Changes in the Oral Health of US Children and Adolescents and Dental Public Health Infrastructure Since the Release of the Healthy People 2010 Objectives

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We examined progress in US children's oral health and dental public health infrastructure since the Healthy People 2010 Oral Health Objectives were issued. We summarize trends in the prevalence of dental caries and dental sealants on the basis of national and state-specific data. Trends in state oral health program activities, funding, and staffing were derived from annual surveys.

The prevalence of dental caries in primary teeth of children aged 2–4 years increased from 18% in 1988–1994 to 24% in 1999–2004. Racial disparities persisted in that age group, with caries significantly more prevalent among non-Hispanic black and Mexican American children than among non-Hispanic white children. Caries prevalence in primary teeth of non-Hispanic white children aged 6–8 years remained unchanged, but increased among non-Hispanic black and Mexican American children. State-specific prevalence of caries among third-graders ranged from 40.6% to 72.2%. Caries in permanent teeth declined among children and adolescents, while the prevalence of dental sealants increased significantly. State oral health programs' funding and staffing remained modest, although the proportion of states with sealant programs increased 75% in 2000 to 85% in 2007 and the proportion with fluoride varnish programs increased from 13% to 53%.

Progress toward improving the oral health of America during the past decade has been mixed. Greater attention to the oral health of young children is clearly needed, and child health professionals can be valuable partners in the effort. With continued high prevalence of a largely preventable disease, ongoing problems with access to basic oral health services, and increased national attention to health care reform, there is a clear need and opportunity for governments to make serious and sustained investments in dental public health.

KEY WORDS: children; dental caries; oral health; pit and fissure sealants; public health dentistry

Academic Pediatrics 2009;9:388–95

Dental caries is, by far, the most common chronic disease affecting children and adolescents in the United States.[1] It is a multifactorial, transmissible disease that involves dissolution of mineralized tooth structure by acids produced by dental plaque bacteria.[2] Untreated dental caries can result in pain, infection, impaired oral function, and other personal and population problems.

Dental caries prevention in children and adolescents involves a range of population- and individual-level strategies that may include oral health education, community water fluoridation, topical fluorides such as fluoride varnish, dental sealants, antibacterial rinses, and dietary interventions. Other than community water fluoridation,[3] the community-based prevention strategies best supported by evidence and feasibility are dental sealants and fluoride varnish application. A dental sealant is an effective method for preventing dental caries in which plasticlike coatings are bonded to the occlusal (chewing) surfaces of permanent molars, the sites most susceptible to dental caries.[4–6] Dental sealant programs typically target children in grade 2, when children are at the age when first permanent molars typically erupt, and grade 7, when the second permanent molars have typically erupted. Fluoride varnish involves professional application of a topical agent that involves painting a small amount of high-concentration fluoride (22 600 ppm fluoride, compared with 1100 ppm fluoride in most toothpastes and 1 ppm fluoride in fluoridated community drinking water). Although fluoride varnish may be used among children of almost any age, it is particularly well suited for young children at high risk for dental caries.[7] Fluoride varnish is far less technique sensitive than dental sealant application, although there is limited information on direct comparisons between the 2 interventions on prevention effectiveness.[8]

A dental public health infrastructure is essential for any jurisdiction to carry out the core dental public health functions of *assessment, policy development,* and *assurance.* That is, there must be an adequate workforce, a sufficient

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Received for publication July 9, 2009; accepted September 20, 2009.

administrative presence within health agencies and departments, adequate financial resources to implement programs, and the legal authority to use personnel in an effective and cost-effective manner.[9]

The *Healthy People 2010 Objectives for Improving Health* were issued in 2000.[10] That comprehensive set of health objectives for the United States represented the input of a broad coalition of experts from many sectors, and included 467 objectives in 28 focus areas. One of those focus areas was oral health, with the overall goal being to prevent and control oral and craniofacial diseases, conditions, and injuries and to improve access to related services. That goal was supported by 17 specific objectives. The 10 objectives most relevant to the oral health of children and adolescents are listed in Table 1.

We are approaching the target date for *Healthy People 2010 Objectives on Oral Health*. Here, we present an overview of the changes in oral health status of American children and adolescents and the dental public health infrastructure during the first decade of the twenty-first century.

METHODS

Data for this study were drawn from several national and state sources. National data on dental caries and selected preventive services are from the National Health and Nutrition Examination Surveys (NHANES). Dental data were collected in 1988–1994 and again in 1999–2004. These data and details on their collection have been published previously,[11] so this report presents just a few key findings. State data on dental caries and dental sealants are available from those states that have conducted basic screening surveys (BSS) at least once during the past decade. The BSS has been developed and supported by the Association of State and Territorial Dental Directors; details of its design and administration are available.[12] Most states have collected such data only once, so trend analysis is not yet possible at the state level. Nearly all states that use the BSS report data only for children in the third grade. The oral health variables collected by the BSS conform to the 3 indicators of child oral health included in the National Oral Health Surveillance System,[13] which are limited to students in third grade and include dental caries experience, untreated dental caries, and the presence of dental sealants.[14]

Most data on state oral health program activities, funding, and staffing are derived from state synopsis survey questionnaires, which are developed and administered annually under a cooperative agreement between the Centers for Disease Control and Prevention's Division of Oral Health and the Association of State and Territorial Dental Directors.[15] Analyses and summaries of changes in state oral health programs were prepared by Dr Kathy Phipps as background for the National Summit on Children's Oral Health.[16] Other infrastructure data are drawn from the Healthy People 2010 database,[17] which monitors national progress toward achieving the Healthy People 2010 Objectives for Improving Health.[10]

The preparation of specialists in dental public health is one aspect of the dental public health infrastructure. The most common route for meeting the minimum educational requirements for eligibility for certification by the American Board of Dental Public Health is completion of a dental degree, a master-level or doctoral-level graduate degree in public health, and a residency in dental public health accredited by the Commission on Dental Accreditation.[18] Therefore, we examined trends in the number of accredited dental public health residency programs, their enrollees, and their graduates. Data on trends in the number of residency programs, residents, and graduates during the past decade were drawn from annual Surveys of Advanced Dental Education conducted by the American Dental Association.[19,20]

RESULTS

Healthy People 2010 Objectives on Oral Health

Table 1 presents the 10 Healthy People 2010 Objectives on Oral Health most relevant to children's oral health, their baseline levels, their target levels, and the most recent estimates available for each. The prevalence of dental caries experience (objective 21-1) and untreated decay (21-8) appear to be moving away from the target for children 8 years of age or younger. The prevalence of dental sealants (21-2) increased for children aged 8 or 14 years, although it remained substantially below the target prevalence of 50% for both ages. The proportion of the public of water systems with optimally fluoridated water increased in the United States to 69%, still shy of the target of 75% (21-9). Overall, dental care utilization by children moved toward the target of 56% (21-10), but use of preventive services by low-income children remained below half of the 2010 target of 66% (21-12). Progress was made toward achieving the objectives on having oral health components within local health departments and community-based health centers (21-14), the number of states with craniofacial recording and referral systems (21-15), and the number of states and Indian Health Service/tribal health programs directed by a dental professional with public health training (21-17a and 21-17b).

Dental Caries in Children and Adolescents

There are a variety of measures and indices used to monitor and report dental caries, including proportions of the population affected, the mean number of teeth or tooth surfaces affected, signs of any caries experience (ie, treated or untreated tooth decay), and signs of untreated caries lesions. For purposes of simplicity, we report the prevalence of dental caries as the proportion of children or adolescents who have experienced the disease and the proportion with untreated lesions at the time of the clinical survey.

Although the oral health status for most American children improved during the past decade, there are notable exceptions. The prevalence of dental caries (treated or untreated tooth decay) in the primary dentition of US children aged 2–4 years increased from 18.5% in 1988–1994