

Dental service mix among working-age adults in the United States, 1999 and 2009

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Introduction

Upward-spiraling health-care costs have been the subject of much debate in the United States during the last few decades. In a recent analysis of global trends, Spiro and colleagues (1) argued that increases in US health-care costs since 1970 have far outpaced the increases in all other high-income nations and are substantially more than would be anticipated, even after population growth has been accounted for. Some might argue that greater expenditures lead to better outcomes; however, economic analysis does not always support this hypothesis (2).

The debate about expenditures in dentistry has also received much attention. Dasanayake and colleagues (3)

Abstract

Objective: In the United States, health-care costs are increasing while state and federal budgets contract. In order to establish a baseline and provide data for alternative oral health workforce models, this report describes the types of dental procedures received by US working-age adults in 2009 and looks at trends since 1999.

Methods: Data for this analysis came from the 1999 and 2009 Medical Expenditure Panel Surveys. The primary outcome variable represented the types of dental procedures undergone during a dental visit in the preceding year. Descriptive variables included dental insurance coverage and income. Analysis was restricted to adults aged 21–64 years.

Results: In 2009, diagnostic and preventive procedures accounted for >75 percent of all dental services received by working-age adults. Those with public insurance and those who were uninsured, as well as those with lower income, were less likely to receive these services than their peers. Between 1999 and 2009, small but statistically significant increases in the proportion of preventive and diagnostic procedures received occurred in the nation. The likelihood that a preventive service would be received during a visit also increased during this period, while the probability that a restorative procedure would be undergone went down.

Conclusions: Preventive-type procedures represented the vast majority of dental services received by working-age adults in 2009. Between 1999 and 2009, receipt of preventive-type procedures generally increased while receipt of surgical-type procedures decreased. These findings emphasize the health-promoting role of the dental team and provide a baseline for the measurement of future trends.

showed that Medicaid-eligible children in Alabama who received dental sealants by age 7 years were subsequently less likely to require restorative care. Griffin and her team (4) concluded that efforts to reduce severe dental disease through early interventions in low-income children could yield dramatic cost savings down the line. However, Edelstein (5) reported that US dental disease rates are, paradoxically, greatest among children who have the highest rates of dental insurance coverage, primarily through Medicaid and the State Children's Health Insurance Program.

Although there are various safety-net programs available to cover the dental needs of children in the United States, relatively few such programs exist for adults (6). For most working-age adults (21–64 years), Medicaid provides only

limited benefits, and these benefits vary state by state. For policymakers trying to address the needs of these adults, a clearer understanding of the types of costs anticipated in this population would be beneficial.

The purpose of this analysis is to describe the types of procedures received by US working-age adults (aged 21-64 years) in 2009, to determine whether there were any notable changes in the distributions of these procedures since 1999, and to assess the impact of dental insurance coverage and income on these distributions. Findings will be useful to policymakers who wish to explore strategies for reducing costs and incorporating new workforce models into the dental-care system.

Methods

Data sources

Data for this report came from the 1999 and 2009 versions of the Medical Expenditure Panel Survey (MEPS) (7,8), a large-scale assessment of families and individuals across the United States as well as their health-care providers and employers. MEPS collects information about the specific health-care services that Americans use, how frequently the services are used, and how much they cost. It also collects data regarding dental insurance coverage. Survey data are representative of the civilian, noninstitutionalized household population of the United States. MEPS is sponsored by the Agency for Healthcare Research and Quality (AHRQ) with cosponsorship by the National Center for Health Statistics.

MEPS consists of three major survey elements: the Insurance Component, Medical Provider Component, and Household Component. The Insurance Component collects data from a sample of private- and public-sector employers concerning the health insurance plans that they offer their employees. The Medical Provider Component covers hospitals, physicians, home health-care providers, and pharmacies identified by MEPS respondents. It is meant to supplement information gathered as part of the Household Component. The Household Component, used for this report, collects data about demographics, health conditions, health status, use of health-care services, health-care costs, and other related topics from every individual within a sampled household.

MEPS utilizes a panel design wherein survey respondents are followed for a 2-year period. Two panels are fielded concurrently, and data for a single calendar year are combined from the two overlapping panels. Periodic interviews conducted during the 2 years make it possible to determine how changes in respondents' health status, income, employment, eligibility for insurance, use of services, and payment for care are related to one another. The Household Component includes a Dental Care section that is the basis for this report.

The Household Component collects information from a sample of families and individuals across the United States. The MEPS sample is a subsample of households that participated in the previous year's National Health Interview Survey (NHIS). The sampling design for the NHIS involves a multi-stage area probability approach, with oversampling of selected populations, including Hispanics, African Americans, and Asians. A detailed description of the NHIS sampling methodology is available elsewhere (9).

Study variables

The primary outcome variable for this report describes the types of dental procedures (services) that were undergone during a dental visit in the last year. For this report, *dental visit* refers to a visit to any type of dental practitioner, including general dentists, dental hygienists, dental technicians, and dental specialists.

In order to ascertain information about what procedures were undergone during a dental visit, the MEPS questionnaire asked, "What did [you/person] have done during this visit?" If more than one procedure was undergone, the questionnaire also asked, "What else was done?" Respondents were shown cards listing corresponding responses from which to choose. Individual responses were grouped into the following procedure categories: *diagnostic* (examinations and radiography), *preventive* (cleanings, fluoride treatments, dental sealant application, and recall visits), *restorative* (fillings and inlays), *prosthetic* (crowns, bridges, fixed and removable dentures, denture repairs, and dental implants), *periodontic* (periodontal services only), *endodontic* (endodontic services only), *oral surgery* (oral surgery services only), *orthodontic* (orthodontic services only), and *other* (any other dental service not in the aforementioned categories).

Similar procedures received during a single dental visit were grouped together. For example, if a respondent received three dental fillings during a particular visit, these three services were combined such that the respondent was said to have received one restorative procedure.

Procedures that belonged to different categories were treated separately. For example, if a respondent received an examination, a dental cleaning, and a partial denture repair during a particular visit, these three services would be counted under the diagnostic, preventive, and prosthetic categories, respectively. As a consequence of counting services in different categories for the same dental visit, the number of procedures that an individual underwent may be greater than the number of dental visits he or she made.

The main descriptor variables were dental insurance coverage (*private*, *public*, *uninsured*) and income [adults with income <100 percent of the federal poverty level (FPL) were defined as *poor*; *low income* was defined as 100-199 percent of the FPL, *middle income* as 200-399 percent, and *high*

income as ≥ 400 percent]. Participants defined as having private insurance were eligible to receive and/or actually received payments on their behalf for dental care obtained in 1999 or 2009. Participants were considered to have dental insurance if a self- or proxy report of private or public dental coverage had been made at any time during 1999 or 2009, regardless of whether they had dental coverage over the entire year. Participants were also considered to have dental coverage if a self- or proxy report of private or public insurance payments for dental care received had been made.

Analysis

The data collected for MEPS were obtained by way of a complex, multistage sampling design that involved stratification and clustering. Given the complex, multistage design, Taylor series linearization methods in the SUDAAN statistical software package (10) were used to generate appropriate standard errors. An alpha value of 5 percent was used as the threshold for determining statistically significant differences between groups.

The reader should note that values in Table 1 and Figure 1 represent procedure-level estimates (i.e., frequency of each specified dental procedure type as a proportion of all dental services received by adults aged 21-64 years in the United States who received at least one service). Values in Table 2 and Figure 2 represent person-level estimates (i.e., the likelihood that any given dental visit included the given type of dental procedure).

Results

Findings from the 2009 MEPS

Table 1 lists the percentage distribution of dental procedures undergone by adults aged 21-64 years who received at least one dental service during 2009. Estimates are presented for all procedures, both overall and stratified by dental insurance coverage and income.

According to Table 1, the most common procedure type received was diagnostic and the least common was periodontic. Taken together, diagnostic and preventive procedures accounted for more than 75 percent of all services received. Compared with services received by those with private insurance, services received by those with public insurance were significantly less likely to have been preventive procedures and significantly more likely to have been restorative and oral surgery procedures. Similarly, compared with services received by those with private insurance, services that were received by those who were uninsured were significantly less likely to have been preventive procedures and significantly more likely to have been oral surgery procedures.

Table 1 also shows income differences. Compared to services received by the reference high-income group, services received by middle-income adults were significantly less likely to have been preventive procedures and were significantly more likely to have been oral surgery procedures, while services received by low-income adults were significantly less likely to have been either diagnostic or preventive procedures and were significantly more likely to have been oral surgery procedures. Services received by poor adults were also

Table 1 Percentage Distribution of Dental Procedure Types, 2009

	Diagnostic	Preventive	Restorative	Prosthetic	Oral surgery	Periodontic	Endodontic	Orthodontic	Other*
Overall	44.98 (0.37)	31.08 (0.34)	6.60 (0.23)	7.29 (0.34)	3.51 (0.19)	0.89 (0.10)	2.31 (0.18)	1.75 (0.27)	1.60 (0.19)
Dental insurance coverage									
Private†	45.41 (0.39)	31.87 (0.37)	6.27 (0.24)	7.29 (0.40)	2.71 (0.20)	0.91 (0.11)	2.39 (0.21)	1.61 (0.26)	1.55 (0.21)
Public	41.09 (2.06)	24.00 (1.44)	9.89 (1.33)	8.17 (2.01)	7.82 (1.12)	1.49 (1.06)	3.73 (1.15)	1.14 (0.80)	2.68 (1.58)
Uninsured	43.49 (0.97)	28.33 (0.89)	7.71 (0.62)	7.06 (0.74)	6.96 (0.52)	0.62 (0.20)	1.53 (0.27)	2.69 (0.74)	1.61 (0.37)
Income									
<100% FPL	41.07 (1.36)	27.37 (1.25)	8.90 (0.98)	7.44 (1.30)	7.42 (0.89)	0.68 (0.35)	2.55 (0.55)	3.03 (1.22)	1.55 (0.42)
100-199% FPL	42.55 (1.12)	26.92 (1.11)	7.77 (0.77)	6.41 (0.79)	7.70 (1.04)	1.10 (0.44)	2.78 (0.55)	2.21 (0.72)	2.56 (1.10)
200-399% FPL	44.72 (0.65)	29.92 (0.67)	7.03 (0.47)	7.19 (0.65)	4.39 (0.39)	0.82 (0.17)	2.74 (0.38)	1.80 (0.53)	1.40 (0.24)
$\geq 400\%$ FPL†	45.84 (0.47)	32.61 (0.48)	6.01 (0.31)	7.46 (0.48)	2.09 (0.18)	0.90 (0.12)	2.02 (0.19)	1.54 (0.30)	1.53 (0.24)

Source: 2009 Medical Expenditure Panel Survey.

Sample consists of United States adults aged 21-64 years who underwent at least one dental procedure in 2009.

Percentage estimates represent the proportion of dental procedures accounted for by each procedure type. Row percentages sum to 100 percent.

Data given as percentage (standard error).

* Procedures not otherwise reported.

† Reference group.

FPL, federal poverty level.

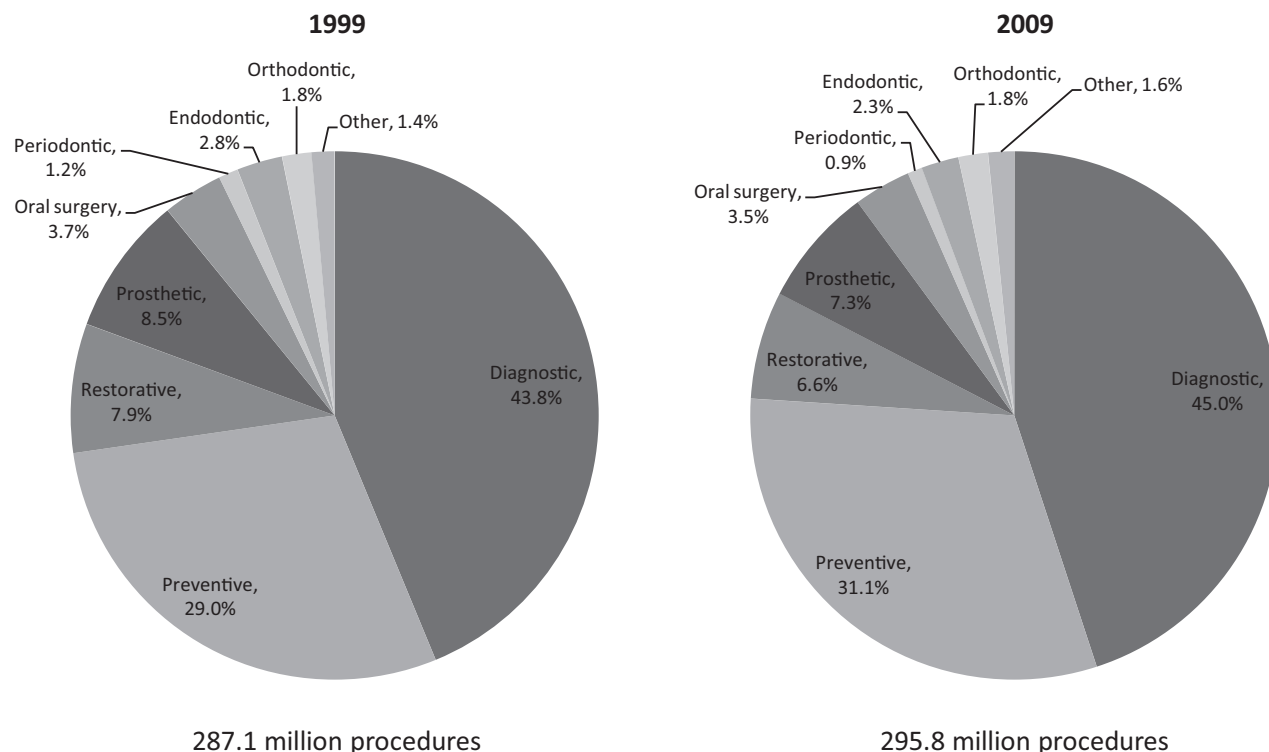


Figure 1 Weighted distribution of dental procedure types among United States adults aged 21-64 years who underwent at least one dental procedure, 1999 and 2009. Source: 1999 and 2009 Medical Expenditure Panel Surveys. Percentage estimates represent the proportion of dental procedures accounted for by each procedure type. Percentages sum to 100 percent. *Other* refers to procedures not otherwise reported.

significantly less likely to have been either diagnostic or preventive procedures; however, they were significantly more likely to have been either restorative or oral surgery procedures.

Table 2 shows the percentages of total dental visits involving given dental service types made by adults aged 21-64 years who received at least one dental service. Estimates of the frequency with which various types of procedures were received

Table 2 Percentages of Total Dental Visits Involving Given Dental Procedure Types, 2009

	Diagnostic	Preventive	Restorative	Prosthetic	Oral surgery	Periodontic	Endodontic	Orthodontic	Other*
Overall	85.59 (0.69)	79.29 (0.72)	20.29	16.09 (0.56)	10.44 (0.46)	2.45 (0.24)	5.82 (0.37)	1.91 (0.24)	4.16 (0.32)
Dental insurance coverage									
Privat†	87.87 (0.69)	83.31 (0.62)	20.18 (0.71)	16.44 (0.67)	8.11 (0.50)	2.64 (0.27)	6.10 (0.43)	1.90 (0.26)	4.23 (0.37)
Public	75.18 (2.71)	62.50 (2.94)	25.69 (2.47)	14.14 (2.42)	23.33 (2.62)	2.20 (1.23)	7.91 (1.87)	1.00 (0.76)	3.82 (1.44)
Uninsured	77.35 (1.60)	64.47 (1.89)	19.68 (1.43)	14.88 (1.25)	18.38 (1.17)	1.63 (0.48)	4.15 (0.64)	2.12 (0.49)	3.91 (0.66)
Income									
<100% FPL	72.93 (2.58)	61.37 (2.71)	20.14 (2.00)	14.24 (1.90)	19.87 (1.94)	1.17 (0.50)	6.05 (1.31)	2.56 (1.05)	4.12 (1.15)
100-199% FPL	79.04 (1.83)	65.77 (1.90)	21.40 (1.81)	13.01 (1.31)	21.07 (1.66)	2.43 (0.76)	6.11 (0.90)	2.61 (0.86)	3.23 (0.75)
200-399% FPL	84.71 (1.10)	77.06 (1.35)	20.90 (1.19)	14.75 (0.99)	11.95 (0.90)	2.33 (0.43)	6.56 (0.77)	1.49 (0.30)	4.05 (0.62)
≥400% FPL†	88.70 (0.77)	84.95 (0.79)	19.80 (0.89)	17.52 (0.84)	6.65 (0.54)	2.66 (0.31)	5.38 (0.42)	1.91 (0.31)	4.38 (0.45)

Source: 2009 Medical Expenditure Panel Survey.

Sample consists of United States adults aged 21-64 years who underwent at least one dental procedure in 2009.

Percentage estimates represent the likelihood that any given dental visit involved the given type of dental procedure. Row percentages sum to >100 percent because patients may have undergone more than one procedure per appointment.

Data given as percentage (standard error).

* Procedures not otherwise reported.

† Reference group.

FPL, federal poverty level.

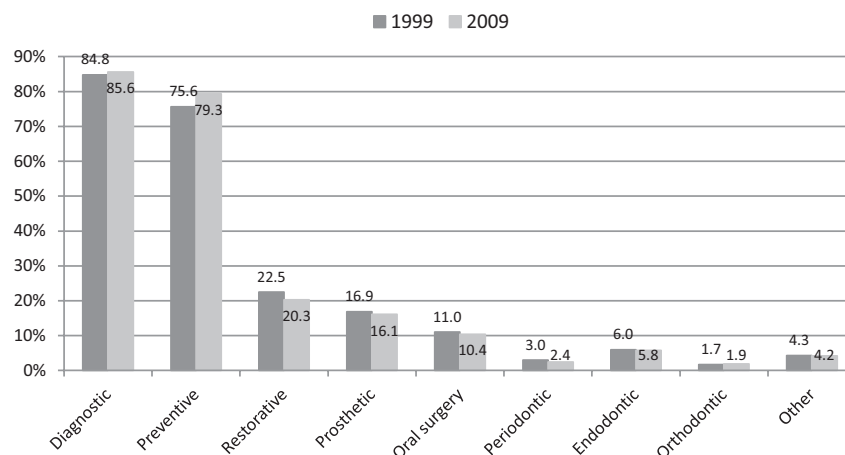


Figure 2 Weighted percentages of total dental visits involving given dental procedure types among United States adults aged 21-64 years who underwent at least one dental procedure, 1999 and 2009. Source: 1999 and 2009 Medical Expenditure Panel Surveys. Percentage estimates represent the likelihood that any given dental visit involved the given type of dental procedure. Percentages sum to >100 percent because patients may have undergone more than one procedure per appointment. *Other* refers to procedures not otherwise reported.

during dental visits are presented for all adults aged 21-64 years, both overall and stratified by dental insurance coverage and income. Note that these estimates represent the likelihood that any given dental visit involved the given type of dental procedure. In other words, these estimates reflect the probability that a person who made a dental visit received a given type of service. The overall percentages sum to more than 100 percent because a person may have undergone more than one type of procedure per visit.

According to Table 2, adults who received at least one dental service were highly likely to have undergone a diagnostic or preventive procedure and relatively unlikely (<10 percent probability) to have undergone an endodontic, periodontic, orthodontic, or “other” type of procedure. Compared with adults with private insurance, those with public insurance were significantly less likely to have undergone either a diagnostic or preventive procedure; however, they were significantly more likely to have undergone a restorative or oral surgery procedure during their dental visit. Uninsured adults also exhibited some differences from those with private insurance. Specifically, the likelihood that an individual received a diagnostic, preventive, or endodontic procedure was significantly lower in the uninsured group; however, the likelihood of receiving an oral surgery procedure was significantly higher.

There were also some differences among income groups, shown in Table 2. Compared with the reference high-income adults who underwent at least one dental service, adults in all other income categories were significantly less likely to have received a diagnostic or preventive procedure but were significantly more likely to have received an oral surgery procedure during their dental visit. Middle-income and

low-income adults were also significantly less likely to have received a prosthetic procedure compared with high-income adults. Finally, poor adults were significantly less likely to have received a periodontic procedure compared with the high-income reference group.

Comparisons between the 1999 MEPS and 2009 MEPS

Figure 1 compares the weighted distribution of dental procedure types received by adults aged 21-64 years who received at least one dental service in 2009 with the distribution in 1999. Overall, the percentages of diagnostic (43.8 percent in 1999, 45.0 percent in 2009) and preventive (29.0 percent in 1999, 31.1 percent in 2009) procedures increased significantly (albeit slightly) during this 10-year period. The percentages of restorative (7.9 percent in 1999, 6.6 percent in 2009) and prosthetic (8.5 percent in 1999, 7.3 percent in 2009) services decreased significantly. There was no overall statistically significant difference between survey years for any other procedure type. The reader is reminded that the values in Figure 1 represent the frequency of individual types of procedure as a proportion of all procedures and do not represent person-level findings. The volume of services recorded in the two MEPS surveys increased by 8.7 million procedures between 1999 and 2009.

With regard to stratum-specific differences related to dental insurance coverage (estimates not shown), the percentage of preventive procedures increased significantly between 1999 and 2009 for both those with private insurance (29.8 percent to 31.9 percent) and those with public insurance (15.3 percent to 24.0 percent). The percentages of

restorative (7.4 percent in 1999, 6.3 percent in 2009) and prosthetic (8.7 percent in 1999, 7.3 percent in 2009) procedures decreased significantly for those with private insurance. The percentage of oral surgery procedures decreased significantly (14.5 percent to 7.8 percent) for those with public insurance. The percentage of endodontic services decreased significantly (3.0 percent to 1.5 percent) for those who were uninsured.

With regard to differences in income groups (estimates not shown), the percentage of diagnostic services increased significantly between surveys only among high-income adults (44.1 percent to 45.8 percent). Preventive procedures increased significantly among high-income (30.7 percent to 32.6 percent), low-income (22.3 percent to 26.9 percent), and poor (22.0 percent to 27.4 percent) adults. By contrast, restorative services decreased significantly for middle-income (8.4 percent to 7.0 percent) and low-income (11.3 percent to 7.8 percent) groups. In addition, prosthetic (9.2 percent in 1999, 7.5 percent in 2009) and periodontic (1.3 percent in 1999, 0.9 percent in 2009) procedures also went down significantly for high-income adults. Orthodontic (0.2 percent to 3.0 percent) services increased significantly for poor adults.

Figure 2 compares the weighted percentages of total dental visits involving given dental procedure types made by adults aged 21-64 years who received at least one dental service in 2009 with the distribution in 1999. Overall, the likelihood of a preventive procedure being undergone during a dental visit increased significantly (75.6 percent to 79.3 percent) between survey years, whereas the likelihood of a restorative procedure being undergone decreased significantly (22.5 percent to 20.3 percent). The reader is reminded that the values in Figure 2 represent person-level findings and reflect the probability of a specific type of procedure being undergone during a single dental visit.

With regard to stratum-specific differences related to dental insurance coverage (estimates not shown), the percentage of adults aged 21-64 years who underwent a preventive procedure increased significantly between survey years for those with insurance (private, 79.2 percent to 83.3 percent; public, 46.2 percent to 62.5 percent). The percentages of adults with public insurance who underwent restorative (39.2 percent in 1999, 25.7 percent in 2009) or oral surgery (33.6 percent in 1999 to 23.3 percent in 2009) procedures decreased significantly between surveys. There were no significant changes between survey years for those who were uninsured.

With regard to income groups (estimates not shown), the percentage who underwent preventive procedures increased significantly for both high-income adults (81.0 percent to 85.0 percent) and low-income adults (58.4 percent to 65.8 percent) between survey years. The percentages of adults who underwent other types of procedures did not differ significantly between survey years for any income group.

Discussion

This report describes the distribution of dental procedures for US adults aged 21-64 years with at least one dental service received and/or dental visit made for 1999 and 2009. The 2009 findings are useful because they can serve as baseline data for future assessments. Policies to improve access to dental care for adults in the future could be evaluated using these results.

The 2009 data also provide an interesting perspective on the current state of dental care in the United States. For instance, our analysis revealed that diagnostic and preventive procedures were the most common services received by Americans aged 21-64 years. These two procedure types reflect dentistry's focus on primary and secondary prevention and speak to the central role of dental professionals as health promoters. However, the relatively high proportion of diagnostic and preventive services reveals that there are large numbers of services provided in dental practice that could be administered, at lower cost, by other members of the dental team beyond the dentist. Included in the "diagnostic" and "preventive" categories are services such as radiography, dental cleaning, fluoride treatment, and application of dental sealants. All of these services are generally covered by the scope of practice for dental hygienists and/or midlevel providers (including dental therapists, advanced dental therapists, and dental health aide therapists) (11). Using lower-salaried health professionals such as dental hygienists and midlevel providers to administer some of these services might meet the increased demand for services (12,13) and ease the financial pressures on the system (14). At the same time, using dental hygienists and midlevel providers to administer these diagnostic and preventive services could allow dentists to oversee the more complicated and technically demanding services for which they are uniquely trained (15,16).

Our analysis also revealed that oral health disparities still exist in the United States. Although the dental-care system meets the needs of most Americans (17), there are still some groups, particularly those with low socioeconomic status, who receive disparate care. As a case in point, those with public insurance and those who were uninsured were less likely to have received preventive-type procedures and were more likely to have received surgical-type services (e.g., restorative procedures, oral surgery) than were their peers with private insurance. This trend suggests that those without private insurance might have been more likely to have grossly decayed teeth or teeth with hopeless prognosis (i.e., teeth requiring oral surgery services) than were those with private insurance. This trend may also imply that those without private insurance might be more likely to face disease in the future given their lower probability of receiving preventive services in the present.

The stratified income findings were very similar to the previously described insurance findings. Compared with high-income adults, the middle-income, low-income, and poor groups were less likely to have received preventive-type services and more likely to have received surgical-type services. In addition, the low-income and poor groups were also less likely to have received diagnostic services than were their high-income peers. Consequently, the low-income and poor groups might currently have disease that is not being diagnosed in a timely fashion, potentially leading to more serious problems in the future.

Of course, we were unable to use these MEPS data to test whether specific population groups were more likely to have unmet needs or more severe disease levels than other groups. However, data from the 1999-2004 National Health and Nutrition Examination Survey (NHANES) (18) provide some support for the aforementioned explanations. According to NHANES, approximately 24 percent of poor adults aged 20-64 years characterized the condition of their teeth as "poor" as compared with only 8 percent of adults earning ≥ 200 percent of FPL. Furthermore, NHANES showed that 44 percent of poor adults aged 20-64 years had untreated dental caries as compared with only 18 percent of those earning ≥ 200 percent of FPL. Finally, 9 percent of poor adults were edentulous compared with only 2 percent of their wealthier peers.

Whereas the 2009 MEPS provides a snapshot of current conditions and a useful baseline for future evaluations, comparisons between data from 1999 and 2009 provide an opportunity to judge progress within the dental care system over the last decade. In terms of overall changes, the total number of procedures increased by only 3 percent, suggesting that the number of dental services provided in dental practice remained fairly stable during the decade. Regarding other overall changes, the proportion of preventive procedures increased between 1999 and 2009 and the proportion of restorative services went down. These two changes fit together, as greater emphasis on prevention might have translated into fewer visits involving one or more restorations.

One possible explanation for the overall changes between 1999 and 2009 among some insurance coverage and income groups may be that there were improvements in oral health for the nation. Preventive procedures were more frequently performed for those with private and public insurance, as well as for those with high and low income. In addition, the proportions of restorative and oral surgery procedures decreased for those with public insurance, also suggesting progress.

Changes among different types of procedures in their probabilities of being received during a given dental visit were also generally consistent with the pattern observed for the procedure-level analysis. Overall, the probability that a preventive service would be received during a given dental visit

increased and the probability that a restorative service would be received decreased, again reflecting improvements in oral health. Changes were consistent with regard to dental insurance coverage and income, reflecting an increase in receipt of preventive services and decreases in receipt of restorative and oral surgery procedures.

It should be noted that, although receipt of preventive services increased significantly for both publicly and privately insured individuals between 1999 and 2009, a statistically significant difference between those with public insurance and those with private insurance remained in 2009. The trend toward increasing receipt of preventive services among those with public or private insurance certainly should be interpreted as a positive movement. However, the fact that those with public insurance still lagged behind those with private insurance suggests that more needs to be done to establish parity between the two groups.

Our analysis has three notable limitations. First, dental procedures were self-reported, and self-reports were not substantiated by record abstraction. Self-reporting of data may be less accurate than collection of data by observation or by record review, potentially limiting the validity of these data. For instance, our findings were limited to the procedures that were reported by respondents; the variety of dental procedures actually received might have been broader. The second limitation relates to the way procedure data were tallied. Multiple services in a particular category were treated as a single procedure when they occurred during a single dental visit. That is, if a participant received three dental restorations during a single visit, they were counted as a single restorative procedure. Consequently, the reported number and relative proportion of services received might be based on underestimates of the actual population and individual values. Note that the receipt of multiple services in different procedure categories was not subject to this limitation. In other words, when different categories of procedures were received during a single visit, they were not grouped together as a single service. As such, underestimation of number of procedures likely only occurred when multiple services of the same type were received during a single appointment. This second limitation might have impacted the interpretation of differences/changes in the receipt of restorative services noted in the analysis. Specifically, given the way that restorative services were coded, it was not possible to identify whether the absolute number of restorations differed/changed. Instead, it was only possible to know whether there were differences/changes in the number of appointments that included one or more restorative procedures. The third limitation is that historical changes at the national level (changes in dental coverage, employment, the economy, etc.) might partially explain some of the differences in receipt of dental services noted between 1999 and 2009.

In summary, preventive-type procedures represented the overwhelming majority of dental services received by US working-age adults in 2009. The provision of these procedures generally fell under the scope of practice for nondentist members of the dental team. The fact that such a large proportion of services fell within the scope of nondentist practice is encouraging for the exploration of innovative oral health workforce models. The timing of these findings is particularly relevant given the recent changes occurring in the delivery and financing of health care.

Between 1999 and 2009, receipt of preventive-type procedures generally increased, while receipt of restorative-type procedures generally decreased. These findings help illustrate the health-promoting role of the dental team and provide a baseline for the measurement of future trends.

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