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A Review of the Literature: The Economic Impact of Preventive Dental Hygiene Services

Stull C Sharon, Irene M Connolly and Kellie R Murphree

Sharon C. Stull, BSDH, MS, is a dental hygiene instructor and community health liaison; and Irene M. Connolly, BSDH, MS, is a dental hygiene lecturer; both are at the Gene W. Hirschfeld School of Dental Hygiene at Old Dominion University in Norfolk, Virginia. Kellie R. Murphree, BSDH, MS, is an associate professor in dental hygiene at Austin Community College in Austin, Texas.

The contributions of dental hygiene as a discipline of prevention, the inception of systemic fluoride in community water systems, the continual research conducted by the National Institute of Dental and Craniofacial Research (NIDCR), and the success of dental sealants have all contributed to the decrease in incidences of dental diseases. The prevalence of employer-based dental insurance must also be recognized as contributing to a substantial paradigm shift on the utilization of oral health preventive services. This review of the economic impact of oral health preventive services on the consumer and the private dental practice suggests that these services have had a significant impact. Dentistry's challenge remains to extend these considerable gains in oral health status to the 150 million U.S. citizens who do not have access to oral health care services identified in the 2000 Oral Health in America: A Report of the Surgeon General. Utilizing preventive, therapeutic, and educational aspects of dental hygiene services, reaching communities without fluoridation of the public water supply, and incorporating mass pediatric dental sealant programs analogous to immunization programs would improve the oral health status of underserved populations.

Keywords: Consumer demand, cost-effectiveness, supply, outcome, price, third-party payer, utilization

Introduction

Dental hygienists are oral health professionals whose primary concern is the promotion of total health through the prevention of oral diseases. Since 1913, dental hygienists have made an impact on oral health through education and therapeutic preventive services.¹ According to information released in 1993 by the Coalition on Oral Health, every dollar invested in preventive oral health care saves between \$8 to \$50 in restorative care.² However, oral health care professionals have engaged in preventive health care-related decisions without documenting or maintaining records of the economic impact of such decisions.³

Since the inception of third-party dental insurance programs, which have increased the economic base in most dental practices, oral health care professionals have become more aware of the financial and reimbursement issues that affect the cost of oral health care. Lack of preventive dental services often results in more expensive oral health care treatments, such as restorative, endodontic, and surgical procedures. Actively promoting preventive oral health care services may result in long-term savings of health care dollars by avoiding more costly dental procedures.

In an effort to explore the economic impact of preventive dental hygiene services, three assumptions can be made. First, money spent on preventive oral health care results in an overall savings of health care dollars to the consumer, which in turn contributes to long-term health benefits, realizing an even greater savings to the consumer. Second, the small business private dental practice, where the majority of preventive oral health care services are provided, has experienced a strong economic base, due in part to third-party dental insurance programs. Lastly, national health care dollars have been saved by utilizing preventive dental hygiene services. However, according to the Surgeon General's report on oral health, disparities exist for 150 million underserved individuals who have little or no access to preventive oral health care services.⁴ This socioeconomic challenge to evenly distribute oral health care services has adversely affected the national supply of health care dollars by spending monies towards programs that will increase the scope of care to underserved populations.

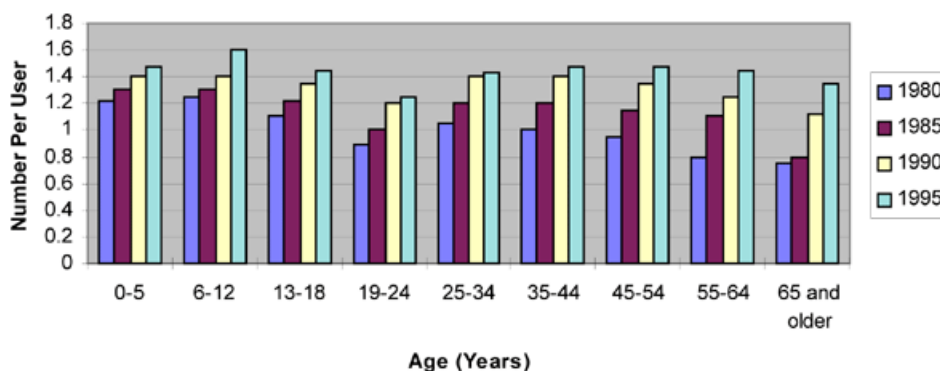
The economic perspective of preventive dental hygiene services has not been specifically documented as a cost-effective preventive treatment modality; therefore, limited research studies have been conducted to reveal the specific economic and health benefits to society. The American Dental Hygienists' Association (ADHA) is keenly interested in research to describe the cost effectiveness of the utilization of dental hygienists. Such advanced research would help to validate the impact of preventive dental hygiene services on the oral health of Americans.

This review of the literature addresses the economic effects on the consumer demanding preventive oral health care services and on the small business private dental practice, whose dual mission is to increase profit margins and provide services that increase oral health. This review also addresses the economic implications that preventive oral health care services would have on decreasing the disparities in access to oral health care for underserved populations.

The Economic Impact of Preventive Dental Hygiene Services on the Consumer

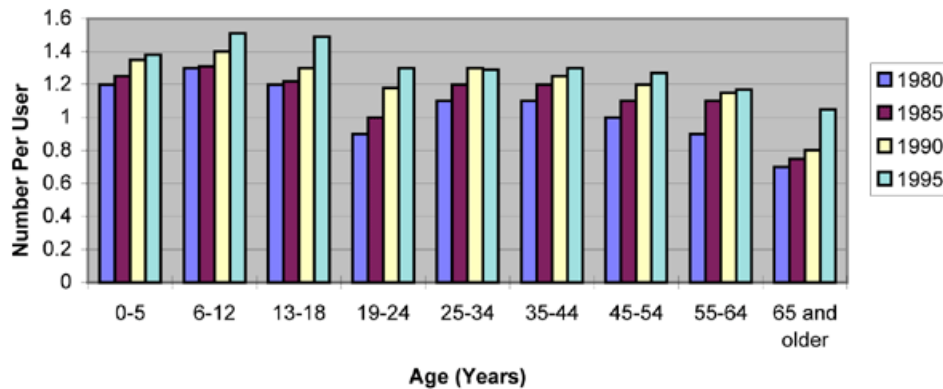
Today, the increasing utilization of third-party insurance programs and dental health maintenance organizations has had a substantial impact on U.S. oral health care delivery and the financial marketplace. Since the establishment of these programs, consumers have seen increased financial access to dental services not available prior to 1960. Out-of-pocket payment and payment through employer-based dental insurance benefits have financed more than 94% of all dental expenditures.⁵

Because of increased insurance coverage, the patterns of dental care reveal profound improvements in the oral health status of most Americans. A 1997 twin longitudinal study evaluated the trends in dental care among insured Americans from 1980 to 1995. The authors defined their sample of 750,000 dental insurance claim records from Delta Dental of Michigan as individuals who filed at least one claim a year. The results indicated an increase in oral examinations and prophylaxes from one visit per year in 1980 to nearly 1.5 visits per year in 1995 (Figures 1 and 2).



Source: Eklund SA, Pittman JL, Smith RC. Trends in dental care among insured Americans: 1980-1995. J Am Dent Assoc. 1997;128:171-178.

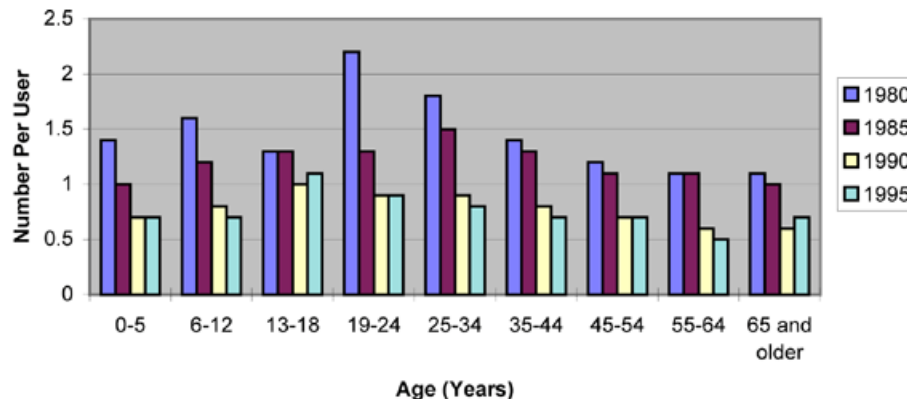
Figure 1. Changes in the Use of Oral Examinations (1980-1995).



Source: Eklund SA, Pittman JL, Smith RC. Trends in dental care among insured Americans: 1980-1995. *J Am Dent Assoc.* 1997;128:171-178.

Figure 2 . Changes in the Use of Prophylaxes (1980-1995).

The results of the study also showed that restorative work, identified as amalgam and composite resin, experienced a significant drop over the 15 years studied. The results indicated a decline from a peak of 1.5 to two restorations per user per year in all age groups to one or fewer restorations needed per user per year (Figure 3).



Source: Eklund SA, Pittman JL, Smith RC. Trends in dental care among insured Americans: 1980-1995. *J Am Dent Assoc.* 1997;128:171-178.

Figure 3 . Changes in the Use of Amalgam and Resin Restoration (1980-1995).

Similar data revealed a significant decrease in simple extractions and full and partial dentures. Eklund et al. suggested that the findings explain the slower growth in dental expenditures. This explanation is consistent with American Dental Association (ADA) data, which indicate that the number of restorative services provided by U.S. dentists declined from 233 million in 1979 to 202 million in 1990, and that the decline is attributed, in part, to improved oral health.^{6, 7}

In another study on consumer dental expenditure savings, the American consumer saved more than \$39 billion (1990 dollars) in dental expenditures from 1979 to 1989.⁸ As the main reason for the savings, the review of literature identifies the effective prevention of dental diseases from increased scientific knowledge of the biological and behavioral factors that cause oral diseases. The authors utilized the Department of Commerce per capita dental expenditures, adjusted for inflation, from 1950 to 1978. Dental expenditures grew at an annual rate of 3.3% during that time period. Since 1978, however, growth in per capita real expenditures has been at a virtual standstill with an annual rate of 0.16% (Figure 4).⁹

1960	\$ 65.85
1970	\$ 95.85
1978	\$123.19
1980	\$120.37
1982	\$126.50
1984	\$122.45
1986	\$123.42
1988	\$125.86

Source: Bureau of Economic Analysis. National income and product accounts of the United States, 1929-1982. Statistical tables. Washington, D.C.: U.S. Government Printing Office; 1986.

Figure 4 . Per Capita Dental Expenditures From 1950-1978 (1990 dollars).

The flattening of the growth in all dental expenditures had prompted debate about the possible factors that may be driving the slowdown. To determine the decline in dental expenditures, the study considered both supply and demand theories of economics and non-economic factors such as dental plaque removal, decrease in refined sugar consumption, and ingestion of systemic fluoride. On the demand side of the dental market, dental insurance programs covered an increased percentage of dental expenditures. On the supply side, the dentist-to-population ratio increased during the study, meaning more dentists were available to serve the consumer.

The non-economic factors considered in this study greatly improved oral health. An approximately one-third decline in dental caries among children was first demonstrated between 1971 and 1974 by a National Institutes of Health (NIH) survey of school children.¹⁰ Evidence of another one-third decline occurred in a second NIH survey in 1986, when dental expenditures remained constant. The regression analysis utilized in this study determined that a significant structural shift in per capita real dental expenditures occurred. The authors did not identify with certainty the sources of this structural shift, but the shift is consistent with the general improvement in oral health documented by recent epidemiological surveys.⁴ In turn, the improvement in oral health reflects the development of more effective oral health preventive methods that emerged from a sustained agenda of dental research and the adoption of these methods by dental professionals.⁸

These two literature reviews provided congruent information that addressed the economic impact of preventive dental hygiene services to the consumer. Not only have preventive oral health care services increased since 1980, contributing to less restorative work, but the amount of money spent on more costly dental procedures is also considerably less. The authors suggest that if this trend continues, preventive dental hygiene services will become a predominate demand of most clients and the implications to the small business dental practice will be significant by this major transition in dental services needs and demand.⁸

The Economic Impact of Preventive Dental Hygiene Service on the Dental Practice

More than 91.7% of all dentists in the United States practice in privately owned practices.⁴ These dental practices are small business entrepreneurship that have a dual mission of increasing their profit margins while, at the same time, providing oral health care services. Consequently, these businesses are highly sensitive to the peaks and valleys of activity that normally occur as part of each economic cycle. On the demand side of the dental market, several economic factors can stimulate per capita dental expenditures. One of the most significant trends in the modern dental market has been a higher percentage of dental expenditures covered by dental insurance. Historically, most dental services were paid in an out-of-pocket payment system that by 1960 accounted for nearly 98% of all dental expenditures.⁴ Since the inception of the third-party insurance program, the accessibility and financing of dental services has increased, allowing 70% of all Americans to utilize dental services annually.¹¹ Of the individuals with private dental insurance, 70.4% reported seeing a

dentist in the past year, compared to 50.8% of individuals without dental insurance. Dental insurance has made the greatest economic impact on the small business dental practice by increasing financial access and dental utilization.

Ninety-eight percent of the dental claims from the three most prominent dental insurance companies-Delta Dental, Anthem-Blue Cross/Blue Shield, and United Concordia-provide 100% coverage for preventive oral health care services (Wes Joynes, senior executive for Delta Dental of Virginia; personal communication with author, October 2001). This particular preventive benefit has impacted dental practices by broadening the clientele base and increasing the dental hygiene profit margins in some dental practices, especially when the licensed dental hygienist performs at least 20% to 25% non-surgical periodontally related services daily (Annette Linder, RDH, president of Capital Associates; personal communication with author, November 2001).

To determine dental hygiene profit, a conservative dental hygiene model used in most dental profitability surveys applies the "times three theory." This theory states that whatever salary a licensed dental hygienist earns should be multiplied by three to determine the gross cost structure. This structure represents one-third cost for dental hygiene salary, one-third cost for the dentist's time, and the remaining third for the overhead expenses utilized by the licensed dental hygienist. Any charge to the consumer or provider greater than the amount identified in the "times three theory" reflects profit (Charles Blair, DDS, president of Dr. Charles Blair and Associates, Inc., and Anne Linder, president of Capital Associates; personal communications with author, November 2001). Dentists who regard dental hygienists as significant providers of oral health services will see profit margins increase in their dental practices if the appropriate care and clinical excellence is applied to the consumer.¹³

Accordingly, preventive dental insurance coverage has impacted the oral health status of Americans who utilize the benefits from their dental programs. The twin longitudinal study evaluated the trends in per-patient gross income to dental practices from 1980 to 1995.¹⁴ The data suggest that a potential transition is underway in the types of dental care services being demanded by insured clients. Utilizing the same sample of 750,000 insurance claims from Delta Dental of Michigan, the study utilized a Classification Treatment System, similar to the prepayment groupings that dental insurance companies use. The Classification Treatment System was defined as:

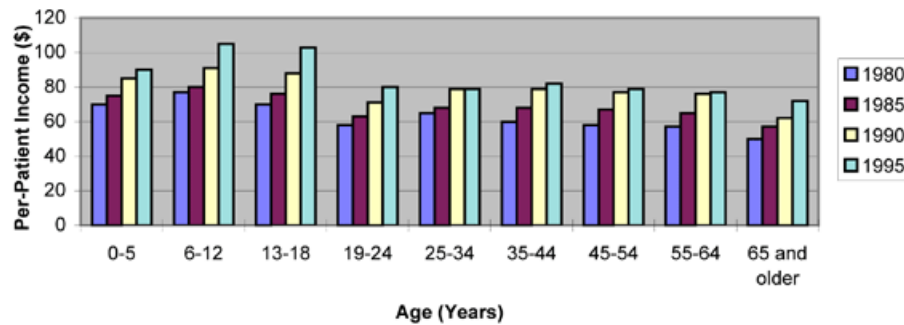
Class I = examination, prophylaxis, topical fluoride treatments and related preventive services

Class II = radiographs, simple restorations, individual crowns, endodontic services, simple extractions, periodontal services and other minor restorative services

Class III = major prosthodontic services such as fixed bridges, dentures/partials

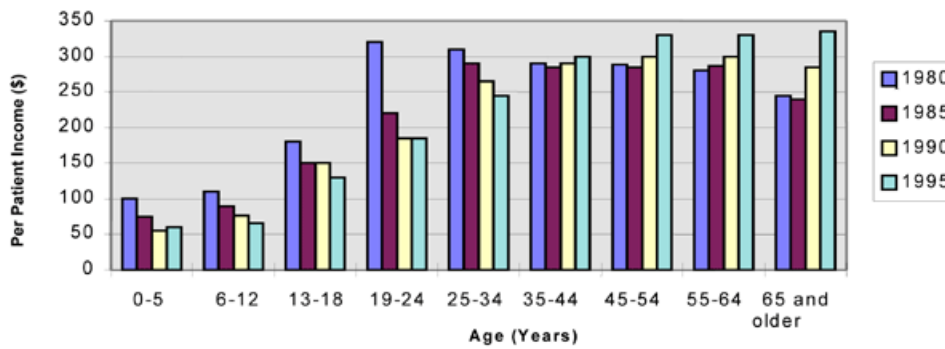
Class IV = orthodontic services

According to the study, the group benefit payment level was 100% for Class I services, 90% for Class II services, and 50% for Class III and IV services. The results of this study determined that there was an increase in Class I preventive oral health care services, especially in patients aged 5 to 18 (Figure 5), and an overwhelming decrease in Class II restorative services for patients aged 5 to 34 (Figure 6). A net loss of income of at least 25% economically equates to a negative impact on the small business dental practice.¹⁴



Source: Eklund SA, Pittman JL, Smith RC. Trends in per-patient gross income to dental practices from insured patients, 1980-1995. *J Am Dent Assoc.* 1998;129:1556-1559.

Figure 5 . Changes in Per-Patient Income: Class I Services (1980-1995).

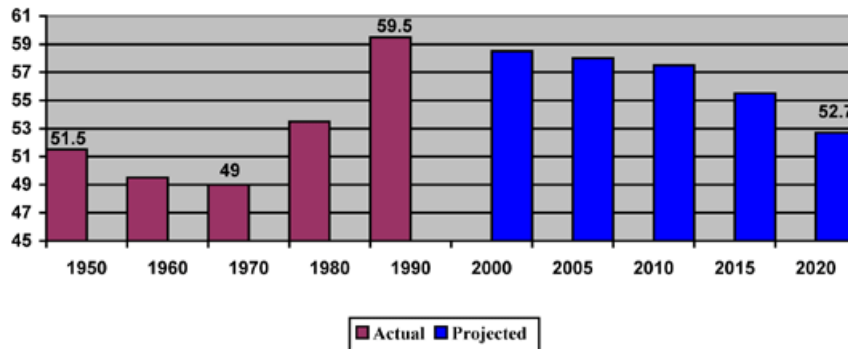


Source: Eklund SA, Pittman JL, Smith RC. Trends in per-patient gross income to dental practices from insured patients, 1980-1995. *J Am Dent Assoc.* 1998;129:1556-1559.

Figure 6 . Changes in Per-Patient Income: Class II Services (1980-1995).

Due to the decrease in expensive restorative services, per-patient income generated from these insured groups significantly dropped, especially among children and young adults. These restorative services formed the economic base for most dental practices. Additionally, the current evidence suggests that this decline is the result of better dental hygiene practices and that these minimal levels of needs will persist as younger patients mature.¹⁴

It is important to consider the supply side of the dental services market, which involves the supply of dentists, licensed hygienists, auxiliary personnel, capital, and equipment. Consideration of this economic aspect of the dental services market allows for further examination where provisions and use of dental services could affect the national oral health status. A March 2001 article in *Access* magazine reported a national shortage of dentists. The shortage was evidenced when the United States population grew by 70 to 80 million people from 1985 to 1993, while the number of people entering dental careers declined from 6,000 dental students in the early 1980s to approximately 3,900 in 2001.¹³ Both the ADA and the Federal Health Resources and Service Administration estimate that the decline in professionally active dentists will continue through 2020 (Figure 7).⁵



Source: Valachovic RW, Weaver RG, Sinkford JC, Haden NK. Trends in dentistry and dental education. *J Dent Educ.* 2001;65(6):539-561.

Figure 7 . Dentists per 100,000 U.S. Population (1950-2020).

This projected inadequate supply of dentists and the increased demand for preventive oral health care services will result in an increased need for licensed dental hygienists in the future. The supply of dental hygienists has far outpaced that of dentists, with the number of dental hygienists doubling in the past 20 years.¹³ Additionally, there is some question as to whether there is a need to significantly increase the number of dentists. When considering increasing the supply of dentists, thought must be given to the current trends of population demographics, changing disease patterns, oral health status, and accessibility to care. From these trends, it could be expected that a fewer number of dentists might be needed to manage the oral health needs of an expanding U.S. population.⁵

If the supply of dentists does not increase, the demand for dental services will cause a significant rise in prices and would result in decreases in dental utilization, thus affecting the national oral health status. Because price, utilization, and expenditures are all affected by the conditions of supply, it is imperative to the economic health of the dental services market to adopt or implement various changes regarding the supply of services or manpower that currently structure the supply side of the dental market.¹⁵

The Economic Impact of Preventive Dental Hygiene Services on the Existing Disparities in Oral Health care

Consumer expenditures for dental services in the United States were \$56 billion in 1999.¹⁶ These expenditures indicate two economic facts: (1) that oral diseases and conditions continue to burden the nation and (2) that, as a reflection of the value they place on oral health, consumers are able and willing to invest in the prevention, treatment, and rehabilitation of oral conditions.⁴ According to the U.S. Surgeon General's report on oral health, the basic message is: "One cannot be healthy without good oral health. It calls attention to the fact that good oral health can be achieved by all Americans, including the most vulnerable citizens—the elderly, poor children, and many members of racial and ethnic minority groups."⁴ However, an estimated 25 million Americans are experiencing barriers to care because of their socioeconomic status, such as race, age, sex, cultural differences, and basic lack of oral health knowledge.⁴ Further, more than 150 million Americans have no dental insurance or have extremely limited coverage.¹⁷ This under- utilization of oral health care services places an economic burden on all health care systems.¹⁸

A recent longitudinal study on the analysis of dental service utilization over a 20-year period, from 1977 to 1997, characterizes the dental utilization patterns of Americans. Utilizing data from the National Medical Expenditures Survey (NMES) and Medical Expenditure Panel Survey (MEPS), the authors provided national estimates of dental visits for each of the several socioeconomic and demographic categories during 1977, 1987, and 1996. Through mailed surveys for each year, the authors were able to construct a multivariate statistical model to assess the relative impact of socioeconomic and demographic variables on dental service utilization during the 20-year period.

The results indicated no significant difference in the rate of utilization during this 20-year period. Those that could access dental services continued to do so, while the lower socioeconomic populations continued to be barred. However, by 1996 a significant narrowing in the utilization rate gap was observed between whites and nonwhites. The data also showed that the gap in utilization rates between lower and higher income individuals widened during the 20-year period, which is congruent with employment status. People who were employed at any time during the study year were more likely to see a dentist. The authors further suggested that policy efforts to reduce the gaps in socioeconomic and demographic disparities appear to have been unsuccessful. In fact, the utilization rates widened between these income groups during the study period. As for the overall trend in the general population, the study found decreased dental visits per person. In conclusion, people who use dental services are more likely to have fewer visits per year on a per capita basis than they did in 1977. This may be due to fewer services needed or requested by clients. Such speculation is consistent with other studies on dental service utilization, which report an increased proportion of dental services for routine diagnostic and preventive services only.^{7, 19}

Although there have been gains in oral health status for the population as a whole, gains have not been evenly distributed across sub-populations. Of the 130,836 professionally active dentists in the United States in 2000, 91.7% were in private practice.⁴ Yet, an estimated 25 million individuals reside in areas lacking adequate dental care services, as defined by Health Professional Shortage Area criteria.²⁰ Access to private dental offices, which increases utilization, is one of the barriers that underserved populations face, along with the high cost of dental care.¹²

The most effective method of defining the oral health needs of a population is a community-based approach that uses principles of public health.²¹ One oral health policy study states that "oral health services must be integrated into the general health continuum."²¹ Another study describes a three-tiered methodology of a prevention continuum for cost-effective public health. Primary prevention is the most cost-effective level, fostering health education, disease prevention, and health promotion strategies (i.e. water fluoridation, dental sealants, and prophylaxis). Secondary prevention eliminates or reduces disease in its early stages. While this stage of prevention is effective, it is also more expensive, requires more technology, and is not as efficient as primary prevention. Tertiary prevention requires extensive rehabilitation and surgical procedures, both of which are more expensive services and require more providers training.^{20, 22}

Of the dollars spent on health care in the United States, fewer than 5% target prevention.²³ Therefore, utilizing the concepts of Leavell, primary prevention is the most cost-effective means to reach underserved populations while producing a positive economic impact on both government and individuals. Further, primary prevention strategies involve licensed dental hygienists and do not require a dentist to perform such duties.²¹ Yet, current public health programs utilize less than 5% of the dental care budget that supports federal, state, and local dental public health programs, and many such programs have experienced serious cutbacks in recent years.²⁴

A study published by Partnership for Prevention established that statewide oral health tracking systems are effective means to establish data about community oral health status and disease risks. Such systems would be needed to plan effective oral health programs for high-risk populations. For example, the North Carolina Dental Health Program utilized a tracking system that identified oral health needs by using public health dental hygienists to screen students in kindergarten and fifth grade to determine and document their oral health status.²⁵ One national health objective is for all states and the District of Columbia to have oral health tracking systems in place by 2010, according to Healthy People 2010.^{25, 26}

Further, the Center for Policy Alternatives documented 15 states that introduced legislation to improve access to oral health. Of the various legislative bills, many involve licensed dental hygienists.¹⁷ The economic trend is to spend oral health care dollars in the most efficient way possible by spending funds on programs where the change in oral health status will be greatest per dollar spent.¹⁵ Dental hygienists should be recognized as the major resource for attaining cost-effective oral health policy goals.¹⁸

Discussion

Historically, limited attention has been given to the economic impact of dental hygiene preventive services, resulting in public health policy that is unplanned, with little focus on disease prevention and oral health promotion. The data that was obtainable revealed that where there is an increase in preventive dental services utilization, a significant decrease in restorative needs exists.

The economic impact of preventive dental hygiene oral health care services on the consumer has yet to be measured completely. Considering the increase in accessibility, mainly because of the impact of employer-based dental insurance, the consumer has been able to seek dental services that historically were not utilized or even valued. Dental insurance is a major determinant of dental utilization.⁴ More Americans now benefit from the multitude of strategies involved in administering oral health disease prevention services. Dental hygienists, in the majority of private practices, administer these preventive oral health care services under the auspices of a consumer advocate, educator, and clinician.

Economically, Americans spend more for dental services than they did in the past. These expenditures indicate an increase in accessibility, and thus utilization, and they show a willingness to invest in dental care and signify the increased value being placed on oral health. More Americans are dentate, free of dental diseases, and need only routine biannual oral prophylaxis rather than the more expensive restorative-based services. This marks a complete transition of dental needs over a 40-year span. With improved oral health and positive health outcomes, one cannot evaluate the true economic impact of preventive oral health care services because of the diversity of variables affecting oral health. For these reasons, the billions saved in dental expenditures through preventive oral health care services and dental research is likely to underestimate the full value of these activities according to the review of literature.

As small business entrepreneurs, dentists are interested in increasing their profit margins while providing oral health care services. However, the consumer seeks less costly preventive dental care primarily because insurance benefits provide total coverage for those services while covering only a percentage of the more expensive dental services. Dental insurance has not only impacted the consumer through accessibility and financial means, but has also economically impacted the dental practice in two distinct relationships. First, dental insurance has increased client population, which has increased utilization of dental services, which, in turn, has increased profit margins for the dental practice. Secondly, this increase in dental utilization has resulted in decreased demand for restorative and/or invasive dental services, thus reducing dental expenditures. Within this literature review, more dental expenditures are going for preventive oral health care services rather than for the more expensive and invasive procedures, causing the decrease in per capita income to the dental practice.

This transition from a historically restorative-based practice has resulted in a significant improvement in the oral health status of clients. This positive oral health outcome trend has created more of a realignment of dental services, rather than the expected negative economic impact on the dental practice seen in the review of literature. Consumers with more disposable income are seeking and demanding alternative dental services, such as cosmetic dentistry, implant technology, and adult orthodontics, as a means to continue to improve their oral and total health. Therefore, dentistry as a business has witnessed significant profitability gains on a cumulative basis, due in part to aesthetic dental services (Charles Blair, DDS, president of Dr. Charles Blair and Associates, Inc.; personal communication with author, November 2001).

The other side to this economic analysis concerns the existing disparities in the oral health status of the underserved populations, as noted in *Oral Health in America: A Report of the Surgeon General*.⁴ While collaboration between dentists and dental hygienists continues to provide comprehensive oral health care to those who can afford and access care, dentistry's ethical challenge in the new millennium is to address these recognized disparities in the underserved populations whose unmet dental needs are enormous. Public dental health programs have not been successful thus far; therefore, dental professionals need to make the difference. Are dentists and licensed dental hygienists willing to break from their private practices to reach the underserved? Are dentists willing to address supervision laws allowing dental hygienists to practice in underserved areas without supervision? Is the profession of dental hygiene ready to address this issue? Are dentists willing to accept more Medicaid clients? Are dentists willing to offer more Donated Dental Services to indigent populations? These are the concerns and decisions that face dentistry today and in the future.

Genuine improvements in oral health spending and policies are only possible with a paradigm shift from curing disease to disease prevention and promotion of oral health. Dental hygiene, as an oral health profession, promotes total health

through the prevention of oral diseases. However, the limitations for increasing the scope of practice for dental hygienists to reach the low socioeconomic populations are numerous. Laws for practice restrictions of licensed dental hygienists significantly prevent the increase of access and utilization of diagnostic and therapeutic preventive oral health care services outside the private practice.²¹ Presently, 47 states in the United States have, in various approaches, moderated direct supervision laws for dental hygienists.²⁷ The increase in the role of dental hygienists positioned in public health environments promotes renewed emphasis on setting and attaining oral health policy goals that address disparity issues for underserved populations. Alfred Fones, the founder of dental hygiene, indicated that the profession is distinct and should be positioned as such in dental public health. In fact, Fones believed that dental hygienists could provide education and dental hygiene treatment outside the dental office, with particular focus on mass pediatric prevention.¹

Conclusion

The economic success that consumers and small business dental practices have witnessed with preventive dental hygiene services currently continues to improve the oral health status of Americans. With the existing disparities, however, underserved populations have yet to experience the same success and results. If the business of dentistry, as the review of literature states, is experiencing significant gains in practice profitability on a cumulative basis, would it not be imperative that the profession of dentistry ethically reach the underserved populations? The impact would be equal to the striking results witnessed by those already served. Although the data and specific statistics are broad-based, this report may be the impetus for more research towards attaining documented results.

Acknowledgements

Notes

Correspondence to: Sharon Stull sstull@odu.edu

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