 (3)	156,300 (3)
Dentists per 100,000 civilian population	53.5 (4)	59.0 (4)
Teeth at Risk	2,800,000,000 (5)	4,400,000,000 (5)
Dentists per 1,000,000 teeth at risk	43.3 (4)	35.5 (4)

Sources: (1) U.S. Bureau of the Census, 1980 Census of the Population.

(2) Bureau of Economic Analysis, U.S. Department of Commerce, Regional Projections in Eric Solomon's Manpower Project Report No. 1, 1988.

(3) Health Resources and Services Administration, U.S. Department of Health and Human Resources. Sixth Report to the President and Congress on the Status of Health Personnel in the United States, 1988, pp. 5-26, 5-39.

(4) Computed using the data shown in the table.

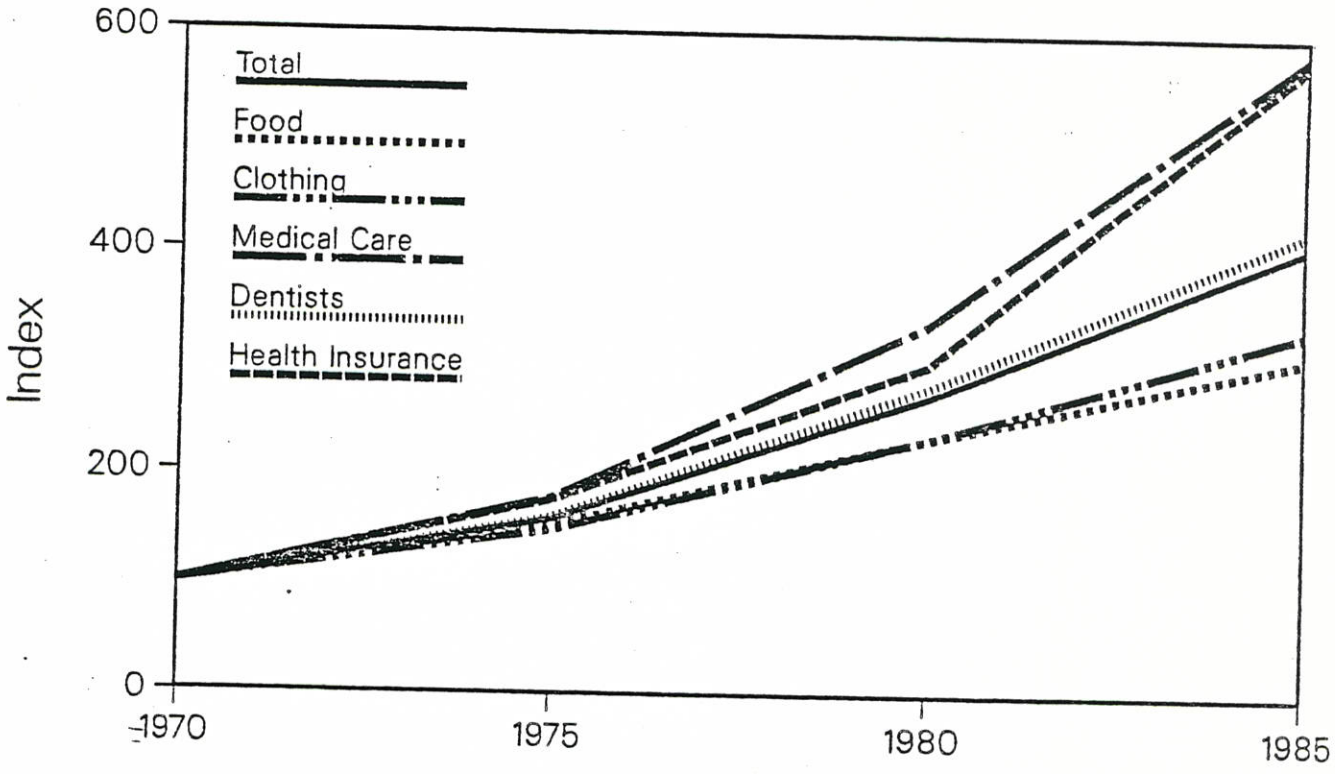
(5) Reinhardt, J. and Douglass, C.W. Department of Dental Care Administration, Harvard School of Dental Medicine. Unpublished Manuscript, 1988.

rewarding to both, economic factors have an important impact on dental services requirements and supplies. The buying power of users of dental services is determined mostly by their income and the degree of private or public insurance coverage. A good indicator of consumer buying power is per capita personal income in constant dollars, that is, the total income received by Americans divided by the population and adjusted to eliminate the effects of inflation. Data from the U.S. Bureau of Economic Analysis show that per capita income in the United States, in 1973 constant dollars, increased 1.4 percent yearly during the 1973-1983 decade, and it is projected to grow at an average 1.8 percent per year during the following seventeen years.[31] For the fifteen-year period between 1970 and 1985, the amount spent on dentists' fees increased slightly faster than total consumption and much faster than food and clothing (Figure 4).[32] This trend shows that consumers' expenditures for dental services have remained strong relative to other good and services and that the combined impact of population and epidemiologic changes described above has produced not only increases in dental care needs in the population at risk, but has stimulated increases in effective demand as well.

While the influence of dental insurance on greater dental care utilization and dental health has been documented in a study of the RAND corporation that included 4,815 dentate people between the ages of six and sixty-one years,[33] the actual impact of third-party payments on the quality and quantity of dental services demanded has not been sufficiently ascertained. Yet, the fact that as early as 1983 over 100 million Americans had private dental insurance and 20 million were enrolled in public insurance programs[34] would seem to indicate that the dental profession is somewhat protected against any large decline in demand. If the percent of persons holding dental insurance were to decline slightly, increases in the size of the population in

FIGURE 4

Changes in the Indexes of Personal Consumption Expenditures and Selected Components, 1970-1985 (1970 = 100)



Source: U.S. Bureau of the Census, *Statistical Abstract of the United States: 1987*, p. 422.

combination with the expected changes in buying power and consumer preferences should provide sustained growth in consumers' purchases of dental services.

Personal income and consumption expenditures depend on the strength of the economy. Even adopting a conservative view of the future and predicting modest growth (less than twe percent yearly) for the national economy during the next four years (to be followed by a recovery), with a demand for dental services gaining shares of personal expenditures, the economic base for a healthy dental industry is in place.[35] Regarding dentistry as a growth industry is consistent with the conclusions of Gotowka's analysis conducted in 1985[35] and those, a year later, of the Fifth Report to the President and Congress on the Status of Health Personnel in the United States by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services. The report states:

> "Forecasts of the explanatory demand variables (per capita income and population) indicate that the demand for dental care will in both scenarios (that is, one predicting a constant 3% increase in real income in 1989 and thereafter, and a pessimistic one assuming a decline in the annual real growth rate after 1990 to 1.9% in the year 2000) show a steady increase over the forecast period."[37]

Finally, the just released "Sixth Report" referring to the 1985-2015 period, confirms that:

> "Forecasts of the explanatory demand variables (per capita income and population) indicate that in both scenarios the demand for dental care will steadily increase over the forecast period."[38]

The report observes, however, that the growth in demand occurs at a lower rate of increase than the one characterizing the decade prior to 1985.

Increase in Prices?

Gotowka stated in 1985, "In contrast to other health professions, prices for dental services increased at a rate slightly below the general economy."[39] Understandably, those who fear an over supply of dental professionals became

concerned that the price change differential was in indication of greater than average competitiveness in the dental markets due to a surplus of dentists. As in the other instances discussed earlier, the concern is justified only when the data observed are those prior to the year 1981 and the trend is projected without incorporating subsequent evidence.

Indexes and yearly percent of changes of average consumer prices, prices of medical care, and prices of dental and physician services, are shown in Table 3 and Figure 5 from 1975 to 1986. The prices of dental services increased yearly at a slower pace than those for all other consumer items only for the years 1978 through 1981. After 1981, however, they have grown at a faster yearly rate than the consumer price index, and between 1983 and 1985, they accelerated faster than total medical care and physician services. In 1986, dental prices showed a smaller increase over the previous year, and they were outpaced for the first time since 1984 by total medical and physician services. Yet, on the average, they increased 3.6 percent points faster than the prices of all the commodities included in the consumer price index.

Is the evidence on the economic strength of the dental markets being reflected in financial rewards to the dental professionals? During the 1981-83 period, the mean net income of general practitioners increased 10.4 percent and that of specialists 13.9 percent. The consumer price index during the same period rose 9.5 percent. Mean dental net monthly fees, a reliable indicator of dental net income, increased 24.5 percent from 1986 to 1987 and exceeded, by a large margin, the 3.1 percent increase in the rate of inflation for the same period.[40] The 1987 practice survey conducted by Dental Economics reveals that "more dentists report movement into upper levels of income.[41] House states in a recent article in the Texas Dental Journal that "...for the first time in the last quarter century, the demand for dental

TABLE 3

CONSUMER PRICE INDEX (CPI) AND INDEXES OF MEDICAL CARE PRICES: 1975-1986

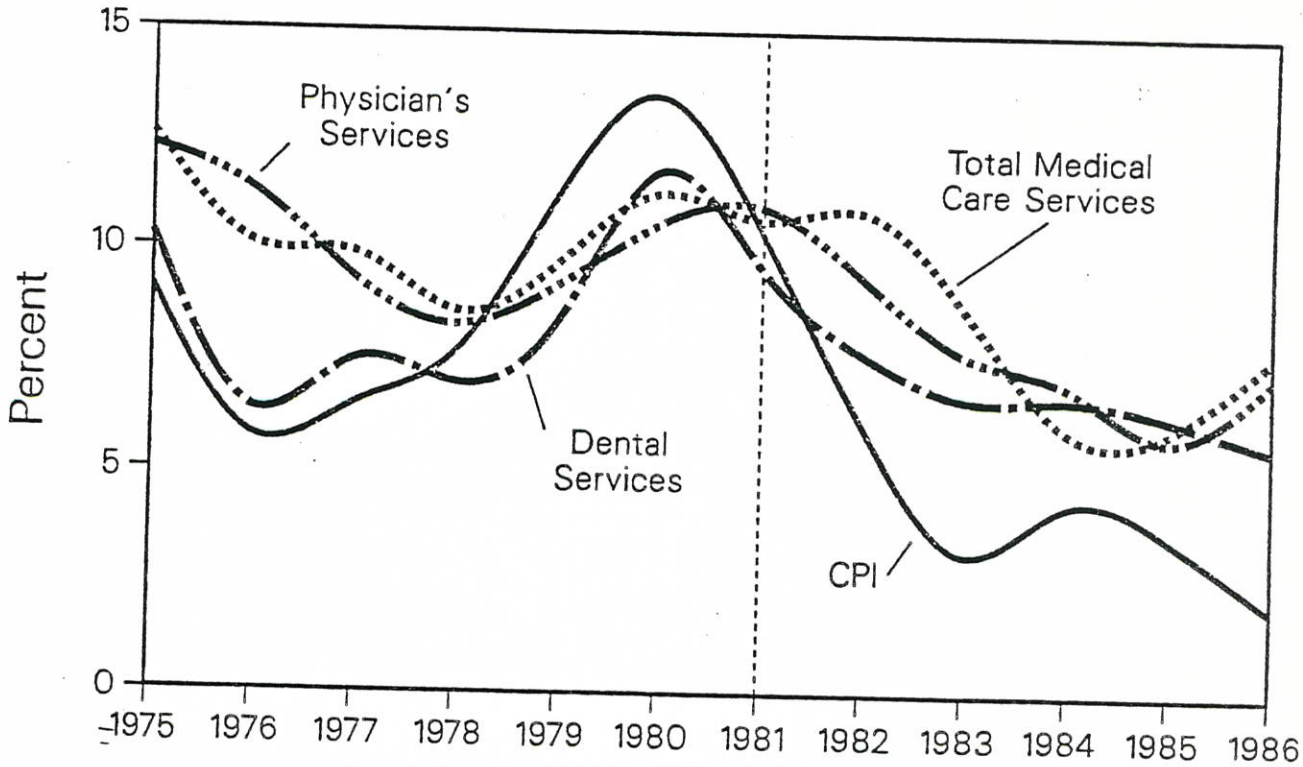
(1967 = 100)

	Dental Services		CPI All Items		Total Medical Care Services		Physicians Services	
Year	Index	Annual % Change	Index	Annual % Change	Index	Annual % Change	Index	Annual % Change
1975	161.9	10.3	161.2	9.1	179.1	12.6	169.4	12.3
1976	172.2	6.4	170.5	5.8	197.1	10.1	188.5	11.3
1977	185.1	7.5	181.5	6.5	216.7	9.9	206.0	9.3
1978	198.1	7.0	195.4	7.7	235.4	8.6	223.1	8.3
1979	214.8	8.4	217.4	11.3	258.3	9.7	243.6	9.2
1980	240.2	11.8	246.8	13.5	287.4	11.3	269.3	10.6
1981	263.3	9.6	272.4	10.4	318.2	10.7	299.0	11.0
1982	283.6	7.7	289.1	6.1	356.0	11.9	327.1	9.4
1983	302.7	6.7	298.4	3.2	387.0	8.7	352.3	7.7
1984	327.3	8.1	311.1	4.3	410.3	6.0	376.8	7.0
1985	347.9	6.3	322.0	3.6	435.1	6.0	398.8	5.8
1986	367.3	5.6	328.4	2.0	468.6	7.7	427.7	7.2

Source: U.S. Bureau of the Census, Statistical Abstract of the United States: 1988, pp. 91 and 451.

FIGURE 5

Annual Percent Change of Selected Price Indexes, 1975-1985 (1967 = 100)



Source: Table 3.

care will increase significantly faster than the supply of dental care. Patient loads will continue to expand as will dentists' earnings."[42] Recent releases from the American Dental Association report that mean net income for all independent dentists in 1986 equalled $76,050 and that between 1983 and 1986, dentists' mean incomes increased twice as fast (21.4 percent) than the "cost of living" (10.0 percent).[43] In a similar vein, the Sixth Report to the President and Congress on the Status of Health Personnel states: "Between 1983 and 1985, the consumer price index rose 8.0 percent, while the cost of dental services rose 14.9 percent."[44]

House concludes that the overall dental market is self-correcting and that improved earnings eventually will attract students back to the dental professions and to a new equilibrium between demand and supply of dental services. On that point we differ in part with House. Self-adjustments assume perfect knowledge among all the decision makers in the dental markets, and no economic or other barriers to the workings of the market mechanism. The differences of opinion, perceptions, and expectations about the dental profession found in the literature testify to the fact that knowledge is not perfect and that it varies among groups of consumers and decision makers. Limited knowledge, unequal access to third-party payments, and other peculiarities of the dental sector act as barriers to a free and equilibrium-seeking dental market. Therefore, adjustments may occur after long delays or, for a period of time, even in the wrong direction, and total reliance on market self-adjustments may produce large, dangerous, and enduring inadequacies in our ability to cope with the increasing dental needs of the public.

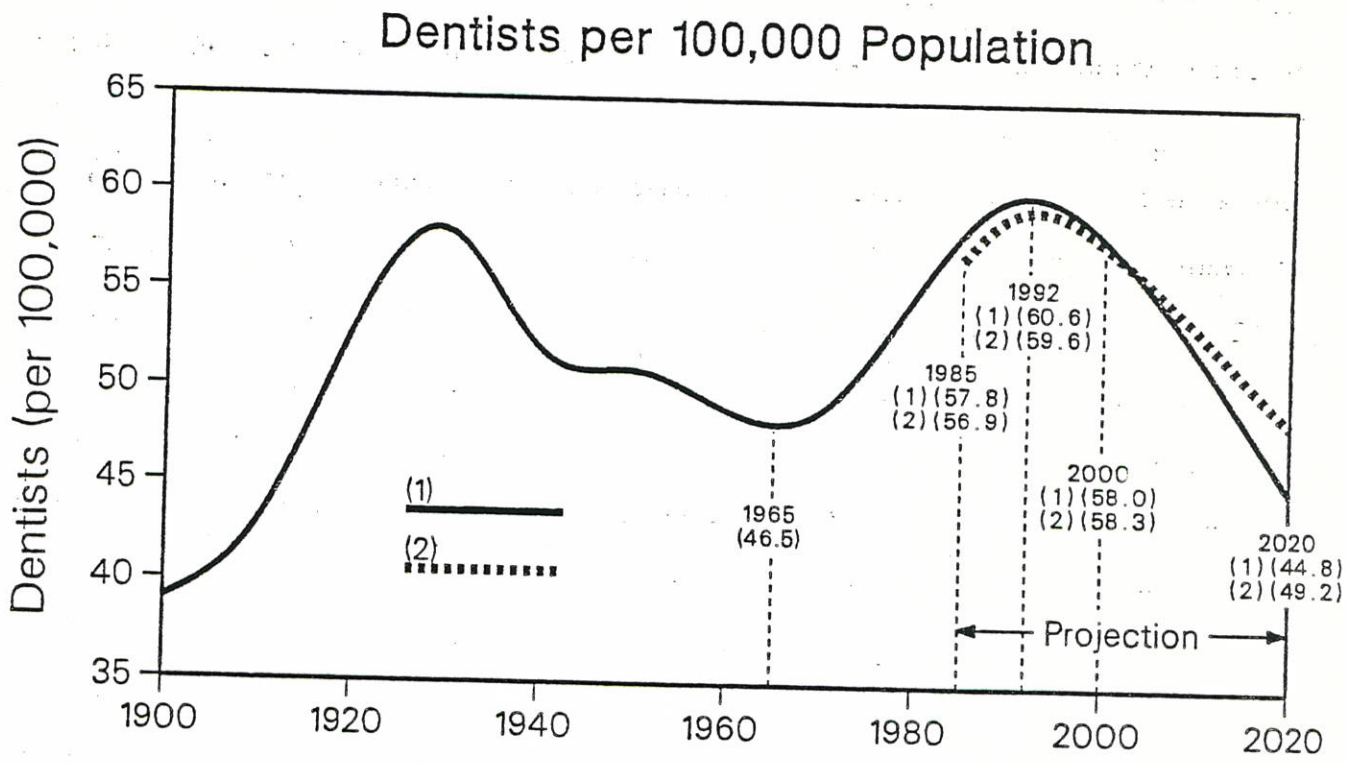
Adequacy of Future Supply?

The growth of the universe of dental needs, accompanied by an expansion of effective demand for dental services and observed increasing prices may be

signaling that effective demand for dental care is beginning to outrun the supply of dental services. Thus, some concern about the adequacy of available dental care providers to meet the future oral health needs of the nation seems to be warranted.

The Fifth Report on the Status of Health Personnel by HRSA indicates that in 1984 there were 132,750 active civilian dentists or 56.3 civilian dentists per 100,000 civilian population, the highest it has ever been. HRSA manpower projections, however, were criticized and considered of little usefulness because they were limited to the year 2000 and, by not extending far enough into the future, failed to register the impact of the current decline in dental school enrollment.[45] Projections of dental manpower that incorporate present data in dental school enrollment were recently made, to the year 2020, by Solomon using the American Association of Dental School's Manpower Model developed in cooperation with RRC, Inc. The projections (see Figure 6) show a rapid increase in the dentist-to-population ratio from 46.5 to 57.8 for the 1965-1985 period. The climb decelerates as it approaches 1993 (in other projections 1995 -- ADAS 1987) and then the change reverses its direction. This trend verifies the estimates made by Douglass in 1984.[46] The most recent projections made by anyone are those shown in the "Sixth Report" completed by the Health Resources and Services Administration in June 1988 and distributed in August of this year. Dentists-to-population ratios computed by Solomon and shown in the "Sixth Report" are plotted in Figure 6 and differ, in most years, only slightly (2 percent in 1992, 1 percent in the year 2000, and 10% in 2020). The differences are due in part to the use of different demographic estimates, and mostly to the assumption by HRSA that the number of first-year dental students will decrease during the next 10 years at about two-thirds the rate of the last 10 years, and then stabilize at 3,630 students (in 1996). Solomon, instead, argues that the overall trend in applicants is driven by demographic trends and that the declining number

FIGURE 6



(1) Solomon, E.S. "Dentists and Dentist-to-Dentist Population Ratios 1985-2020." *Manpower Project*. AADS, 1988.

(2) U.S. Department of Health and Human Services. *Sixth Report to the President and Congress on the Status of Health Personnel, 1988.*

of 20- to 22-year-old college graduates will produce a contraction of the level of first-year enrollees to 2,899 (in 1997).

The past twenty-three years of growth in dental human resources have been the source of much concern and debate. One must now note that when the expected dental school enrollment figures are extended to the year 2020, the horizon changes dramatically. After the turn of the century, the dentist-to-population ratio is seen as declining in twenty years to levels so low (49.2 or 44.8) that are equalled in the past only by data from the sixties or prior to World War I (Figure 6). In Table 4, the Solomon forecasts are compared with those made in 1986 and in 1988 by the Health Resources and Services Administration. While in all forecasts the dentist-to-population ratio peaks during the 1900-1995 period and then begins to decline, Solomon's ratio declines faster than HRSA's. The main reason for the difference is the fact that the HRSA 1986 forecast assumed a lesser decrease in the first-year enrollment at dental schools than the one that actually took place and that, as noted earlier, the more recent HRSA projections use the higher actual decrease but still assume a smaller-than-Solomon future reductions of the first-year enrollment. How fast and for how long the number of dental students will decline and whether it is affected uniquely by demographic trends or influenced in some degree by perceptions of career opportunities, is difficult to determine. However, in looking at all of the projections, it is obvious that the dentist-to-population ratio can be expected to decline after 1995 and that it could decline rapidly.

Whatever the decline in school enrollment, its impact on the overall dentist-to-population ratio will become more obvious and, possibly, very serious in about 20 more years when the large classes of dentists who attended dental schools during the 1970's will begin retiring from practice. Even with the adjusted but perhaps still high estimate appearing in the new report by the Health Resources and Services

TABLE 4

COMPARISON OF FORECASTS OF ACTIVE DENTISTS AND DENTIST-TO-POPULATION RATIO AADS MANPOWER PROJECT AND HRSA REPORT 1990-2020

	Manpower Project (1)		HRSA V Report (2)		HRSA VI Report (3)	
	Number	Ratio	Number	Ratio	Number	Ratio
1990	149,680	60.3	150,760	60.1	150,300	59.9
1995	154,456	60.2	156,800	60.2	154,800	59.6
2000	154,007	58.0	161,180	60.0	156,300	58.3
2005	151,661	55.1	N/A	-	156,300	56.7
2010	148,187	52.0	N/A	-	154,700	54.6
2015	143,433	48.5	N/A	-	151.100	52.0
2020	137,365	44.8	N/A	-	145,800	49.2

Source: (1) Solomon, E. Manpower Project Report No. 1, AADS, February 1988.

(2) Health Resources and Service Administration, U.S. Department of Health and Human Resources. Fifth Report to the President and Congress on the Status of Health Personnel in the United States, March 1986, pp. 5-34.

(3) Health Resources and Service Administration, U.S.Department of Health and Human Resources. Sixth Report to the President and Congress on the Status of Health Personnel in the United States, June 1988, pp. 5-39.

Administration (3,760 graduates in 1993 declining to 3,350 in 2020) there is likely to be a net loss of approximately 2,000 dentists between the years 2000 and 2010 (from 156,300 to 154,700) and of approximately 1,000 dentists a year in the following decade (from 154,700 in 2010 to 145,800 in 2020).[47] Other computations on requirements have estimated by the year 2000 a shortage of approximately 4,000 dentists. This projected shortage in the relatively short-term future is caused by a dental enrollment decrease of over 30 percent from 6,301 in 1978-79 to 4,370 in 1987-88, the equivalent of closing twenty dental schools with an entering class size of 100 each.[48]

Conclusions

When one considers the very large increase in the dentulous population and in the number of teeth at risk, it would seem that careful consideration must be given to endowing our dental care provider resources with strength and flexibility appropriate to the high probability of greater dental care needs and effective demand lying ahead. The data presented in this paper suggests that the expectation of decreased need for dentists will not occur because a reduction of future dental care needs is not supported by the currently available evidence. Even when considering the decline in dental caries in children, adolescents and young adults, the demographic and epidemiologic factors combined with attitudes and trends are substantially increasing the size and age of the population at risk. Longevity and increases in dentulous older cohorts dramatically affect the universe of dental needs. Whether the younger generations will have markedly less caries and will need less dental care as middle-aged and older adults has yet to be determined. In the meantime, a large increase in the dental care needs of current adults over the next 20 to 30 years is inevitable. Only close cooperation among practitioners, educators, and public policy leaders can help to prepare for such a challenging and demanding

future. Failing to do so could possibly result in the "sudden" realization of a large shortage of dentists at the beginning of the twenty-first century. The situation calls for special efforts in developing and maintaining appropriate data bases at the regional level so that accurate monitoring of both dental needs and available dental care providers may be possible.

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