

# 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.<sup>1</sup> It is a multifactorial, transmissible disease that involves dissolution of mineralized tooth structure by acids produced by dental plaque bacteria.<sup>2</sup> 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,<sup>3</sup> 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.<sup>4–6</sup> 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.<sup>7</sup> 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.<sup>8</sup>

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.<sup>9</sup>

The *Healthy People 2010 Objectives for Improving Health* were issued in 2000.<sup>10</sup> 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,<sup>11</sup> 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.<sup>12</sup> 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,<sup>13</sup> which are limited to students in third grade and include dental caries experience, untreated dental caries, and the presence of dental sealants.<sup>14</sup>

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.<sup>15</sup> 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.<sup>16</sup> Other infrastructure data are drawn from the Healthy People 2010 database,<sup>17</sup> which monitors national progress toward achieving the Healthy People 2010 Objectives for Improving Health.<sup>10</sup>

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.<sup>18</sup> 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.<sup>19,20</sup>

## 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

**Table 1.** Progress Toward Achieving Selected Healthy People 2010 Objectives on Oral Health\*

Number	Objective	Baseline Year	Baseline	2004 Estimate	Healthy People 2010 Target
21-1	Reduce the proportion of children and adolescents who have dental caries in their primary and permanent teeth				
a	Age 2–4 y	1988–1994	18%	24%	11%
b	Age 6–8 y	1988–1994	52%	53%	42%
c	Age 15 y	1988–1994	61%	56%	51%
21-2	Reduce the proportion of children, adolescents and adults with untreated decay				
a	Age 2–4 y	1988–1994	16%	19%	9%
b	Age 6–8 y	1988–1994	28%	29%	21%
c	Age 15 y	1988–1994	20%	18%	15%
21-8	Increase the proportion of children who have received dental sealants on their molar teeth				
a	Age 8 y	1988–1994	23%	32%	50%
b	Age 14 y	1988–1994	15%	21%	50%
21-9	Increase the proportion of the US population served by community water systems with optimally fluoridated water	1992	62%	69%	75%
21-10	Increase the proportion of children aged 2–17 y who use the oral care system each year	1996	48%	52%	56%
21-12	Increase the proportion of low-income children and adolescents who received any preventive dental service in the past year	1996	25%	31%	66%
21-13	Increase the proportion of school-based health centers with an oral health component, including:				
a	Dental sealants	2001–2002	12%	NA	15%
b	Dental care	2001–2002	9%	NA	11%
21-14	Increase the proportion of local health departments and community-based health centers, including community migrant, and homeless health centers that have an oral health component	1997	52%	69%	75%
21-15	Increase the number of states and the District of Columbia that have a system for recording and referring infants and children with cleft lips, cleft palates, and other craniofacial anomalies to craniofacial anomaly rehabilitative teams	2003	16	32 (2006)	51
21-16	Increase the number of states and District of Columbia that have an oral health craniofacial health surveillance system	1999	0	NA	51
21-17	Increase the number of health agencies that have a public dental health program directed by a dental professional with public health training:				
a	For state (including the District of Columbia) and local health agencies that serve jurisdictions of 250 000 or more persons (out of 191)	2003	39	51 (2006)	41
b	For Indian Health Service areas and tribal health programs that serve jurisdictions of 30 000 or more persons (out of 27)	2003	9	10 (2006)	9

\*Data from Centers for Disease Control and Prevention, "DATA 2010: the Healthy People 2010 database"<sup>17</sup> (available at: <http://wonder.cdc.gov/data2010/focus.htm>). NA = not available.

**Table 2.** Prevalence of Treated or Untreated Dental Caries in Primary or Permanent Teeth Among Children by Race/Ethnicity and Age, United States, 1988–1994 and 1999–2004\*

Race, Ethnicity, and Age (y)	1988–1994		1999–2004		Difference in Caries Prevalence Between Time Periods
	Percentage With Dental Caries	Standard Error	Percent With Dental Caries	Standard Error	
All races and ethnicities					
2–4†	18.49	1.24	23.67	1.44	5.18**
6–8‡	51.62	1.96	53.20	2.49	1.59
6–11§	25.49	1.60	21.06	0.91	–4.43**
12–19§	67.80	1.51	59.11	0.96	–8.69**
White, non-Hispanic					
2–4†	12.94	1.44	20.45	1.99	7.52**
6–8‡	48.50	2.51	48.92	3.56	0.43
6–11§	23.69	1.77	18.59	1.39	–5.11**
12–19§	68.15	2.22	58.08	1.55	–10.07**
Black, non-Hispanic					
2–4†	24.31	2.11	26.13	2.44	1.82
6–8‡	49.41	2.25	56.12	2.05	6.71**
6–11§	23.38	1.98	19.03	1.52	–4.35
12–19§	62.93	2.10	54.36	1.66	–8.57**
Mexican American					
2–4†	33.84	1.59	35.33	1.82	1.49
6–8‡	63.85	3.13	68.53	2.82	4.68
6–11§	27.56	1.62	30.76	2.01	3.20
12–19§	68.53	2.19	64.49	1.53	–4.04

\*Data from Dye and colleagues,<sup>10</sup> tables 10, 20, 21, and 25.

†Primary teeth only.

‡Primary or permanent teeth.

§Permanent teeth only.

\*\* $P < .05$ .

to 23.7% in 1999–2004 (Table 2).<sup>11</sup> Among children aged 6–8 years, the prevalence of dental caries among non-Hispanic white children in that age group remained unchanged at about 49%; it increased among non-Hispanic black children from 49.4% to 56.1% and remained above 63% among Mexican American children. Overall, dental caries in the permanent dentition declined among children aged 6–11 years and among adolescents aged 12–19 years, although the declines were not statistically significant among 6–11-year-old non-Hispanic blacks or among Mexican Americans in either age group.

Disparities in dental caries prevalence by poverty status persisted between 1988–1994 and 1999–2004 (Table 3). Across all age groups and in both time periods, dental caries was more prevalent among children living in or near poverty than among those living above 200% of the federal poverty level. Other than a 6.75 percentage point decline in caries among adolescents aged 12–19 years living below 100% of the federal poverty level, the only statistically significant declines in caries in permanent teeth occurred among those living above 200% of federal poverty level.

As of May 2009, data on dental caries in third-graders were available for 37 states (Table 4).<sup>14</sup> During the past decade, the prevalence of dental caries among third-graders ranged from 40.6% (Connecticut) to 72.2% (Arkansas). However, these data were collected over a period of 10 years and may not be directly comparable across states as a result of secular changes in disease prevalence.

The prevalence of untreated dental caries among the 37 states that have administered the BSS ranged from 13.2% (Iowa) to 44.0% (Nevada) (data not shown). Trend data were not available for that oral health indicator.

### Dental Sealants among Children and Adolescents

On the basis of data from NHANES, the prevalence of dental sealants on at least one permanent tooth increased significantly among children aged 6–11 years, from 22% in 1988–1994 to 30% in 1999–2004 and among adolescent aged 12–19 from 18% to 38%<sup>11</sup> (Table 5). The increase in the prevalence of sealants was consistent among all racial/ethnic and age groups. Although there were large gains in the presence of sealants among non-Hispanic black and Mexican American children and adolescents, those groups continued to have a significantly lower prevalence of sealants than did non-Hispanic whites.

Among third-graders in the 37 states that administered a BSS during the past decade, the prevalence of sealants varied, ranging from 23.3% (Michigan) to 66.1% (Vermont) (data not shown).<sup>14</sup>

### Dental Public Health Infrastructure

There have been some gains in the US dental public health infrastructure during the past decade. For example, the proportion of community health centers with an oral health component increased from 52% in 1997 to 70% in 2006.<sup>16</sup> There has also been an increase in the number of states with a system to record and refer infants and children

**Table 3.** Prevalence of Treated or Untreated Dental Caries in Primary or Permanent Teeth Among Children by Poverty Status and Age, United States, 1988–1994 and 1999–2004\*

Poverty Status and Age, y	1988–1994		1999–2004		Difference in Caries Prevalence Between Time Periods
	Percentage With Dental Caries	Standard Error	Percentage With Dental Caries	Standard Error	
All income levels					
2–4†	18.49	1.24	23.67	1.44	5.18††
6–8‡	51.62	1.96	53.20	2.49	1.59
6–11§	25.49	1.60	21.06	0.91	–4.43††
12–19§	67.80	1.51	59.11	0.96	–8.69††
Less than 100% FPL					
2–4†	28.61	2.20	34.07	2.56	5.46
6–8‡	61.80	2.29	67.40	3.26	5.60
6–11§	28.00	3.02	28.28	2.28	0.27
12–19§	72.29	2.35	65.55	1.40	–6.75††
100%–199% FPL					
2–4†	21.01	1.91	27.61	3.35	6.61
6–8‡	58.39	4.56	61.60	3.50	2.21
6–11§	28.89	3.03	24.09	2.14	–5.80
12–19§	69.16	2.66	64.40	1.51	–4.77
Greater than or equal to 200% FPL					
2–4†	10.08	1.40	14.54	1.51	4.46
6–8‡	42.21	3.19	41.60	3.66	–0.61
6–11§	22.28	1.93	16.31	1.33	–5.97††
12–19§	65.58	2.20	54.00	1.49	–11.59††

\*Data from Dye and colleagues,<sup>10</sup> tables 10, 20, 21, and 25. FPL = federal poverty level or threshold.

†Primary teeth only.

‡Primary or permanent teeth.

§Permanent teeth only.

†† $P < .05$ .

with craniofacial abnormalities to rehabilitative teams, from 16 in 2003 to 32 in 2006.<sup>16</sup>

Funding for state oral health programs has experienced some increases since 2000, but program funding generally remains modest. In fiscal year (FY) 2000, 30% of state oral health programs had total budgets of \$1 million or more.<sup>16</sup> By FY 2007, 45% of programs met that funding threshold. From FY 2000 to FY 2007, 19 state programs reported level funding or a decrease, and 10 states reported a budget increase.

In FY 2000, 75% of states that submitted a synopsis questionnaire (33 of 44 respondents) had a full-time dental director; that figure rose to 91% (43 of 48 respondents) in FY 2007.<sup>16</sup> The median number of full-time equivalent employees in state dental programs was 2.0 in FY 2000 and 3.0 in FY 2007. Detailed state-specific staffing information is available for FY 2002 and FY 2007 (but not FY 2000). Between FY 2002 and FY 2007, 20 states experienced an overall increase in staffing (including employees and contractors), 4 had the same staffing level, and 20 experienced a decrease in overall staffing.

State oral health programs generally reported increases in community-based caries prevention programs. In FY 2000, 75% of reporting states had a dental sealant program, which rose to 85% in FY 2007.<sup>16</sup> The number of children served by state sealant programs nearly doubled during that period, from 193 670 to 354 755. In addition, there was a dramatic increase in the proportion of states reporting a fluoride varnish program, from 13% of states in FY 2000 to 52% in FY 2007. The number of children served

by those fluoride varnish programs rose during that period from 3154 to 162 531.

### Dental Public Health Residency Programs

The number of accredited dental public health residency programs and enrolled first-year residents from 2001–2002 to 2007–2008 is shown in the [Figure](#). The number of residency programs has declined during the past decade, from 18 in academic year 2000–2001 to 12 in 2007–2008. The number of first-year residents enrolled in an accredited program also declined during that time period, from 21 to 17.

## DISCUSSION

Progress toward improving the oral health of America's children and adolescents since the Healthy People 2010 Objectives were released has been mixed. Dental caries in the permanent dentition generally declined between 1988–1994 and 1999–2004, although the largest declines occurred among non-Hispanic whites and among those living above 200% of federal poverty level. This decline in caries is perhaps directly related to the significant increase in the prevalence of dental sealants and the expansion of sealant programs in many states. Unfortunately, racial, ethnic and economic disparities persist in oral health status and receipt of that preventive service. As has been demonstrated in at least one state, adequate funding and targeting of school-based sealant programs can effectively eliminate such disparities.<sup>21</sup>

**Table 4.** Prevalence of Treated or Untreated Dental Caries Among Third-Grade Students in Selected States, 1998–2008\*

State	School Year	Sample Size	Response Rate, %†	Prevalence of Caries Experience, %	95% Confidence Interval
Alaska	2007–2008	826	48	59.6‡	56.1–62.9
Arizona	1999–2002	3189	NR	66.7	63.2–70.2
Arkansas	2001–2002	815	86	72.2‡	68.9–75.5
California	2004–2005	10444	52	70.9	69.1–72.8
Colorado	2006–2007	3012	79	57.2	55.4–58.9
Connecticut	2006–2007	8755	81	40.6	36.3–44.8
Delaware	2001–2002	1032	43	54.5	49.5–59.4
Georgia	2004–2005	2861	51	56.3	54.9–57.6
Idaho	2000–2001	3126	71	65.4	62.6–68.2
Illinois	2003–2004	6630	66	55.4	52.6–58.2
Iowa	2005–2006	1126	68	42.8‡	40.0–45.8
Kansas	2003–2004	3375	32	58.6‡	55.5–61.5
Kentucky	2000–2001	3244	64	59.8	57.1–62.6
Maine	1998–1999	1297	51	44.7‡	42.0–47.4
Maryland	2000–2001	2482	50	42.4	37.5–47.3
Massachusetts	2006–2007	2211	46	40.7‡	36.5–44.8
Michigan	2005–2006	1586	68	58.0	54.8–61.2
Mississippi	2004–2005	2824	62	68.9	67.5–70.2
Missouri	2004–2005	3535	49	54.7	53.6–55.8
Montana	2005–2006	957	90	64.4‡	61.3–67.4
Nebraska	2004–2005	2057	92	59.3	55.0–63.6
Nevada	2005–2006	794	22	71.4	64.8–78.0
New Hampshire	2000–2001	410	78	52.0‡	45.5–58.4
New Mexico	1999–2000	2136	47	64.6‡	59.5–69.7
New York	2001–2003	10895	38	54.1	51.5–56.6
North Dakota	2004–2005	1015	73	55.6‡	52.5–58.7
Ohio	2004–2005	14029	53	55.0	52.8–57.1
Oklahoma	2002–2003	495	74	69.4‡	65.1–73.4
Oregon	2006–2007	1259	76	66.3	62.6–70.0
Pennsylvania	1998–1999	1767	NR	52.6	49.2–55.9
Rhode Island	2007–2008	1303	66	47.6‡	42.5–55.9
South Carolina	2007–2008	2657	38	54.3‡	52.3–56.2
South Dakota	2005–2006	643	66	65.6	62.5–68.6
Utah	2000–2001	800	51	61.0‡	59.0–64.0
Vermont	2002–2003	409	68	45.1	39.0–51.1
Washington	2004–2005	3633	77	59.7	56.6–62.8
Wisconsin	2007–2008	4413	89	54.7	53.2–56.2
Minimum		409	22	40.6	
Maximum		14029	92	72.2	
Median		2136	66	57.2	

\*NR = not reported. Data from Centers for Disease Control and Prevention.<sup>13</sup>

†Survey response rates differ among states. Differential nonresponse can bias the estimates. Response rates, the percentage of selected children who actually participated, are presented to help the reader judge the potential for bias.

‡The prevalence of caries experience reported by this state has not been adjusted for nonresponse.

However, dental caries in the primary dentition of young children appears to be on the rise. The reason for that increase is uncertain, but the trend suggests the need for enhanced oral health education of parents and caregivers, expansion of prevention services such as fluoride varnish programs, and perhaps greater involvement of child health professionals in the prevention, detection, and management of early childhood caries.

Although there have been some gains in the size and strength of the dental public health infrastructure in the United States, it generally remains small, understaffed, and underfunded. More than half of state dental programs operate on total annual budgets of less than \$1 million and 3 or fewer full-time equivalent staff members. Such limited resources virtually ensure that many state programs will not be able to fully carry out their public health missions to protect and enhance the oral health of their states' residents. For example, the more than 2-fold difference in

sealant prevalence among states may reflect the variation in the capacity of state programs to promote and guide school-based sealant programs.

Oral health surveillance remains problematic at the national and state levels in the United States.<sup>22</sup> Most indicators of oral health status at the national level are based on clinical surveys such as NHANES. Such large surveys provide useful information on a wide range of conditions, but their complexity leads to at least a 3-year lag between data collection and dissemination and oral health data are not collected in every year. It is for that reason that assessments of progress toward achieving many Healthy People 2010 Objectives on Oral Health are based on data that are already more than 5 years old. In addition, it is a very resource-intensive approach to public health surveillance, and because the Centers for Disease Control and Prevention's ability to conduct the oral health component in NHANES has relied on support from another agency, the

**Table 5.** Prevalence of Dental Sealants on Permanent Teeth Among Children and Adolescents by Race/Ethnicity and Age, United States, 1988–1994 and 1999–2004\*

Race, Ethnicity, and Age, y	1988–1994		1999–2004		Difference in Sealant Prevalence Between Time Periods†
	Percentage With Sealants	Standard Error	Percentage With Sealants	Standard Error	
All races and ethnicities					
6–11	21.71	2.36	30.48	1.71	8.76
12–19	18.03	1.69	37.65	1.47	19.62
White, non-Hispanic					
6–11	26.48	3.14	36.06	2.32	9.58
12–19	22.57	2.34	43.90	1.81	21.33
Black, non-Hispanic					
6–11	9.72	0.81	21.26	1.82	11.54
12–19	7.97	1.27	25.68	2.01	17.71
Mexican American					
6–11	10.99	1.59	24.22	2.27	13.23
12–19	8.16	1.07	27.23	2.34	19.07

\*Data from Dye and colleagues.<sup>10</sup>

† $P < .05$  for all

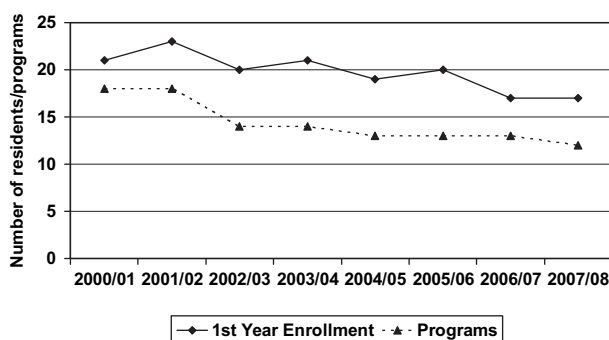
National Institute of Dental and Craniofacial Research, its continuation is uncertain. The oral health component in NHANES changed substantially beginning in 2005.<sup>23</sup> In 2005–2008, a much less detailed basic oral health screening examination was provided for persons aged 5 years and older. Beginning in 2009, basic screening data will be collected for children aged 3–19 years. Clearly, trend analyses for some age groups (eg, age 2–4 years) will not be possible, and comparability of the data collected under the current protocol to earlier NHANES data remains unclear.

Effective public health practice requires ongoing monitoring, intervention, and evaluation, which requires an adequate dental public infrastructure at the jurisdiction level at which services are delivered. At the state level, it is not yet possible to consider the approach to monitoring children's oral health status to be public health surveillance. Most states have measured the prevalence of dental caries and dental sealants at just one point in time, so it is not truly an ongoing assessment of oral health status. For some states, the existing data are more than a decade old, so the assessment is neither timely nor current. No data on children's oral health status are available for 13 states, which creates major impediments for their program planning, evaluation, and policy development. Many public

health activities are organized and delivered by county or city health departments, whose dental public health infrastructure is likely to be even less well established than at the state level. Unfortunately, there are nearly no data available on the oral health status, prevention services, or infrastructure at county or local levels in the United States.

Despite recognition that oral health has tremendous impacts on quality of life of individuals and costs to society, none of the currently used approaches for oral health surveillance measures such domains. Although clinically determined evidence of disease is important to monitor in populations, it misses some of the most important effects of oral health on societal well-being. For example, dental conditions in children and adolescents can result in severe pain, more than 1.6 million missed school days per year, lost work days and income among their caregivers, and negative self-perception.<sup>1</sup> It is hoped that future approaches to oral health surveillance and new oral health objectives will address those types of impacts. Such data may help make a stronger case for the societal need to better prevent and control oral disease than strictly relying on measures such as the prevalence of dental caries.

The number of accredited dental public health residency programs and enrolled first-year residents has been declining during the past decade, which raises concerns about the future of the recognized specialty of dental public health. Unfortunately, this decline is occurring at a time when there is increasing attention to reforming the US health care system and enhancing its capacity for public health and prevention, which potentially could demand an increase in the number of dentists with competence in the application of public health principles. To ensure that dental public health practice is guided by appropriately trained and credentialed professionals, it is critical to understand the forces behind the recent declines and to strategize new educational models or modalities for developing the next generation of public health dentists. Unless this trend is reversed, we may soon see a vacuum of leadership in dental public health and a lack of expertise in



**Figure.** Number of accredited dental public health residency programs and first-year residents, 2000–2001 to 2007–2008 academic years. Source: American Dental Association.<sup>18,19</sup>

incorporating public health approaches to addressing the oral health needs of populations.

In conclusion, 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.

### ACKNOWLEDGMENTS

We thank Drs William Maas and Wendy E. Mouradian for their helpful suggestions. We also thank Dr Kathy Phipps for her input on state infrastructure and surveillance activities.

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