

The Past and Future Evolution of the Dental Workforce Team

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Abstract: This article looks at changes in the number and mix of providers in the dental workforce over the past sixty years. First, enrollment trends in dental education programs are investigated. These educational programs feed directly into the dental workforce. Then, the changes in the dental workforce are examined. The focus of this investigation is the composition of the dental workforce and how the components of the workforce have changed over time. The forces that are responsible for these changes in the workforce are explored next. Finally, the possibility for workforce changes in the future is considered.

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The practice of dentistry, as well as dental education, has experienced significant changes over the past sixty years. During that period of time, dental practice has evolved from a cottage industry to an integral component of the health care system. These changes are reflected in a major shift in the number and mix of dental care providers. These changes and the forces that have promulgated them will be explored in this article. Finally, it will look to the future to see if more change to the dental workforce is in the offing.

Past and Present Members of the Dental Workforce

The completion of an accredited educational program is the entry requirement for licensure and practice for dentists and dental hygienists. The history and changes in their enrollment levels are integral to the understanding of the current dental workforce.

Dental Schools

There were fifty-seven U.S. dental schools in the year 1900¹ and sixty-one in 2011, but much has changed in the interim (Figure 1). Approximately half (49 percent) of the schools in 1900 were for-profit proprietary schools; the remaining schools were affiliated with a university (37 percent were private and 14 percent public institutions). By the 1930s, a system of accreditation was instituted. A consequence of this change was the demise of the proprietary school. In 1929, the last of the proprietary schools closed; then, all dental schools were affiliated with

an institution of higher education. Of the thirty-nine remaining dental schools, 72 percent were affiliated with a private university, and 28 percent were affiliated with a public university. New dental schools began to open in the post-World War II period, and by 1978, there were sixty accredited dental schools in the United States. Most of the new schools were affiliated with public universities or were former private schools that had joined a public university (42 percent were private and 58 percent were public institutions). Between 1987 and 1993, seven dental schools closed; all were private schools.

Since 1993, eight new dental schools have opened, bringing the total number of schools to sixty-one (38 percent private and 62 percent public). Another new school is scheduled to open in 2012, and three additional schools are planning to accept their first classes in 2013; these will bring the total number of U.S. dental schools to sixty-five. In addition, a number of universities are currently considering opening dental schools (Table 1).

The dental school applicant pool has had a significant influence on the number of dental schools and dental school enrollments.² The number of applicants to dental school began increasing steadily between 1960 and 1971: 104 percent total or 9.5 percent per year (Figure 2). Applicants to dental school rose even more rapidly between 1971 and 1975, to an all-time high of 15,734, an increase of 65 percent total or 16.3 percent per year. Most of these applicants were still male, but schools began to see increasing numbers of female applicants in the 1970s. There are a host of reasons for the surge in applicants including unfavorable employment conditions (students tend to extend their education during periods of high

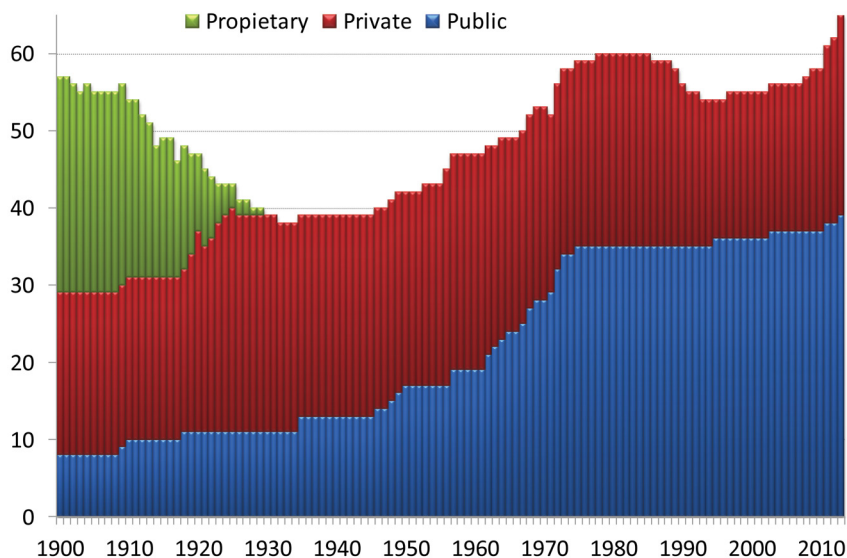


Figure 1. U.S. dental schools by type, 1900–2010

unemployment), the Vietnam War (deferment from the draft), and relatively low dental school tuition. Certainly, demographics played a role as the baby boom generation began graduating from college in the late 1960s into an increasingly competitive job market. Then, between 1975 and 1989, the number of applicants to dental school plummeted from 15,734 to 4,996, a 68.2 percent decrease. This decline was due to deteriorating economic conditions and a growing perception that dentistry offered limited career opportunities. In actual numbers, the applicant decline was largely due to a drop in male applicants; female applicants actually increased from 1,495 in 1975 to 1,782 in 1989.

Applicants to dental school have rebounded since 1989, almost doubling from 5,123 in 1990 to 9,829 in 1997, then falling to 7,267 in 2001. After 2001, applicants increased significantly to 13,742 in 2007 and remained above 12,000 until 2009, decreasing slightly to 11,872 in 2011. The representation of women in the applicant pool increased as well. In 1990, women represented 37.8 percent of the applicant pool. Women as a percentage of applicants peaked in 2009 at 47.2 percent, and they currently represent 46.7 percent of the pool.

Dental school enrollment generally follows a similar pattern to that of the applicant pool.³ Between 1950 and 1971, there was a steady increase in first-

Table 1. U.S. dental schools opened since 1997 and currently under consideration

Dental Schools Opened

- Nova Southeastern University, Fort Lauderdale, FL (1997)
- University of Nevada, Las Vegas (2002)
- A.T. Still University, Mesa, AZ (2003)
- Midwestern University, Glendale, AZ (2008)
- Western University of Health Sciences, Pomona, CA (2009)
- East Carolina University, Greenville, NC (2011)
- Southern Nevada University, South Jordan, UT (2011)
- Midwestern University, Downers Grove, IL (2011)
- Lake Erie College of Osteopathic Medicine, Bradenton, FL (2012)
- University of New England, Portland, ME (2013)
- University of Utah, Salt Lake City, UT (2013)
- A.T. Still University, Kirksville, MO (2013)

Dental Schools Under Consideration

- Texas Tech University, El Paso, TX
- University of Arkansas, Little Rock, AR
- Marshfield Clinic, Rice Lake, WI
- A.T. Still University, San Diego, CA
- Florida A&M University, Tallahassee, FL
- University of Central Florida, Lake Nona, FL
- Florida Atlantic University, Boca Raton, FL
- University of New Mexico, Albuquerque, NM
- East Tennessee State University, Johnson City, TN

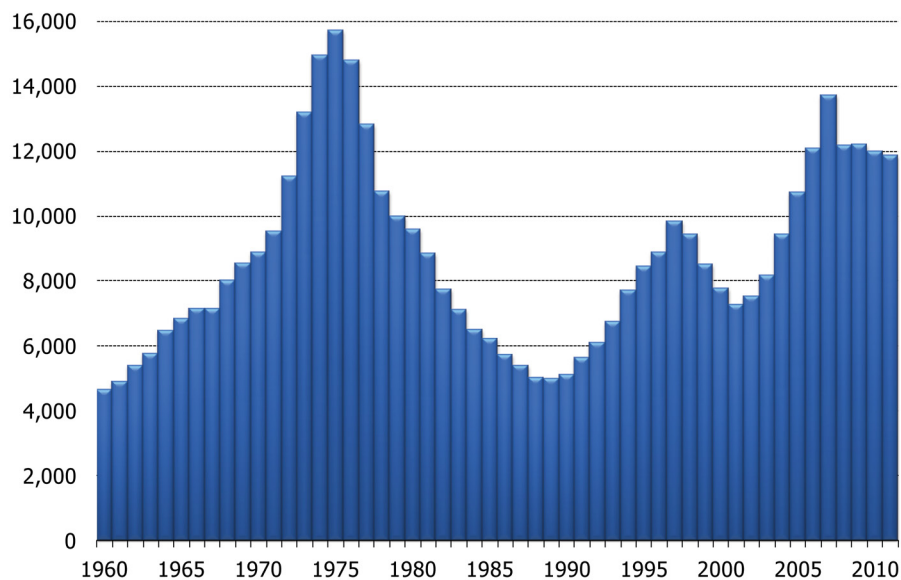


Figure 2. Applicants to U.S. dental schools, 1960–2010

year enrollment in dental schools, 47.1 percent total or 2.2 percent per year (Figure 3). The first-year enrollment growth rate then more than doubled between 1971 and 1978, increasing by 32.8 percent total or 4.7 percent per year. A significant amount of this growth can be attributed to a federal capitation program that began in 1972. Through this program, the federal government gave dental schools approximately \$251.5 million to build new dental schools, renovate existing schools, and provide incentives to increase enrollment. If this amount were adjusted for inflation, it would be close to a billion dollars today. These funds played a crucial role in updating the dental education infrastructure.

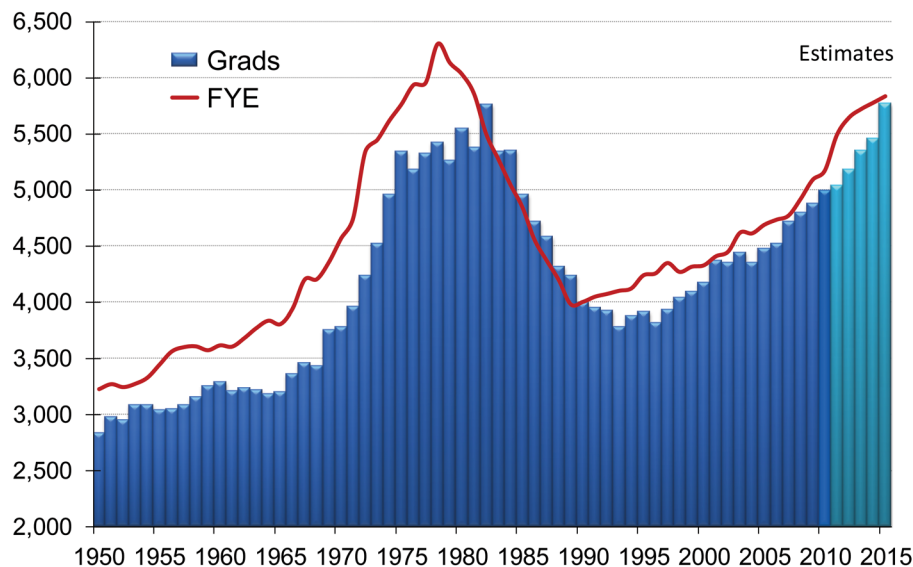
As enrollment increased, dental school graduates followed. Between 1950 and 1975, the number of dental school graduates increased by 2,506 (88.6 percent). Enrollment trends continued to follow the applicant trend through the late 1970s and the 1980s. First-year enrollment in dental school peaked in 1978 at 6,301 and then dropped to 3,979 in 1989, a decrease of 36.9 percent. Because of the enrollment buildup, dental school graduates did not begin to fall off until the mid-1980s. Between 1976 and 1985, dental schools graduated more than 5,000 dentists a year. By 1991, the number of dental school graduates had dropped to less than 4,000 (3,995). The drop in

applicants had a devastating impact on dental education. Schools struggled to fill their classes with quality students and were often forced to decrease class size. By the early 1990s, 12 percent of all U.S. dental schools had closed (seven schools); all of these schools were components of private universities. First-year enrollment in dental school followed the applicant trend upward after 1989.

Since 1989, first-year enrollment has increased 30.0 percent, from 3,979 to 5,171 (2010). Based upon historical trends and the opening of new dental schools, first-year enrollment in dental schools should increase to about 5,900 by 2015. Dental school graduates increased during this time period as well, by more than 1,000 from 3,778 in 1993 to 4,996 in 2010 (32.2 percent). Increases in enrollment will result in a projected increase in graduates to about 5,800 in 2015.

Dental Hygiene Programs

As a profession, dental hygiene came of age during the second half of the twentieth century. In 1950, there were twenty-six accredited dental hygiene programs in the United States, with a first-year enrollment of 862 and 529 graduates⁴ (Figure 4). Programs and enrollments grew steadily until the late 1970s. In 1978, there were 196 programs, with a first-



Source: American Dental Association, Survey of Dental Education, projection by E Solomon

Figure 3. First-year enrollment and graduates of U.S. dental schools, 1950–2015

year enrollment of 5,706 and 5,149 graduates. For the next decade, enrollments fell in a similar manner to dental school enrollments. In 1988, the first-year enrollment in dental hygiene programs was 4,883 (a 14.4 percent decline), and the number of graduates had fallen to 3,904 (a 24.2 percent decline). Since 1988, programs and enrollments have risen steadily. In 2010, there were 323 programs, with a first-year enrollment of 8,007 and 7,000 graduates.

Dental Assisting Programs

Although not a job requirement, many dental assistants complete an accredited dental assisting program to develop their skills and improve employment opportunities. First-year enrollment in accredited dental assisting programs has expanded dramatically over the past two years, from 8,633 to 10,390 (20.4 percent). Graduates of these programs increased from 6,110 in 2008 to 7,294 in 2010 (19.4 percent). Since 1999, first-year enrollment in dental assisting programs has increased by 75.8 percent.

Dental Personnel in the Workforce

Dental personnel in the workforce have typically been classified as dentists, dental hygienists,

dental assistants, and other dental personnel. The category of “other personnel” represents individuals who are working in a dental practice but not a member of the other categories. Jobs in this category include, but are not limited to, secretaries, receptionists, financial coordinators, office managers, and sterilization assistants.

The number and mix of these individuals has changed dramatically over the past sixty years⁵⁻¹¹ (Figure 5). In 1950, there were a total of about 157,000 individuals working in dental practices in the United States. Over half (51 percent) were dentists, 2 percent were dental hygienists, 35 percent were dental assistants, and 11 percent were other staff. Since 1950, the number of dentists has more than doubled (an increase of 118 percent), but other staff members have increased at a far greater pace.¹² The number of dental assistants has increased more than fourfold (433 percent), other dental personnel have increased from about 17,000 to about 181,000, and dental hygienists increased from about 3,200 to almost 178,000. Total dental office personnel now totals about 927,000 individuals. In terms of distribution, less than 20 percent of these individuals are dentists, and there are about the same number of dental hygienists as there are dentists. Dental as-

sistants make up about one-third of the practice staff, and other dental personnel comprise the remaining 30 percent. American Dental Association (ADA) survey data reflect these changes. In 1949, there was an average of 0.81 staff members per dentist, and

over one-third of dentists had no staff at all (34.4 percent). The average number of staff members per dentist had risen to 4.7 by 2008.

A variety of factors have influenced the changes in the dental workforce; among them are major eco-

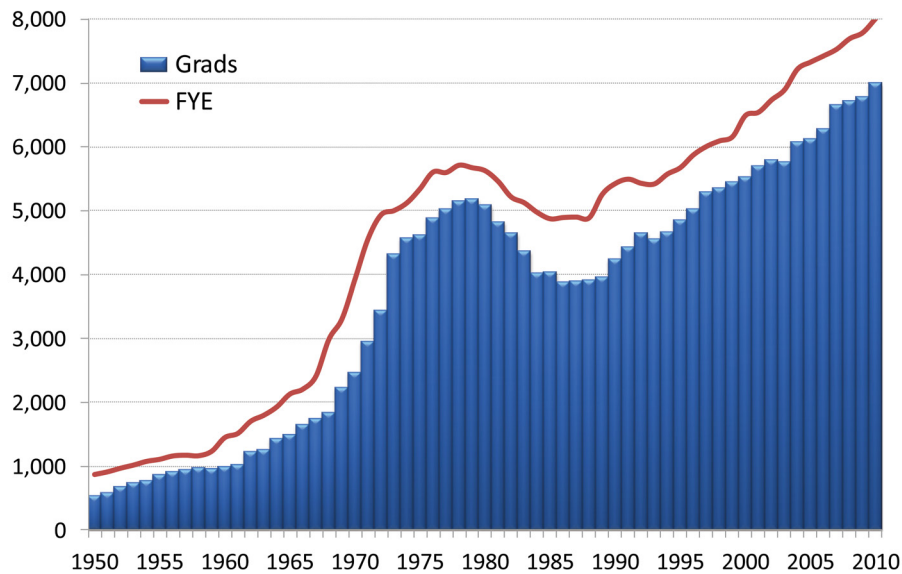


Figure 4. First-year enrollment and graduates of U.S. dental hygiene programs, 1950–2010

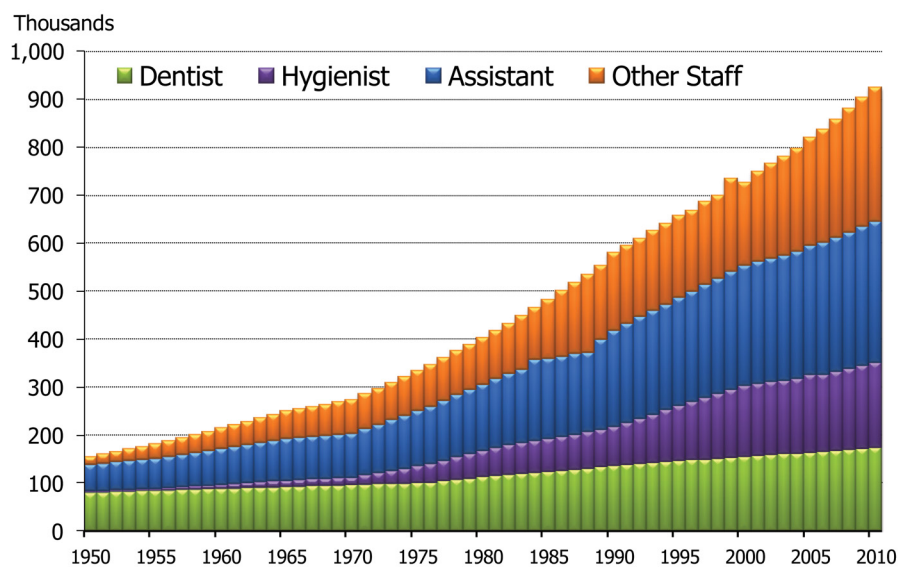


Figure 5. Dental personnel in the U.S. labor force, 1950–2010

conomic cycles. Two of the most well-known measures of the economy are the unemployment rate and the rate of inflation, reported by the U.S. Bureau of Labor Statistics (www.bls.gov/home.htm). Since 1950, the average annual unemployment rate has been 5.7 percent; however, there have been periods when the unemployment rate has been much higher (Figure 6). For instance, from the mid-1970s to the early 1980s, the unemployment rate was frequently above 7 percent. In addition, the unemployment rate has been very high from 2009 through 2011. These periods of high unemployment can be associated with recessionary periods as well. High unemployment rates often have a negative impact on dental practice since routine dental care is often deferred when an individual is not earning an income. There are times, however, when high unemployment rates have a positive impact on applicants to the health professions. When jobs are tight, college graduates often elect to further their education, so enrollment rates in all graduate areas tend to increase during these periods of time.

Periods of high inflation occur less frequently, but can have a very negative impact on dental practice and enrollment levels. Since 1950, the average annual inflation rate has been 3.7 percent; however,

there have been times when the inflation rate has been much higher (Figure 7). During the period from the mid-1970s to the early 1980s, the inflation rate was frequently above 8 percent and reached double-digit levels four times. High inflation rates have a negative impact on dental incomes because dentists often have a difficult time increasing their fees to match the inflation rate increases. During these periods, dental incomes often fall relative to increases in the rate of inflation. High inflation rates also have a negative impact on dental program enrollments. Virtually all dental students must borrow to fund their education. During periods of double-digit inflation, the cost of borrowing soars and can discourage some students from pursuing a career in the health professions. The period of severe applicant decline from the mid-1970s to the late 1980s is largely coincident with this period of high inflation.

Changing disease patterns in dentistry, specifically, the decline in dental caries, has also had an impact on the number and distribution of dental staff. Decayed, Missing, or Filled Surfaces (DMFS) of permanent teeth in children have declined significantly since the early 1970s.¹³ Average DMFS in permanent teeth among children aged five to seventeen years decreased from 7.1 in 1971 to 2.5 in 1991 (a decrease

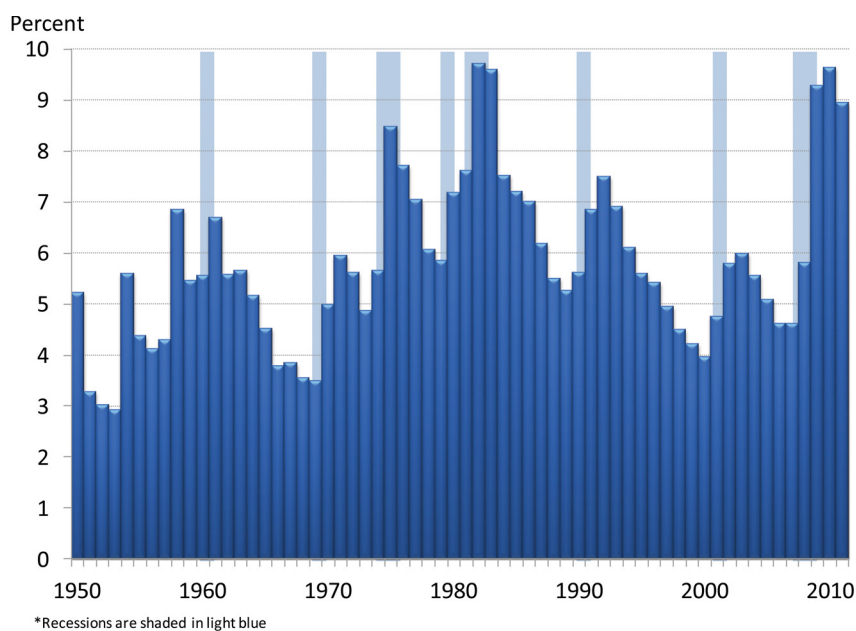


Figure 6. U.S. overall unemployment rate, 1950–2010

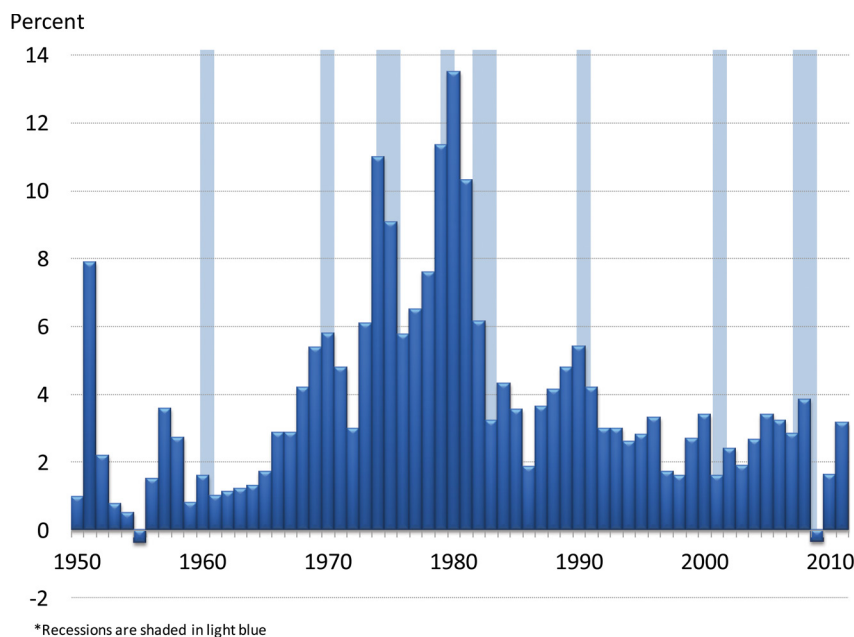


Figure 7. U.S. inflation rate, 1950–2010

of 65 percent). In addition, the average DMFS in permanent teeth among children and adolescents six to nineteen years of age decreased by 17.4 percent between 1988–94 and 1999–2002. Fluoridation of the water supply and a greater awareness of the benefits of good oral care were likely the principal reasons for this decline in caries. Since the late 1970s, the percentage of the public water supply that has been fluoridated has increased from about 40 percent to 72.4 percent.¹⁴ Routine visits to dentists have increased as well. In 1950, just under one-third of the population had an annual dental visit. In 2002, the percentage of the population with an annual dental visit peaked at 67.1 percent of the population. Since 2002, the percentage of the population with an annual dental visit has declined slightly to 65.4 percent in 2009. As one might expect, there is evidence that the decline in childhood caries has translated into less dental disease and the corresponding need for restorative treatment in the adult population.¹⁵

Changing disease rates have had an impact on the distribution of procedures performed in dental offices over time. In 1959, 42 percent of these procedures were diagnostic or preventive.¹⁶ By 2005, 74 percent of the procedures performed by general dentists were diagnostic or preventive.¹⁷ These changes

along with the increased need for sterilization protocols and other regulatory requirements help to explain some of the significant changes we have seen in the distribution of staff in dental offices.

Staffing increases have had a significant impact on the productivity of dentists. Based upon Centers for Disease Control and Prevention (CDC) and U.S. Census Bureau data, there were fewer than 50 million annual dental visits in 1950. These visits increased fourfold to just over 200 million by 2009. Therefore, there were about 631 dental visits per dentist in 1950 and 1,172 visits per dentist in 2009, an 85.6 percent increase.

Future of the Dental Workforce

In the near term, the dental workforce is not likely to continue the diversification we have seen over the past half-century. According to the ADA's 2009 Survey of Dental Practice,¹⁸ "The average number of full- and part-time non-dentist staff members per dentist employed by independent dentists has not changed during the 2004 to 2008 time period." Pressure to contain the cost of dental services is a

likely reason why dentists have not been hiring more staff. Over the past three decades, the cost of dental services has risen significantly. The relative cost of goods and services over time can be measured with the Consumer Price Index (CPI). Between 1985 and 2011, the cost of all goods and services (the overall CPI) increased by 109 percent. In other words, the cost of all goods and services more than doubled over this time period, while the cost of medical services increased by 200 percent. In comparison, the cost of dental services rose by 258 percent over this time period.¹⁹ Therefore, a dental visit that cost \$100 in 1985 would now cost \$358. The increased rigor of the sterilization protocols in the dental office along with the increased staffing probably accounts for most of this rise in cost. One of the ways dentists can control their costs is to limit the number of staff members in the dental office. Therefore, it is not surprising that the number of staff members per dentist has not increased. The recent recession and its aftermath are likely to continue this trend for some time.

The development of mid-level providers has been a topic of much discussion. To a large degree, the discussion has focused on the scope of activities these providers would perform. In terms of the potential impact of mid-level providers on the dental workforce, only those providers who are licensed to perform irreversible dental procedures and administer local anesthesia would likely have any impact on the dental workforce. These providers would then be able to perform some of the functions currently administered by dentists. The development and employment of mid-level providers are functions of economics. Mid-level providers would only have a significant impact on the dental workforce when their entry-level salaries are significantly lower than the entry-level salary for a dentist and if the practice has a sufficiently large patient population that some of the traditional activities of the dentist could be shifted to the mid-level provider. Then, some cost savings could be realized that would provide an economic benefit to the employment of a mid-level provider.

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