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DOI: 10.1377/hlthaff.2020.00799
 HEALTH AFFAIRS 39,
 NO. 10 (2020): 1762-1769
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 The People-to-People Health
 Foundation, Inc.

ANALYSIS

Children's Oral Health: Progress, Policy Development, And Priorities For Continued Improvement

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ABSTRACT Considerable progress has occurred in the US over the past quarter-century in terms of improving children's oral health. Federal and state policies, programs, and partnerships have contributed to improvements in oral health status. Medicaid and Children's Health Insurance Program coverage expansions helped increase the use of dental services, and investments in safety-net facilities and training programs helped expand service delivery and the oral health workforce. Nevertheless, dental caries remains the most common chronic disease of childhood, notable oral health disparities persist, and the adoption of evidence-based innovations remains slow and uneven. This article highlights improvements during the past twenty-five years in US children's oral health and oral health care that stem from major federal and state initiatives, as well as persistent disparities. We offer promising strategies for reducing gaps and suggestions for overcoming challenges to future progress, including renewed emphasis on oral health during early childhood; greater integration in education and clinical service delivery programs; development of standardized quality measures; and data collection systems that support more robust surveillance, program monitoring, and system improvements.

Oral health is increasingly recognized as an essential component of a child's overall health and well-being.^{1,2} The majority of children in the US enjoy the benefits of good oral health: a socially acceptable smile; relatively easy, straightforward visits to the dentist; and freedom from pain caused by their teeth. The cost of their dental care generally is modest and often covered (at least partially) by commercial dental insurance provided as a benefit through a parent's employer.³⁻⁵

Children with fair or poor oral health, estimated to be 20–25 percent of all children, in contrast, tend to have smiles with missing teeth and visible tooth decay (also called dental caries) that likely started when they were preschoolers.^{3,4,6}

They also frequently experience stressful visits to the emergency department or dentist for long appointments to repair or remove damaged teeth, as well as pain and associated infection that can spread throughout a child's body and, in rare cases, lead to death.² The cost of their dental care can be extensive, totaling thousands of dollars if sedation or general anesthesia is required to perform dental treatment, and generally is covered by Medicaid or Children's Health Insurance Program (CHIP) benefits or paid for by their family out of pocket.⁷

In addition to the physical damage caused by caries, children with poor oral health often experience delayed overall physical growth and development, difficulty eating, and impaired speech. They also are at risk for diminished

self-esteem and social interactions as a result of being seen as different as well as at risk for reduced academic performance stemming from dental pain, difficulty sleeping, and absences from school.^{2,3,8}

Children with poor oral health are more likely to be a member of a racial/ethnic minority group (Black, Hispanic, Native American) and to live with a number of social risk factors including parents with no more than a high school education, family income less than 200 percent of the federal poverty level, a household with fewer than two parents, a household with family conflict or low maternal mental health, and an unsafe neighborhood.^{3,4,9} The greater the number of these social risk factors, the greater the odds of suboptimal oral health.⁹

Public policies and programs focused on children's oral health generally have two broad aims: minimizing the impact of oral diseases on the population and reducing barriers that limit access to medically necessary oral health care services. Examples of the former include water fluoridation, education campaigns aimed at improving oral health literacy and promoting healthy behavior, surveillance activities to monitor trends and identify high-risk or high-need groups, and programs that provide screenings and preventive services in schools or other community settings. Examples of the latter include various health professions training programs, programs focused on addressing the limited local availability of oral health care providers and services (for example, National Health Service Corps, federally qualified health centers/community health centers), and programs that provide insurance coverage to reduce financial barriers for oral health care services—most notably Medicaid and CHIP.¹⁰

Over the past fifty-plus years, federal and state efforts, along with a variety of private-sector and local initiatives, have resulted in considerable improvement in US children's oral health.^{1,6} Part of this improvement, especially for children most at risk for dental caries, has come from a variety of initiatives during the past twenty-five years to expand coverage and use of dental and oral health services by children enrolled in Medicaid and CHIP.^{11–13} Despite notable progress in the use of dental services and documented declines in dental caries in children, caries remains the most common chronic disease of childhood, with persistent disparities seen in children's oral health status and use of services related to household income, race/ethnicity, and source of insurance coverage.^{3,4,6} Further progress toward improving children's oral health and ensuring that all children have the opportunity to have optimal oral health throughout their lives depends on the

extent to which sustained efforts to carry out coordinated, evidence-based strategies are devised, implemented, and revised to adapt to changing circumstances.

In this article we examine progress made over the past twenty-five years in children's oral health, highlight major federal and state strategies and initiatives that have contributed to improvements, and conclude by identifying current challenges and suggestions for overcoming them. Specifically, we review progress toward reducing dental disease rates and unmet dental care needs and toward increasing dental insurance coverage and use of dental services. We then summarize key federal and state policy and program activities and achievements that have served as catalysts for progress. Finally, we provide a future-looking set of suggestions for policy makers to consider to continue driving overall improvements and reductions in disparities.

Progress

DISEASE TRENDS The predominant disease affecting children's oral health is dental caries. Dental caries is a multifactorial, chronic disease with social determinants in which acid-producing bacteria cause destruction of tooth structure, which can result in pain and the spread of infection throughout the body.^{1,14–16} Common measures of dental caries that are of interest to policy makers and program officials include the number of children affected by tooth decay (caries prevalence), how many teeth or tooth surfaces are affected (caries severity or caries experience), and what proportion of either children or decayed teeth have not received treatment to stem infection or restore damaged tooth structure (untreated caries).⁶

Comparisons of National Health and Nutrition Examination Survey (NHANES) results over the course of the past three decades show substantial overall improvements in childhood dental caries measures. Analysis of NHANES data from the period 1988–94 showed disparities in US children's caries experience, caries severity, and untreated caries by household income level and race/ethnicity, with lower-income children being as likely to receive some treatment but three to five times more likely to have unmet dental treatment needs.¹⁷ A more recent analysis by the Centers for Disease Control and Prevention (CDC) compared findings from NHANES surveys conducted during two earlier periods and reported that the “prevalence of caries among children aged 2–5 years decreased from 28% during 1999–2004 to 23% during 2011–2016.”¹⁶

“The prevalence of caries [in primary teeth] among children aged 6–8 years was 52%, with

no changes detected overall or across sociodemographic groups since 1999–2004,” according to the CDC report. “The prevalence of untreated tooth decay in primary teeth [during 2011–16] was 10% among children aged 2–5 years and 16% among those 6–8 years, reflecting a 10 percentage point decrease in both groups since 1999–2004. Notable decreases occurred among Mexican American [31 percent during 2011–16 versus 15 percent], near-poor, and poor [31 percent during 2011–16 versus 17 percent during 1999–2004] children.”⁶

The CDC report also found that “the prevalence of children with untreated tooth decay in permanent teeth decreased by 3 percentage points, to 5% among children aged 6–11 years and 17% among adolescents aged 12–19 years since 1999–2004.... The largest decline was 8 percentage points among Mexican American adolescents, followed by 6 percentage points among near-poor children, and 5 percentage points among non-Hispanic black children.”⁶

Despite statistically significant reductions in the number of carious dental surfaces and statistically significant increases in the number of restored dental surfaces (fillings) in younger children, overall there was little change in the prevalence of children with caries experience in older children and adolescents.⁶

Together, these trends indicate that efforts over the past thirty years have had some statistically significant positive impacts on caries prevalence, caries experience and caries severity, and untreated caries in children covered by public programs. However, there has been little impact on the percentage of older children and adolescents who have experienced caries.⁶ Part of the reason for this limited impact relates to the traditional emphasis placed on restoring teeth (that is, dealing with the consequences of disease, often characterized as a “surgical” approach) as an approach to treatment of dental caries.^{16,18} Although beneficial from the standpoint of improving function and appearance and avoiding pain, traditional restorations have little impact on the underlying disease process, recurring need for treatment, or future risk for disease.^{16,18}

USE OF DENTAL SERVICES Limited use of dental services, particularly by children from lower-income households, has been a notable concern for federal and state policy makers and program officials.^{19–21} The primary strategy for increasing utilization at the federal level has been expansion of public dental insurance coverage, notably in the form of dental benefits for children as part of Medicaid’s Early and Periodic Screening, Diagnostic, and Treatment benefit (which dates back to 1967). Additional coverage expansions were enacted more recently as part of CHIP leg-

Much more needs to be done to promote oral health as part of healthy lifestyle initiatives and to improve oral health literacy.

islation and, to a more limited extent, the Affordable Care Act (ACA).²²

Growth of these programs has substantially increased public dental benefits coverage for children over time, to the point that in 2017 Medicaid and CHIP covered 39 percent of American children younger than age nineteen, with coverage by state ranging between 25 percent in Wyoming and 56 percent in New Mexico.²² Expanded coverage and efforts to improve the performance of state Medicaid programs have contributed to a substantial positive impact nationwide on Medicaid-enrolled children’s use of dental services, increasing from 18 percent in fiscal year 1993¹⁹ to nearly 50 percent in FY 2018²³ (see online appendix exhibit A1).²⁴ The percentage increase in children and adolescents enrolled in Medicaid who used dental services is noteworthy in its own right, but considering that Medicaid enrollment by children more than doubled between FY 1993 and FY 2018, the improvement in utilization rates is even more impressive. Data from the Centers for Medicare and Medicaid Services (CMS), shown in appendix exhibit A1,²⁴ indicate that of the 40,003,713 people ages twenty and younger who were enrolled in Medicaid for at least ninety continuous days in FY 2018, 19,871,123 (49.7 percent) received at least one dental service and 18,348,129 (45.9 percent) received at least one preventive dental service.²³

Analyses conducted by the American Dental Association Health Policy Institute found that in 2016, 50.4 percent of children enrolled in Medicaid or CHIP had a dental visit in the past year, with steady increases since 2006, when 35.3 percent of children enrolled in Medicaid visited a dentist.²⁵ Data from 2016 also showed that a higher percentage (67.1 percent) of commercially insured children visited a dentist in the past year, up from 57.9 percent in 2006. Thus,

although use of dental services in 2016 by privately insured children exceeded that of children enrolled in Medicaid, the gap declined between 2006 and 2016 (22.6 percent versus 16.7 percent). Further analyses of state-level data by the American Dental Association Health Policy Institute, shown in appendix exhibit A2,²⁴ reveal considerable variation across states, with some states showing relatively large gaps in use between Medicaid enrollees and commercially insured children and others showing little or no differences.²⁵ Several states actually demonstrate equivalent or even higher use among Medicaid enrollees compared with commercially insured children.

Major Federal And State Strategies And Initiatives

As noted earlier, considerable progress has been made toward improving children's oral health pursuant to a wide range of activities organized by federal and state governments and private stakeholders. By way of further explanation and elaboration, appendix exhibit A3 and the appendix section "Children's Dental Benefits Public Policy and Program Milestones"²⁴ offer an overview of major activities undertaken by Congress and various Department of Health and Human Services (HHS) agencies and offices over the past twenty-five years. Additional details are available in publications developed by the Institute of Medicine (now the National Academy of Medicine)^{26,27} and the HHS Office of Inspector General.¹⁹ State activities overlap in some instances—most notably Medicaid/CHIP—but also include a host of additional interests including ensuring a competent, adequate workforce and supporting various public health initiatives and community service programs.²¹ A review of these federal and state activities reveals several key strategies and initiatives, which are highlighted below.

Reducing financial barriers is a paramount goal for federal and state programs designed to provide access to medically necessary dental and oral health services. Although dental expenditures make up only a small fraction (4 percent) of Medicaid health expenditures,²⁸ out-of-pocket spending for dental services accounts for a large fraction of personal health expenditures for Medicaid (and commercially insured) beneficiaries.²⁹ Although considerable success has been achieved since the mid-1990s in expanding Medicaid coverage, inclusion of meaningful dental benefits in federal programs remains a constant struggle politically, with many implementation challenges. For example, the ACA reinforced the status quo approach of maintaining separate

medical and dental care financing and delivery systems and afforded some interesting lessons. Notably, "the inclusion of children's dental care as an essential health benefit under the ACA has had major implementation challenges...largely due to the fact that dental insurance plans are offered alongside medical plans [in insurance exchanges] and there is no mandatory purchase," as has been reported.³⁰ It bears noting that dental insurance coverage was expanding among children before the implementation of the ACA. As a consequence, the impact of the ACA on expansion of dental insurance for children has been modest. According to the most recent data, 8.3 percent of US children were uninsured for dental services in 2017 compared with 11.0 percent in 2014 and 15.8 percent in 2010.³¹

Beyond Coverage: Federal Oversight And State Partnerships

The design and administration of Medicaid/CHIP dental benefits is highly dependent on programs organized by state agencies.¹⁰ History is replete with examples of slow, erratic, and uneven translation of federal legislation and regulations into actual use of services by Medicaid/CHIP beneficiaries.^{12,19,20}

CMS and the federal courts play key roles in providing oversight for state programs and efforts to address poor program performance.³² Recent examples include efforts over the past decade to improve the delivery of preventive services under the auspices of the CMS Oral Health Initiative.¹⁵ A recent CMS bulletin highlighted state-level progress (or lack thereof) in increasing the use of preventive services by 10 percentage points, as well as several state-level initiatives.¹³ Overall, ten states met, exceeded, or were within 1 percentage point of their respective goals based on FY 2018 data.³³ Of notable concern however, twelve states were not within 10 percentage points of their goal after seven years of participation, and seven states had not achieved use of preventive services by 40 percent of children enrolled in Medicaid, which is well shy of the national CMS Oral Health Initiative goal of 52 percent and the overall national utilization rate of 46 percent. CMS is offering technical support for states as part of a continuation of the CMS Oral Health Initiative; however, it is not clear whether low-performing states will be required to participate or whether there will be consequences for failure to improve.

Training And Community Clinics

Federal agencies, most notably the Health Resources and Services Administration (HRSA),

and some states have taken steps to support various health professions training programs, including pediatric dentistry and general dentistry.³¹ Efforts also have been made to expand service delivery in areas of limited dental provider capacity through designation of dental Health Professional Shortage Areas; various loan repayment or loan forgiveness programs; and the National Health Service Corps, which was expanded as part of the ACA.^{34,35} Approximately 12 percent of National Health Service Corps slots are filled by dentists.³⁵

Another strategy involves various efforts to integrate oral health services into primary care. Barriers to, challenges to, and facilitators of oral health–primary care integration have been identified elsewhere.^{36,37} Expanding oral health care as part of primary care also has been supported by a US Preventive Services Task Force recommendation for primary care providers to apply fluoride varnish to the teeth of children ages five and younger.³⁸ Although these strategies represent important steps toward improving access to care for vulnerable populations, training does not necessarily translate into practice, robust models of medical-dental integration are nascent, and most federally qualified health centers still lack the capacity to provide dental services in spite of expansion efforts over the past fifteen years.^{36,39} Clearly, more must be done to foster better integration of dental services and oral health care within safety-net clinics and as part of new initiatives (for example, home visitation programs) that seek to expand service delivery outside clinical settings—approaches that are consistent with new population health approaches and evolving appreciation of the chronic disease nature of common oral diseases.

Factors Underlying Limited And Uneven Progress

Reasons for limited progress in improving children's oral health include the slow, limited, and uneven adoption of evidence-based approaches to improving children's oral health and oral health care, especially for young children. Evidence underscoring the importance of early interventions to prevent or reduce the human impact and costs of early childhood caries throughout the life course continues to mount.^{40–42} And yet only one in three preschoolers and fewer than one in five children younger than age three covered by Medicaid in FY 2018 received any preventive dental services.²³ Failure to provide preventive services beginning at an early age results in many young children being treated in costly emergency departments and hospital or surgical center set-

tings, which struggle to meet the demand for extensive dental treatment for children who require sedation or general anesthesia.⁷ And although some states have achieved utilization parity among Medicaid-insured and commercially insured children, demonstrating that effective strategies for improving the Medicaid dental program exist, substantial utilization gaps remain in many states²³ (appendix exhibit A2).²⁴

Looking beyond the use of services, very little is known about the quality of care provided in public or private dental benefits programs because of the limited development and use of credible measure sets to assess children's oral health care and data collection challenges. Moreover, applications of quality improvement science and methods to children's oral health care are limited.^{43,44}

Much more needs to be done to promote oral health as part of healthy lifestyle initiatives and to improve oral health literacy. Meaningful progress toward achieving optimal oral health for all children and reducing the impact of oral diseases, especially within vulnerable populations in which substantial oral health disparities persist, is unlikely to occur unless and until members of the public, health professionals, policy makers, and people working in community programs understand the nature of dental caries and work collaboratively to prevent or manage common oral diseases.

Policy And Program Priorities For Future Improvements

As with any complex issue, progress generally results from a combination of factors, some of which are planned and foreseen and others of which emerge over time. A comprehensive plan for improving children's oral health is beyond the scope of this article; nevertheless, we do highlight prominent challenges in oral health and suggestions for improvement in exhibit 1. We offer the following policy priorities and interventions for consideration.

REDESIGN CARE DELIVERY AND BENEFITS BASED ON CHRONIC CARE MODELS Traditional dental care delivery and benefits designs are overly simplistic (diagnose, prevent, treat); incomplete (little to no emphasis on disease management); insensitive to differences in people's disease risk; and dominated by a focus on procedures that address damage caused by disease, rather than prevention or management of chronic diseases. Existing financing and reimbursement arrangements often are not based on sound actuarial models that recognize the greater underlying levels of untreated disease and elevated risk in populations of children covered by Med-

EXHIBIT 1**Selected challenges to improvement and solutions within oral health care in the US**

Challenges	Suggestions for overcoming challenges
Limited understanding by the public, health professionals, and policy makers that caries must be addressed using evidence-based chronic disease approaches	Invest in developing evidence-based approaches for increasing oral health literacy, focusing on at-risk children and their caregivers, starting in infancy
“Siloed” education and care delivery systems and lack of integrated approaches to caries prevention and management	Federal and state support for innovative professional education and care delivery in settings that embrace dental-medical integration and clinical excellence
“Siloed” approaches to providing oral health benefits	Support integration of dental and oral health benefits as part of whole-person care
Paucity of meaningful evidence and effective models on how to address oral health disparities	Prioritize meaningful clinical and translational research, demonstration programs, and centers of excellence to address oral health disparities
Inadequate data systems for monitoring disease status and the impact of clinical and population health interventions or quality improvement efforts	Incentivize use of data collection tools that support surveillance, program evaluation, and quality improvement (including diagnostic codes to assess outcomes)
Limited development and use of standardized, tested quality and performance measures	Support collaborative approaches for the development and use of tested quality and performance measures, especially across federal and state programs
Limited and inconsistent oversight and efforts to ensure accountability and improvements in the performance of Medicaid and CHIP	Establish and monitor key Medicaid and CHIP performance standards, ensure that programs meet minimum performance standards, and reward high performance
Lack of consistent and coordinated leadership at federal and state levels for oral health programs	Ensure that federal oral health leaders have education and experience qualifications consistent with professional standards applied to other health disciplines

SOURCE Authors’ synthesis of literature cited and experience working with federal, state, and local programs. **NOTE** CHIP is Children’s Health Insurance Program.

icaid and CHIP. Priorities for systems improvement include revising coding frameworks (for example, the American Dental Association’s Code on Dental Procedures and Nomenclature) to identify a distinct set of evidence-based disease management procedures, including risk assessments; requiring the use of diagnostic codes to better monitor variations in population health and outcomes of care; redesigning benefits and payment models to reward cost-effective risk reduction, prevention, and disease management; and financing programs based on sound actuarial models.²⁰

SUPPORT DEVELOPMENT OF MODEL PROGRAMS THAT EMPHASIZE EARLY INTERVENTION AND INTEGRATED CARE

Dentistry is a profoundly “siloed” sector of health care in terms of education, care delivery, third-party coverage, and financing. Although changes in some components of these arrangements are likely to be slow and variable, greater efforts must be made to align and coordinate investments in new models for future oral health care delivery for children that focus on early coordinated or integrated interventions. Priorities for systems improvement include support for demonstration programs that focus on creating sustainable new integrated care delivery systems in which dental and other types of health care professionals work together with community partners (perhaps Head Start or

the Special Supplemental Nutrition Program for Women, Infants, and Children) to provide evidence-based oral health care for young children. Such programs should serve as training sites for future health professionals. Embedding dental benefits within health insurance instead of having a separate dental insurance system would enable better integration and likely reduce costs.¹⁵ However, care should be taken to ensure that new service delivery models are based on actuarially sound financing.

REVITALIZE ORAL HEALTH EDUCATION PROGRAMS

The persistent disparities in children’s oral health cannot be substantially improved without greater attention being paid to addressing the underlying causes of dental disease. Doing so begins with efforts to better educate children, their parents, and caregivers about how dental disease occurs and what steps they can take to achieve good oral health. Without this fundamental component (embodied in Early and Periodic Screening, Diagnostic, and Treatment benefits and successful approaches to dealing with other childhood diseases and conditions), the impact of professional services and community programs will be seriously diminished. Priorities include support for evidence-based public education and health literacy campaigns using proven early childhood education programs (for example, *Sesame Street*) to reach

large numbers of children and families with consistent appropriate messaging via multiple media.

ALIGN FEDERAL AND STATE EFFORTS TO MEASURE AND IMPROVE PROGRAM PERFORMANCE

Greater efforts should be directed toward fostering interagency collaboration among federal and state agencies and public-private partnerships to drive improvements in Medicaid and CHIP programs. Priorities include using information technology to streamline program performance data collection, analysis, and reporting (for example, the CMS Transformed Medicaid Statistical Information System); supporting the development and use of electronic clinical record systems that integrate oral, physical, and behavioral health data; and continuing efforts to identify core measurement sets for assessing quality and performance across programs, plans, and

provider settings (for example, private practices, public clinics, and community programs).

Conclusion

Oral health is an often-overlooked but important and integral component of children's health, development, and well-being. Awareness of the significance of children's oral health is evident in various federal and state policies and program frameworks in the US, especially those geared toward vulnerable segments of the population. The history of attention to children's oral health policies and programs has been one of sporadic efforts and mixed results. Future progress will depend on sustained vigilance, commitment, and collaborative innovation by a broad range of stakeholders. ■

James Crall received honoraria and travel expense reimbursement to participate as a member of the MetLife Dental Advisory Council, was a paid

policy consultant for Centene Corporation, and received honoraria and travel expense reimbursement to serve as chair of the Quality Improvement

Advisory Team for Georgetown University's National Maternal and Child Health Oral Health Resource Center.

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