



# RESEARCH IN ACTION



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## Dental Care: Improving Access and Quality

The oral health of Americans has improved in recent years, yet considerable gaps in the provision of dental care remain, according to a recent report by the Surgeon General.<sup>1</sup>

This *Research in Action* highlights dental care research sponsored by the Agency for Healthcare Research and Quality (AHRQ). Studies look at the impact of factors such as reimbursement, race, income, and age on access to and use of care. Research suggests that educating families about how to enroll in and access the Medicaid system, streamlining Medicaid administrative procedures, and adjusting provider reimbursement could facilitate broader access to dental care. Studies show that specific treatments such as dental sealants for children may have a positive impact on both health outcomes and costs. The quality of dental care can be further improved by developing and using performance measures for specific treatments. Finally, the production of evidence reports evaluating research on various aspects of care helps to advance evidence-based dental practice and thereby improve the quality of care.

### Background

The Surgeon General's recent report states that oral health is essential to the general health and well-being of all Americans.<sup>1</sup> Although oral health extends beyond dental health, the report clearly stresses the importance of the two

leading types of dental disease: tooth decay (dental caries) and periodontal disease.

Dental care can be either preventive or restorative. Preventive care, such as tooth cleaning and dental sealants, is aimed at avoiding dental problems. Restorative care

#### Making a Difference

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repairs problems such as those caused by tooth decay and periodontal disease.

### Oral health improves overall but gaps exist

Over the past several decades, oral health in the United States has improved.<sup>a</sup> Among most age groups, the average number of teeth per person affected by dental caries has decreased. Also, the average number of teeth per person that show no signs of infection, as well as the proportion of the population that is caries free, has increased. In addition, a lower proportion of U.S. adults have lost all their natural teeth (a process associated with both tooth decay and periodontal disease) now than was the case two decades ago. This improvement is most pronounced at older ages.

Despite the overall improvement in oral health status, gaps in the provision of care remain. Over the 20-year period 1977-96, the gap in the use of services between low-income people (those with incomes under 200 percent of the Federal poverty level) and higher income people (those with incomes over 400 percent of the Federal poverty level) increased.<sup>2</sup> The number of preventive visits is below recommended levels, and access to dental care remains problematic for minorities, the elderly, children on Medicaid, and other low-income children. For example:

- More than one third (36.8 percent) of poor children ages 2 to 9 have one or more untreated decayed primary teeth, compared to 17.3 percent of nonpoor children.
- Uninsured children are half as likely as insured children to receive dental care.<sup>3</sup>
- Untreated dental decay afflicts one-fourth of children entering kindergarten in the United States.
- Low-income and minority children have more dental cavities than other children.
- Poor Mexican-American children ages 2 to 9 have the highest proportion of untreated decayed teeth (70.5 percent), followed by poor non-Hispanic black children (67.4 percent).
- Poor Mexican-American and non-Hispanic black children see the dentist less often than other children.
- Less than one of every five poor children enrolled in Medicaid receives preventive dental services in a given

year, even though Medicaid provides dental coverage for enrolled children.

In addition to the considerable access problems faced by poor and Medicaid-eligible children, poor elderly people and minorities have their own problems with access.

- In the 50-69 age group, non-Hispanic blacks (31.2 percent) are more likely than Mexican Americans (28.2 percent) or non-Hispanic whites (16.9 percent) to have at least one tooth site with periodontal disease.
- In the age category 70 years and over, the percentages rise to 47.1 percent, 32.0 percent, and 24.1 percent for the three groups.

With more elderly people having discretionary income and retaining their natural teeth, demand for dental services among the elderly has grown. But this demand can be substantially influenced by financial barriers and other health concerns. Studies show that the elderly typically underuse needed dental services.

The underuse of cost-effective preventive services such as dental sealants, plastic coating applied to protect the chewing surface of teeth, also illustrates that dental care in the United States has room for improvement.

### Performance measurement is in its early stages

Beyond the issues of access and underuse, there is the question of how to measure the quality of care that is delivered. The ability to measure the quality of dental care is a key to improving it, but most plans do not collect data to produce standardized measures. Once the process of performance measurement is underway, it will be possible to identify specific treatment areas where improvements can be made. For example, some research has shown that the treatment of dental patients with previous restorations (different repairs to teeth, such as fillings, crowns, and bridges, that restore original function) has a relatively high degree of variability, which may or may not be related to patient-specific factors. Further research may be able to show which type of restoration is most effective. Measuring performance becomes more feasible when evidence reports are available that systematically evaluate the efficacy of techniques for the diagnosis, prevention, and treatment of dental caries and other dental diseases.

<sup>a</sup>Unless otherwise referenced, the information in this section comes from the Surgeon General's report.

## Access to adequate care

AHRQ-funded studies have identified disparities in the dental care used by poor children and elderly blacks. These studies have shown that, despite Federal requirements, children who are enrolled in the Medicaid program or are among the near-poor receive less dental care than is recommended for their age group. For example, they are less likely to receive regular preventive visits than those in higher income groups. Also, they are less likely to have their teeth treated with dental sealants (plastic coating on the chewing surfaces of teeth), a treatment shown to improve outcomes and lower overall treatment costs. Poor elderly minority people also may not receive needed dental care. The reasons for these disparities are varied, but they include financial barriers to care, unavailability of dentists in poor neighborhoods, administrative complexities in qualifying for Medicaid eligibility and treatment approval, and insufficient participation by dentists in the Medicaid program.

### Low-income children have unmet dental needs

An AHRQ-supported study analyzing data from the 1996 Medical Expenditure Panel Survey (MEPS)<sup>b</sup> on use of preventive dental care by 6,595 children and adolescents found that poor children have significantly fewer preventive

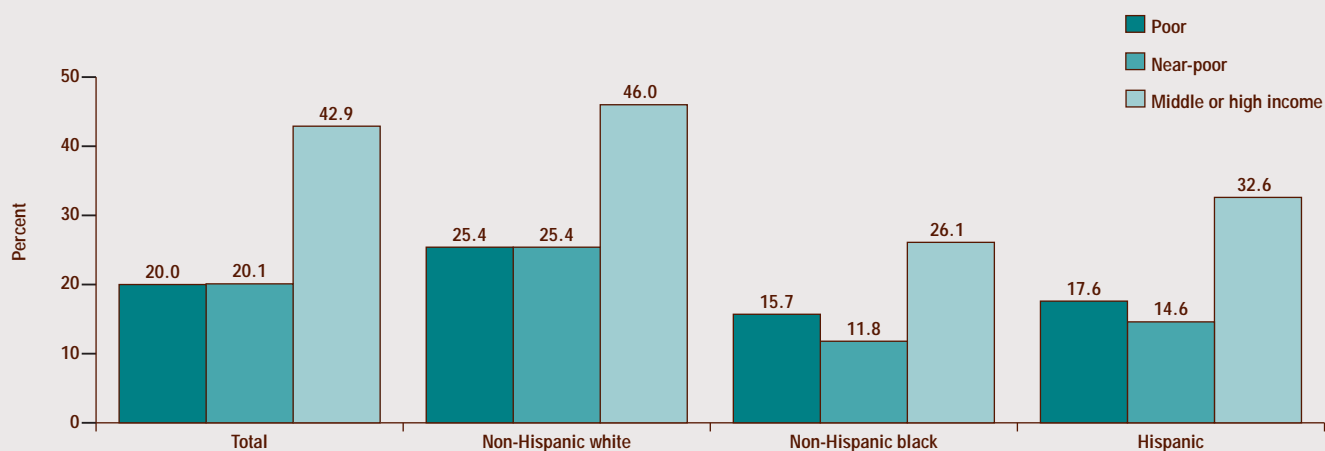
dental visits than those with higher incomes.<sup>4</sup> Poor and near-poor children age 18 and under were only about half as likely to have had preventive dental visits as children in middle or high income brackets across racial/ethnic groups (Figure 1).<sup>c</sup> For example, 16 percent of poor black children and 12 percent of near-poor black children had preventive visits, compared with 26 percent of those with middle or high income.

The same study also analyzed Maryland-specific data from the Centers for Medicare & Medicaid Services and found that only 31 percent of Medicaid-insured children had received preventive care during 1996. This proportion was unexpectedly low, given that States are required by Federal law to provide dental care to all Medicaid-eligible children from birth to 21 years of age. The required coverage includes annual dental exams, prophylaxis and fluoride treatments, and other emergency, preventive, and restorative services, such as fillings and oral surgery.<sup>4</sup>

<sup>b</sup>MEPS is the third in a series of medical expenditure surveys conducted by AHRQ. It is a nationally representative survey that collects detailed information on the health status, access to care, health care use and expenses, and health insurance coverage of the civilian noninstitutionalized population of the United States.

<sup>c</sup>In 1996, the Federal poverty line was approximately \$16,500 for a family of four. The near-poor are those between 101 and 200 percent of the Federal poverty line.

Figure 1. Percent of children 18 and under with a preventive dental visit, by poverty status and race/ethnicity: United States, 1996



Source: Watson MR, Manski RJ, Macek D. The impact of income on children's and adolescents' preventive dental visits. J Am Dental Assoc 2001;132:1580-7.

## AHRQ-Funded Research on Dental Care

### Research Programs Discussed in This Report

**Clinical Performance Measures for Dental Plans.** University of North Carolina School of Dentistry. The project developed measures of performance for dental care plans. The dimensions of performance for which measures were developed include the effectiveness of the care provided by the plan (the extent to which appropriate evaluation and treatment is provided and new disease is prevented), use of services (the rates and/or ratios at which selected services are provided), and access (the availability of plan benefits to enrollees).

**Strategies for Management of Dental Caries in Children.** University of North Carolina School of Dentistry. This project used North Carolina Medicaid data to explore factors associated with providers' use of sealants in this population, including the initiation of a reimbursement benefit for dental sealants.

**The Effect of Medicaid Policy on Dentist Participation.** Sheps Center for Health Services Research, University of North Carolina. This project studied how changes in Medicaid policy, in particular fee increases and the size of the Medicaid population, affect providers' participation in the North Carolina Medicaid program. In addition, the study explored the relationship between Medicaid price increases and charges to non-Medicaid dental patients.

The situation for Medicaid children in Georgia and Alabama is comparable to the situation in Maryland, according to a study by the Children's Health Insurance Research Initiative (CHIRI™),<sup>d</sup> funded by AHRQ, The David and Lucile Packard Foundation, and the Health Resources and Services Administration.<sup>5</sup> Less than a third of Georgia Medicaid children (30 percent) received dental care in 1997, and less than a quarter of Alabama Medicaid children (18 percent) received dental care in 1999. Almost all of the children who had any dental care received preventive care, with approximately half receiving acute dental services such as emergency or restorative care.

Another AHRQ-funded study reported that half of 1,297 Medicaid-enrolled schoolchildren in North Carolina never used dental services. Among children who got care, 45 percent needed restorations in primary teeth and 25 percent needed restorations in permanent teeth. Among these children, 29 percent had all their dental needs met, 28 percent had their needs partially met, and 43 percent had no dental needs met.<sup>6</sup>

### Dental sealants for Medicaid children are underused

Even when poor and near-poor children have access to a dentist, they may not receive generally accepted

<sup>d</sup>The CHIRI™ study is based on claims data from Alabama (1999) and Georgia (1997); therefore, its findings cannot be directly compared to the earlier study based on 1996-97 survey data from MEPS.

recommended care such as dental sealants. Dental sealants prevent tooth decay, save money, and are an important preventive measure, complementing the use of fluorides. They work by preventing decay from developing in the pits and fissures of teeth, channels that are often inaccessible to brushing and where fluoride may be less effective. All States now include sealants as a dental benefit for children enrolled in their Medicaid dental programs; however, dental sealants are underused.

An AHRQ-funded study that examined the dental experiences of 15,438 children enrolled in the North Carolina Medicaid program from 1985 to 1992 found that sealants were effective in preventing tooth decay in the chewing (occlusal) surfaces of the bicuspid and molar teeth.<sup>7</sup> This reduced the need for CRSOs (caries-related services involving the occlusal surfaces of these teeth). The most effective use of sealants was among children who had more dental services for cavities before sealant placement. Furthermore, researchers found that restoration rates (cavity fillings) for high-risk children peaked at 8 years for unsealed teeth and at 9 years for sealed teeth (18 vs. 8 percent). The effects of sealants are greatest when the child is roughly 8 years old; after that age, sealant effectiveness declines.

The Medicaid program saved money by using sealants for children prone to cavities. The greatest difference between expenses for sealed and unsealed teeth (\$15.21 per molar)



occurred among the high-risk patients at age 9. These savings were realized within a 2-year period following sealant application among children with two or more prior CRSOs.

However, AHRQ research has documented that, in spite of the savings realized from their use, these treatments are underused in the Medicaid program.<sup>6</sup> For example, among 219 North Carolina children enrolled in Medicaid who needed sealants for 615 teeth, only 21 teeth (3 percent) were sealed, 195 (32 percent) received fillings, 23 (4 percent) were extracted, and 376 (61 percent) received no treatment within a 2-year followup period.

### **Poor elderly African Americans may lack access**

The Surgeon General's report found that people 55 to 74 years of age have higher rates of periodontal disease and also have an increasing amount of tooth decay compared to younger adults. The elderly's use of dental care can be substantially influenced by financial barriers and other nondental health concerns. AHRQ-supported researchers analyzed dental and medical claims data from 1983 to 1992 for 3,458 individuals age 62 years and over who visited two urban health care facilities and participated in a special Medicare-waiver program that reimbursed for dental services (not usually covered by Medicare).<sup>8</sup> They compared age, race, medical use, and pharmaceutical use among people who used both medical and dental services (dental users) and those who used only medical services (nondental medical users).

Researchers found that among poor, elderly city residents, blacks were twice as likely as whites to use dental services that are reimbursed by a Medicare waiver program. Eliminating financial barriers among less affluent and less educated minority elderly people has a definite effect on their use of oral health care services.

In addition, nondental medical users had twice as many medical visits each month and more than twice the monthly medical charges in the program as dental users had (.99 visit vs. .56 visit per month and \$43 vs. \$21 in charges per month). Dental users were more likely to be younger (born after 1910) and black (63 percent vs. 36 percent white) than nondental users, with twice as many blacks as whites participating in the dental waiver program.

The decrease in oral health care services associated with increased use of medical services seems to indicate that as

health declines, people are less inclined or able to seek dental care. This could indicate a decrease in the priority given to oral health care, decreased ability to access oral health care services, or both. The researchers suggested that African Americans in the study were more likely to use dental services because their access to services improved. The absence of private-sector dentists in their own communities was mitigated by the availability of a city-run facility providing dental services under a special Medicare-waiver program that reimbursed for dental services.<sup>8</sup>

### **Access to Medicaid dental care may be improved**

AHRQ-supported researchers have offered their own suggestions about how to improve access to Medicaid dental care. Their suggestions focused on two areas: education and administrative simplification. For example, the research team that studied the impact of income on the use of preventive care suggested that poor and near-poor families may not know how to use available resources effectively. They concluded that educating families eligible for Medicaid and State Children's Health Insurance Program (SCHIP) programs about how to enroll and access the system may be essential for the success of these programs.<sup>4</sup>

Another group of researchers who studied schoolchildren and Medicaid suggested that streamlining Medicaid administrative procedures (e.g., Medicaid eligibility, treatment approval) could also contribute to better care. For example, instituting a mechanism for prior approval of care once a child appears for his or her first dental visit would help to ensure that all needed care could be completed quickly and without the need for further approvals.<sup>6</sup>

One factor contributing to insufficient dental care may be that dentist participation rates in Medicaid remain low. The CHIRI™ study<sup>5</sup> found that children were more likely to receive restorative dental care if they lived in counties where there was a greater than average number of Medicaid-participating dentists per enrollee.

The dentist participation rates are themselves partly a function of the reimbursement levels provided under the Medicaid program. One AHRQ-funded study examined what happened to participation when reimbursement rates were increased.<sup>9</sup> The study found that increasing provider reimbursement by 23 percent, even when accompanied by a doubling of enrollment for individuals under age 21, had

only marginal effects on increasing access to dental services for the Medicaid population. From 1985 to 1991, Medicaid enrollment doubled in North Carolina; during the final 4 years of the study (1988-91) there was a 23-percent increase in Medicaid reimbursement to dentists. However, following the implementation of these two measures, the percentage of dentists seeing 5 or more Medicaid-insured children per quarter remained fairly constant and the percentage seeing 10 or more such children per quarter increased only slightly.

Among providers seeing at least 10 Medicaid children per quarter, an increase in real Medicaid reimbursement from \$13 to \$14 yielded an expected 3 percent (.83 person) increase in the number of Medicaid children seen per quarter. Pediatric dentists were significantly more likely to participate in Medicaid than general dentists (probability of .58 vs. .20). Pediatric dentists also saw more than 2.5 times as many Medicaid children per quarter as general dentists did. Dentists in solo versus group practices were more likely to participate in Medicaid, and dentists with more years of experience were less likely to participate.

The researchers who conducted the North Carolina study did not conclude that increased reimbursement had little or no effect on dentist participation. Instead, they concluded that greater participation may require much larger increases in reimbursement.<sup>9</sup>

## Measuring the quality of dental care

An important focus of performance measurement to improve quality of care is the study of variations in the use of dental procedures. These variations (by geographic area, practice type, etc.) suggest the possibilities of overuse and underuse. Similar concerns are found in medical care. For example, health services research has examined variations in the provision of medical care for patients with similar medical conditions living in different geographic areas. It has also studied patterns of possible overuse and underuse of medical procedures.<sup>10-12</sup> These studies in turn have raised questions about the extent to which patient-specific factors, provider preferences, and practice styles influence treatment decisions.

### Unexplained variations in clinical decisions are widespread

Are documented variations in the provision of dental treatments simply reflections of the art of dentistry or are

they caused by uncertainty or disagreement about which treatment is the most effective? Because quality-of-care measures for evaluating the performance of oral health insurance plans have not been available, these questions have not yet been answered and the quality of care furnished cannot be systematically evaluated.

In a comprehensive review of the literature regarding variation in dentists' clinical treatment decisions, AHRQ-funded researchers found substantial variation in areas such as the rate of provision of specific procedures, the cost and number of procedures recommended for specific patients, diagnoses, intervention decisions, and treatment selection for individual teeth.<sup>13</sup> For example, in one study that compared six capitated practices with five fee-for-service practices, average rates of restorative services were higher in the fee-for-service practices: three times as high for adults and four times as high for children. In another study, the proposed treatment costs for two patients examined by 15 North Carolina dentists ranged from \$180 to \$1,340 for one patient and \$420 to \$2,400 for the other.<sup>13</sup>

From their review of the literature, the researchers concluded that even when differences in patients are accounted for, variations in dentists' clinical decisions are widespread. Such variations, which raise questions about possible overuse and underuse of care, definitely need to be better understood.<sup>13</sup> The studies discussed below have begun to lay the foundations of evidence-based performance measurement for dental care.

### Cost-effectiveness of different restorative treatments is unknown

Further studies examine restorative treatment recommendations and the effects of the choice of treatment on the cost of care. One study examined the extent to which dentists agreed about the treatment of 1,187 teeth in 43 patients.<sup>14</sup> Each patient was examined by an average of 6.6 dentists, with a total of 51 participating dentists. Overall, agreement among the participating dentists in recommending individual teeth for treatment was 62 percent. Among all teeth receiving at least one recommendation for treatment, only 22 percent received a unanimous recommendation. However, over half of all instances of lack of agreement occurred when one dentist's recommendation differed from those of all the other dentists examining the tooth. The results suggested that much of the variation stemmed from basic differences in recommended treatment for individual teeth with specific

conditions. In cases where a tooth had been previously restored, differences in treatment recommendations tended to be greater. The researchers conclude that their study shows the need to develop objective criteria for treatment of teeth with previous restorations.<sup>14</sup>

Another study by the same researchers explored the effects of variation in both dentists' decisions to treat and choices of restorative treatment on the cost of care.<sup>15</sup> The patients selected for the study needed decisions about a variety of single-tooth restorations and had no substantial periodontal complications. Three types of restorations—amalgam fillings, composite fillings, and crowns—varying widely in cost were considered.<sup>e</sup> Thirty-seven patients were examined individually by several practicing dentists. For each dentist's recommended treatment for each patient, the total cost of restorative treatment was calculated first by using the least expensive treatment possible for each tooth designated as needing treatment and second by using the treatment selected by the dentist. The average cost per patient of the treatment selected (\$893) was three times larger than the cost per patient of basic treatment (\$269). Most dentists did not consistently recommend either higher or lower cost treatment plans.

The findings suggest that inconsistencies in both dentists' decisions to perform restorations and their selection of treatment have a profound effect on costs. However, the researchers caution that since there is a relative lack of information about the cost-effectiveness of low- and high-cost treatment alternatives, appropriate treatment planning and rational cost containment are very difficult. The researchers suggest that comprehensive efforts to improve consistency across the profession would be more productive than focusing on "outlier" dentists who choose more high-cost treatments.<sup>15</sup>

### Use of dental crowns and alternatives varies

Another AHRQ-funded study looked at the use of dental crowns and their alternatives.<sup>16</sup> It found that the use of crowns among patients with substantially compromised

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<sup>e</sup>Amalgam fillings are made from a silver/mercury mixture. Composite fillings contain a mixture of filler particles such as silica, aluminum, zinc, tin, copper, and iron in a liquid resin. A crown is full coverage for a tooth (used when the tooth cannot be restored by a filling). Crowns are much more expensive than either the amalgam or composite fillings. Most dental schools teach that a crown is the preferred treatment for substantially compromised posterior teeth with extensive caries, fractures, or large defective restorations (fillings), as opposed to a direct metal alloy (amalgam) or composite resin filling.

posterior teeth varies significantly by age and region and that these differences, in turn, are related to substantial differences in costs. The study found that older patients are significantly more likely to receive crowns than young patients. Patients 50 and over had an average cost per tooth of \$269, compared to an average cost per tooth of \$181 for patients ages 18-34. Also, regional variation in the provision of crowns appears to contribute to a 31-percent difference in the average per-tooth treatment cost between the highest and lowest cost regions. The most notable geographic difference in average cost per tooth was between the Northeast (\$173) and the West (\$251). Based on the sample included in the study, the average cost of restoring a tooth requiring either a crown or its alternative was \$225. Since crowns can cost up to six times as much as the alternative, seemingly small differences in the use of crowns can have major effects on overall costs.<sup>16</sup>

In addition, the ratio of crowns to their alternatives varies more than the amount that can be accounted for by the patient and practice factors that were measurable through the claims data used in this study, raising questions about the consistency of dentists' treatment recommendations.<sup>17</sup> For example, 43 percent of practices provided crowns at either 50 percent below or 150 percent above the expected rate. This variation found at the practice level also raises concerns about the appropriateness of care. However, as the researchers note, "... a determination of appropriateness depends upon comparison with a known standard of treatment effectiveness, which is currently unavailable."<sup>15</sup> Other reasons for disagreement about treatment recommendations could include differences in the thoroughness of the examination, application of diagnostic criteria used to define a condition, assessment of risk, interpretation of nonclinical patient factors, and interpersonal interaction between the dentist and patient.

The researchers concluded that if a substantial portion of the variation noted in this study indeed stems from dentists' idiosyncratic use of crowns, the profession has a clear indication of the need to improve knowledge of treatment outcomes among practitioners. Since there is substantial disagreement about the relative life expectancies of crowns vs. their alternatives, the researchers conclude that more outcomes effectiveness research is needed, given the wide difference in the costs of alternative treatments.

In fact, one of the researchers points out that the dental profession lacks basic evidence that many of the dental treatments provided are even effective.<sup>17</sup> He also suggests

that soon payers and consumers will no longer accept anecdotal stories about quality; they will want measurement and quantification instead. He argues that dental schools are the logical site for the development of valid, reliable, and acceptable health services research methods and databases. In addition, he describes the actual development of an insurance claims database to demonstrate the types of investigations possible with it. This database was used to conduct the study described here on practice variations in the use of crowns.<sup>16</sup>

### Dental performance measures have been developed

Performance measures for dental care plans can improve the ability to measure effectiveness of care and use of services, but no standardized measures of the performance of dental care plans exist. Currently most plans do not collect sufficient administrative information to determine the outcomes of care delivered by their providers. To fill the gap left by the lack of standardized performance measures, AHRQ-funded researchers developed seven effectiveness-of-care measures and six use-of-services measures modeled after the Health Plan Employer Data and Information Set (HEDIS®) measures of medical care.<sup>18</sup> (See the text box.) The measures enable oral health plans to determine the percentage of enrollees with various conditions and the percentage receiving various services. Since basic restorative and periodontal care accounts for one-half of all dental expenditures and approximately 50 percent of the population has some dental care coverage, these measures cover care costing more than \$10 billion.

All of the measures are expressed as proportions, i.e., the proportion of all enrollees meeting certain criteria who have experienced a certain clinical outcome or have received a certain service. For example, the first effectiveness-of-care measure, “current disease activity assessment,” reports the percentage of all enrollees who have had a caries activity assessment within 2 years of the end of the reporting year. The proportions for children (ages 6-17) and adults (ages 18 and over) are reported separately. The second and third measures address dental caries: a process measure assessing receipt of appropriate preventive services such as fluoride treatment or dental sealants, and an outcome measure assessing caries experience among enrollees. This pattern is repeated for periodontal disease. A final measure assesses the extent of tooth loss from both diseases.

Of the six use-of-services measures, three are ratio measures comparing the provision of services that could be

#### Effectiveness-of-care measures

- Current disease activity assessment.
- Preventive treatment for caries-active children and adults.
- New caries.
- Periodontal treatment for perio-present adults.
- Improvement in periodontal status.
- Deterioration in periodontal status.
- Tooth loss.

#### Use-of-services measures

- Receipt of prophylaxis.
- Preventive treatment: restorative treatment ratio.
- Casting (e.g., crown, inlay): large direct fillings ratio.
- Endodontic treatment: extraction ratio.
- Receipt of third molar (wisdom tooth) extractions.
- Mean number of third molars extracted.

Source: Bader JD, Shugars DA, White A, et al. Development of effectiveness of care and use of services measures for dental care plans. *J Public Health Dent* 1999; 59(3):142-9.

considered alternative therapies (e.g., endodontic treatment vs. extraction). Two measures are concerned with wisdom tooth (third molar) extractions. Another measure is a traditional assessment of the proportion of enrollees receiving prophylaxis.

The two groups of measures were pilot tested using administrative data from two group model oral health plans with approximately 205,000 eligible enrollees. The testing provided partial evidence that the measures are reliable and sensitive to differences among plans. However, the results reported in the study are not to be taken as benchmarks for comparison with other dental plans since they are the first such performance data to be reported for any dental plan.

The measures offer several advantages that can help promote their implementation. They can be calculated directly from a dental plan’s administrative data system (assuming that the system included diagnostic codes), thereby minimizing data collection costs and related recording errors. They are standardized to facilitate comparisons across plans. They include a means of risk adjustment to account for differing oral disease status among enrollees of different plans. However, the measures, in their final form, cannot be widely implemented



immediately because diagnostic codes are not routinely used in dentistry and a universally accepted set of codes is not available at present. The researchers also reported a set of interim measures that can be applied using audit-based data until carriers do include diagnostic codes in their administrative data systems.<sup>19</sup>

### Scientific evidence for tooth decay treatment strategies is limited

Measuring the quality of care presupposes the ability to systematically evaluate the validity and effectiveness of diagnostic, preventive, and surgical interventions. AHRQ, in a collaborative effort with the National Institute of Dental and Craniofacial Research (NIDCR), sponsored an evidence report systematically evaluating research on the diagnosis, prevention, and nonsurgical treatment of dental caries.<sup>20</sup> The Evidence-based Practice Center (EPC) performing the analysis looked at 39 studies describing the performance of diagnostic methods.<sup>f</sup> The analysis included separate evaluations for different types of tooth decay (e.g., cavitated lesions, lesions involving dentin, enamel lesions) and also for different surfaces and tooth types. The EPC report found that the strength of the evidence on the performance of almost all diagnostic methods is poor. Several factors were responsible: an insufficient number of studies, variation among reported results, and the quality of the available studies. The evidence did not support the superiority of either visual or visual/tactile diagnostic methods since the number of available assessments was small and there was substantial variation among the reports for each method. The evidence suggests, but is not conclusive, that some digital radiographic methods offer small gains in sensitivity compared to conventional film x-rays. The evidence also suggests that electrical conductance methods may offer heightened sensitivity on occlusal surfaces, but at the expense of specificity. Again, the evidence was not conclusive.

The EPC also reviewed nine methods of managing caries-active individuals: fluoride varnishes, fluoride topical

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<sup>f</sup>Evidence reports are based on rigorous, comprehensive reviews of relevant scientific literature performed under contract by Evidence-based Practice Centers. The reports' emphasis is on explicit and detailed documentation of methods, rationale, and assumptions. The goal of these reports is to provide the scientific foundation that public and private organizations can use to develop their own clinical practice guidelines, quality measures, review criteria, and other tools to improve the quality and delivery of health care services.

<sup>g</sup>The conclusions of the EPC report apply to research published between 1966 and 1999. The earlier discussion of sealant effectiveness was based on research published in 2001.

solutions, fluoride rinses, chlorhexidine varnishes, chlorhexidine topicals, chlorhexidine rinses, combined chlorhexidine-fluoride applications, sealants, and other approaches. In its analysis of 35 studies, the evidence for the efficacy of fluoride varnishes was rated as fair and the evidence for all other methods was incomplete.<sup>g</sup>

Once again, the number of available studies for any specific method proved to be a serious limitation. Among studies addressing a method, the variety of experimental protocols, comparison groups, and other community and individual preventive dentistry exposures further restricted the opportunity to draw conclusions about the efficacy of specific methods. Also, generalization from the studies to the broader U.S. population is problematic, as nearly all studies included only children and evaluated changes only in the permanent teeth.

Finally, the EPC report evaluated the efficacy of preventive methods among individuals who have experienced, or are expected to experience, an elevated incidence of noncavitated tooth decay. Here the evidence was rated as incomplete, since the team found only five studies addressing the topic. No conclusions were drawn.

### More AHRQ-funded evidence reports on dental care are available

**Cardiovascular Effects of Epinephrine in Hypertensive Dental Patients.** AHRQ and NIDCR sponsored and issued an evidence report on the cardiovascular effects of epinephrine in hypertensive dental patients.<sup>21</sup> Epinephrine is widely used as an additive in local anesthetics to improve the depth and duration of the anesthesia, as well as to reduce bleeding. The added risks attributed to the use of epinephrine in hypertensive patients include the increased probability of acute hypertensive crisis (dangerously high blood pressure), angina pectoris, myocardial infarction, and cardiac arrhythmias.

The EPC looked at five studies on the outcomes of the use of epinephrine-containing anesthetic solutions in hypertensive patients. The report rated the evidence on this issue as poor because the outcomes considered in the five studies did not represent a reasonably complete assessment of risk indicators. Also, transient effects in blood pressure and heart rate, the principal outcomes reported, might have remained undetected in three of five studies.

The EPC recommended that a long-term research study be initiated in one or more large dental clinics in order to

quantify the magnitude of additional risk represented by the use of epinephrine in hypertensive dental patients.

### **Management of Dental Patients Who Are HIV Positive.**

Another evidence report cosponsored by AHRQ and NIDCR focused on several aspects of the dental management of a special population subgroup—the estimated 900,000 people in the United States with HIV/AIDS.<sup>22</sup> These aspects include:

- Complications associated with invasive dental treatments.
- Dental conditions as markers or indicators of change in HIV serostatus and immunosuppression.
- The efficacy or effectiveness of available antifungal drugs to prevent or treat oral candidiasis.

The EPC found that there is limited evidence on the risks of oral procedures among people with HIV/AIDS. Very few studies have been reported, and only two types of procedures—root canal therapy and extractions—have been investigated. From this limited base, there is little evidence of unusual rates or severity of complications for these procedures among people with HIV/AIDS.

Evidence for the utility of selected oral lesions as markers for seroconversion is limited to a single study of a single oral condition—candidiasis. The review does not suggest the use of oral conditions as markers for seroconversion.

The evidence with respect to the efficacy of fluconazole to prevent oropharyngeal candidiasis is good, but for other antifungal agents there is no evidence. The situation is different with respect to the effectiveness of antifungals as treatments for oropharyngeal candidiasis. With the exception of amphotericin B, the evidence is good that all tested antifungals are effective, although all are not equally effective.

## **Ongoing research and programs**

### **U. S. Preventive Services Task Force (USPSTF)**

**Recommendations on Dental Care.** In fall 2003, the USPSTF will issue recommendations to cover primary prevention in pre-school-aged children. These recommendations will update the previous USPSTF recommendations, which were issued in 1996.

### **The Effect of Public Insurance on Oral Health**

**Outcomes.** University of North Carolina. R03 HS11514. This project represents an indepth comparison of the use of

dental services, effectiveness of established pediatric oral health performance measures, and oral health status for children enrolled in either the North Carolina Medicaid program or the North Carolina Health Choice for Children program (North Carolina's SCHIP program). This study provides an opportunity to determine the benefits of public dental insurance for low-income children when it is structured similarly to private insurance.

### **Effects of WIC on Child Medicaid Dental Use and Costs.**

University of North Carolina. R03 HS11607. The purpose of this research project is to examine the relationship of the Women, Infants and Children's Supplemental Food Program (WIC) on the oral health use patterns and cost to the Medicaid program of children under age 5. The current low level of oral health service use in Medicaid had presented a major public policy challenge, as evidenced by reports from the Office of Technology Assessment, the General Accounting Office, and the Office of the Surgeon General. This investigation will examine the role of a partnership between Medicaid and WIC, and its effects on Medicaid use and expenses.

## **Conclusion**

Despite a falling general rate of tooth decay among children, widespread disparities exist in the provision of care to poor and minority populations because of a cluster of access and financial issues. Availability of coverage and provider reimbursement rates seem to make a difference in access to care and in quality of care.

Measuring the quality of dental care provided through dental care plans is a difficult task, but one that has parallels in performance measures already in use for health care. The quality of dental care provided by oral health plans could benefit if performance measures developed for dental services by AHRQ-funded research were put into broader use. AHRQ's evidence reports, such as the one on validity and efficacy of diagnostic, treatment, and preventive strategies for carious lesions, are designed to evaluate the strengths and weaknesses of existing research on a broad array of health care subjects. Where gaps in the research are shown to exist, AHRQ-funded research, such as evaluation of the effectiveness of dental sealants, can help to address the need for more evidence-based practice. In addition, the relatively recent growth in alternative treatments available for both diagnosis and management of dental caries has yet to be fully assimilated by dental

practice. Thorough reviews of methods for diagnosis and management of dental caries should assist in that assimilation process.

AHRQ's research has continued to point out the disparities in the provision of care that need to be addressed, the possibility of systematic measurement of dental plan performance leading to improvements in the quality of care, and the paths that dental research should take in pursuing the goal of evidence-based practice.

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