

Trends in Oral Health by Poverty Status as Measured by *Healthy People 2010* Objectives

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SYNOPSIS

Objective. Poverty is a significant social determinant for oral health, yet *Healthy People 2010 (HP 2010)* does not monitor changes in oral health status by poverty. We assessed recent trends for six *HP 2010* oral health objectives by poverty status.

Methods. We used data from the 1988–1994 and 1999–2004 National Health and Nutrition Examination Surveys to analyze trends for *HP 2010* age-specific objectives relating to caries experience, untreated tooth decay, dental sealants, periodontal disease, tooth retention, and complete tooth loss by poverty status.

Results. Dental caries significantly increased from 19% to 24% for children aged 2–4 years, but when stratified by poverty, caries only increased significantly for non-poor 2- to 4-year-old children (10% to 15%) (Objective 21-1a). The largest percentage point increase in dental caries was for non-poor boys (9% to 18%). The use of dental sealants continues to grow in the U.S. The largest percentage point increase in sealant use (Objective 21-8) between the two survey periods was for all poor children aged 8 years (3% to 21%). Among adults aged 35–44 years, periodontal disease significantly declined in the U.S. from 22% to 16% (Objective 21-5b) and more adults retained all of their natural teeth (30% to 38%) (Objective 21-3). However, the increase in tooth retention was significant only for non-poor adults, particularly non-poor men (34% to 48%).

Conclusions. Overall, the oral health status of Americans as measured by *HP 2010* objectives mostly showed improvement or remained unchanged between 1998–1994 and 1999–2004. However, some changes in oral health status for some traditionally low-risk groups, such as non-poor children, may be reversing improvements in oral health that have consistently been observed in previous decades. These results suggest that poverty status is an important factor for planning and monitoring future national oral health goals.

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In 2000, the executive and legislative branches of the U.S. government released two major reports on oral health in the United States. The Department of Health and Human Services published the Surgeon General's Report on Oral Health in America,¹ and the U.S. General Accounting Office (GAO) released a report entitled Oral Health: Dental Disease Is a Chronic Problem Among Low-Income Populations.² The GAO report was prepared for congressional requesters to address a persistent concern that low-income populations continued to have a disproportionately greater burden of dental disease in the U.S.

The GAO report highlighted a number of issues affecting oral health for children and adults.² For one, the report noted that nearly one in three children aged 2–5 years living in families with incomes of <\$10,000 had untreated dental caries compared with one in 10 children living in families where the income was ≥\$35,000. Furthermore, poor children (i.e., those living in families with incomes <\$20,000) had nearly 12 times more restricted-activity days (e.g., missing school) because of dental problems compared with children living in families with incomes of ≥\$20,000. The GAO report also concluded that poverty and poor health continued into adulthood. Among adults aged 19–64 years, nearly one in two adults living in households with incomes <\$10,000 had untreated dental caries compared with one in six adults living in households where the income level was ≥\$35,000.

Although the Surgeon General's report on oral health is known for promoting the understanding that “oral health means much more than healthy teeth,” the report also framed the debate regarding oral health disparities. The report recognized that profound oral health disparities existed across a number of sociodemographic characteristics, including family income, but more importantly that “social, economic, and cultural factors and changing demographics affect how health services are used and how people care for themselves.” Thus, the Surgeon General concluded that more information was required to reduce oral health disparities and improve the nation's oral health.¹

Both the GAO report and the Surgeon General's report were released shortly after the introductory period for *Healthy People 2010* (*HP 2010*).³ This U.S. Public Health Service initiative was implemented to provide 10-year health promotion, disease prevention, and health access goals for the U.S. and has two overarching aims: (1) to increase the years and quality of life for individuals of all ages and (2) to eliminate health disparities. The oral health focus area is one of 28 focus areas and comprises 17 main objectives: eight for monitoring the oral health status of Ameri-

cans, five for improving access to oral health care, and four related to program infrastructure/workforce and surveillance systems. Information from the National Health and Nutrition Examination Survey (NHANES) is used to monitor progress toward reducing oral health disparities for many of the oral health status objectives. However, the influence of poverty on oral health disparities is not officially tabulated for the periodic *HP 2010* reviews.

Poverty is a significant global social determinant for oral health.⁴ As this decade ends and *HP 2010* transitions to a new set of 2020 health goals for the nation, with a potentially stronger focus on the social determinants of health to address health disparities,⁵ the level of interest in the impact of poverty on oral health in the U.S. will continue to be a concern. Therefore, the purpose of this article is to highlight six *HP 2010* oral health objectives that utilize NHANES as a data source for both children and adults by poverty status. Estimates differentiating changes in oral health status for the U.S. population are presented by poverty and stratified by gender and race/ethnicity.

METHODS

Data source

For this study, we used data from two NHANESs: NHANES III, which was conducted from 1988–1994, and NHANES 1999–2004. Both surveys were conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) and used a stratified, multistage sampling design to obtain a representative probability sample of the civilian, noninstitutionalized U.S. population. Oversampling was conducted during both surveys to increase precision in estimates for non-Hispanic black and Mexican American people as well as people aged ≥60 years. People aged ≤6 years were oversampled during NHANES III. During NHANES 1999–2004, people aged 12–19 years and low-income white people were oversampled. Data were obtained from in-home interviews, with health examinations and laboratory tests conducted in mobile examination centers (MECs) during both surveys.

Our analyses used data obtained from the household interview questionnaire and a standardized oral health exam. Trained interviewers administered the interview questionnaire in the survey participants' homes and assessed a variety of sociodemographic characteristics, health utilization issues, and health conditions, including oral health. Oral health examinations in both surveys followed essentially the same protocol for topic areas common to both survey periods, and all

participants were examined by a trained dentist in the MEC. Additional information on survey sample design, informed consent, and the NHANES dental examination protocols is available elsewhere.⁶⁻⁹ Information for accessing NHANES data, technical notes, and analytical guidelines can be found at <http://www.cdc.gov/nchs/about/major/nhanes/datalink.htm>.

Study population

For this study, we used information from young people, adolescents, adults, and seniors based on age and other sociodemographic characteristics previously reported in a CDC publication.¹⁰ The age-based oral health outcomes in this article are the *HP 2010* oral health objectives that utilize data from NHANES. All age groupings presented in this article for each objective are identical to those used for *HP 2010* monitoring activities. The selected age subgroups used were 2–4 years and 6–8 years for children, 35–44 years for adults, and 65–74 years for seniors. Single-year age groups used were 8 years of age for children, and 14 and 15 years of age for adolescents. Sample sizes for each of these age groups by survey period are listed in Table 1.

Variables

We used six *HP 2010* objectives as outcome variables for this article:

- 21-1: Reduce the proportion of children and adolescents who have dental caries experience in their primary or permanent teeth.
- 21-2: Reduce the proportion of children, adolescents, and adults with untreated dental decay.
- 21-3: Increase the proportion of adults who have never had a permanent tooth extracted because of dental caries or periodontal disease.

- 21-4: Reduce the proportion of older adults who have had all their natural teeth extracted.
- 21-5: Reduce periodontal disease.
- 21-8: Increase the proportion of children who have received dental sealants on their molar teeth.

Dental caries experience includes untreated caries, filled teeth, and teeth missing due to disease. Periodontal disease is defined as having at least one periodontal site with clinical attachment loss of ≥ 4 millimeters. Additional information regarding these objectives and past *HP 2010* progress reviews can be accessed at <http://www.cdc.gov/nchs/about/otheract/hpdata2010/focusareas/fa21-oral2.htm>.

We obtained the sociodemographic variables used in these analyses from information gathered during the home interview. In addition to age, other basic demographic variables included were gender and race/ethnicity. Race/ethnicity was categorized as non-Hispanic white, non-Hispanic black, and Mexican American. Given the oversampling of Mexican Americans and the relatively small number of participants from other Hispanic subgroups during these two NHANES cycles, population estimates for total Hispanic population by some demographic factors are not stable. Because poverty is strongly associated with oral health status, all estimates of trends in this article are presented stratified by poverty. The poverty level was categorized as poor ($\leq 100\%$ of the federal poverty level [FPL]), near-poor ($100\%–199\%$ FPL), and non-poor ($\geq 200\%$ FPL) following previously published reports.^{10,11} We calculated poverty by dividing total family income by the adjusted federal poverty income threshold as determined by NCHS, and this derived variable was made available in the public data release.

Data analysis

We conducted all analyses using SUDAAN[®] and SAS[®] software.^{12,13} We used sample weights to produce accurate population estimates and calculated standard errors using SUDAAN, which takes into consideration the surveys' complex sample design. Following guidelines for reporting *HP 2010* estimates, we did not adjust estimates for age, and we considered estimates based on < 30 events in the denominator or having a relative standard error $> 30\%$ to be statistically unreliable.¹⁴ We evaluated the statistical significance of differences between estimates using two-sided t-tests at the $\alpha=0.05$ level. We conducted these tests without adjusting for other sociodemographic factors.

Table 1. Sample sizes for age groups monitored by Healthy People 2010 oral health objectives, NHANES 1988–1994 and NHANES 1999–2004

Age (in years)	Survey years	
	1988–1994	1999–2004
2–4	3,270	1,830
6–8	1,577	1,597
8	508	548
14	403	838
15	369	778
35–44	2,977	2,175
65–74	2,083	1,808

NHANES = National Health and Nutrition Examination Survey

RESULTS

Children and adolescents

Table 2 presents estimates and trends for both children and adolescent *HP 2010* oral health objectives for males and females stratified by poverty status. Overall, caries experience among 2- to 4-year-olds (Objective 21-1a) significantly increased from approximately 19% to 24% between 1988–1994 and 1999–2004. Furthermore, the magnitude of the difference of caries experience prevalence from 1988–1994 to 1999–2004 among children aged 2–4 years remained unchanged between poor and non-poor children. We observed a 10% to 15% increase between the two time periods for non-poor 2- to 4-year-olds. Among all boys aged 2–4 years, caries significantly increased from 18% to 26%, with non-poor boys experiencing the largest percentage point increase (9% to 18%) during this period. However, this level of change was not observed for girls or for children living in poverty. Caries experience (Objective 21-1b) remained unchanged for 6- to 8-year-olds (52% vs. 53%). Although caries experience increased by nine percentage points for poor boys aged 6–8 years between 1988–1994 and 1999–2004, this increase was not statistically significant.

Although untreated caries (Objective 21-2a) did not significantly increase among 2- to 4-year-olds (16% vs. 19%), we observed a significant increase of five percentage points (7% to 12%) for non-poor 2- to 4-year-olds. Among non-poor boys aged 2–4 years, untreated caries significantly increased approximately seven percentage points (7% to 14%). The disparity in untreated caries among children aged 2–4 years who were poor vs. non-poor remained unchanged between 1988–1994 and 1999–2004. For those aged 6–8 years, untreated caries (Objective 21-2b) remained unchanged from 1988–1994 to 1999–2004 for most boys and girls. However, non-poor boys aged 6–8 years did experience a significant increase in untreated caries (from 13% to 21%) during the same period. Overall, there was little change in untreated caries among poor children (47% to 41%). The prevalence of dental sealants (Objective 21-8a), a key preventive measure that has been demonstrated to reduce dental caries, improved among all poor 8-year-olds by 18% and among poor girls of the same age by 15% between 1988–1994 and 1999–2004. Overall, the disparity gap between poor and non-poor children with dental sealants contracted by more than 10 percentage points between the survey periods.

Although caries experience for adolescents aged 15 years (Objective 21-1c) appeared to decrease (61% to 56%) from 1988–1994 to 1999–2004, this difference was not statistically significant. The only significant decline

in caries experience observed for 15-year-olds was for poor girls (90% to 73%). Untreated caries (Objective 21-2c) remained unchanged for most adolescents aged 15 years, but increased significantly for poor boys (15% vs. 34%). Among all 14-year-olds, approximately 21% had at least one dental sealant (Objective 21-8b) in 1999–2004. There were no significant changes observed between 1988–1994 and 1999–2004 in dental sealant prevalence by gender or poverty status.

Estimates and trends for both young people and adolescent *HP 2010* oral health objectives by race/ethnicity and poverty status are shown in Table 3. Among 2- to 4-year-olds, caries experience (Objective 21-1a) remained unchanged for Mexican American (34% vs. 36%) and non-Hispanic black (24% vs. 26%) children, but caries did significantly increase for non-Hispanic white children (13% to 21%). Although caries experience for 6- to 8-year-olds (Objective 21-1b) was not significantly higher for Mexican Americans (64% vs. 69%) and was unchanged for non-Hispanic white people (49%), it was significantly higher in 1999–2004 (56%) compared with 1988–1994 (49%) for non-Hispanic black children. For poor non-Hispanic black children, caries experience significantly increased by 17 percentage points (from 52% to 69%) during the two time periods.

Untreated caries (Objective 21-2a) remained unchanged for Mexican American (30% vs. 28%) and non-Hispanic black (22% vs. 20%) children aged 2–4 years, but untreated caries did significantly increase for non-Hispanic white children of the same age (11% to 16%). Among young people aged 6–8 years (Objective 21-2b), untreated caries decreased significantly for poor Mexican American children (56% to 44%). Although untreated disease decreased for poor non-Hispanic white children (44% vs. 40%) and increased for non-Hispanic black children (40% vs. 49%), these differences were not statistically significant. Overall dental sealant prevalence (Objective 21-8a) significantly increased for 8-year-old Mexican American (10% to 19%) and non-Hispanic black (11% to 23%) children between 1988–1994 and 1999–2004.

Caries experience for 15-year-olds (Objective 21-1c) may be decreasing across most racial/ethnic and poverty groups; however, only non-Hispanic black 15-year-olds experienced a significant decrease in caries experience (68% to 53%). Overall, untreated caries (Objective 21-2c) significantly decreased from 37% to 21% for Mexican American 15-year-olds but did not significantly decrease for same-aged non-Hispanic black (28% vs. 25%) or non-Hispanic white (18% vs. 15%) teens.

Table 2. Total and gender population prevalence estimates for children and adolescent oral health Healthy People 2010 objectives by poverty status, NHANES 1988–1994 and NHANES 1999–2004

Objective/poverty status ^a	Total				Males			Females			
	1988–1994	1999–2004	Percent difference	Percent (SE)	1988–1994	1999–2004	Percent (SE)	1988–1994	1999–2004	Percent (SE)	Percent difference
	Percent (SE)	Percent (SE)			Percent (SE)	Percent (SE)		Percent (SE)	Percent (SE)		
Children											
21-1a: Caries experience (ages 2–4 years)											
Poor	28.6 (2.2)	34.1 (2.6)	5.5	28.7 (2.9)	34.1 (3.8)	28.6 (2.9)	34.1 (3.7)	5.4	28.6 (2.9)	34.1 (3.7)	5.5
Near-poor	21.0 (1.9)	27.6 (3.4)	6.6	22.5 (2.8)	30.1 (4.6)	19.3 (2.7)	25.1 (3.8)	7.6	19.3 (2.7)	25.1 (3.8)	5.8
Non-poor	10.1 (1.4)	14.5 (1.5)	4.5 ^b	9.2 (1.7)	18.2 (2.6)	11.0 (2.0)	11.1 (2.2)	8.9 ^b	11.0 (2.0)	11.1 (2.2)	0.1
Total	18.5 (1.2)	23.7 (1.4)	5.2 ^b	18.4 (1.4)	25.9 (2.0)	18.6 (1.6)	21.3 (1.8)	7.6 ^b	18.6 (1.6)	21.3 (1.8)	2.7
21-1b: Caries experience (ages 6–8 years)											
Poor	61.8 (2.3)	67.4 (3.3)	5.6	60.2 (4.8)	69.4 (3.8)	63.2 (4.6)	65.2 (4.9)	9.2	63.2 (4.6)	65.2 (4.9)	2.0
Near-poor	59.4 (4.6)	61.6 (3.5)	2.2	57.9 (7.1)	60.6 (3.9)	61.1 (5.6)	63.0 (6.2)	2.7	61.1 (5.6)	63.0 (6.2)	1.8
Non-poor	42.2 (3.2)	41.6 (3.7)	-0.6	40.1 (4.6)	45.0 (4.3)	45.2 (4.4)	38.5 (5.0)	4.9	45.2 (4.4)	38.5 (5.0)	-6.6
Total	51.6 (2.0)	53.2 (2.5)	1.6	49.6 (3.1)	55.7 (2.8)	54.0 (2.9)	50.6 (3.4)	6.1	54.0 (2.9)	50.6 (3.4)	-3.4
21-2a: Untreated caries (ages 2–4 years)											
Poor	25.8 (2.3)	28.4 (2.3)	2.6	26.5 (2.8)	26.1 (3.2)	25.0 (3.2)	31.0 (3.5)	-0.4	25.0 (3.2)	31.0 (3.5)	5.9
Near-poor	19.6 (1.8)	21.1 (3.2)	1.5	20.9 (2.7)	24.0 (4.4)	18.1 (2.7)	18.2 (3.5)	3.1	18.1 (2.7)	18.2 (3.5)	0.2
Non-poor	6.9 (0.9)	11.6 (1.3)	4.7 ^b	6.9 (1.1)	14.4 (2.4)	7.0 (1.5)	8.9 (2.0)	7.5 ^b	7.0 (1.5)	8.9 (2.0)	2.0
Total	15.9 (1.4)	18.9 (1.7)	3.0	16.3 (1.4)	20.1 (1.9)	15.5 (1.4)	17.6 (1.7)	3.8	15.5 (1.4)	17.6 (1.7)	2.1
21-2b: Untreated caries (ages 6–8 years)											
Poor	47.3 (3.3)	41.3 (2.7)	-6.0	44.0 (5.4)	42.6 (3.8)	50.3 (6.4)	39.9 (3.9)	-1.4	50.3 (6.4)	39.9 (3.9)	-10.4
Near-poor	31.7 (3.3)	36.7 (3.9)	5.0	33.0 (5.3)	34.0 (5.6)	30.1 (4.7)	40.3 (7.2)	0.9	30.1 (4.7)	40.3 (7.2)	10.2
Non-poor	16.2 (2.4)	18.8 (2.3)	2.6	13.2 (2.3)	20.6 (2.9)	20.5 (3.6)	17.2 (2.7)	7.4 ^b	20.5 (3.6)	17.2 (2.7)	-3.4
Total	28.5 (1.8)	29.2 (2.1)	0.8	25.4 (2.2)	30.3 (2.8)	32.0 (2.5)	28.1 (3.0)	4.9	32.0 (2.5)	28.1 (3.0)	-3.9
21-8a: Dental sealants (age 8 years)											
Poor	3.2 (1.3)	21.0 (5.3)	17.8 ^b	NR	21.7 (8.5)	4.7 (2.3)	19.9 (5.7)	NR	4.7 (2.3)	19.9 (5.7)	15.2 ^b
Near-poor	18.5 (4.8)	25.5 (4.3)	7.0	19.2 (8.6)	29.8 (6.7)	17.4 (7.4)	19.9 (7.5)	10.5	17.4 (7.4)	19.9 (7.5)	NR
Non-poor	35.1 (6.2)	42.4 (5.0)	7.3	34.2 (8.7)	40.6 (6.0)	36.3 (5.3)	43.9 (7.0)	6.4	36.3 (5.3)	43.9 (7.0)	7.6
Total	22.7 (4.3)	32.3 (3.3)	9.6	22.1 (5.9)	32.2 (3.6)	23.5 (4.2)	32.3 (4.5)	10.1	23.5 (4.2)	32.3 (4.5)	8.9
Adolescents											
21-1c: Caries experience (age 15 years)											
Poor	76.3 (7.2)	66.6 (4.4)	-9.7	61.8 (13.3)	59.6 (6.3)	89.9 (4.3)	72.9 (5.0)	-2.1	89.9 (4.3)	72.9 (5.0)	-17.0 ^b
Near-poor	69.0 (8.5)	57.9 (5.7)	-11.1	78.3 (9.7)	57.7 (7.5)	57.5 (13.4)	58.2 (7.1)	-20.5	57.5 (13.4)	58.2 (7.1)	0.8
Non-poor	51.1 (6.5)	52.4 (3.3)	1.2	50.6 (8.8)	49.1 (4.7)	51.6 (8.0)	56.5 (4.4)	-1.5	51.6 (8.0)	56.5 (4.4)	5.0
Total	61.2 (4.6)	56.1 (3.3)	-5.1	59.7 (6.9)	52.7 (3.3)	62.5 (5.8)	60.1 (3.3)	-7.0	62.5 (5.8)	60.1 (3.3)	-2.4

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Table 2 (continued). Total and gender population prevalence estimates for children and adolescent oral health Healthy People 2010 objectives by poverty status, NHANES 1988–1994 and NHANES 1999–2004

Objective/poverty status ^a	Total			Males			Females		
	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference
21-2c: Untreated caries (age 15 years)									
Poor	20.1 (4.2)	31.1 (6.3)	11.0	14.7 (3.9)	33.5 (8.5)	18.7 ^b	25.1 (8.4)	28.9 (7.9)	3.8
Near-poor	28.1 (6.2)	24.2 (5.5)	-3.9	27.1 (6.3)	24.8 (7.5)	-2.3	29.3 (10.0)	23.3 (7.2)	-6.0
Non-poor	15.7 (4.5)	11.8 (1.9)	-3.9	13.5 (6.7)	12.1 (2.7)	-1.4	17.4 (5.4)	11.5 (3.3)	-5.9
Total	19.8 (3.2)	18.2 (2.1)	-1.6	16.9 (3.6)	18.6 (2.7)	1.7	22.4 (4.1)	17.8 (2.7)	-4.6
21-8b: Dental sealants (age 14 years)									
Poor	NR	13.0 (4.1)	NR	NR	NR	NR	NR	NR	NR
Near-poor	NR	16.3 (4.0)	NR	NR	20.1 (6.4)	NR	NR	12.7 (4.7)	NR
Non-poor	25.7 (6.2)	24.8 (3.3)	-0.9	33.5 (8.8)	27.7 (4.2)	-5.8	NR	22.1 (4.5)	NR
Total	15.2 (3.4)	20.5 (2.6)	5.4	16.1 (5.0)	23.8 (3.2)	7.7	14.3 (4.3)	17.6 (3.0)	3.4

^aPoor = ≤100% FPL, near-poor = 100%–199% FPL, non-poor = ≥200% FPL

^bStatistically significant at $p < 0.05$

NHANES = National Health and Nutrition Examination Survey

SE = standard error

NR = not reportable

FPL = federal poverty level

Table 3. Racial/ethnic population prevalence estimates for child and adolescent oral health Healthy People 2010 objectives by poverty status, NHANES 1988–1994 and NHANES 1999–2004

Objective/poverty status ^a	Mexican American				Non-Hispanic black				Non-Hispanic white			
	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference
Children												
21-1a: Caries experience (ages 2–4 years)												
Poor	36.6 (2.2)	43.8 (3.3)	7.2	25.5 (2.3)	30.7 (2.9)	5.3	24.9 (4.7)	34.7 (5.4)	5.5	24.9 (4.7)	34.7 (5.4)	5.5
Near-poor	34.4 (3.8)	35.5 (4.2)	1.1	29.4 (3.5)	25.5 (5.5)	-3.9	16.5 (2.5)	24.6 (4.9)	5.8	16.5 (2.5)	24.6 (4.9)	5.8
Non-poor	22.4 (4.6)	21.7 (2.3)	-0.7	15.3 (3.2)	18.8 (3.9)	3.5	8.1 (1.5)	13.7 (2.0)	0.1	8.1 (1.5)	13.7 (2.0)	0.1
Total	33.8 (1.6)	35.5 (1.8)	1.5	24.3 (2.1)	26.1 (2.4)	1.8	12.9 (1.4)	20.5 (2.0)	7.5 ^b	12.9 (1.4)	20.5 (2.0)	7.5 ^b
21-1b: Caries experience (ages 6–8 years)												
Poor	68.2 (3.9)	71.8 (3.9)	3.6	51.5 (3.4)	68.6 (3.6)	17.2 ^b	61.4 (5.6)	66.1 (5.6)	2.0	61.4 (5.6)	66.1 (5.6)	2.0
Near-poor	69.5 (6.4)	63.4 (4.2)	-6.1	53.7 (5.6)	50.3 (4.2)	-3.3	56.2 (6.6)	61.9 (4.9)	1.8	56.2 (6.6)	61.9 (4.9)	1.8
Non-poor	55.8 (5.6)	67.3 (5.2)	11.5	39.9 (5.7)	45.8 (3.3)	5.9	41.7 (3.7)	39.6 (4.5)	-6.6	41.7 (3.7)	39.6 (4.5)	-6.6
Total	63.9 (3.1)	68.5 (2.8)	4.7	49.4 (2.3)	56.1 (2.1)	6.7 ^b	48.5 (2.5)	48.9 (3.6)	0.4	48.5 (2.5)	48.9 (3.6)	0.4
21-2a: Untreated caries (ages 2–4 years)												
Poor	33.1 (2.5)	36.2 (2.9)	3.1	23.3 (2.1)	23.6 (3.1)	0.2	23.3 (4.7)	30.3 (5.0)	5.9	23.3 (4.7)	30.3 (5.0)	5.9
Near-poor	30.8 (3.8)	27.7 (3.8)	-3.0	25.5 (3.5)	20.7 (5.3)	-4.8	16.0 (2.5)	17.2 (4.4)	0.2	16.0 (2.5)	17.2 (4.4)	0.2
Non-poor	18.6 (4.6)	18.1 (2.5)	-0.5	14.5 (3.1)	14.3 (3.6)	-0.2	5.0 (1.0)	10.9 (1.6)	2.0	5.0 (1.0)	10.9 (1.6)	2.0
Total	30.1 (1.4)	28.0 (1.8)	-2.1	22.0 (2.0)	20.4 (2.4)	-1.6	10.8 (1.2)	16.0 (1.9)	5.3 ^b	10.8 (1.2)	16.0 (1.9)	5.3 ^b
21-2b: Untreated caries (ages 6–8 years)												
Poor	56.0 (4.0)	44.3 (3.3)	-11.8 ^b	40.0 (3.6)	49.3 (3.1)	9.4	44.0 (6.1)	39.7 (4.8)	-10.4	44.0 (6.1)	39.7 (4.8)	-10.4
Near-poor	47.9 (6.3)	35.1 (4.3)	-12.9	36.6 (5.2)	33.2 (4.6)	-3.4	25.9 (5.2)	36.6 (5.9)	10.2	25.9 (5.2)	36.6 (5.9)	10.2
Non-poor	29.9 (7.8)	34.4 (5.2)	4.5	25.6 (4.0)	28.7 (3.0)	3.1	14.7 (2.8)	16.3 (3.1)	-3.4	14.7 (2.8)	16.3 (3.1)	-3.4
Total	47.2 (3.2)	40.6 (2.6)	-6.6	35.1 (1.6)	37.4 (2.0)	2.3	22.4 (2.2)	25.0 (3.4)	2.7	22.4 (2.2)	25.0 (3.4)	2.7
21-8a: Dental sealants (age 8 years)												
Poor	7.6 (3.4)	14.9 (4.4)	7.3	8.5 (4.0)	20.6 (4.7)	12.1	NR	NR	15.2 ^b	NR	NR	15.2 ^b
Near-poor	8.3 (4.3)	12.7 (6.1)	10.9	23.3 (6.8)	20.9 (5.5)	12.6	18.5 (4.8)	NR	NR	18.5 (4.8)	NR	NR
Non-poor	24.5 (9.3)	33.1 (7.2)	8.6	19.4 (5.8)	31.7 (6.7)	12.4	39.2 (7.3)	48.3 (6.4)	7.6	39.2 (7.3)	48.3 (6.4)	7.6
Total	9.8 (2.4)	19.4 (3.7)	9.7 ^b	11.3 (2.8)	22.6 (3.1)	11.4 ^b	28.7 (5.8)	37.7 (4.5)	9.0	28.7 (5.8)	37.7 (4.5)	9.0
Adolescents												
21-1c: Caries experience (age 15 years)												
Poor	68.4 (5.2)	66.0 (4.0)	-2.4	66.6 (7.6)	57.5 (5.8)	-9.1	81.1 (13.7)	64.3 (8.9)	-17.0 ^b	81.1 (13.7)	64.3 (8.9)	-17.0 ^b
Near-poor	62.0 (9.4)	52.7 (7.5)	-9.2	72.4 (6.9)	46.4 (7.1)	-26.0 ^b	82.2 (6.8)	67.6 (8.5)	0.8	82.2 (6.8)	67.6 (8.5)	0.8
Non-poor	57.5 (11.0)	53.1 (7.0)	-4.5	67.0 (8.2)	55.2 (6.8)	-11.8	50.7 (7.6)	50.9 (4.3)	5.0	50.7 (7.6)	50.9 (4.3)	5.0
Total	64.4 (4.3)	58.0 (3.7)	-6.3	67.7 (4.0)	52.9 (4.1)	-14.8 ^b	61.1 (6.6)	55.6 (3.7)	-5.5	61.1 (6.6)	55.6 (3.7)	-5.5
21-2c: Untreated caries (age 15 years)												
Poor	44.4 (7.0)	28.8 (4.4)	-15.6	29.2 (6.2)	31.1 (5.9)	1.9	NR	NR	3.8	NR	NR	3.8
Near-poor	33.7 (10.6)	24.2 (5.0)	-9.6	40.6 (8.5)	28.3 (6.0)	-12.3	NR	NR	-6.0	NR	NR	-6.0
Non-poor	NR	NR	NR	NR	19.1 (4.6)	NR	16.6 (5.3)	9.7 (2.1)	-5.9	16.6 (5.3)	9.7 (2.1)	-5.9
Total	36.5 (3.4)	21.0 (3.0)	-15.5 ^b	27.5 (5.3)	25.0 (3.0)	-2.5	17.8 (4.5)	15.3 (2.9)	-2.5	17.8 (4.5)	15.3 (2.9)	-2.5

continued on p. 824

Table 3 (continued). Racial/ethnic population prevalence estimates for child and adolescent oral health Healthy People 2010 objectives by poverty status, NHANES 1988–1994 and NHANES 1999–2004

Objective/poverty status ^a	Mexican American			Non-Hispanic black			Non-Hispanic white		
	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference	1988–1994 Percent (SE)	1999–2004 Percent (SE)	Percent difference
21-8b: Dental sealants (age 14 years)									
Poor	NR	11.6 (3.5)	NR	NR	NR	NR	NR	NR	NR
Near poor	NR	18.1 (5.8)	NR	NR	NR	NR	NR	NR	NR
Non-poor	NR	28.6 (7.2)	NR	NR	15.0 (4.2)	NR	27.2 (7.2)	24.7 (3.7)	NR
Total	NR	18.4 (3.3)	NR	NR	10.1 (1.9)	NR	19.0 (4.9)	22.7 (3.4)	3.7

^aPoor = ≤100% FPL, near-poor = 100%–199% FPL, non-poor = ≥200% FPL

^bStatistically significant at p<0.05

NHANES = National Health and Nutrition Examination Survey

SE = standard error

NR = not reportable

FPL = federal poverty level

Adults and seniors

Overall, untreated caries remained unchanged (approximately 27%) for adults aged 35–44 years (Objective 21-2d) (Table 4). However, periodontal disease (Objective 21-5b) significantly decreased for adults (22% to 16%). Periodontal disease also significantly decreased for both poor (42% to 28%) and non-poor (17% to 11%) adults. Periodontal disease significantly decreased for all men aged 35–44 years (29% to 20%) but did not significantly decrease for all similarly aged women (15% vs. 12%). Periodontal disease prevalence was significantly lower for both non-poor men and women in 1999–2004 than in 1988–1994. Overall, the difference between poor and non-poor adults with periodontal disease decreased from a nearly 25-percentage-point disparity in 1988–1994 to a 17-percentage-point disparity in 1999–2004.

Tooth retention improved for adults aged 35–44 years (Objective 21-3). Overall, 38% of adults had no tooth loss due to disease in 1999–2004 compared with 30% in 1988–1994. Men made significant gains in tooth retention, with 43% of men experiencing no tooth loss in 1999–2004 compared with 29% in 1988–1994. Women, however, made little gain in tooth retention (34% vs. 31%) and this change was nonsignificant. For seniors aged 65–74 years, complete tooth loss was generally lower, but the differences were not statistically significant. Overall complete tooth loss was 24% for this age group in 1999–2004 compared with 29% in 1988–1994. However, among poor men aged 65–74 years, complete tooth loss significantly increased from 29% to 49% between the time periods. Among adults aged 35–44 years, there was little change in the magnitude of the difference of no tooth loss between poor non-poor adults from 1988–1994 to 1999–2004. However, for seniors aged 65–74 years, the disparity between poor and non-poor people with complete tooth loss increased from approximately 19 percentage points in 1988–1994 to 23 percentage points in 1999–2004.

Table 5 shows estimates and trends for *HP 2010* oral health objectives by race/ethnicity and poverty status for adults and seniors. Untreated caries (Objective 21-2d) significantly increased for both non-poor and near-poor Mexican American adults (18% vs. 33% and 28% vs. 46%, respectively), but significantly decreased for all non-Hispanic black adults (47% to 40%). Overall, periodontal disease (Objective 21-5b) among adults decreased significantly for Mexican American (25% to 16%), non-Hispanic black (33% to 24%), and non-Hispanic white (20% to 14%) adults.

Tooth retention (Objective 21-3) improved significantly for all Mexican American (30% to 38%), non-Hispanic black (12% to 27%), and non-Hispanic

white (34% to 42%) adults between 1988–1994 and 1999–2004. Non-poor adults who were non-Hispanic black or non-Hispanic white made significant gains in tooth retention (15% to 38% and 38% to 47%, respectively). There was little change in complete tooth loss (Objective 21-4) for Mexican American (16% vs. 18%) and non-Hispanic black (26% vs. 25%) seniors aged 65–74 years. However, complete tooth loss significantly decreased from 29% to 23% for non-Hispanic white seniors, and among those who were non-poor, complete tooth loss significantly decreased from 22% to 16% between 1988–1994 and 1999–2004.

DISCUSSION

From 1988–1994 to 1999–2004, caries experience significantly increased for children aged 2–4 years. This increase was observed for all boys but not girls and for non-Hispanic white children but not for non-Hispanic black or Mexican American children. Furthermore, when stratified by poverty, only non-poor children aged 2–4 years experienced a significant increase in caries compared with similarly aged poor and near-poor children. Non-poor boys and non-poor non-Hispanic white children experienced a significant increase in caries as well. Among 2- to 4-year-olds, untreated caries increased for non-Hispanic white and non-poor children. A significant increase was also seen among non-poor boys.

An increase in caries in the primary teeth among 2- to 4-year-olds is troublesome because one of the best predictors of future caries activity is current untreated decay or a history of past tooth decay.^{15–17} Moreover, this increase in caries is a concern because it affects groups that have traditionally been considered low risk for caries development and suggests that health behaviors are changing among some groups of young children. One important health behavior change that has affected young children has been an increase in the consumption of sweetened beverages such as juice drinks and sodas.^{18,19} An increase in soda consumption is more likely to increase caries prevalence and extent in the primary teeth among young children.^{20,21} Among children aged 6–8 years, caries experience and untreated dental decay remained mostly unchanged between 1988–1994 and 1999–2004. However, non-poor boys aged 6–8 years did significantly experience more untreated caries between the two survey periods. This increase among untreated caries was also seen in preschool non-poor boys and suggests that some health behaviors must be different between boys and girls.

Overall, adult oral health did improve between 1988–1994 and 1999–2004. Although untreated dental

Table 4. Total and gender population prevalence estimates for adult and senior Healthy People 2010 oral health objectives by poverty status, NHANES 1988–1994 and NHANES 1999–2004

Objective/poverty status ^a	Total				Males				Females			
	1988–1994	1999–2004	Percent difference	Percent (SE)	1988–1994	1999–2004	Percent (SE)	Percent difference	1988–1994	1999–2004	Percent (SE)	Percent difference
	Percent (SE)	Percent (SE)			Percent (SE)	Percent (SE)			Percent (SE)	Percent (SE)		
Adults (ages 35–44 years)												
21–2d: Untreated caries												
Poor	53.4 (2.8)	49.4 (3.2)	-4.0	55.9 (5.8)	54.1 (4.3)	-1.8	51.4 (4.1)	46.4 (5.1)	-5.0			
Near-poor	44.4 (3.4)	44.9 (3.0)	0.5	46.9 (5.2)	48.1 (3.8)	1.1	42.3 (4.0)	42.3 (3.7)	0.0			
Non-poor	19.1 (1.6)	19.2 (1.6)	0.0	22.4 (2.6)	23.3 (2.3)	0.8	16.1 (1.7)	14.6 (1.6)	-1.5			
Total	26.9 (1.4)	27.8 (1.6)	0.9	29.4 (1.8)	30.1 (2.1)	0.7	24.6 (2.0)	25.4 (1.6)	0.8			
21–3: Tooth retention												
Poor	15.9 (3.1)	23.3 (2.9)	7.4	19.0 (5.8)	33.9 (5.8)	14.9	13.6 (3.5)	16.7 (3.2)	3.1			
Near-poor	17.3 (2.5)	23.6 (2.1)	6.3	14.7 (3.6)	24.3 (3.8)	9.6	19.5 (3.1)	23.0 (3.3)	3.5			
Non-poor	35.4 (2.2)	45.3 (1.6)	10.0 ^b	33.6 (2.8)	47.8 (2.1)	14.2 ^b	37.1 (2.5)	42.5 (2.6)	5.5			
Total	30.1 (1.6)	38.4 (1.4)	8.3 ^b	28.9 (2.2)	42.5 (2.0)	13.7 ^b	31.2 (2.0)	34.2 (2.0)	3.0			
21–5b: Periodontal disease												
Poor	41.9 (4.4)	27.7 (3.3)	-14.1 ^b	49.6 (7.2)	38.3 (5.2)	-11.3	35.1 (5.0)	20.7 (3.6)	-14.4 ^b			
Near-poor	30.9 (3.0)	27.6 (2.2)	-3.2	41.5 (4.9)	31.9 (3.6)	-9.6	22.0 (3.1)	24.0 (3.5)	2.0			
Non-poor	17.4 (1.3)	11.0 (0.9)	-6.5 ^b	23.8 (2.0)	15.0 (1.5)	-8.8 ^b	11.4 (1.7)	6.3 (1.2)	-5.1 ^b			
Total	22.1 (1.4)	16.2 (0.9)	-6.0 ^b	29.4 (2.0)	20.2 (1.4)	-9.2 ^b	15.4 (1.6)	11.9 (1.3)	-3.5			
Seniors (ages 65–74 years)												
21–4: Complete tooth loss												
Poor	40.5 (4.2)	39.5 (5.2)	-1.0	29.4 (6.6)	49.1 (5.0)	19.7 ^b	45.4 (4.5)	33.3 (8.7)	-12.1			
Near-poor	43.1 (3.5)	34.8 (2.5)	-8.2	42.1 (4.2)	36.6 (3.8)	-5.6	43.7 (4.5)	33.7 (3.3)	-10.1			
Non-poor	21.3 (1.8)	16.7 (1.6)	-4.6	23.6 (2.1)	13.4 (2.0)	-10.2 ^b	18.9 (2.4)	20.0 (2.3)	1.1			
Total	28.6 (1.9)	23.8 (1.5)	-4.7	27.7 (1.9)	22.2 (2.0)	-5.5	29.4 (2.5)	25.4 (1.9)	-4.0			

^aPoor = ≤100% FPL, near-poor = 100%–199% FPL, non-poor = ≥200% FPL

^bStatistically significant at $p < 0.05$

NHANES = National Health and Nutrition Examination Survey

SE = standard error

FPL = federal poverty level

Table 5. Racial/ethnic population prevalence estimates for adult and senior Healthy People 2010 oral health objectives by poverty status, NHANES 1988–1994 and NHANES 1999–2004

Objective/poverty status ^a	Mexican American				Non-Hispanic black				Non-Hispanic white			
	1988–1994		1999–2004		1988–1994		1999–2004		1988–1994		1999–2004	
	Percent (SE)	Percent (SE)	Percent (SE)	Percent (SE)	difference	Percent (SE)	Percent (SE)	Percent difference	Percent (SE)	Percent (SE)	Percent difference	
Adults (ages 35–44 years)												
21-2d: Untreated caries												
Poor	54.0 (4.5)	48.4 (5.3)	-5.6	60.0 (4.1)	51.1 (4.9)	8.9	53.6 (6.4)	50.3 (5.0)	-3.3			
Near-poor	28.3 (4.1)	45.7 (4.0)	17.4 ^b	60.4 (3.5)	50.6 (5.2)	-9.8	44.8 (5.5)	42.2 (4.9)	-2.6			
Non-poor	17.8 (2.7)	32.8 (3.4)	15.0 ^b	34.0 (3.6)	28.5 (2.8)	-5.5	17.2 (1.9)	16.9 (2.0)	-0.3			
Total	33.6 (1.8)	40.2 (2.8)	6.6	47.0 (2.4)	40.0 (2.7)	-7.1 ^b	22.6 (1.7)	23.1 (2.0)	0.5			
21-3: Tooth retention												
Poor	24.7 (1.9)	32.6 (3.9)	7.9	9.6 (2.0)	14.9 (3.0)	5.3	17.4 (6.8)	22.3 (4.3)	4.9			
Near-poor	27.8 (3.5)	33.2 (5.4)	5.4	8.0 (2.1)	18.0 (3.5)	10.0 ^b	20.1 (3.7)	22.8 (3.1)	2.7			
Non-poor	37.6 (3.4)	45.5 (3.2)	7.9	15.0 (2.7)	37.8 (2.9)	22.8 ^b	38.1 (2.6)	47.4 (1.8)	9.2 ^b			
Total	30.2 (1.3)	38.2 (1.9)	8.0 ^b	11.6 (1.6)	27.4 (2.2)	15.8 ^b	34.4 (2.1)	41.6 (1.7)	7.1 ^b			
21-5b: Periodontal disease												
Poor	28.8 (3.3)	20.6 (4.8)	-8.2	42.3 (3.7)	25.8 (5.8)	-16.5 ^b	49.9 (10.0)	28.4 (5.7)	-21.6			
Near-poor	30.0 (3.0)	16.6 (3.6)	-13.4 ^b	38.9 (3.5)	32.9 (3.7)	-6.0	28.7 (4.2)	26.8 (3.4)	-1.8			
Non-poor	18.1 (2.5)	14.4 (2.8)	-3.7	27.6 (2.3)	17.2 (2.5)	-10.4 ^b	16.2 (1.3)	9.7 (1.1)	-6.6			
Total	25.1 (1.6)	16.0 (2.6)	-9.1 ^b	33.3 (2.0)	23.5 (2.1)	9.8 ^b	19.7 (1.5)	13.8 (0.8)	-5.9 ^b			
Seniors (ages 65–74 years)												
21-4: Complete tooth loss												
Poor	22.0 (3.9)	19.1 (4.5)	-2.9	26.8 (4.1)	28.4 (6.6)	1.6	48.0 (6.4)	43.1 (7.0)	-4.8			
Near-poor	15.3 (4.6)	21.9 (3.7)	6.6	27.5 (4.5)	25.2 (4.5)	-2.3	45.3 (4.0)	37.0 (2.9)	-8.3			
Non-poor	13.7 (4.5)	12.6 (3.3)	-1.1	25.9 (3.8)	22.9 (3.9)	-3.0	21.9 (2.0)	16.4 (1.9)	-5.6 ^b			
Total	16.0 (2.6)	18.3 (2.4)	2.4	26.3 (2.4)	25.0 (2.3)	-1.3	29.2 (2.2)	23.3 (1.8)	-5.9 ^b			

^aPoor = ≤100% FPL, near-poor = 100%–199% FPL, non-poor = ≥200% FPL

^bStatistically significant at p<0.05

NHANES = National Health and Nutrition Examination Survey

SE = standard error

FPL = federal poverty level

caries remained unchanged for most adults aged 35–44 years, untreated caries significantly decreased for non-Hispanic black people, but increased for near-poor and non-poor Mexican American adults. Among adults aged 35–44 years, more are retaining all of their natural teeth. Significant increases in tooth retention were observed for males, Mexican American, non-Hispanic black, and white people. We also observed gains in tooth retention mostly among the non-poor, including non-poor males and non-Hispanic black and white people.

Most adults aged 35–44 years experienced a decrease in periodontal disease, and this decrease was observed for both poor and non-poor adults across gender and race/ethnicity. The decline in periodontal disease parallels a decline in smoking. In 1987, 29% of adults ≥ 18 years of age smoked cigarettes²² and by 1994, 21% of adults were cigarette smokers.²³ Smoking is a major risk factor for periodontal disease, and current cigarette smoking may be responsible for more than 40% of periodontal disease cases in the U.S.²⁴ Current smokers are also more likely to report needing periodontal treatment and dental extractions compared with nonsmokers.²⁵ Tobacco use also impacts tooth loss,^{26,27} and smoking cessation improves tooth retention.²⁸ Consequently, as smoking and periodontal disease continue to decline, complete tooth loss should decline as well.

Complete tooth loss significantly declined for adults aged 20–64 years.¹⁰ However, the decline in complete tooth loss observed for most seniors aged 65–74 years (Objective 21-4) was not statistically significant. Although non-poor men aged 65–74 years experienced a significant decrease in complete tooth loss (24% vs. 13%), poor 65- to 74-year-old men experienced significantly more complete tooth loss (30% vs. 49%) between 1988–1994 and 1999–2004. Tooth loss is an important public health issue for older adults. Complete tooth loss has many shared common risk factors, such as age, being male, and living in poverty, for many chronic diseases with underlying systemic inflammatory influences. During the past decade, numerous studies have suggested a link between periodontal disease and tooth loss with a number of adverse health outcomes in adults. A recent review of the epidemiologic literature has concluded that periodontal disease is a risk factor for coronary heart disease incidence.²⁹ Moreover, recent studies have suggested that complete tooth loss may be associated with chronic kidney disease³⁰ and early mortality.³¹

In recent years, there has been a strong emphasis on shifting from individual behaviors, lifestyle choices,

risk factors, and genetic influences to include social and environmental influences on overall health.^{32–34} Social environmental factors would include living conditions, social policies, and distribution of wealth.^{32,33} For example, poverty is often thought of as only a lack of income. Distribution of income, goods, and services is often overlooked when considering health outcomes.³³ The social and economic structures play a critical role in health status. Poverty and inadequate living standards can be considered extremely strong determinants of ill health and health inequity.^{32,33} Consequently, the next iteration of *Healthy People* may move toward utilizing more social and environmental determinants to assess U.S. health goals. For instance, a topic area that focuses on social determinants has been proposed; however, there are currently no objectives developed in this focus area.

Accounting for oral health disparities by poverty should be an important consideration for future national health goals. Our findings illustrate a mixed picture, with some goals experiencing a narrowing in oral health disparities between the poor and non-poor (e.g., dental sealants among children and periodontal disease among adults), and some goals experiencing a widening disparity (e.g., complete tooth loss between poor and non-poor seniors). Another important consideration is the impact on disparities of increasing disease among non-poor people at a greater rate compared with poor people. For example, among non-poor boys aged 2–4 years, caries experience increased at a greater level compared with the rate experienced by poor boys; thus, the disparity in caries experience observed for young boys during 1988–1994 actually decreased during 1999–2004.

Differences in the oral health status between poor and non-poor groups are often ascribed to access to dental care issues. The GAO report concluded that “the use of dental care by the poor is low despite the availability of coverage” for both children and adults. The GAO also stated that a “key marker of the use of dental care—the use of sealants for children—showed that low-income populations use dental services at a much lower rate than more affluent groups.”¹ Our findings show that sealant use (Objective 21-8a), although lower in non-poor children, increased at a greater rate for poor children compared with non-poor children between 1988–1994 and 1999–2004. This finding indicates that public dental sealant programs and community health centers (with an oral health component) may have had a favorable impact on poor children during the past decade.

Limitations and strengths

As *HP 2010* evolves into *HP 2020*—the next generation of health goals for the nation—there are some limitations affecting the current oral health objectives reviewed in this article that should be addressed. First, some objectives had very restrictive age ranges that impeded the reporting of statistically reliable estimates. For example, Objective 21-8, an important prevention objective focusing on dental sealant use, was structured on single-age years. Given the data source and sample size issues, oral health objectives should be built on multiple years of age to permit appropriate trend analyses between select subgroups to monitor oral health disparities.

Another important consideration is accounting for changes in our understanding of the natural history of oral diseases and the use of appropriate case definitions for population surveillance. For example, at the time the oral health objectives for *HP 2010* were developed, there was little consensus regarding case definitions for periodontal disease (Objective 21-5b). Since that time, CDC and the American Academy of Periodontology (AAP) have jointly developed a definition for periodontitis that is suitable for epidemiologic applications in surveillance and research.³² Estimates for the U.S. using the CDC-AAP definition of periodontitis have been published elsewhere.¹⁰

Another important limitation of our analyses was that the relatively small sample sizes for some poverty-demographic subgroups in the single-year age groups may have contributed to the lack of significance observed for some objectives between the two NHANES data cycles. For some subgroups, sample sizes were sufficient, but there is greater variability within the sample that produces larger standard errors, which may affect statistical significance.

There were also some key strengths regarding these analyses. First, this study used a nationally representative sample not selected by multiple risk indicators or other potentially confounding factors. Second, the data collection methods remained nearly unchanged for NHANES 1988–1994 and 1999–2004, thus reducing the impact of measurement bias.

CONCLUSIONS

This study shows that poverty continues to be an important factor in contributing to poor oral health and that poverty status stratified by gender and race/ethnicity is very important in showing current trends in oral health. For example, the increase in caries experience is affecting non-poor boys and non-poor non-Hispanic

white children and not most other subgroups of young children. Likewise, although overall tooth retention is improving among adults, significant improvement was seen mostly among non-poor adults who were male, non-Hispanic black, or non-Hispanic white. Poverty is an important element of the social and environmental construct that contributes to oral health in the U.S. These results suggest that poverty status is an important factor for planning and monitoring future national oral health goals.

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