Published in final edited form as:

J Public Health Dent. 2018 September ; 78(4): 337–345. doi:10.1111/jphd.12278.

Examining the association between type of health insurance and children's oral health, NHANES 2011–2014

Erin L. Duffy, MPH^a, Ashley M. Kranz, PhD^b, Andrew W. Dick, PhD^c, Mark Sorbero, MS^d, and Bradley D. Stein, MD, PhD^d

^aPardee RAND Graduate School, 1776 Main Street, Santa Monica, CA 90407

^bRAND Corporation, Arlington, 1200 South Hayes Street, Arlington, VA 22202

^cRAND Corporation, Boston, 20 Park Plaza, 9th Floor, Suite 920, Boston, MA 02116

^dRAND Corporation, Pittsburgh, 4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213

Abstract

Objectives.—To examine the association between type of health insurance (public, uninsured private, or other) and oral health outcomes for children in the United States using nationally representative surveillance data.

Methods.—Using the National Health and Nutrition Examination Survey (2011/12–2013/14), logistic regression models were used to estimate the odds of any dental caries and any untreated caries by type of health insurance (public, uninsured, private, and other) for children aged 2–19 years, with adjustment for relevant individual and socioeconomic characteristics.

Results.—Among 6,057 children, the odds of having any dental caries or untreated caries was not significantly different for publicly insured and uninsured children compared to privately insured children, when adjusting for family income and education. Children in families with income to poverty ratios <200% had greater odds of caries and untreated caries relative to children in families with income to poverty ratios ≥400%. Children with less educated parents also experienced greater odds of caries and untreated caries.

Conclusions.—Oral health outcomes, after adjusting for covariates, were similar for children with public and private health insurance. However, children in low-income families and with less educated parents had greater odds of untreated caries and dental caries, suggesting that initiatives focused on publicly-insured populations may miss other vulnerable children of low socioeconomic status.

Keywords

Oral health; Dentistry; Health insurance; Poverty; Socioeconomic factors

Corresponding author: Erin L. Duffy, Assistant Policy Researcher, RAND, 1776 Main Street, Santa Monica, CA 90405, 310.393.0411 x6600, eduffy@rand.org.

Conflict of Interest: The authors have no conflict of interest to report.

Introduction

Dental caries, often called tooth decay, is a common, preventable disease with high individual, familial, and societal costs, including pain and decreased quality of life from untreated caries, increased risk of future caries, emergency room visits, and school and work absenteeism.¹ Dental visits provide an opportunity to deliver preventive services, provide oral health education, and treat painful problems. While many factors influence dental care utilization, cost is a barrier for many children from low-income families. Dental insurance coverage can mitigate this barrier and help improve appropriate dental care use.²

Rates of dental coverage have been increasing and a high percentage of U.S. children now have coverage. In 2013, an estimated 87.8% of children had dental coverage, a 9.5 percentage point increase since 2000.³ This increase is largely attributable to increasing enrollment in Medicaid and the Children's Health Insurance Program's (CHIP) coverage of pediatric dental care since 2009. As dental coverage increased, so have rates of children's dental visits. Per the Medical Expenditure Panel Survey, rates of dental visits in the past year among children younger than 21 years increased from 41.9% in 2000 to 48.0% in 2015.³ Using Centers for Medicare & Medicaid Services (CMS) state-level data, rates of receipt of any dental services for Medicaid-enrolled children increased from 38.6% in 2010 to 48.2% in 2016.⁴ A study of 2008 Medicaid Analytic Sample reporting that children with longer lengths of continuous Medicaid enrollment had a greater probability of dental service utilization.⁵

While dental coverage and dental visits have increased, disparities in children's dental visits and oral health remain. In 2013, 48.3% of publicly insured children had a dental visit compared to 64% of children with private dental coverage.⁶ Dental visits are twice as common for children in high-income families (61.8%) compared to those in poor families (30.8%).⁷ Additionally, minority children are less likely to receive dental care compared to white children.⁸ Because dental visits provide an opportunity to obtain preventive services and receive needed treatment, poor access to dental care may exacerbate oral health disparities. Caries is concentrated among children in low-income families and racial/ethnic minorities^{8,9} who historically have low rates of dental visits.⁶ While rates of caries and untreated caries in primary teeth have decreased over time, children from higher income families continue to have better oral health.⁹

Less is known about how oral health varies for children with public, private, and no health insurance. Prior research suggests that there is no difference in the oral health of Medicaid-enrolled children and children who are uninsured but Medicaid eligible.¹⁰ A study using parent-reported information from 2011–2012, reported that children with private and public health insurance had similar odds of dental visits, but children with public insurance had worse oral health.¹¹ However, the study used a parent-reported oral health measure which may not accurately reflect children's oral health, particularly for young children for whom parents may have difficulty recognizing problems. Additionally, parent-reported measures of oral health do not provide information about whether caries is treated or untreated.

As the number of children with dental coverage and dental visits increases in the United States, it is important to know if children are experiencing improvements in oral health, and if these improvements are reducing disparities for children in low-income families historically covered by Medicaid and CHIP. The objective of this study was to use nationally representative surveillance data from 2011–2014 to examine the association between type of health insurance and children's experience of dental caries and untreated caries.

Methods

Data

We used the 2011/2012 and 2013/2014 National Health and Nutrition Examination Survey (NHANES), which provides a sample representative of the noninstitutionalized civilian U.S population.¹² We included respondents aged 2 to 19 years who had completed dental examinations. Information on the presence or absence of caries was obtained from dental examinations conducted by licensed dentists at mobile examination centers.^{13,14} Specifically, examiners identified treated caries as a crown or restoration on a surface and untreated caries as a surface with coronal caries. A full description of the exam is available in the examiners manuals.^{13,14} Health insurance, demographic, and oral health utilization information was obtained from questionnaires administered in the respondents' homes by trained interviewers using a Computer-Assisted Personal Interview system. Individuals aged 16 years and older were interviewed directly, while younger children had a proxy provide information. Our Institutional Review Board deemed the study exempt.

Variables

We used information about the presence or absence of caries in primary and permanent teeth to construct a measure of any dental caries experience (decayed or filled teeth, $dft/DFT > 0$). The presence of any untreated caries (decayed teeth, $dt/DT > 0$) provides an approximate measure of a child's access to dental treatment. We excluded missing teeth from our measure of dental caries because these teeth could be missing due to natural exfoliation.

The child's health insurance type was categorized as private, public (i.e., Medicaid and CHIP), other (i.e., Medicare, military health care, Indian Health Service), or uninsured. NHANES does not collect dental insurance status, however, all children with Medicaid and CHIP have dental coverage and most children with private insurance have dental coverage.¹⁵ Therefore, we used health insurance as a proxy for dental insurance.

We used family poverty status and parental education as measures of socioeconomic status. NHANES includes a derived variable based on family size and income relative to the federal poverty guidelines. The family income to poverty ratios categorized children into 5 groups: $<100\%$, $100\text{--}199\%$, $200\text{--}299\%$, $300\text{--}399\%$, and 400% or more. We also categorized parental education level into 5 groups: less than 9th grade, 9–11th grade, high school graduate/GED or equivalent, some college or an associate degree, and college graduate or above. For a child with multiple parents, we used the highest education level.

Additional demographic variables included child age group (2–5, 6–8, 9–11, 12–15, and 16–19 years based on National Center for Health Statistics groupings¹⁰); race/ethnicity

(Mexican American, Other Hispanic, Non-Hispanic White, Non-Hispanic Black, and Other Race); gender; and head of household marital status (married or living with partner, or not). Child's general health status and whether or not they had a routine place to go for healthcare was obtained from the health utilization questionnaire.

Analysis

The analyses included all children with no missing responses for any of the variables. Analyses were weighted using the standard two-year weights for the sample of persons with examination data. Weighted frequencies and percentages describe the demographic and health-related characteristics of the study sample. Descriptive statistics are reported by presence of caries and untreated caries.

We used logistic regression models to estimate the odds of having any dental caries and any untreated caries by health insurance-type (private, public, uninsured, and other), adjusting for individual characteristics described above. Because income and insurance-type are correlated, we estimated alternative specifications that excluded the income variables (family income to poverty ratios) as a sensitivity analysis. The NHANES study period, 2011/2012 and 2013/2014, was also included as a fixed effect. All analyses were conducted using STATA v14.0 (College Station, TX: StataCorp LP). We used the STATA survey (*svy*) command to account for the complex survey design of the NHANES data when determining variance estimates.

Results

There were 7,314 NHANES respondents between 2 and 19 years of age. We excluded 481 due to incomplete dental examinations and 776 due to missing responses for other variables, yielding a final unweighted analytical sample of 6,057. Children with missing observations were more likely to have any caries and less likely to have a routine place for healthcare (Appendix 1).

Descriptive results

The sample was 55.0% non-Hispanic white, 14.9% Mexican American, 13.8% non-Hispanic black, and 7.4% other Hispanic (Table 1). Approximately one quarter (25.8%) of children lived in families with the ratio of family income to poverty less than 100%, while 26.4% lived in families with poverty income ratios greater than 300%. Nearly a third of parents had some college or an associate degree (30.5%) and more had a college degree (36.8%). Most children had a routine place for healthcare (94.0%) and excellent (43.5%) or very good (29.0%) general health. More than half of children had private health insurance (52.3%), followed by public insurance (26.6%), other insurance, (12.9%), and no insurance (8.2%). As illustrated in Table 2, children in families with a ratio of family income to poverty less than 100% were overrepresented in the public insurance (63.4%), uninsured (43.0%), and other insurance (39.5%) groups, while underrepresented in the privately insured group (7.8%).

Nearly half (48.2%) of children experienced dental caries and 12.1% had untreated caries (Table 1). When examining unadjusted presence of caries by insurance-type (Figure 1),

41.7% of privately insured children had experienced caries, compared to 54.7% of children with public insurance, 53.2% of children with the other category of insurance, and 60.7% of uninsured children. Similarly, unadjusted rates of untreated caries varied for children with private insurance (8.9%), public insurance (15.3%), other insurance (12.2%), and uninsured (22.0%).

Adjusted results

As described above, our preferred models include both measures of family income and health insurance-type (Models 1 and 3). We estimated models that excluded measures of family income as a sensitivity analysis (Models 2 and 4), recognizing that income and insurance are correlated. A comparison of the estimation results, presented in Table 3, shows that Models 1 and 3 yielded slightly narrower confidence intervals than Models 2 and 4, and substantively similar results except for insurance-type.

Across all regression models, low parental education was significantly associated with greater odds of any dental caries and any untreated caries. This association was monotonic, with each additional level of parental education decreasing the risk that a child had any caries or untreated caries. Children whose parents had less than a 9th grade education had 2.36 (95% confidence interval [CI]=1.47, 3.78) and 2.04 (95% CI=1.01, 4.09) times greater odds of having any caries and any untreated caries, respectively, relative to children of college graduates (Models 1 and 3). Results for parent education were unchanged in direction and significant in models that excluded family income (Models 2 and 4). Similarly, children younger than 16 years had significantly lower odds of having any caries or untreated caries.

Results for the main models (Models 1 and 3) showed that family income as a percent of poverty was statistically significant and substantively important, but type of health insurance was not. Children with family income to poverty ratios less than 100% and 200% had 1.70 (95% CI=1.21, 2.40) and 1.51 (95% CI=1.09, 2.10), respectively, times greater odds of any caries than children in families with incomes of 400% poverty or greater (Model 2). Ratios of family income to poverty less than 100% and 200% were associated with 1.73 (95% CI=1.07, 2.80) and 1.72 (95% CI=1.03, 2.87) times greater odds of untreated caries than income to poverty ratios of 400% or more (Model 3). Furthermore, compared to white children, non-Mexican Hispanic children had lower odds of having untreated caries 0.65 (95% CI=0.44, 0.96) (Model 3).

Models 2 and 4, which excluded a measure of family income, produced statistically significant and substantively important differences by health insurance-type. In these models, publicly insured children had 1.37 (95% CI=1.05, 1.78) times greater odds of any caries and 1.39 (1.05, 1.84) times greater odds of untreated caries relative to privately insured children. Children having insurance in the other category had 1.28 (95% CI=1.01, 1.63) times greater odds of any caries relative to privately insured children. Uninsured children had 1.88 (95% CI=1.13, 3.15) times greater odds of untreated caries relative to privately insured children. In addition, none of the race/ethnicity variables were significantly different from zero.

Discussion

Using a national sample of children with oral health surveillance data, we found that the adjusted odds of having any dental caries or untreated caries was not significantly different for publicly insured children compared to privately insured children, yet disparities by poverty status and parental education remain. Our findings add to the evidence regarding oral health disparities by socioeconomic status and provide new information about the ambiguous relationship between oral health and health insurance-type.

We found that caries was concentrated among children without private health insurance. More than half of children with public, other, or no insurance had caries, compared to 41.7% of privately insured children. Rates of untreated caries were lower, but distributed similarly to any caries, with 22.0% of uninsured children and 15.3% of publicly insured children experiencing untreated caries compared to 8.9% of privately insured children.

While prior literature indicates that children with Medicaid and CHIP have historically encountered challenges to obtaining dental care^{16,17} and had worse parent-reported oral health than children with private coverage,¹¹ our results suggest that type of health insurance is not a strong predictor of oral health once poverty and parental education are controlled for. We found that the odds of any caries and untreated caries were not significantly different for children with public and private insurance, potentially due to increases in dental visits for publicly insured children and federal and state prioritization of oral health.⁶ Furthermore, since 2010, CMS's state oral health initiative may have contributed to reductions in oral health disparities by prioritizing increasing children's use of dental care, deploying training materials and analytic tools, and providing technical assistance to help states track and improve children's dental utilization and outcomes.¹⁸

Despite positive findings about similar rates of dental caries among children with public and private insurance, uninsured children remain at elevated risk of untreated caries. Uninsured children had the highest rate of untreated caries (22.0%) and had significantly greater odds of untreated caries relative to privately insured children, the largest odds ratios observed when examining the relationship between insurance-type and any untreated caries. Untreated caries can be viewed as a proxy for access to care, and our findings suggest that having any type of health insurance compared to no insurance may help improve access to dental treatment and reduce untreated caries. Future efforts to improve children's oral health and reduce disparities may consider focusing on increasing access to timely restorative treatment to all children regardless of insurance status. Expanded use of dental therapists, a midlevel provider trained to provide preventive dental services and some restorative care under dentists' supervision, is another potential strategy to efficiently make care more accessible due to their lower salaries and common directive to serve vulnerable populations.¹⁹ Dental therapists are widespread throughout the world, but currently only authorized to practice in four states and several American Indian tribes.

Our finding that children in low-income families had worse oral health than children in higher income families is consistent with prior literature.^{8,9} A myriad of factors including diet, behavior, receipt of preventive dental care, timely treatment of dental problems,

knowledge, and opinions interact to affect oral health. Furthermore, children from low-income families may face barriers to dental care, including distance to care,²⁰ parents' value and knowledge of oral health,²¹ and dentists' reluctance to treat young children or accept Medicaid resulting from administrative hassle or low reimbursement rates.¹⁷ Our findings suggest that screening or initiatives focused on only the publicly insured are likely not sufficient to reduce such disparities. Poverty is associated with oral health problems, but as our results illustrate, it is not perfectly correlated with having public insurance, which means strategies are needed to promote oral health that focus on a child's risk of developing caries rather than insurance-type. Caries risk assessment tools have been developed for use by both medical and dental professionals, which encourage the collection of both clinical and sociodemographic factors beyond insurance-type, can be used to develop individualized treatment plans, educate and engage parents, and provide recommendations unique to the child's needs.^{22, 23}

We also found substantial numbers of income-eligible children not enrolled in public insurance. During our study period, children in families with incomes less than 200% of the federal poverty level were eligible for Medicaid or CHIP in 45 states.²⁴ However, we found that 77.1% of uninsured children had ratios of family income to poverty less than 200%. A 2015 study reported that CHIP beneficiaries were more likely than uninsured children to have a usual source of dental care, to have had a dental visit in the past year, and to be less likely to have an unmet need for dental care.¹⁶ Thus, efforts to enroll currently uninsured children may help expand dental care access and reduce disparities among children living in poverty. Uninsurance rates may have decreased with recent Medicaid and CHIP eligibility expansion, but our findings reinforce the importance of facilitating the enrollment of uninsured children in Medicaid or CHIP.

Consistent with the literature on parental education and child oral health, we found across all models that low parental education was associated with greater odds of caries and untreated caries. The association between education and oral health observed in models adjusting for poverty demonstrates that there are independent effects of parental education on children's oral health status beyond what is mediated by poverty status. The 2000 Surgeon General's Workshop on Children and Oral Health identified low parental education as a risk factor for caries.²⁵ A recent study of pre-school aged children in a Florida Head Start program whose guardians had less education were found to be at greater risk of decayed, missing and filled teeth than peers with more educated parents.²⁶ Similarly, caregivers of low-income Black kindergarteners with a high school diploma or higher education were less likely to have children with untreated caries or any caries experience, relative to children of less educated caregivers.²⁷

Limitations

Our findings must be viewed within the context of our study's limitations. Whereas children with public health insurance have dental coverage, we do not know if children with private health insurance, other health insurance, or no health insurance have dental coverage. An estimated 83% of privately insured children had dental coverage in 2003,¹⁴ a rate that the ACA's requirement that pediatric dental coverage be sold on all insurance marketplaces

beginning in 2014 may have increased. While medical insurance coverage is the best proxy available for dental insurance, we also recognize that many privately insured children do not have dental coverage. Furthermore, we classify children as publicly insured if they were ever enrolled in Medicaid or CHIP at any time during the study period, rather than enrolled continuously, which may overestimate the effects attributable to public insurance.

Like the Healthy People 2020 oral health indicators,²⁸ we classified children as having any caries or any untreated caries and future analyses should explore whether the relationships we observed hold for severity of caries experience. Additionally, caries management strategies vary based on risk assessment, age, and parent and practitioner preferences,²⁹ and untreated caries may not always indicate lack of access to dental care. We are unable to draw causal conclusions from the cross-sectional NHANES; specifically, children may have had a different health insurance-type when they developed caries than when their data was collected. The NHANES excludes children of active duty military personnel living overseas and children living in institutionalized group quarters, such as juvenile group homes and residential treatment centers, and we do not know if our findings would generalize to such populations, nor do we know how restricting the sample to children with non-missing observations may limit generalizability. Finally, many NHANES measures are self-reported, including income, which fluctuates and may be reported unreliably. We therefore chose to use broad income categories. We note that because of income's importance in our findings and because income may proxy for myriad factors, further research regarding the role of income and poverty is warranted.

Despite these limitations, our findings provide important insights about the relationship between health insurance-type and oral health and have important public health implications. Increasing dental visits and reducing caries for children are Healthy People 2020 objectives and important steps toward reducing oral health disparities.²⁸ The mechanism by which health insurance-type is believed to affect oral health is through access to dental care, but we found that even after insurance expansion, dental caries remained concentrated among children in low-income families and type of insurance was not a strong predictor of oral health.

Understanding the relationship between health insurance and oral health is increasingly important because of the ACA's impact on integrating health and dental insurance. The ACA essential health benefits, a package of health care services that most health plans are required to cover, includes pediatric dental care, leading many health plans to cover pediatric dental care. In addition to increasing dental coverage, health plan coverage of dental benefits also provides an opportunity for greater coordination between medical and dental providers.

Increasing insurance coverage may lead to more dental visits, but our findings highlight the importance of activities outside of dental offices in reducing caries, particularly among children in low-income families. This may include delivering preventive services in non-dental settings frequented by children, such as fluoride varnish in pediatrician's offices and sealants in schools. Whereas dental practitioners are needed to treat problems, a variety of dental and medical professionals, including dental hygienists, promotoras and community health workers, can help educate parents and children about maintaining healthy teeth and

gums through healthy diets and frequent and proper brushing. These public health approaches to children's oral health are important complements to federal and state initiatives to increase dental visits, and both are needed to successfully improve children's oral health and reduce disparities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

This study was supported by the National Institute of Dental and Craniofacial Research [grant number R01 DE026136–01]. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Dental and Craniofacial Research or the National Institutes of Health. The funding source had no involvement in study design; collection, analysis, and interpretation of data; the writing of the report; nor in the decision to submit the article for publication.

Funding: This study was supported by the National Institute of Dental and Craniofacial Research [grant number R01 DE026136–01]. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Dental and Craniofacial Research or the National Institutes of Health. The funding source had no involvement in study design; collection, analysis, and interpretation of data; the writing of the report; nor in the decision to submit the article for publication.

References

1. US Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.
2. Lewis C, Mouradian W, Slayton R, Williams A. Dental insurance and its impact on preventive dental care visits for US children. *J Am Dent Assoc.* 2007;138:369–80. [PubMed: 17332043]
3. Nasseh K, Vujcic M. Dental benefits coverage rates increased for children and young adults in 2013 In: Research Brief. Chicago (IL): American Dental Association Health Policy Institute; 2015 10.
4. Manski RJ and Rohde F. Dental Services: Use, Expenses, Source of Payment, Coverage and Procedure Type, 1996–2015: Research Findings No. 38 11 2017 Agency for Healthcare Research and Quality, Rockville, MD.
5. CMS-416 Annual Reporting Data Files [Internet]. Baltimore (MD): Centers for Medicare and Medicaid Services c1995—2016 Available from: <https://www.medicaid.gov/medicaid/benefits/epsdt/index.html>.
6. Bouchery E (2013). Utilization of Dental Services Among Medicaid-Enrolled Children. *Medicare & Medicaid Research Review*, 3(3), mmrr.003.03.b04 <http://doi.org/10.5600/mmrr.003.03.b04>.
7. Vujcic M, Nasseh K. Gap in dental care utilization between Medicaid and privately insured children narrows, remains large for adults Research Brief. Chicago (IL): American Dental Association Health Policy Institute; 2015.
8. Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr.* 2009;9(6):415–419. [PubMed: 19945076]
9. Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and sealant prevalence in children and adolescents in the United States, 2011–2012: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics; 2015.
10. Dye BA, Mitnik GL, Iafolla TJ, Vargas CM. Trends in dental caries in children and adolescents according to poverty status in the United States from 1999 through 2004 and from 2011 through 2014. *The Journal of the American Dental Association.* 2017 6 13.
11. Fisher M, Mascarenhas A. A comparison of medical and dental outcomes for Medicaid-insured and uninsured Medicaid eligible children. *J Am Dent Assoc.* 2009;140(11):1403–1412. [PubMed: 19884400]

12. Shariff J, Edelstein B. Medicaid meets its equal access requirement for dental care, but oral health disparities remain. *Health Aff.* 2016;35(12):2259–2267.
13. Johnson CL, Dohrmann SM, Burt VL, Mohadjer LK. National health and nutrition examination survey: sample design, 2011–2014. *Vital Health Stat 2* 2014;1–33.
14. Centers for Disease Control and Prevention. NHANES: Oral Health Examiners Manual 2011–2012. Atlanta (GA); 2011.
15. Centers for Disease Control and Prevention. NHANES: Oral Health Examiners Manual 2013–2014. Atlanta (GA); 2013.
16. Liu J, Probst JC, Martin AB, et al. Disparities in dental insurance coverage and dental care among US children: The National Survey of Children's Health. *Pediatrics*. 2007;119 Suppl 1:S12–21. [PubMed: 17272579]
17. Clemans-Cope L, Kenney G, Waidmann T, et al. How well is CHIP addressing oral health care needs and access for children? *Acad Pediatr*. 2015;3(Suppl):S78–84.
18. Seale NS, Casamassimo PS. Access to dental care for children in the United States: a survey of general practitioners. *J Am Dent Assoc*. 2003;134(12):1630–1640. [PubMed: 14719761]
19. Centers for Medicare and Medicaid Services. Improving access to and utilization of oral health services for children in Medicaid and CHIP programs: CMS oral health strategy Baltimore (MD): CMS; 2011 4 11.
20. Koppelman J, Vitzthum K, Simon L. Expanding where dental therapists can practice could increase Americans' access to cost-efficient care. *Health Aff.* 2016;35(12):2200–2206.
21. Kranz AM, Lee J, Divaris K, et al. North Carolina physician-based preventive oral health services improve access and use among young Medicaid enrollees. *Health Aff.* 2014;33(12):2144–2152.
22. Kelly S, Binkley C, Neace W, Gale B. Barriers to care-seeking for children's oral health among low-income caregivers. *Am J Public Health*. 2005;95(8):1345–1351. [PubMed: 16043666]
23. American Dental Association. ADA Caries Risk Assessment Form Completion Instructions [Internet]. Available from: http://www.ada.org/~media/ADA/Member%20Center/Files/topics_caries_instructions.pdf?la=en
24. American Academy of Pediatrics. Oral Health Risk Assessment Tool [Internet]. Available from: <https://brightfutures.aap.org/Bright%20Futures%20Documents/OralHealthRiskAssessmentTool.pdf>
25. Artiga S, Cornachione E. Trends in Medicaid and CHIP eligibility over time. Menlo Park, CA: Kaiser Family Foundation; 2016.
26. Edelstein BL. Disparities in oral health and access to care: Findings of national surveys. *Ambul Pediatr*. 2002;2(2):141–147. [PubMed: 11950385]
27. Weatherwax J, Bray K, Williams K, Gadbury-Amyot C. Exploration of the relationship between parent/guardian sociodemographics, intention, and knowledge and the oral health status of their children/wards enrolled in a Central Florida Head Start Program. *Int J Dent Hyg*. 2015;13(1):49–55. [PubMed: 25040842]
28. Heima M, Lee W, Milgrom P, Nelson S. Caregiver's Education level and child's dental caries in African Americans: A path analytic study. *Caries Res*. 2015;49(2):177–183. [PubMed: 25661111]
29. Healthy People 2020: Oral health of children and adolescents Washington, DC: U.S. Department of Health and Human Services; 2015.
30. Tinanoff N, Douglass JM. Clinical decision-making for caries management in primary teeth. *J Dent Educ* 2001;65:1133–42 [PubMed: 11699990]

Figure 1. Unadjusted dental caries experience by insurance-type, children aged 2–19 years (NHANES, 2011–2014).

This figure presents the weighted, unadjusted percentage of children with each type of insurance who experienced any caries and any untreated caries. The error bars and value labels in parentheses display the 95% confidence interval around this weighted percentage.

Table 1.

Characteristics of the weighted study sample, children aged 2–19 years (NHANES, 2011–2014)

Description	All Children, % N=6,057	Children Experiencing Any Caries, % N=2,989	Children Experiencing Any Untreated Caries, % N=782
Any caries	48.2	100.0	100.0
Any untreated caries	12.1	25.1	100.0
Survey period 2011/2012	49.7	50.5	44.9
Survey period 2013/2014	50.3	49.5	55.1
Type of Health Insurance			
Private	52.3	45.3**	38.5**
Public	26.6	30.2	33.5
Other	12.9	14.2	13.1
Uninsured	8.2	10.3	14.9
Ratio of family income to poverty			
<100%	25.8	31.1**	35.3**
100–199%	24.1	26.6	29.1
200–299%	14.5	14.5	15.4
300–399%	14.5	14.5	15.4
≥400%	11.9	10.4	7.4
Age group			
2–5 years	22.7	11.1**	15.1**
6–8 years	17.4	19.4	14.3
9–11 years	16.4	17.8	15.5
12–15 years	23.8	24.7	23.6
16–19 years	19.8	27.0	31.5
Female	48.8	47.5	46.9
Race/Ethnicity			
Non-Hispanic White	55.0	50.6**	50.4**
Mexican American	14.9	18.6	18.1
Non-Hispanic Black	13.8	14.4	17.3
Other Hispanic	7.4	7.7	6.7
Non-Hispanic Asian	4.4	4.3	4.2
Other Race	4.6	4.4	3.4
Head of household is married or living with partner	75.8	73.6**	65.9**
Parent education			
Less than 9th grade	5.7	8.1**	9.7**
9–11th grade	10.0	12.4	15.0
High school grad/GED or equivalent	17.1	20.2	22.0
Some college or AA degree	30.5	32.4	31.5
College graduate or above	36.8	27.0	21.8
Self-reported general health			
Excellent	43.5	38.1**	36.2**

Description	All Children, % N=6,057	Children Experiencing Any Caries, % N=2,989	Children Experiencing Any Untreated Caries, % N=782
Very good	29.0	28.6	28.4
Good	22.4	26.7	29.7
Fair	4.6	5.8	5.1
Poor	0.5	0.8	0.6
Had a routine place for healthcare	94.0	92.0**	88.4**

Table 2.

Distribution of the ratio of family income to poverty by insurance-type, children aged 2–19 years (NHANES, 2011–2014)

Ratio of family income to poverty	Private, %	Public, %	Uninsured, %	Other, %
<100%	7.8	63.4	43.0	39.5
100–199%	19.4	28.9	34.1	36.8
200–299%	18.9	5.2	13.6	10.0
300–399%	18.3	1.6	5.3	4.7
400%	35.6	1.0	3.9	9.0

Table 3.

Weighted logit models estimating the effect of type of health insurance on any dental caries and untreated caries for children aged 2–19 years

	Dependent variable: Child has any dental caries				Dependent variable: Child has any untreated			
	Model 1		Model 2		Model 3		Model 4	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Type of health insurance (reference (ref): Private)								
Public	1.13	(0.82 – 1.55)	1.37 *	(1.05 – 1.78)	1.18	(0.87 – 1.59)	1.39 *	(1.05 – 1.84)
Other	1.12	(0.85 – 1.47)	1.28 *	(1.01 – 1.63)	1.02	(0.71 – 1.46)	1.17	(0.80 – 1.71)
Uninsured	1.11	(0.85 – 1.44)	1.25	(0.97 – 1.60)	1.66	(0.98 – 2.80)	1.88 *	(1.13 – 3.15)
Ratio of family income to poverty (ref: 400%)								
<100%	1.70 **	(1.21 – 2.40)			1.73 *	(1.07 – 2.80)		
100–199%	1.51 *	(1.09 – 2.10)			1.72 *	(1.03 – 2.87)		
200–299%	1.32	(0.97 – 1.80)			1.59	(0.93 – 2.73)		
300–399%	0.97	(0.68 – 1.39)			0.97	(0.510 – 1.84)		
Education (ref: College graduate or above)								
Less than 9th grade	2.36 **	(1.47 – 3.78)	2.86 **	(1.86 – 4.37)	2.04 *	(1.01 – 4.09)	2.49 **	(1.29 – 4.80)
9–11th grade	1.94 **	(1.34 – 2.81)	2.35 **	(1.68 – 3.29)	1.70 *	(1.13 – 2.55)	2.09 **	(1.49 – 2.93)
High school graduate/ GED or equivalent	1.86 **	(1.38 – 2.50)	2.18 **	(1.70 – 2.81)	1.52 *	(1.05 – 2.18)	1.84 **	(1.33 – 2.56)
Some college or associate degree	1.57 **	(1.22 – 2.03)	1.78 **	(1.43 – 2.20)	1.30	(0.91 – 1.85)	1.52 *	(1.10 – 2.10)
Age in years (ref: 16–19 years)								
2–5 years	0.14 **	(0.11 – 0.19)	0.15 **	(0.11 – 0.20)	0.39 **	(0.28 – 0.55)	0.40 **	(0.29 – 0.57)
6–8 years	0.60 **	(0.47 – 0.78)	0.62 **	(0.48 – 0.81)	0.49 **	(0.33 – 0.74)	0.51 **	(0.34 – 0.76)
9–11 years	0.58 **	(0.46 – 0.71)	0.59 **	(0.47 – 0.74)	0.58 **	(0.39 – 0.86)	0.60 *	(0.40 – 0.88)
12–15 years	0.51 **	(0.40 – 0.66)	0.51 **	(0.40 – 0.66)	0.62 **	(0.47 – 0.82)	0.63 **	(0.47 – 0.83)
Race/Ethnicity (ref: Non-Hispanic White)								
Mexican American	1.23	(0.96 – 1.57)	1.26	(0.98 – 1.61)	0.82	(0.58 – 1.16)	0.85	(0.60 – 1.20)
Other Hispanic	0.91	(0.71 – 1.15)	0.95	(0.75 – 1.20)	0.65 *	(0.44 – 0.96)	0.68	(0.46 – 1.01)
Non-Hispanic Black	0.96	(0.79 – 1.17)	0.98	(0.81 – 1.19)	1.00	(0.79 – 1.262)	1.02	(0.81 – 1.30)
Other Race	1.15	(0.94 – 1.40)	1.16	(0.96 – 1.42)	0.86	(0.62 – 1.19)	0.88	(0.63 – 1.21)
Head of household is married or living with partner (ref: not married or co-habiting)	1.16	(0.94 – 1.43)	1.08	(0.89 – 1.30)	0.79	(0.62 – 1.01)	0.74 *	(0.59 – 0.93)

Note: Table 3 provides results from logistic regression models that were used to estimate the odds of any dental caries and any untreated caries by type of health insurance (public, uninsured, private, and other) for children aged 2–19 years, with adjustment for relevant individual and socioeconomic characteristics. In addition to the variables listed in this table, all four models are also adjusted for sex, self-reported general health, having a routine place for healthcare, and survey year. Variables not listed in this table were not statistically significant in any of the four models.

OR, odds ratio, CI, confidence interval, GED, General Educational Development.

*
P<0.05 and

**
P<0.01.

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