

Dental Sealant Utilization among Rural and Urban Children



South Carolina
Rural Health
Research Center
At the Heart of Health Policy

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Executive Summary

We examined the proportion of rural children who have received dental sealants, thin plastic materials applied to the surface of the teeth to prevent or delay the development of dental decay. Our principal source of information was the Survey of Income and Program Participation (SIPP) of the Census Bureau (2001-2004 panel, the most recent SIPP version available when the project was initiated), which asked parents about children's teeth. To confirm findings based on parental report, we also examined dental results from the 2003-2004 National Health And Nutrition Examination Survey (NHANES), which are based on professional examination of children's teeth.

Key findings:

- Similar proportions of rural (43.7%) and urban (43.0%) children had sealants.
- Within racial/ethnic groups, rural white children were significantly less likely to have parentally reported sealants than were urban white children; there were no significant differences based on residence for black or Hispanic children.
- Across racial/ethnic groups, white children (47.9%) were significantly more likely to have sealants than Hispanic children (35.3%) while black children were the least likely of all three racial/ethnic groups to report having sealants. Within rural children, 45.2% of white children, 35.6% of black children, and 39.3% of Hispanic children were reported to have sealants (not significantly different).
- Children at greatest risk of subsequent decay because they lack dental sealants include minority children, children receiving public insurance or without insurance, and those from low-income and low-education households.

Conclusions:

- While Healthy People 2020 goals for sealants have been met (goal: 28% of children aged 6 – 9), less than half of children have sealants. Future research should identify where rural children receive sealants, e.g. school-based sealant programs, community health center dental programs, and identify ways to maximize outreach in safety net settings to ensure at-risk children receive sealants.
- Coordinated efforts between the Oral Health Program at CDC and agencies tasked with rural and minority public health interests, such as the Office of Rural Health Policy, the Bureau of Primary Care, and the National Institute for Minority Health and Health Disparities, could ensure that availability of preventive oral care services for rural populations is monitored and assessed for future strategic planning.

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Introduction: Importance of Dental Sealants

More than 40% of children aged 6 to 19 have dental caries, also known as tooth decay or a cavity, in their permanent teeth.¹ Caries are particularly prevalent among minority children, those living in poverty, and children in poor health.^{2,3,4} Rural children experience multiple challenges to optimal dental health. Rural children live in areas where there are shortages of both pediatric and general dentists.^{5,6} Rural children are less likely than urban children to have dental insurance and are less likely to receive preventive dental care.^{7,8} Rural children also experience transportation barriers and limited access to fluoridated water systems.⁶ Finally, poverty is more common among rural than urban children, particularly in remote rural areas.⁹

Sealants are thin, plastic materials that are applied to the rough surfaces of molars.¹⁰ Because most childhood caries (85% to 90%) are found in the pits and fissures of permanent teeth,¹¹ dental sealants are an effective method for reducing caries.¹² Once applied, dental sealants provide a protective coating that prevents new or existing decay from spreading deeper into teeth.¹² Caries reduction post-sealant application has been documented as high as 86% after one year and 58.6% after four years.¹³ The American Dental Association (ADA) recommends that sealants be put on children's primary and permanent teeth when risk for caries is established.¹⁴ Assessment of risk is left to the individual clinician, but is influenced by both the state of the child's teeth and social factors that may reduce use of dental services. The ADA also recommends placing sealants on teeth with carious lesions in order to reduce disease progression.

Most private insurance and state Medicaid programs pay for dental sealants.¹⁰ In 1999 – 2002, 29.5% of children age 6-11, and 37.4% of those aged 12 – 15, had at least one sealant.¹ Minority children and poor children were less likely to have sealants. For example, only 22.7% of non-Hispanic African American children and 23.4% of Hispanic children had sealants, versus 37.9% of white children.¹

Study Purpose

This study examined the proportion of rural children who have dental sealants. We used parent-reported information about sealants for approximately 14,500 children

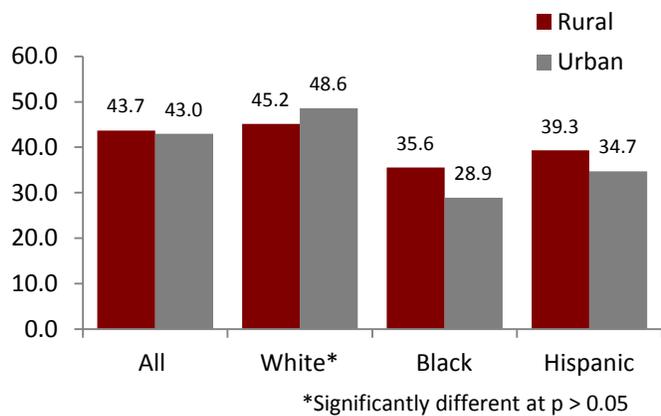
age 6 – 14 years, obtained from the Survey of Income and Program Participation (SIPP) of the Census Bureau. To confirm findings based on parental report, we also examined dental results of the 2003 – 2004 National Health And Nutrition Examination Survey (NHANES), which are based on professional examination of children’s teeth.

Findings

Parentally Reported Dental Sealant Use

Overall, similar proportions of rural (43.7%) and urban (43.0%) children were reported to have sealants (Figure 1). Within racial/ethnic groups, rural white children were significantly less likely to have parentally reported sealants than were urban white children. For other children, residence differences were not significant. Across racial groupings, white children (47.9%) were more likely to have sealants than Hispanic children (35.3%) while black children were the least likely of all three racial/ethnic groups to report having sealants (29.7%; $p < 0.001$).

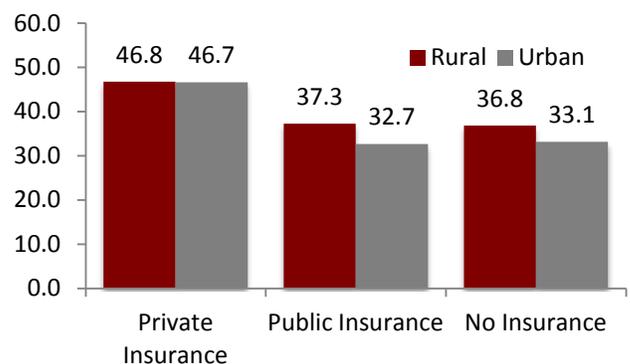
Figure 1. Proportion of children with reported dental sealants, by race and residence, 2001-2004 SIPP



Characteristics Associated with Reported Sealant Use

Among both rural and urban children, child and household characteristics were associated with sealant use (Table 1, in Appendix). As anticipated, older children were more likely to have sealants in both rural and urban populations. In both populations, children with private health insurance (Figure 2), children from families

Figure 2. Percent of children with reported sealants, by insurance and residence, 2001-2004



with a college education or more, and children whose families had incomes greater than 400% of the federal poverty level (FPL) were most likely to have sealants. Conversely, children whose families had incomes 200% or below the FPL, were least likely to have sealants in both rural and urban populations.

Among rural children, the proportion of children who had received sealants was similar across free or reduced lunch status, another measure of income, (42.48% among eligible students, 45.83% among ineligible students). In urban populations, on the other hand, only 32.1% of urban children who were eligible for school lunch had sealants compared to 49.9% of urban children who were not eligible. In addition, urban children from one-parent households were less likely to have sealants (36.0%) than children from two parent urban households (45.8%), while rural households did not differ. The child's gender was not related to sealant use in rural or urban children.

Confirming parent data: comparison of SIPP to NHANES

To measure how closely parental report of sealants might coincide with a professional assessment, we repeated our analysis using information from the professional oral examinations carried out as part of the National Health and Nutrition Examination Survey (NHANES). SIPP and NHANES contacted different sets of children. However, since both were intended to be nationally representative and both address similar time periods (2001 – 2004 for SIPP, 2003 – 2004 for NHANES), findings regarding sealants should be similar. Due to data limitations, we could not examine NHANES results among rural children.

Comparable proportions of children from both SIPP and NHANES had sealants (43.2% in SIPP, 37.7% in NHANES). Anticipated differences between children with and without sealants were found in both data sources. For instance, white children, children with private health insurance, older children and children who came from families with household incomes greater than 400% of the FPL, or from families with a college education or greater were more likely to have sealants than children without those characteristics. The high degree of agreement between the two data sources suggests that parental report is an adequate guide for assessing the presence of sealants.

Conclusions

With 43.7% and 43.0%, respectively, of rural and urban children between the ages of 6 – 14 having dental sealants, the goals set by Healthy People 2020 in this area of children’s oral health have already been exceeded.¹⁵

Nonetheless, less than half of all children have received this important preventive service.

Children at greatest risk of subsequent tooth decay because they lack dental sealants include

minority children, children receiving public insurance, and those from low-income and low-education households.

<u>Healthy People 2020 Objectives for Sealants:</u>			
<i>Increase the proportion of children who have received dental sealants on one or more of their permanent molar teeth.</i>			
Objective	Age	Target	Referent Teeth
OH-12.2	6 to 9 years	28.1%	1 st molars
OH-12.3	13 to 15 years	21.9%	2 nd molars

The Centers for Disease Control and Prevention (CDC) have supported the state-based Oral Disease Prevention Program since 2001. Using the cooperative agreement funding mechanism, CDC currently provides assistance to 20 states to develop their oral health prevention capacities. As part of the cooperative agreement, states can develop their capacity to provide or enhance school-based sealant programs aimed at reducing disparities for poor children.

Improving sealant delivery continues to be a CDC priority, as outlined in their Oral Health Program Strategic Plan, 2011 – 2014. The benefits of sealants for improved oral health are addressed in four of the seven strategic goals outlined.¹⁶ The unique needs of rural children and their families, however, are not addressed in the strategic plan. Coordinated efforts between the Oral Health Program at CDC and agencies tasked with rural public health interests, such as the Office of Rural Health Policy, could ensure that rural populations are monitored and assessed for future strategic planning.

The Institute of Medicine (IOM) has addressed oral health issues in rural populations in two reports, *Advancing Oral Health in America*¹⁷ and *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*.¹⁸ Both reports acknowledge the disparities experienced by rural populations and recommend workforce

and policy approaches to address rural disparities. The IOM recommends that the CDC and relevant Bureaus within the Health Resources and Services Administration (HRSA) “collaborate with states to ensure that each state has the infrastructure and support necessary to perform core dental public health functions (e.g., assessment, policy development, and assurance).”^{18, p. 14} Given the limited public health infrastructure and reliance on safety net providers in rural, the CDC and HRSA response to this recommendation, with appropriate emphasis on the unique health care challenges faced by rural children, could provide important policy and practice insights on how rural health systems can be optimized to ensure access to preventive oral health services.

The IOM report on vulnerable populations recommended that Medicaid programs work to improve access to preventive services, while noting multiple barriers to such improvement: insufficient dental workforce, restrictive licensing laws, and the inability of reimbursement changes alone to ensure that services reach children in need. In the current economic climate, however, Medicaid reimbursement rates for sealants, as well as other preventive services, could be vulnerable to reduction as states work to manage Medicaid enrollment expansion against balancing budgets.

Oral health advocates need to work to ensure that preventive services, such as sealants, continue to be available and that public health assessment activities, such as monitoring the uptake of sealants across children of differing levels of vulnerability, continue to be conducted. Continuing public education regarding the nature and importance of sealants is also needed. Finally, research is needed to help identify the most effective ways to make sealants available to children across the geographic and economic spectrum and understand where underserved children, especially rural children, actually receive sealants. One important policy area of inquiry is ascertaining the degree to which the Patient Protection and Affordable Care Act impacts access and receipt of sealants for underserved children.

Appendix

Table 1. Proportion of US children aged 6 – 14 years with parentally-reported dental sealants, by residence, SIPP, 2001-2004

Sealant Status	Rural		Urban	
	% Yes (n=1310)	p**	% Yes (n=4971)	p**
Characteristics of the Child				
Race/ethnicity		0.00		0.10
Non-Hispanic White	47.9		45.2	
Non-Hispanic Black	29.7		35.6	
Hispanic	35.3		39.3	
Age (years)		0.00		0.00
6-8	38.2		35.1	
9-12	45.4		47.1	
13-14	47.6		46.2	
Gender		0.10		0.14
Male	42.4		42.2	
Female	43.9		45.1	
Health Insurance				
Yes		0.00		0.00
Private	46.8		46.7	
Public	37.3		32.7	
No	36.8		33.1	
Characteristics of the Household				
Family Income		0.00		0.00
<200% FPL***	40.0		33.6	
200- 400% FPL	43.3		43.3	
>400% FPL	51.8		52.2	
Free and Reduced Lunch Eligibility		0.33		0.00
School Serves Lunch				
Eligible	42.5		32.1	
Ineligible	45.8		49.9	
School Lunch Not Served	42.2		45.1	
Highest level of education		0.00		0.00
High school or less	37.9		32.7	
College or more	46.4		46.5	
Household configuration		0.52		0.00
2 parent	44.2		45.8	
1 parent	42.3		36.0	
*Percentages weighted to reflect population. **p-values from chi-square tests of independence. ***FPL: federal poverty level.				

Summary of Methods

Information provided is derived from two secondary data sets, the 2004 Panel of the Survey of Income and Program Participation (SIPP), which contains data from 2001 – 2004, and the 2003 - 2004 waves of the National Health and Nutrition Examination Survey (NHANES).

Conducted by the Demographic Division of the U.S. Census Bureau, the SIPP collects information on income, labor force participation, government program participation and eligibility, and demographics of a representative sample of the U.S. population. Each SIPP panel follows a stratified sample of U.S. civilian non-institutionalized households for 2 to 4 years. We used the 2004 panel, initiated in February of that year, which consisted of more than 46,000 households. Parents of children aged 3 – 14 years (n=12,152) were asked about their child's utilization of dental sealants:

Dental sealants are special plastic coatings that are painted on the tops of the back teeth to prevent tooth decay. They are different from fillings, caps, crowns, and fluoride treatments. Has (CHILD) ever had dental sealants painted on (HIS/HER) teeth? [Question ME33].

SIPP sealant information is based on parental report, does not distinguish between sealants on some but not all teeth, and does not allow for sealants that may have become detached. Thus, we conducted a second, confirmatory analysis using data from the 2003-2004 NHANES. Unlike SIPP, NHANES is based on professional examination of children's teeth, making its information a better standard for surveillance. In NHANES, sealant presence was based on professional examination of the child's teeth by a dentist. Sealants were scored as present on a surface when any part of the surface remains covered. The bicuspid/primary molars, first and second molars, and the permanent maxillary lateral incisors only were considered when examining the child's teeth for sealants. The teeth of children between the ages of 6 and 18 years were examined for sealants.

After accessing the restricted data, we found that NHANES did not contain sufficient observations of rural children to support all analyses of interest. In addition, we discovered that there were no rural NHANES participants from the Northeast. This confirmed the decision to use the SIPP data for our primary analysis. At the national level, however, the NHANES profile of the types of children with sealants was used to compare to the parallel SIPP data, allowing a rough estimate of the validity of SIPP data.

Study Methods

Sample size and exclusions

In SIPP, there was an initial sample of 23,359 children between 6 and 14 years of age. Exclusions were subsequently made for missing information on sealants (7,112), type of residence (426), other race (1,001), and other covariates (297), resulting in an analytic sample size of 14,523. In NHANES, there was an initial sample of 6,491

children between the ages of 6 and 18 years. As with SIPP, exclusions were made for missing data on sealants (439), residence type (243), race/ethnicity (143), and other covariates (844) leaving an analytic sample of 4,822.

Defining residence and race/ethnicity

The main independent variables were residence and race/ethnicity. In SIPP, *residence* was measured at the county level using a publicly available variable that specified participants as living in a metropolitan (hereafter, urban) or nonmetropolitan area (hereafter, rural). Important to note is a procedure used by the Census to avoid disclosure risk. In the 2001 SIPP User's Guide, they explain that in some states where the nonmetropolitan population is very small, a proportion of that state's metropolitan population is recoded to nonmetropolitan. This introduces a bias into the overall analysis, slanting rural populations to look more like their urban counterparts. Given the similarities between the SIPP and NHANES findings for the current project, the degree of bias is considered to be slight.

In NHANES, *residence* was measured at the county level using restricted files where participants were categorized as rural or urban using urban influence codes. UICs of 1 and 2 were considered urban while UICs of 3-9 and 12 were considered rural.

Race/ethnicity, based on self-report, was categorized as non-Hispanic white (hereafter, white), non-Hispanic black (hereafter, black) and Hispanic in both data sources. Respondents who identified their race/ethnicity as "other" were excluded due to small sample sizes.

Analytic approach

Both the SIPP and NHANES use complex sampling frames, which required appropriate weighted analysis. SAS-callable SUDAAN was used for all analyses. Bivariate comparisons were made using chi square tests. All analyses for SIPP were conducted at the S.C. Rural Health Research Center (SCRHRC) using public use data sets. For NHANES, development of variables and preliminary analyses were conducted at the SCRHRC using public use data sets, and analyses incorporating rural/urban residence were conducted at the National Center for Health Statistics (NCHS) Research Data Center in Hyattsville, MD.

Limitations to study design

The NHANES contains professionally verified information about sealant presence, while SIPP is based on parental report. The SIPP rural/urban variable is limited by the residence recoding procedure, which recodes a fraction of the urban population in certain states to rural to avoid disclosure risk. Rural children were under-represented in both data sets (7.2% in NHANES, 18.6% of SIPP), and not all regions of the U.S. were represented. Limitations to both data sets include the absence of information regarding the type of provider who applied sealants (primary care physician, dentist, or hygienist), the age at which sealants were applied, the number or proportion of teeth that were covered by sealants or whether the sealants have been retained (SIPP data), and information on multiple levels of rurality.

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