Cover Story

Preventive oral health care use and oral health status among US children

2016 National Survey of Children's Health

Lydie A. Lebrun-Harris, PhD, MPH; María Teresa Canto, DDS, MS, MPH; Pamella Vodicka, MS, RD

ABSTRACT

Background. Research has identified significant gaps in preventive oral health care among certain subpopulations of US children. The authors of this study sought to estimate children's preventive oral health care use and oral health and investigate associations with child, family, and health care characteristics.

Methods. Data for this observational, cross-sectional study came from the 2016 National Survey of Children's Health. Children aged 2 through 17 years were included (n = 46,100). Caregiver-reported measures were preventive dental visits, prophylaxis, toothbrushing or oral health care instructions, fluoride, sealants, fair or poor condition of the teeth, and problems with carious teeth or caries. Univariate, bivariate, and multivariable logistic regression analyses were conducted.

Results. As reported by parents or caregivers, 8 in 10 children had a preventive dental visit in the past year but lower rates of specific services: 75% prophylaxis, 46% fluoride, 44% instructions, and 21% sealants. In addition, 12% had carious teeth or caries and 6% had fair or poor condition of the teeth. In adjusted analyses, young children (aged 2-5 years), children with no health insurance, and those from lower-income and lower-educated households had decreased likelihood of a preventive dental visit as well as specific preventive services. Children with preventive health care visits and a personal physician or nurse had increased likelihood of receiving preventive oral health care.

Conclusions. Preventive oral health services are lagging among young children and children from lower socioeconomic backgrounds. Further studies are needed to identify interventions that encourage use of specific preventive services.

Practical Implications. Dentists should work with caregivers and primary care providers to promote preventive oral health care, especially among young children and those from lower socioeconomic backgrounds.

Key Words. Oral health care for children; dental health services; preventive dentistry; oral health; oral health care; primary health care; National Survey of Children's Health.

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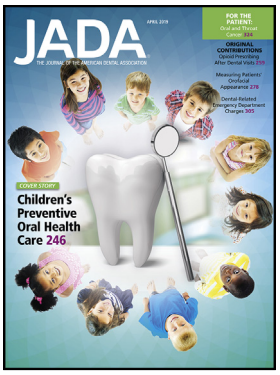

Caries is one of the most prevalent health problems facing children and adolescents in the United States, and numerous demographic and socioeconomic disparities persist.[1] Left untreated, caries can negatively affect children's quality of life and impair academic performance.[2-4] Early childhood caries affects 23% of preschool-aged children,[5] and 18% of children aged 5 through 18 years have untreated caries.[6] The prevalence of caries in primary teeth among preschool-aged children has improved in the past decade, whereas the prevalence of having no caries in permanent teeth among children and adolescents remains unchanged.[6]

Preventive oral health care, early detection, and management of caries is critical to improving the oral health of children and adolescents. Caries can be prevented through a combination of steps

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taken at home (for example, oral hygiene), in the dental office or other care locations (for example, fluoride varnish, dental sealants),[7-11] or on a communitywide basis (for example, water fluoridation).

It is important to address the significant gaps in access to preventive oral health care that persist among certain subpopulations of children.[12-16] Improving low-income children's use of preventive dental services is a Healthy People 2020 objective.[17] Although children's access to oral health care in general (that is, dental visits) has been widely studied, little is known about the specific preventive care services received during those visits. The authors of 1 study found that from 2001 through 2014, preventive dental visits among low-income children increased for all racial and ethnic groups; however, rates of evidence-based preventive services (that is, topical fluoride and dental sealants) remained low in 2014.[18] Additional up-to-date data are needed to identify other potential disparities in children's use of specific preventive oral health services and oral health status. In 2016, the National Survey of Children's Health (NSCH) for the first time included questions about specific preventive services received by children. The NSCH is unique in its ability to provide nationally representative estimates on an annual basis, describe individual preventive oral health care services, and include numerous covariates of interest to provide additional contextual information. In our study, we sought to estimate the prevalence of children's access to preventive oral health care, including receipt of specific services, as well as their oral health status, and, investigate independent associations between preventive oral health care and oral health status and various child-level, family-level, and health care—related characteristics.

METHODS

Data sources

We analyzed data from the 2016 NSCH, a cross-sectional, nationally representative Web- and paper-based survey of noninstitutionalized children from birth through the age of 17 years across the 50 US states and the District of Columbia.[19] The Health Resources and Services Administration's Maternal and Child Health Bureau provided direction and funding for the survey, and the US Census Bureau conducted the survey. Survey respondents were parents or caregivers familiar with the child's health and health care needs. The total sample was 50,212 children. The overall weighted response rate was 40.7%, and the interview completion rate (proportion of households with children who completed a detailed questionnaire) was 69.7%. Sampling weights were adjusted to account for nonresponse and to reduce the magnitude of bias.[20] Poststratification adjustment was conducted to ensure that sociodemographic subgroups were appropriately represented in the estimates. Additional information regarding the survey's method can be found elsewhere.[21-23] This study was exempt from institutional review board review because it used publicly available data.

Outcome measures

Parent-reported measures of preventive oral health care in the past year were preventive dental visit, prophylaxis, instructions on toothbrushing and oral health care, fluoride treatments, and sealants. Oral health status measures were fair or poor condition of teeth and frequent or chronic difficulty with carious teeth and caries in the past year.

Independent variables

We examined several child-, family-, and health care—related covariates, selected on the basis of data availability and previous literature indicating associations with children's oral health care and oral health status.[12-16,24-28] Child-level factors included age, sex, special health care needs status and qualifying category,[29,30] race and ethnicity, and insurance status and type. Family-level factors included poverty ratio, highest education level, primary language, parent or caregiver general health status, and parent or caregiver mental or emotional health status. Health care factors included preventive health care visit in the past year, having a personal physician or nurse, and usual source of care when sick.

Analysis

From the total sample of 50,212 children from birth through the age of 17 years, we excluded children younger than 2 years and limited our analyses to children aged 2 through 17 years (n = 46,100), except for receipt of sealants, which also excluded children aged 2 through 5 years,

ABBREVIATION KEY

CSHCN: Children with special health care needs.
FPT: Federal poverty threshold.
MEPS: Medical Expenditure Panel Survey.
NSCH: National Survey of Children's Health.

Table 1. Characteristics of children aged 2 through 17 years, 2016 National Survey of Children's Health (N = 46,100).

CHARACTERISTICS	UNWEIGHTED NO.	WEIGHTED %	95% CONFIDENCE INTERVAL
Child-Level Factors			
Age Category, y			
2-5	10,382	24.4	23.6 to 25.3
6-8	7,052	18.9	18.1 to 19.8
9-11	7,958	18.8	18.0 to 19.7
12-15	12,802	25.2	24.4 to 26.1
16-17	7,906	12.6	11.9 to 13.2
Sex			
Male	23,593	51.0	47.9 to 50.0
Female	22,507	49.0	50.0 to 52.1
Special Health Care Needs Status and Qualifying Category			
No special health care needs	34,957	79.0	78.1 to 79.7
Functional limitations	2,523	5.4	4.9 to 5.9
Medications only	3,727	6.4	6.0 to 6.9
Services only	1,739	3.5	3.2 to 3.9
Medications and services	3,154	5.7	5.3 to 6.1
Race or Ethnicity			
Hispanic or Latino	5,055	24.6	23.5 to 25.7
Non-Hispanic black	2,695	12.9	12.1 to 13.6
Non-Hispanic other	5,975	10.7	10.1 to 11.2
Non-Hispanic white	32,375	51.9	50.9 to 52.9
Current Insurance Status and Type			
Private only	33,721	56.7	55.6 to 57.8
Public only	8,362	31.2	30.1 to 32.3
Private and public	1,659	4.3	3.9 to 4.8
Insurance type unspecified	520	1.7	1.4 to 2.1
Uninsured	1,665	6.1	5.5 to 6.7
Family-Level Factors			
Family Poverty Ratio*			
< 100%	4,508	21.1	20.0 to 22.2
100%-199%	7,341	22.3	21.3 to 23.3
200%-399%	14,226	26.9	26.0 to 27.9
≥ 400%	20,025	29.6	28.7 to 30.5
Highest Household Education			
Less than high school	1,029	9.5	8.5 to 10.5
High school	5,655	19.7	18.8 to 20.7
More than high school	38,308	70.8	69.6 to 71.9
Primary Language			
English	42,888	86.1	85.0 to 87.0
Non-English	2,868	13.9	13.0 to 15.0
Parent or Caregiver General Health			
Excellent or very good	32,221	67.3	66.3 to 68.3
Good	10,264	24.7	23.8 to 25.7
Fair or poor	2,562	8.0	7.3 to 8.6

* Family poverty ratio is calculated as the ratio of total family income and the family poverty threshold.

Table 1. Continued

CHARACTERISTICS	UNWEIGHTED NO.	WEIGHTED %	95% CONFIDENCE INTERVAL
Parent or Caregiver Mental or Emotional Health			
Excellent or very good	35,632	77.4	76.5 to 78.3
Good	7,582	17.7	16.9 to 18.5
Fair or poor	1,802	4.9	4.4 to 5.4
Health Care Factors			
Any Preventive Health Care Visit, Past Year			
Yes	28,831	79.6	78.5 to 80.7
No	5,346	20.4	19.3 to 21.5
Personal Physician or Nurse			
Yes	35,690	72.4	71.4 to 73.4
No	10,146	27.6	26.6 to 28.6
Usual Source of Care When Sick			
Physician's office	35,893	69.9	68.9 to 71.0
Clinic or health center	3,597	7.8	7.1 to 8.5
Other (hospital outpatient, retail store clinic or "minute clinic," school, or other)	874	1.8	1.6 to 2.1
None or emergency department	7,380	20.5	19.5 to 21.4

Table 2. Receipt of preventive oral health care and oral health status among children aged 2 through 17 years, 2016 National Survey of Children's Health.

VARIABLE	UNWEIGHTED SAMPLE SIZE	WEIGHTED POPULATION FREQUENCY	WEIGHTED %	95% CONFIDENCE INTERVAL
Preventive Oral Health Care, Past Year				
Preventive dental visit	39,268	53,333,085	82.3	81.4 to 83.1
Prophylaxis	36,940	49,085,533	74.8	73.8 to 75.7
Instruction on tooth brushing	22,810	28,997,049	44.2	43.2 to 45.2
Fluoride treatment	24,687	30,426,287	46.3	45.3 to 47.4
Sealant (ages 6-17 y)	8,493	10,631,400	21.4	20.5 to 22.4
Oral Health Status				
Fair or poor condition of teeth	1,714	3,748,311	5.7	5.2 to 6.3
Carious teeth or caries, past year	4,392	7,996,465	12.4	11.6 to 13.2

consistent with clinical practice guidelines.[31,32] We conducted univariate analyses to describe the sample characteristics and obtain the prevalence of the outcome measures among the overall population. We then conducted bivariate analyses to obtain the unadjusted prevalence of the outcome measures for each independent variable and multivariable logistic regressions to assess the relationship between each of the outcome measures and the independent variables. For the oral health status models, we added past-year preventive dental visit as an independent variable to assess the association between preventive oral health care and oral health status. Model results are reported as adjusted prevalence rate ratios (aPRRs) and 95% confidence intervals (CIs) comparing the effect of each independent variable on the relative prevalence of each outcome measure, controlling for all other independent variables.

We dropped observations with missing or unknown data from the analyses. Sex (0.1% missing), race (0.3% missing), ethnicity (0.6% missing), and family poverty ratio (18.6% missing) were imputed during weighted procedures. More information is available elsewhere about the imputation methods.[33] All analyses were weighted on the basis of the survey's sampling design to produce estimates that were nationally representative. We used STATA SE Version 15 (StataCorp) and set statistical significance at $P < .05$.

Table 3. Unadjusted proportions and adjusted prevalence rate ratios of receipt of preventive oral health care in the past year among children (aged 2-17 years), 2016 National Survey of Children's Health.*

VARIABLE	PREVENTIVE DENTAL VISIT (N = 31,681)			PROPHYLAXIS (N = 31,990)		
	Unadjusted %	Adjusted PRR	95% CI†	Unadjusted %	Adjusted PRR	95% CI
Child-Level Factors						
Age Category, y						
2-5	65.6	0.78	0.74 to 0.83	52.5	0.67	0.63 to 0.72
6-8	87.3	1.05	1.01 to 1.10	80.6	1.05	1.00 to 1.10
9-11	89.2	1.07	1.03 to 1.11	82.7	1.08	1.03 to 1.13
12-15	88.8	1.05	1.01 to 1.09	84.5	1.08	1.03 to 1.12
16-17	83.8	1.00	—‡	77.6	1.00	—
Sex						
Male	82.2	1.00	0.98 to 1.02	74.7	1.00	0.97 to 1.03
Female	82.4	1.00	—	74.8	1.00	—
Special Health Care Needs Status and Qualifying Category						
No special health care needs	81.5	1.00	—	73.8	1.00	—
Functional limitations	80.8	0.95	0.89 to 1.00	73.5	0.93	0.86 to 1.00
Medications only	89.4	1.05	1.02 to 1.09	83.5	1.08	1.04 to 1.12
Services only	78.9	0.93	0.86 to 1.00	71.6	0.93	0.85 to 1.01
Medications and services	88.0	1.05	1.02 to 1.08	81.5	1.07	1.02 to 1.11
Race or Ethnicity						
Hispanic or Latino	80.4	1.01	0.98 to 1.04	71.0	1.00	0.96 to 1.05
Non-Hispanic black	77.9	0.95	0.92 to 0.99	66.8	0.91	0.87 to 0.96
Non-Hispanic other	80.3	1.00	0.97 to 1.03	72.3	0.98	0.94 to 1.02
Non-Hispanic white	84.7	1.00	—	79.0	1.00	—
Current Insurance Status and Type						
Private only	86.0	1.00	—	80.6	1.00	—
Public only	80.3	1.01	0.98 to 1.04	69.8	1.00	0.96 to 1.03
Private and public	82.3	0.99	0.93 to 1.06	74.3	1.00	0.91 to 1.08
Uninsured	59.9	0.84	0.77 to 0.90	59.8	0.80	0.72 to 0.88
Family-Level Factors						
Family Poverty Ratio§						
< 100%	76.4	0.92	0.88 to 0.97	66.1	0.91	0.85 to 0.97
100%-199%	79.7	0.95	0.91 to 0.98	71.1	0.93	0.89 to 0.97
200%-399%	81.9	0.95	0.92 to 0.97	75.2	0.94	0.91 to 0.97
≥ 400%	88.8	1.00	—	83.3	1.00	—
Highest Household Education						
Less than high school	72.1	0.93	0.86 to 1.01	60.9	0.90	0.81 to 0.99
High school	79.4	0.99	0.97 to 1.02	70.2	0.98	0.95 to 1.02
More than high school	84.5	1.00	—	78.2	1.00	—

* Adjusted Prevalence rate ratio (PRR) compare the effect of each independent variable on the relative prevalence of each outcome measure, controlling for all other independent variables. † CI: Confidence interval. ‡ —: Not applicable. § Family poverty ratio is calculated as the ratio of total family income and the family poverty threshold.

RESULTS

Sample characteristics

Approximately 20% of the sample consisted of children with special health care needs (CSHCN) (Table 1). One-quarter were Hispanic or Latino, and 13% were non-Hispanic black. Among the children aged 2 through 17 years, 57% were privately insured, whereas 31% were publicly insured.

Table 3. Continued

INSTRUCTION ON TOOTH BRUSHING (N = 31,990)			FLUORIDE TREATMENT (N = 31,990)			SEALANT (AGES 6-17 Y) (N = 19,996)		
Unadjusted %	Adjusted PRR	95% CI	Unadjusted %	Adjusted PRR	95% CI	Unadjusted %	Adjusted PRR	95% CI
36.6	1.10	0.99 to 1.22	31.2	0.77	0.68 to 0.85	–	–	–
51.0	1.57	1.41 to 1.73	53.8	1.36	1.23 to 1.49	24.3	1.27	1.11 to 1.44
51.2	1.59	1.43 to 1.74	55.0	1.39	1.27 to 1.52	26.5	1.43	1.25 to 1.61
45.6	1.35	1.22 to 1.48	51.5	1.29	1.18 to 1.39	20.1	1.00	Not estimable
35.1	1.00	–	41.2	1.00	–	12.2	1.00	–
44.6	0.97	0.92 to 1.03	46.7	0.97	0.92 to 1.02	21.1	0.92	0.82 to 1.03
43.7	1.00	–	46.0	1.00	–	21.8	1.00	–
42.9	1.00	–	44.7	1.00	–	21.0	1.00	–
42.1	0.96	0.84 to 1.08	46.0	0.89	0.78 to 1.00	21.9	0.87	0.65 to 1.09
53.2	1.17	1.05 to 1.28	56.3	1.19	1.09 to 1.30	21.5	0.85	0.69 to 1.00
48.4	1.11	0.96 to 1.25	50.1	0.99	0.86 to 1.12	23.4	0.96	0.71 to 1.20
51.2	1.14	1.01 to 1.27	56.5	1.09	0.97 to 1.21	24.8	1.12	0.89 to 1.35
34.5	0.85	0.76 to 0.94	37.5	0.92	0.83 to 1.00	17.5	0.92	0.75 to 1.09
36.7	0.77	0.69 to 0.86	35.9	0.74	0.66 to 0.82	18.2	0.76	0.61 to 0.91
43.6	0.94	0.86 to 1.02	43.1	0.88	0.81 to 0.95	21.5	0.89	0.74 to 1.04
50.7	1.00	–	53.8	1.00	–	24.1	1.00	–
51.1	1.00	–	53.4	1.00	–	23.2	1.00	–
37.3	0.92	0.84 to 1.01	39.2	0.95	0.87 to 1.03	20.6	1.06	0.87 to 1.25
43.6	0.98	0.82 to 1.15	48.6	1.07	0.90 to 1.24	19.0	1.02	0.71 to 1.32
26.5	0.77	0.61 to 0.93	22.5	0.66	0.53 to 0.79	14.3	0.96	0.59 to 1.33
33.4	0.83	0.71 to 0.96	35.0	0.80	0.70 to 0.91	17.5	0.83	0.61 to 1.04
38.7	0.90	0.82 to 0.98	41.5	0.90	0.81 to 0.98	20.3	0.99	0.82 to 1.17
45.8	0.89	0.83 to 0.96	47.8	0.90	0.85 to 0.96	22.2	0.93	0.82 to 1.04
54.5	1.00	–	56.7	1.00	–	24.4	1.00	–
24.3	0.66	0.49 to 0.82	26.6	0.71	0.54 to 0.88	12.3	0.80	0.42 to 1.18
34.2	0.82	0.74 to 0.91	38.6	0.92	0.84 to 1.00	18.8	1.02	0.85 to 1.20
50.1	1.00	–	51.8	1.00	–	23.8	1.00	–

Approximately 43% of children came from low-income households (< 200% of federal poverty threshold [FPT]), and 29% came from households with a high school education or less. Among the sample, 8% had a parent with fair or poor general health, and 5% had a parent with fair or poor mental or emotional health. In addition, 80% had a preventive health care visit in the past year, and 72% had a personal physician or nurse. About 70% had a physician's office as their usual source of sick care, whereas 21% had no usual source of sick care.

Table 3. Continued

VARIABLE	PREVENTIVE DENTAL VISIT (N = 31,681)			PROPHYLAXIS (N = 31,990)		
	Unadjusted %	Adjusted PRR	95% CI†	Unadjusted %	Adjusted PRR	95% CI
Primary Language						
English	83.5	1.00	–	76.5	1.00	–
Non-English	75.1	0.98	0.93 to 1.03	64.7	0.98	0.92 to 1.04
Parent or Caregiver General Health						
Excellent or very good	84.0	1.00	–	76.9	1.00	–
Good	79.2	0.95	0.92 to 0.98	71.9	0.93	0.90 to 0.97
Fair or poor	77.6	0.96	0.91 to 1.00	67.7	0.92	0.86 to 0.99
Parent or Caregiver Mental or Emotional Health						
Excellent or very good	83.6	1.00	–	76.3	1.00	–
Good	78.9	0.97	0.94 to 1.01	71.9	0.97	0.93 to 1.01
Fair or poor	75.6	0.95	0.89 to 1.01	67.3	0.94	0.87 to 1.00
Health Care Factors						
Any Preventive Health Care Visit, Past Year						
Yes	85.7	1.10	1.05 to 1.14	80.0	1.15	1.09 to 1.20
No	69.0	1.00	–	60.3	1.00	–
Personal Physician or Nurse						
Yes	85.4	1.08	1.05 to 1.11	78.5	1.10	1.06 to 1.13
No	74.2	1.00	–	65.3	1.00	–
Usual Source of Care When Sick						
Physician's office	85.5	1.00	–	79.4	1.00	–
Clinic or health center	79.4	0.95	0.90 to 1.01	70.9	0.92	0.86 to 0.98
Other (hospital outpatient, retail store clinic or "minute clinic," school, or other)	82.9	0.95	0.88 to 1.03	72.4	0.92	0.82 to 1.01
None or emergency department	72.4	0.93	0.90 to 0.96	62.2	0.88	0.84 to 0.92

Estimates of preventive oral health care and oral health status

Approximately 82% of children were reported by their parent or caregiver to have had a preventive dental visit in the past year (Table 2). Rates of specific services were lower; 75% of children had prophylaxis, 44% received instructions on toothbrushing or oral health care, 46% received fluoride treatments, and 21% of children aged 6 through 17 years received sealants. Regarding oral health status, 5.7% of children were reported by their parent or caregiver to have teeth in fair or poor condition, and 12% had problems with carious teeth or caries in the past year (Table 2).

Factors associated with preventive oral health care services

Children in the youngest age category (2-5 years) had lower relative prevalence of receipt of oral health care (Table 3). Specifically, children in this age group had 22% decreased prevalence of a preventive dental visit (aPRR, 0.78; 95% CI, 0.74 to 0.83), 33% decreased prevalence of prophylaxis (aPRR, 0.67; 95% CI, 0.63 to 0.72), and 23% decreased prevalence of fluoride treatment (aPRR, 0.77; 95% CI, 0.68 to 0.85) compared with children aged 16 through 17 years. Rates of past-year sealants for age groups corresponding to first molar eruption (6-8 years) and second molar eruption (12-15 years) were higher than those for children aged 16 through 17 years, although they were universally low across all ages (24% and 20% versus 12%, respectively).

CSHCN who qualified on the basis of medication use only, or medication combined with elevated service use or need, generally had slightly increased prevalence of receipt of preventive oral

Table 3. Continued

INSTRUCTION ON TOOTH BRUSHING (N = 31,990)			FLUORIDE TREATMENT (N = 31,990)			SEALANT (AGES 6-17 Y) (N = 19,996)		
Unadjusted %	Adjusted PRR	95% CI	Unadjusted %	Adjusted PRR	95% CI	Unadjusted %	Adjusted PRR	95% CI
47.2	1.00	–	49.6	1.00	–	22.7	1.00	–
26.8	0.86	0.73 to 0.99	27.4	0.79	0.67 to 0.91	14.2	0.89	0.62 to 1.17
46.0	1.00	–	48.0	1.00	–	21.5	1.00	–
41.1	0.95	0.88 to 1.03	43.8	0.91	0.84 to 0.98	21.7	1.11	0.94 to 1.28
41.3	1.00	0.85 to 1.15	44.5	1.07	0.94 to 1.21	21.7	1.30	0.92 to 1.69
45.0	1.00	–	47.0	1.00	–	21.2	1.00	–
42.3	0.98	0.89 to 1.06	46.1	1.05	0.97 to 1.13	22.2	1.03	0.86 to 1.21
45.0	1.13	0.97 to 1.28	46.6	1.04	0.90 to 1.18	25.4	1.08	0.73 to 1.44
49.3	1.40	1.25 to 1.54	52.0	1.39	1.25 to 1.53	23.3	1.46	1.19 to 1.72
25.7	1.00	–	28.6	1.00	–	12.9	1.00	–
48.3	1.17	1.08 to 1.26	50.8	1.15	1.07 to 1.24	23.2	1.17	1.00 to 1.35
33.8	1.00	–	35.3	1.00	–	17.1	1.00	–
49.4	1.00	–	51.7	1.00	–	24.3	1.00	–
41.6	0.95	0.82 to 1.07	41.4	0.89	0.78 to 1.01	17.1	0.75	0.53 to 0.98
43.1	0.88	0.68 to 1.08	41.9	0.74	0.58 to 0.90	19.8	0.78	0.49 to 1.07
28.7	0.73	0.66 to 0.80	31.1	0.73	0.66 to 0.79	13.9	0.70	0.57 to 0.83

health care compared with non-CSHCN. Non-Hispanic black children had decreased prevalence of preventive oral health care, compared with non-Hispanic white children. Lack of health insurance (compared with private insurance) was also associated with decreased prevalence of most preventive oral health care measures.

Lower household income (compared with income $\geq$ 400% of FPT) and lower household education (compared with more than high school) were associated with decreased prevalence of all oral health care services except sealants. Household non-English language was associated with decreased prevalence of toothbrushing and oral health care instructions and fluoride treatment compared with household English language.

Preventive health care visits in the past year were associated with increased prevalence of all oral health care measures, as was having a personal physician or nurse. Having no usual source of sick care was associated with decreased prevalence of all oral health care measures, compared with having a physician's office as the usual source of care.

Factors associated with oral health status

Children aged 6 through 11 years had increased prevalence of carious teeth and caries relative to children aged 16 through 17 years (Table 4). Children aged 6 through 8 years, in particular, were twice as likely to have problems with carious teeth and caries in the past year (aPRR, 2.02; 95% CI, 1.48 to 2.57). CSHCN with functional limitations and those who needed both medications and

Table 4. Unadjusted proportions and adjusted prevalence rate ratios of fair or poor oral health status and carious teeth or caries among children (aged 2-17 years), 2016 National Survey of Children's Health.*

VARIABLE	FAIR OR POOR GENERAL CONDITION OF TEETH (N = 31,590)			CARIOUS TEETH OR CARIES, PAST YEAR (N = 31,230)		
	Unadjusted %	Adjusted PRR	95% CI†	Unadjusted %	Adjusted PRR	95% CI
Child-Level Factors						
Age Category, y						
2-5	4.5	0.96	0.52 to 1.41	8.9	1.13	0.80 to 1.46
6-8	6.3	1.26	0.69 to 1.82	17.6	2.02	1.48 to 2.57
9-11	7.0	1.29	0.77 to 1.81	15.1	1.58	1.14 to 2.03
12-15	5.3	1.13	0.66 to 1.60	11.0	1.16	0.84 to 1.49
16-17	6.3	1.00	—‡	10.0	1.00	—
Sex						
Male	5.8	1.03	0.75 to 1.32	12.1	1.01	0.85 to 1.17
Female	5.7	1.00	—	12.7	1.00	—
Special Health Care Needs Status and Qualifying Category						
No special health care needs	4.7	1.00	—	11.5	1.00	—
Functional limitations	17.1	2.97	1.72 to 4.21	17.5	1.34	0.82 to 1.87
Medications only	4.7	0.80	0.44 to 1.17	12.8	1.02	0.68 to 1.36
Services only	9.6	1.76	0.78 to 2.73	18.1	1.34	0.81 to 1.88
Medications and services	8.1	2.25	1.18 to 3.31	14.7	1.03	0.68 to 1.38
Race or Ethnicity						
Hispanic or Latino	8.0	1.13	0.75 to 1.52	15.5	1.14	0.88 to 1.40
Non-Hispanic black	8.2	1.42	0.86 to 1.97	12.4	0.86	0.64 to 1.09
Non-Hispanic other	8.2	1.47	0.85 to 2.09	13.7	1.18	0.90 to 1.46
Non-Hispanic white	3.9	1.00	—	10.6	1.00	—
Current Insurance Status and Type						
Private only	2.7	1.00	—	8.3	1.00	—
Public only	9.6	1.67	1.03 to 2.32	18.3	1.58	1.24 to 1.93
Private and public	8.4	1.58	0.60 to 2.56	13.1	1.32	0.83 to 1.82
Uninsured	12.0	2.37	0.99 to 3.75	18.6	2.32	1.57 to 3.07
Family-Level Factors						
Family Poverty Ratio§						
< 100%	10.8	1.90	0.85 to 2.96	18.5	1.33	0.91 to 1.75
100%-199%	7.0	1.55	0.81 to 2.29	14.9	1.29	0.91 to 1.67
200%-399%	4.9	1.45	0.80 to 2.11	10.8	1.13	0.88 to 1.38
≥ 400%	2.0	1.00	—	7.5	1.00	—
Highest Household Education						
Less than high school	12.7	1.03	0.53 to 1.52	19.4	1.56	1.00 to 2.11
High school	12.7	1.18	0.81 to 1.55	16.2	1.21	0.97 to 1.46
More than high school	4.2	1.00	—	10.3	1.00	—
Primary Language						
English	4.9	1.00	—	11.6	1.00	—
Non-English	10.7	1.97	1.20 to 2.73	16.8	1.01	0.69 to 1.32
Parent or Caregiver General Health						
Excellent or very good	3.4	1.00	—	9.8	1.00	—
Good	8.5	1.79	1.17 to 2.42	16.8	1.42	1.13 to 1.71
Fair or poor	16.6	2.76	1.56 to 3.96	20.6	1.53	1.07 to 2.00

* Adjusted prevalence rate ratio (PRR) compare the effect of each independent variable on the relative prevalence of each outcome measure, controlling for all other independent variables. † CI: Confidence interval. ‡ —: Not applicable. § Family poverty ratio is calculated as the ratio of total family income and the family poverty threshold.

Table 4. Continued

VARIABLE	FAIR OR POOR GENERAL CONDITION OF TEETH (N = 31,590)			CARIOUS TEETH OR CARIES, PAST YEAR (N = 31,230)		
	Unadjusted %	Adjusted PRR	95% CI†	Unadjusted %	Adjusted PRR	95% CI
Parent or Caregiver Mental or Emotional Health						
Excellent or very good	4.1	1.00	–	10.7	1.00	–
Good	10.2	1.64	1.07 to 2.22	16.8	1.33	1.03 to 1.63
Fair or poor	15.8	1.91	1.00 to 2.82	24.5	1.48	1.00 to 1.97
Health Care Factors						
Any Preventive Health Care Visit, Past Year						
Yes	4.2	0.66	0.46 to 0.87	11.6	1.19	0.91 to 1.47
No	8.6	1.00	–	12.5	1.00	–
Personal Physician or Nurse						
Yes	5.2	0.91	0.63 to 1.20	12.1	1.05	0.85 to 1.25
No	7.1	1.00	–	13.0	1.00	–
Usual Source of Care When Sick						
Physician's office	5.0	1.00	–	11.6	1.00	–
Clinic or health center	8.0	1.05	0.56 to 1.54	15.9	0.94	0.63 to 1.25
Other (hospital outpatient, retail store clinic or "minute clinic," school, or other)	8.0	1.05	0.35 to 1.75	12.7	0.83	0.46 to 1.19
None or emergency department	7.3	0.72	0.44 to 1.00	13.6	0.94	0.73 to 1.16
Preventive Dental Visit, Past Year						
Yes	5.0	0.78	0.52 to 1.05	12.9	1.45	1.08 to 1.83
No	8.9	1.00	–	9.7	1.00	–

special services had increased prevalence of teeth in fair or poor condition relative to non-CSHCN. Compared with privately insured children, publicly insured children had increased prevalence of fair or poor conditon of the teeth. In addition, both publicly insured and uninsured children had increased prevalence of carious teeth or caries.

Children from non-English-speaking households had 97% increased prevalence of fair or poor condition of the teeth, relative to children from English-speaking households (aPRR, 1.97; 95% CI, 1.20 to 2.73). Worse parental general health was associated with increased prevalence of fair or poor condition of the teeth and carious teeth or caries compared with excellent or very good health status.

Preventive health care visits in the past year were associated with 34% decreased prevalence of fair or poor condition of the teeth (aPRR, 0.66; 95% CI, 0.46 to 0.87). In addition, preventive dental visits in the past year were associated with a 45% increased prevalence of carious teeth or caries (aPRR, 1.45; 95% CI, 1.08 to 1.83).

DISCUSSION

This study provides a snapshot of US children's use of specific preventive oral health services and identifies several associated factors. As reported by parents or caregivers, 82% of children aged 2 through 17 years had a preventive dental visit in the past year, including 76% of children from households with less than 100% FPT and 80% of children from households with 100% through 199% FPT. These rates are consistent with those from the National Health Interview Survey, which found that 85% of children aged 2 through 17 years had a dental visit in the past year in 2015.[34] However, both the NSCH and National Health Interview Survey estimates are much higher than the Medical Expenditure Panel Survey (MEPS), which reported a rate of 37% for low-income (≤ 200% FPT) children aged 2 through 18 years in 2014.[17] The discrepancy may be due to measurement differences; the MEPS takes a more restrictive approach to defining a preventive dental visit,[17] whereas the NSCH allows respondents to self-determine what they consider to be preventive oral health care. In addition, MEPS uses probes and detailed follow-up questions that may protect against overestimates.[35]

In our study, parental reports of toothbrushing instruction, fluoride application, and sealants were much lower than those for preventive dental visits and prophylaxis. Similar patterns were found in a 2018 study by Wei and colleagues.[18] Among the preventive dental services examined, rates of receipt of sealants were consistently low. The National Health and Nutrition Examination Survey, which includes a clinical examination to positively identify sealants on children's teeth, indicates that sealant prevalence among school-aged children (6-11 years) ranged from 39% through 48% in 2011 through 2014, depending on income group.[36] The National Health and Nutrition Examination Survey identifies any past sealants, whereas the NSCH only captures reports of sealants in the past 12 months; therefore, some of the difference between the 2 surveys may be explained by means of the different periods considered. Regardless of data source, the application of sealants remains universally low among US children. School-based programs offer 1 avenue for increasing access to sealants by children and adolescents of low socioeconomical backgrounds. These programs also address nonfinancial barriers, such as lack of convenient appointment hours or distance to an oral health care provider.[37]

Adjusted models indicated that children aged 2 through 5 years had decreased likelihood of receiving a preventive dental visit and specific preventive services, whereas older children, especially those aged 6 through 8 years, had increased likelihood of having carious teeth or caries, highlighting opportunities to promote preventive oral health care use in early childhood. We also found persistent differences on the basis of socioeconomic status; children with no health insurance, those from lower-income households, and those whose parents had lower education levels were less likely to use preventive oral health care than their counterparts with private insurance, from high-income households, and with higher-educated parents. In addition, non-Hispanic black children were less likely to receive preventive oral health care than their non-Hispanic white counterparts, and children from non—English-speaking households had decreased prevalence of instructions on toothbrushing and fluoride but increased prevalence of fair or poor condition of the teeth, compared with children from English-speaking households. Taken together, these results underscore the importance of educating parents on using preventive measures at home, including increasing instruction on proper toothbrushing and identifying early signs of caries.

We also found that CSHCN—on the basis of medication use only or on medication use combined with elevated service use or need—had a higher prevalence of preventive oral health care services (with the exception of sealants), relative to non-CSHCN. Although previous studies have focused on this population,[28,38-40] future analyses of the NSCH could provide estimates of oral health and oral health care needs specific to CSHCN, with particular attention to how the various qualifying categories relate to oral health outcomes. Additional studies are also needed to investigate oral hygiene behaviors, fluoride exposure, and dietary risk factors among CSHCN.[41]

Our findings also highlight the role of primary care in supporting preventive oral health care. Having a past-year preventive health care visit and a personal physician or nurse were each associated with increased likelihood of having a preventive dental visit and receiving specific preventive dental services in the past year; in contrast, having no usual source of care was associated with decreased likelihood of receipt of preventive oral health care.[42] Somewhat counterintuitively, we found that having a preventive dental visit in the past year was associated with increased likelihood of having carious teeth or caries. We hypothesize that this is because caries is more likely to be diagnosed during a dental visit and that parents whose children visit the dentist less frequently are less likely to be aware of carious teeth or caries.

There are several study limitations to bear in mind. First, estimates were based on parent reports, which are subject to recall bias leading to possible underestimation of oral health care use. Parents may not recall or be aware of specific preventive services that took place during visits. This seems to be suggested by means of the lower rates of reported fluoride treatments and oral hygiene instructions compared with prophylaxis. Wei and colleagues[18] found similar patterns using MEPS data. Alternatively, certain preventive dental services may truly be provided at lower rates. It is not possible to identify the true cause of this discrepancy without clinical validation studies. However, other nationally representative surveys rely on respondent self-report (including parental reports about their children) to estimate oral health care use.[35,39,43,44] Among these surveys, the MEPS is typically considered to be the benchmark because it is used to track progress on Healthy People national objectives and is believed to have the most protections against overestimates.[35] However, it is also possible that the MEPS results in undercounting of services[35]; indeed, a validation study of the MEPS found that office-based health care

visits were underreported by respondents with Medicare coverage.[45] Although there are differences in estimates derived from different data sources, trends over time are consistent as are stratum-specific associations.[43] Thus, our findings on disparities between groups may be considered reliable and provide additional contextual information that other national surveys lack, including various child, family, and health care factors that may influence use of preventive oral health care.

Another limitation is that the NSCH survey wording for the item on carious teeth or caries only captures "frequent or chronic difficulty" in the past year; thus, it may underestimate the prevalence of any caries. Finally, the survey only inquired about preventive dental services received by a dentist or other oral health care provider; however, we may have missed services provided by non—oral health care providers, such as pediatricians or other primary care providers. Future studies are needed to identify the extent to which preventive oral health services are provided by a dentist, other oral health care provider, or non—oral health care provider.

Despite these limitations, our study provides an up-to-date snapshot of US children's service-specific use of preventive oral health care and oral health status for several population subgroups, underscoring the ongoing need to increase services during the early childhood years and among children from lower socioeconomic backgrounds. The American Academy of Pediatric Dentistry and the American Academy of Pediatrics recommend that all children establish a "dental home" by 12 months of age, particularly for children at risk of oral problems. The American Academy of Pediatric Dentistry guidelines advise a typical examination interval of 6 months (or more frequently depending on patient history),[46] and the American Academy of Pediatrics also provides specific guidelines for pediatricians to perform oral examinations and fluoride applications during well-child visits.[47] There is moderate evidence to indicate that certain interventions can increase the percentage of children who receive a preventive dental visit, including school- and preschool-based interventions, public insurance coverage, and Medicaid reforms.[48] More research is needed to elucidate the role of primary care services in increasing rates of specific preventive oral health services among children and to assess the effectiveness of parent or caregiver education and counseling on improving preventive measures at home.

CONCLUSIONS

On the basis of data from the 2016 NSCH, we found that preventive oral health services are lagging among young children and children from lower socioeconomic backgrounds. Dentists should work with parents or caregivers and primary care providers to promote preventive oral health care, especially among these populations. ■

Dr. Lebrun-Harris is a senior social scientist, Office of Epidemiology and Research, Maternal and Child Health Bureau, Health Resources and Services Administration, US Department of Health and Human Services, 5600 Fishers Lane, 18N-142, Rockville, MD 20857, e-mail lharris2@hrsa.gov. Address correspondence to Dr. Lebrun-Harris.

Dr. Canto is a dental officer, Division of Child, Adolescent and Family Health, Maternal and Child Health Bureau, Health Resources and Services Administration, US Department of Health and Human Services, Rockville, MD.

Ms. Vodicka is a program director, Division of Child, Adolescent and Family Health, Maternal and Child Health Bureau, Health Resources and Services Administration, US Department of Health and Human Services, Rockville, MD.

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