Oral Health Care Utilization by US Rural Residents, National Health Interview Survey 1999

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Abstract

Objective: *To compare the dental care utilization practices of rural and urban residents in the United States.* ***Methods:*** *Data on dental care utilization from the 1999 National Health Interview Survey for persons 2 years of age and older (n=42,139) were analyzed by rural/urban status. Percentages and 95 percent confidence intervals were calculated to produce national estimates for having had a visit in the past year, the number of visits, reasons given for last dental visit and for not visiting a dentist, unmet dental needs, and private dental insurance.* ***Results:*** *Rural residents were more likely to report that their last dental visit was because something was "bothering or hurting" (23.3% vs 17.6%) and that they had unmet dental needs (10.1% vs 7.5%). Urban residents were more likely to report having a dental visit in the past year (57.7% vs 66.5%) and having private dental insurance (32.7% vs 37.2%), compared to rural residents. There were no significant differences in most reasons given for not visiting the dentist between rural and urban respondents.* ***Conclusion:*** *Dental care utilization characteristics differ between rural and urban residents in the United States, with rural residents tending to underutilize dental care. [J Public Health Dent 2003;63(3):150-57]*

Key Words: NHIS, rural, urban, oral health, dental care utilization.

Even though the utilization of dental health care in the United States has improved over the past two decades, significant inequalities in oral health care utilization remain (1). Some population groups, such as racial/ethnic minorities and low socioeconomic status groups, continue to exhibit lower dental care utilization than their counterparts (2). Despite extensive study of dental care utilization, little is known about dental care utilization differences by place of residence or rural/urban status. In his report "Oral Health in America," the US Surgeon General has called for a renewed effort to address and eliminate oral health disparities affecting various groups within the United States, including rural populations (1). Part of this effort must include the acquisition of knowledge that provides additional understanding of the underlying reasons that promote underutilization of dental care.

Although many factors have been identified that promote underutilization of dental care, the lack of dental insurance has received the greatest attention (3). Although most health insurance does not cover dental care directly, private health insurance is used as a proxy for dental coverage when information on dental insurance is not available. Rural adults are typically self-employed or work in small businesses and consequently lack private health insurance coverage. Many are also employed in part-time or seasonal work. In rural America, the rate of health uninsurance is 20 percent higher than that of urban areas (4), possibly related to the employment characteristics of rural residents. It also has been reported that individuals with private health insurance are more likely to utilize dental care services compared to the uninsured (5-7) and that nearly 23 percent of adults without health insurance have unmet dental care needs (8).

The ability to support the delivery of dental services and to promote utilization of care is not limited to reimbursement issues, but also requires dental providers available to deliver care. As dental student indebtedness increases, fewer dentists will choose to practice dentistry in lower-income communities (1). Currently, the existing ratio of dentists to individuals in rural areas is significantly lower than in urban areas (29 vs 61 per 100,000) (9). Moreover, there are indications that the annual rate of population increase in some rural areas was more than three times as great in the 1990s compared to the 1980s (10). As the availability of local dental providers becomes more limited, obtaining dental care for many rural Americans becomes more challenging.

Research has shown that the advantages of dental insurance on dental care utilization are more likely to benefit individuals from middle to lower income groups (11). Recently, Manski and Moeller reported that poorer individuals (in families with income ≤200 percent of the federal poverty line) are significantly more likely to have fewer diagnostic and preventive dental visits compared to persons with more economic resources (12). Given that earned income and health insurance coverage are lower in rural areas compared to urban areas, it is expected that significant disparities in utilization will exist between rural and urban America. Therefore, the aim of this report is to describe the dental care utilization characteristics of residents in rural America.

Methods

Data Source. Comparisons of dental care utilization and related issues between rural and urban populations were made using data from the 1999 National Health Interview Survey

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(NHIS 1999). The NHIS is an annual survey conducted by the Centers for Disease Control and Prevention, National Center for Health Statistics (NCHS), and has been conducted continuously since 1957. The sample selection for the NHIS follows a complex sample design using a weekly probability sample to produce a nationally representative sample of the civilian noninstitutionalized household population of the United States. The survey interview is administered by personnel from the US Census Bureau. The NHIS oversampled non-Hispanic black and Hispanic persons to provide reliable information on these special populations.

The NHIS collects information from each participant via face-to-face home interviews. Since the instrument's redesign in 1997, the NHIS includes a basic module and periodical modules. Every year supplements are implemented to obtain more detailed information on topics from the basic module and / or new topics. The basic module contains three components: the family core, the sample adult, and sample child core (13). The family core collects sociodemographic information from all family members, basic indicators of health status, and health services utilization. From each household, an adult and a child (if there were children under 18 years of age) were selected randomly to respond to the sample adult core and the sample child core, respectively. A knowledgeable adult provided responses to the questions on behalf of the sample child. However, for the simplification of writing this report, we will say that "the child responded."

Oral health-related questions included in the NHIS basic module are unmet dental needs, complete tooth loss (edentulism), and dental visits in the past year from the sample child and sample adult cores. In the NHIS 1999, a periodic module asked questions related to dental care utilization: reason for last dental visit, reason for no visit in the past year, number of dental visits in the past year, and private dental insurance coverage.

Population. The 1999 NHIS sample included approximately 40,000 households with close to 120,000 inhabitants between 0 and 99 years of age. Because the questions on dental care were limited to participants aged 2 years and older, we excluded participants under 2 years of age (n=1,572) for our analyses. A total of 42,139 persons 2 years of age and older were selected to respond to the adult and child cores. To make better use of the available data, cases with missing data were excluded only from analyses of the specific missing variable.

TABLE 1
Percentage of Persons 2 Years of Age and Older Reporting Having Private Dental Insurance by Place of Residence, United States, 1999

	Percent (95% Confidence Interval)		
	Total	Rural	Urban
Total	36.2 (35.5, 36.9)	32.7 (31.2, 34.1)	37.2 (36.4, 38.0)
Age group (years)			
2–4	36.2 (33.7 38.6)	33.5 (27.1, 39.9)	36.8 (34.2, 39.4)
5–17	38.0 (36.4, 39.5)	34.0 (31.2, 36.9)	39.0 (37.2, 40.8)
18–34	39.3 (38.0, 40.5)	35.2 (32.2, 38.1)	40.2 (38.8, 41.6)
35–54	43.0 (41.9, 44.1)	39.8 (37.6, 42.0)	43.8 (42.6, 45.0)
55–64	33.9 (32.1, 35.7)	30.4 (27.1, 33.6)	35.0 (32.9, 37.1)
65–74	17.4 (15.7, 19.0)	11.6 (9.2, 14.0)	19.2 (17.2, 21.2)
75 plus	12.3 (10.8, 13.8)	9.0 (6.3, 11.7)	13.3 (11.5, 15.0)
Sex			
Men	36.2 (35.3, 37.1)	32.1 (30.3, 33.9)	37.3 (36.3, 38.3)
Women	36.3 (35.5, 37.1)	33.3 (31.3, 35.2)	37.1 (36.2, 38.1)
Race/ethnicity			
Non-Hisp. white	39.1 (38.3, 39.9)	34.2 (32.7, 35.7)	40.7 (39.7, 41.7)
Non-Hisp. black	33.1 (31.1, 35.2)	25.5 (21.3, 29.7)	34.4 (32.1, 36.7)
Hispanic	24.7 (23.1, 26.3)	22.8 (16.0, 29.5)	24.9 (23.3, 26.5)
Education			
< High school	25.8 (24.6, 27.0)	23.4 (21.0, 25.8)	26.6 (25.2, 28.0)
High school	37.4 (32.2, 42.5)	30.0 (27.3, 32.7)	38.9 (33.6, 44.3)
> High school	38.4 (35.0, 41.8)	40.9 (38.9, 42.8)	39.1 (35.0, 43.2)
Poverty			
Poor	13.0 (11.5, 14.4)	11.8 (8.8, 14.8)	13.5 (11.9, 15.0)
Near poor	30.2 (29.0, 31.5)	28.5 (26.3, 30.6)	31.0 (29.5, 32.5)
Nonpoor	47.1 (46.1, 48.0)	45.4 (43.0, 47.7)	47.4 (46.2, 48.5)

Data source: National Health Interview Survey, 1999.

Variables. All NHIS 1999 questions related to dental care were included in this study as outcome variables: unmet dental needs because the person could not afford treatment, a dental visit in the past year, the number of dental visits, the reasons given for last dental visits, and the reasons given if no dental visit in the past year. Study participants who had a visit in the past year were asked the reason for their last dental visit. For these analyses, respondents' answers were recoded as "a visit for check-up, treatment, or follow-up" and "a visit because something was hurting or bothering." Among the possible answers to "reasons for last dental visit," we elected to describe only one reason unmodified (i.e., "something was hurting or bothering"). All of the remaining reasons were collapsed into an alternative category (i.e., "a visit for check-up, treatment, or follow-up") to describe visits occurring for reasons related to routine dental care or a continuation of treatment.

The number of visits was presented as one visit, two visits, and three or more. The reason for no dental visit in the past year was asked with 12 options. For these analyses, respondents' answers were collapsed into 6 categories: problems with cost or insurance, no perceived problem, no teeth, different types of fears (e.g., needles, nervousness, or afraid), various barriers (e.g., the dentist was too far, don't know a dentist, or transportation problems), and "other" reasons. Information on dentition status was self-reported. For these analyses, dentition status was defined as either being edentulous or dentate and was limited

to individuals aged 65 years and older. The analysis of "no teeth" as a reason given for no dental visit in the past year included individuals aged 45 years and older to improve sample size. The full text of questions is provided in the appendix.

The main classificatory variable in this study is rural status. The NHIS uses the Census Bureau guidelines to define rural residence. Consequently, a rural resident is described as a person residing in a place that is not located within an urbanized area as defined by the Census Bureau and that has fewer than 2,500 inhabitants (14).

Table 1 shows the prevalence of private dental insurance coverage. Overall, urban residents were more likely than rural residents to be covered by private dental insurance (37.2% vs 32.7%). Differences in private dental insurance coverage by place of residence were observed in most categories of the classificatory variables. However, these differences did not reach statistical significance within poverty levels, for the highest and lowest level of educational attainment, for Hispanic persons, and for the youngest and oldest age groups.

Demographic variables used for the analyses were age, sex, race/ethnicity, education, and poverty status. Using questions on Hispanic origin and racial self-classification, race/ethnicity was categorized as non-Hispanic white, non-Hispanic black, or Hispanic. Other racial/ethnic groups were not included in these analyses for race/ethnicity because of their small sample size. However, they were included in all analyses of other demographic variables. Education for adults was measured as the highest level of formal education completed; for children, education is measured as the highest level of education attained by the parents. Poverty status was defined by using the federal poverty level, which was calculated by comparing the family income and family size to an established threshold adjusted annually for cost of living. For example, in 1997 the federal poverty level was established at $16,400 for a family of four. Participants with family incomes below 100 percent of the federal poverty level were classified as poor, persons with incomes between 100 percent and less than 200 percent were classified as near poor, and persons with incomes 200 percent and over of the federal poverty level were classified as nonpoor.

TABLE 2
Percentage of Persons 2 Years of Age and Older with Dental Visit in Past Year by Place of Residence, United States, 1999

	Percent (95% Confidence Interval)		
	Total	Rural	Urban
Total	65.2 (64.5, 65.8)	57.7 (56.1, 59.2)	66.5 (65.8, 67.1)
Age group (years)			
2–4	39.9 (37.4, 42.3)	39.7 (32.3, 47.1)	40.0 (37.4, 42.7)
5–17	78.9 (77.6, 80.2)	76.4 (72.9, 80.0)	79.3 (78.0, 80.7)
18–34	60.7 (59.4, 62.0)	55.5 (51.6, 59.3)	61.4 (60.0, 62.8)
35–54	68.3 (66.4, 70.1)	59.1 (56.6, 61.7)	69.8 (68.7, 70.8)
55–64	62.1 (60.3, 64.0)	45.5 (41.0, 50.0)	65.5 (63.5, 67.4)
65–74	57.3 (55.3, 59.2)	46.7 (41.6, 51.8)	59.3 (57.2, 61.3)
75 plus	52.2 (50.0, 54.3)	37.6 (32.3, 42.9)	54.4 (52.1, 56.7)
Sex			
Men	62.5 (61.6, 63.4)	53.9 (52.0, 55.8)	64.0 (63.1, 65.0)
Women	67.7 (67.0, 68.5)	61.1 (59.3, 62.8)	68.8 (67.9, 69.6)
Race/ethnicity			
Non-Hisp. white	68.8 (68.1, 69.5)	59.6 (58.0, 61.1)	70.6 (69.8, 71.4)
Non-Hisp. black	56.2 (54.5, 57.9)	44.2 (39.0, 49.4)	57.3 (55.6, 59.0)
Hispanic	52.5 (50.8, 54.2)	39.0 (31.6, 46.4)	53.0 (51.2, 54.8)
Education			
< High school	49.0 (47.4, 50.6)	43.7 (39.6, 47.7)	50.2 (48.4, 52.0)
High school	58.1 (56.9, 59.2)	43.9 (41.8, 46.0)	63.0 (61.6, 64.4)
> High school	75.0 (74.3, 75.7)	71.7 (69.9, 73.6)	75.4 (74.6, 76.2)
Poverty			
Poor	45.4 (43.6, 47.3)	37.7 (34.1, 41.3)	47.1 (44.9, 49.2)
Near poor	48.4 (47.0, 49.8)	43.4 (40.4, 46.5)	49.7 (48.1, 51.3)
Nonpoor	71.8 (71.1, 72.5)	67.2 (65.4, 69.0)	72.6 (71.8, 73.3)
Dentition status*			
Edentulous	17.3 (15.1, 19.5)	11.7 (8.1, 15.3)	18.7 (16.1, 21.2)
Dentulous	71.0 (69.3, 72.7)	64.8 (60.3, 69.3)	71.9 (70.1, 73.6)

*Persons 65 years old and older.
Data source: National Health Interview Survey, 1999.

Statistical Methods. Analyses are for the whole population and are age-group-specific for relevant variables. Data for the whole population were age-adjusted by the direct method using the US 2000 population as the standard. All analyses were performed using the sample weights provided with the 1999 NHIS dataset to account for over sampling and nonresponse (13). Analyses were conducted by using SUDAAN (15), a statistical package designed to calculate standard errors while accounting for the survey's complex sample design. Statistical analyses included bivariate analyses of outcome variables and classificatory variables; differences between estimates were approximated with 95 percent confidence (CI) intervals calculated with the formula "estimate: +/− (1.96 * standard error [SE])." Overlapping of confidence intervals, although sometimes conservative, was used to define a lack of significant difference between estimates. [In Table 5 we present only standard errors because of space considerations.]

For reasons of confidentiality, the variable used to classify rural status was not released in the public use datasets. The NCHS's Research Data Center was used to access the rural/urban variable and to analyze these data.

Results

Data from the 1999 National Health Interview Survey (NHIS) were used to describe the oral health care utilization

TABLE 3
Percentage of Persons 2 Years of Age and Older by Number of Dental Visits in Past Year and Place of Residence, United States, 1999

	Percent (95% Confidence Interval)		
	1 Visit	2 Visits	3 Visits or More
Total	23.2 (22.7, 23.8)	26.0 (25.4, 26.6)	16.6 (16.1, 17.1)
Rural	23.0 (21.4, 24.5)	22.3 (20.6, 24.0)	13.6 (12.3, 14.8)
Urban	23.3 (22.7, 23.9)	26.3 (26.0, 27.3)	17.2 (16.6, 17.7)
Sex			
Men	23.0 (22.3, 23.6)	24.7 (23.9, 25.5)	15.6 (15.0, 16.3)
Rural	23.0 (22.8, 23.2)	20.7 (18.9, 22.5)	10.9 (9.5, 12.3)
Urban	23.0 (22.2, 23.7)	25.4 (24.4, 26.3)	16.5 (15.7, 17.2)
Women	23.5 (22.8, 24.2)	27.3 (26.5, 28.2)	17.5 (16.9, 18.2)
Rural	22.8 (20.7, 24.9)	23.8 (21.5, 26.0)	15.2 (13.5, 16.9)
Urban	23.6 (22.8, 24.4)	27.9 (27.0, 28.8)	17.9 (17.2, 18.6)
Race/ethnicity			
Non-Hisp. white	23.1 (22.5, 23.8)	28.9 (28.1, 29.7)	17.2 (16.7, 17.8)
Rural	23.5 (21.8, 25.2)	23.2 (21.3, 25.0)	13.6 (12.3, 15.0)
Urban	23.0 (22.3, 23.8)	30.1 (29.2, 30.9)	18.0 (17.3, 18.6)
Non-Hisp. black	24.3 (22.9, 25.7)	19.0 (17.6, 20.4)	14.4 (13.3, 15.6)
Rural	21.9 (17.7, 26.1)	15.0 (14.9, 15.0)	8.7 (4.8, 12.5)
Urban	24.5 (23.1, 26.0)	19.4 (18.0, 20.7)	14.9 (13.7, 16.2)
Hispanic	23.5 (22.2, 24.7)	15.7 (14.5, 17.0)	14.3 (13.2, 15.5)
Rural	15.0 (9.6, 20.4)	13.7 (7.4, 19.9)	11.1 (6.3, 15.8)
Urban	23.8 (22.5, 25.1)	15.8 (14.5, 17.1)	14.5 (13.3, 15.6)
Education			
< High school	20.8 (19.8, 21.8)	17.3 (16.4, 18.2)	11.9 (11.1, 12.7)
Rural	19.0 (16.4, 21.6)	15.5 (13.0, 17.9)	10.5 (8.8, 12.3)
Urban	21.3 (20.2, 22.3)	17.7 (16.7, 18.7)	12.3 (11.4, 13.1)
High school	21.2 (18.8, 23.6)	25.8 (20.6, 31.0)	15.8 (11.6, 20.0)
Rural	22.3 (17.8, 26.8)	21.5 (17.1, 25.9)	11.1 (8.7, 13.4)
Urban	21.3 (18.8, 23.8)	26.1 (20.8, 31.4)	16.6 (12.4, 20.9)
> High school	26.7 (23.1, 30.2)	29.7 (25.9, 33.5)	18.9 (16.0, 21.8)
Rural	34.2 (27.7, 40.7)	21.4 (19.3, 23.5)	16.5 (10.0, 23.0)
Urban	26.2 (22.6, 29.9)	30.6 (26.3, 34.8)	18.9 (16.0, 21.8)
Poverty status			
Poor	21.6 (20.1, 23.0)	14.6 (13.2, 15.9)	10.2 (9.1, 11.2)
Rural	19.5 (16.2, 22.7)	11.8 (9.1, 14.5)	7.4 (5.3, 9.4)
Urban	21.9 (20.3, 23.6)	15.2 (13.6, 16.7)	10.8 (9.6, 12.0)
Near poor	22.4 (21.6, 23.3)	15.6 (14.5, 16.8)	11.0 (10.1, 11.9)
Rural	21.8 (18.9, 24.7)	13.4 (11.0, 15.7)	9.1 (7.1, 11.1)
Urban	22.6 (21.2, 24.1)	16.2 (14.9, 17.5)	11.5 (10.5, 12.6)
Nonpoor	22.9 (22.0, 23.8)	30.7 (29.8, 31.5)	18.5 (17.8, 19.2)
Rural	23.2 (21.1, 25.2)	28.3 (26.4, 30.2)	16.0 (14.0, 18.0)
Urban	22.9 (22.1, 23.6)	31.0 (30.1, 31.9)	18.9 (18.1, 19.6)

Data source: National Health Interview Survey, 1999.

of rural and urban residents in the United States. Rural residents were more likely than urban residents to be non-Hispanic whites (86.3% [SE=1.26] vs 70.4% [SE=0.44]). A greater percentage of urban than rural residents were classified as nonpoor (54.6% [SE=0.51] vs 39.4% [SE=1.32]) (data not shown).

The prevalence of individuals reporting a dental visit in the past year is presented in Table 2. Urban residents were more likely to report a dental visit compared to rural residents (66.5% vs 57.7%) This pattern was similar for all categories of the classificatory variables, except for children under 18 years of age.

The number of dental visits in the past year is presented in Table 3. Almost one quarter (23.2%) of participants reported having only one dental visit in the past year. Overall and within most classification variables, there was no difference in reporting only one visit between rural and urban residents. Having two dental visits in the past year was reported by 26 percent of participants. Urban residents were more likely to report two visits than rural residents (26.6% vs 22.3%). This trend remained significant among men and women, non-Hispanic white and black persons, and persons with more than a high school education. Urban residents were also more likely to report three dental visits in the past year than rural residents (17.2% vs 13.6%). A similar pattern was seen among men and women, non-Hispanic white and black persons, and poor and nonpoor persons.

Table 4 shows the prevalence of persons seeking dental care because "something was hurting or bothering" them. For the total population, 18.3 percent of individuals reported that the reason for their last dental visit was because of pain or discomfort. Rural residents were more likely than urban residents to report that their visit was motivated by hurting or bothering events (23.3% vs 17.6%). Overall, a larger percentage of persons of ethnic minority status, persons with lower educational attainment, and persons classified as poor and near poor reported visiting the dentist because of symptomatic events compared to their counterparts. The percentage of participants reporting hurting or bothering events as the reason for the last dental visit increased with age from 10.7 percent among 2–4-year-olds to 25.1 percent among persons 75 years of age and older. In all age groups, except 65–74 years of age, rural residents were more likely than urban residents to report that the reason for their last dental visit was because "something was hurting or bothering them." The difference, however, only reached statistical significance among younger children and young adults.

Reasons for no dental visit in the past year are presented in Table 5. We did not find differences between rural and urban residents in reasons for not

TABLE 4
Percentage of Persons 2 Years and Older Who Reported "Something Was Hurting or Bothering" as Reason for Last Dental Visit by Place of Residence, United States, 1999

	Percent (95% Confidence Interval)		
	Total	Rural	Urban
Total	18.3 (17.7, 18.9)	23.3 (21.6, 25.1)	17.6 (17.0, 18.2)
Age group (years)			
2–4	10.7 (8.3, 13.1)	24.8 (12.7, 37.0)	8.9 (6.8, 11.0)
5–17	8.8 (7.9, 9.8)	9.6 (6.8, 12.4)	8.7 (7.7, 9.7)
18–34	19.8 (18.5, 21.1)	29.2 (24.8, 33.7)	18.6 (17.3, 19.9)
35–54	20.2 (19.1, 21.2)	24.5 (21.0, 28.1)	19.6 (18.5, 20.7)
55–64	23.2 (21.0, 25.4)	29.8 (23.0, 36.6)	22.3 (20.0, 24.6)
65–74	23.9 (21.4, 26.4)	21.2 (15.0, 27.4)	24.3 (21.5, 27.0)
75 plus	25.1 (22.5, 27.7)	33.0 (23.7, 42.2)	24.3 (21.5, 27.0)
Sex			
Men	19.0 (18.1, 19.9)	24.1 (21.3, 27.0)	18.4 (17.5, 19.3)
Women	17.7 (17.0, 18.5)	23.0 (20.4, 25.5)	17.0 (16.3, 17.8)
Race/ethnicity			
Non-Hisp. white	17.1 (16.4, 17.8)	22.6 (20.6, 24.6)	16.3 (15.5, 17.0)
Non-Hisp. black	23.3 (21.3, 25.2)	26.2 (16.5, 35.8)	23.0 (21.0, 25.0)
Hispanic	23.2 (21.4, 25.0)	35.2 (24.4, 45.9)	22.8 (20.9, 24.6)
Education			
< High school	27.9 (26.0, 29.8)	40.0 (35.0, 45.1)	26.0 (24.0, 28.1)
High school	19.8 (18.4, 21.1)	26.7 (22.1, 31.3)	18.9 (17.6, 20.2)
> High school	16.5 (13.7, 19.3)	20.8 (14.1, 27.5)	15.9 (13.0, 18.8)
Poverty			
Poor	29.2 (26.4, 31.9)	31.4 (24.1, 38.8)	28.8 (25.8, 31.8)
Near poor	29.3 (27.2, 31.4)	35.1 (29.4, 40.8)	28.0 (25.8, 30.1)
Nonpoor	17.0 (16.3, 17.8)	20.3 (17.8, 22.9)	16.6 (15.9, 17.4)

Data source: National Health Interview Survey, 1999.

having visited the dentist in the past year because of "insurance or cost problems" (28.2%) or for the "absence of perceived problem" (45.6%) or because of "fears" (8.3%) or "barriers" (4.5%). Across most classificatory variables the differences were minimal. The percentage of participants citing "no problems" as the reason for no dental visit in the past year increased with age. Although not statistically significant, urban residents were more likely than rural residents to report "fear" (8.5% vs 7.6%) as well as "barriers" (4.7% vs 3.5%) as the reason for no dental visit in the past year. These trends were consistent across the classification variables. "Other reasons" were mentioned by 10 percent of individuals; there was no statistical difference by urban/rural residency. Being "too young" was given as the primary reason for having no dental visit in the past year (22.7%; SE=1.32) for children 2–4 years of age. There were no differences by place of residence (data not shown).

The distribution of respondents reporting unmet dental needs because they could not afford treatment is shown Table 6. Rural residents were more likely to report unmet dental needs than urban residents (10.1% vs 7.5%). The differences in unmet dental needs between rural and urban residents did not remain significant in most analyses by classificatory variables, except for sex and the non-Hispanic white category in race/ethnicity. Among the total population, unmet dental needs were more frequently reported by women, persons with low educational attainment, and persons classified as poor and near poor than by their counterparts.

Discussion

In this study representative of the US population aged 2–99 years, we found differences between rural and urban populations in dental care utilization. These findings support the argument that there is inadequate utilization of dental services among rural residents compared to urban residents in the United States. Rural residents had fewer visits in the past year, were more likely to report that the last visit was because of pain or discomfort symptoms, and were more likely to report unmet dental needs and private dental insurance compared to their urban counterparts.

Our findings indicate that rural residents were less likely to have had a dental visit in the past year compared to urban residents. Although urban residents were more likely to have had 2, 3, or more visits than rural residents, there was little difference between rural and urban residents reporting only one visit. This lack of difference may be explained by utilization patterns—although a single visit could be either for an urgent or an emergency dental problem or for a routine dental check-up—it seems that rural residents were more likely to visit the dentist because of a problem or pain. Consequently, rural residents may be more likely to have sought immediate treatment that is chief-complaint-oriented and less likely to have sought more comprehensive treatment or rehabilitation options.

To compound the dental care utilization disparity between rural and urban residents, the ability to provide dental care in rural America may be diminishing. The ratio of rural dentists to population (29 per 100,000) is nearly 50 percent less than urban centers (9). Moreover, the number of active dentists in the United States has continued to decline from 59.1 to 53.7 per 100,000 over the past decade (1). Although Health Professional Shortage Area (HPSA) designations for both rural and urban areas are utilized to attract dental providers to underserved areas by offering financial incentives to participants, it has been reported that only 6 percent of the dental needs of HPSAs residents are being met (1). Our findings show that a higher percentage or rural residents reported unmet dental needs than urban residents, with both men and women more likely to express unmet dental needs than their urban counterparts. Although unmet needs are often reflective of an individual's perception that a problem exists, there was no significant difference

TABLE 5
Percentage of Persons 2 Years of Age and Older by Reasons for No Dental Visit in Past Year and Place of Residence, United States, 1999

	Percent (Standard Error)					
	Cost/Insurance	No Problem	No Teeth*	Fears	Barriers	Others
Total	28.2 (0.6)	45.6 (0.7)	10.9 (0.3)	8.3 (0.3)	4.5 (0.2)	10.0 (0.4)
Rural	28.0 (1.5)	46.9 (2.1)	14.2 (0.8)	7.6 (0.7)	3.5 (0.5)	7.5 (0.9)
Urban	28.3 (0.7)	45.3 (0.7)	10.1 (0.3)	8.5 (0.3)	4.7 (0.3)	10.6 (0.4)
Sex						
Men	24.7 (0.7)	48.9 (0.9)	10.7 (0.4)	6.9 (0.4)	3.8 (0.3)	7.5 (0.8)
Rural	23.6 (1.7)	49.0 (2.5)	14.6 (1.1)	7.6 (0.9)	3.2 (0.6)	7.1 (0.9)
Urban	25.0 (0.7)	48.9 (0.9)	9.7 (0.4)	6.8 (0.4)	3.9 (0.3)	8.0 (1.0)
Women	32.4 (0.7)	41.6 (0.7)	11.0 (0.4)	9.9 (0.5)	5.3 (0.4)	10.9 (0.4)
Rural	34.7 (1.8)	44.0 (2.5)	13.4 (0.9)	7.6 (1.3)	3.9 (0.8)	10.8 (0.5)
Urban	32.1 (0.8)	41.1 (0.9)	10.4 (0.4)	10.4 (0.5)	5.6 (0.4)	11.1 (0.6)
Race/ethnicity						
Non-Hisp. white	28.3 (0.7)	45.6 (0.9)	11.8 (0.3)	9.0 (0.4)	5.0 (0.3)	11.1 (0.5)
Rural	28.6 (1.6)	45.9 (2.2)	14.6 (0.8)	7.4 (0.8)	4.0 (0.7)	7.8 (1.0)
Urban	28.2 (0.8)	41.6 (0.9)	11.0 (0.4)	9.6 (0.5)	5.1 (0.4)	12.0 (0.6)
Non-Hisp. black	27.7 (1.2)	48.3 (1.4)	8.4 (0.5)	8.3 (0.6)	3.8 (0.4)	8.3 (0.8)
Rural	29.6 (4.1)	52.2 (4.1)	11.1 (2.6)	7.1 (1.4)	1.9 (0.8)	6.2 (1.9)
Urban	27.4 (1.2)	47.7 (1.4)	8.1 (0.5)	8.4 (0.7)	4.1 (0.5)	8.6 (0.8)
Hispanic	32.1 (1.2)	51.7 (1.3)	7.5 (0.6)	5.7 (0.6)	3.0 (0.3)	7.1 (0.6)
Rural	30.4 (4.7)	57.9 (5.5)	†	†	†	†
Urban	32.4 (1.1)	51.3 (1.2)	7.2 (0.5)	5.6 (0.6)	3.1 (0.4)	7.2 (0.6)
Education						
< High school	31.5 (0.9)	44.9 (1.2)	13.5 (0.6)	7.4 (0.5)	3.8 (0.3)	6.9 (0.5)
Rural	29.8 (2.3)	43.5 (3.3)	18.5 (1.6)	6.7 (1.1)	3.0 (0.8)	5.2 (1.0)
Urban	31.9 (1.0)	45.4 (1.1)	12.1 (0.6)	7.8 (0.6)	4.0 (0.3)	7.5 (0.5)
High school	28.8 (1.7)	46.4 (1.7)	12.2 (0.5)	8.4 (0.5)	3.3 (0.4)	8.5 (1.2)
Rural	29.7 (3.4)	43.8 (2.3)	14.7 (1.3)	6.7 (1.0)	2.4 (0.6)	5.7 (1.1)
Urban	28.7 (2.0)	47.1 (1.7)	11.5 (0.5)	9.0 (0.6)	3.6 (0.5)	9.8 (1.6)
> High school	25.9 (2.8)	36.8 (0.8)	7.6 (0.4)	7.7 (0.4)	4.5 (0.3)	26.1 (2.7)
Rural	25.7 (2.5)	47.1 (1.7)	11.0 (1.4)	10.1 (1.7)	3.0 (0.7)	10.0 (1.1)
Urban	25.8 (2.8)	36.5 (0.8)	7.4 (0.4)	7.6 (0.4)	4.8 (0.4)	26.8 (2.7)
Poverty status						
Poor	39.6 (1.4)	38.9 (1.6)	12.2 (0.7)	6.2 (0.6)	6.0 (0.6)	7.0 (0.6)
Rural	42.8 (3.3)	38.5 (3.4)	14.7 (0.2)	4.6 (1.2)	4.5 (1.2)	4.4 (1.3)
Urban	39.1 (1.5)	38.7 (1.7)	11.7 (0.8)	6.5 (0.6)	6.4 (0.7)	7.7 (0.7)
Near Poor	37.9 (1.2)	43.5 (1.3)	12.3 (0.6)	6.8 (0.6)	3.5 (0.5)	6.9 (0.5)
Rural	35.9 (2.6)	43.5 (1.3)	18.3 (1.6)	6.5 (1.2)	2.3 (0.7)	5.5 (1.2)
Urban	38.6 (1.3)	43.8 (1.4)	10.4 (0.7)	6.9 (0.6)	3.8 (0.6)	7.4 (0.6)
Nonpoor	21.7 (0.7)	46.7 (0.9)	10.3 (0.4)	9.7 (0.5)	4.7 (0.4)	13.1 (0.3)
Rural	18.2 (2.1)	51.3 (2.9)	12.1 (1.1)	10.4 (1.6)	4.1 (1.1)	10.1 (1.4)
Urban	22.1 (0.8)	46.0 (0.9)	9.9 (0.4)	9.8 (0.5)	4.8 (0.4)	13.5 (0.7)

*"No teeth" is for persons 45 years of age and older.
†Unreliable estimate, relative SE>30%.
Data source: National Health Interview Survey, 1999.

between rural and urban residents giving "no problem" as a reason for not visiting a dentist in the past year. This suggests that oral health literacy may be lower in rural America compared to urban centers because a difference in the perception of a dental "need" exists between rural and urban residents, but there is no difference in the perception of a dental "problem."

Because the Academy of Pediatric Dentistry recommends that the first dental visit should occur at age 1 year (16), the higher percentage of rural parents reporting that their child "is

TABLE 6
Percentage of Persons 2 Years of Age and Older Reporting Unmet Dental Needs by Place of Residence, United States, 1999

	Percent (95% Confidence Interval)		
	Total	Rural	Urban
Total	7.8 (7.4, 8.2)	10.1 (8.9, 11.4)	7.5 (7.1, 7.8)
Age group (years)			
2–4	4.9 (3.7, 6.1)	7.2 (2.5, 11.8)	4.6 (3.5, 5.8)
5–17	6.7 (5.9, 7.5)	7.8 (5.4, 10.3)	6.5 (5.7, 7.3)
18–34	10.6 (9.9, 11.4)	14.8 (12.3, 17.3)	10.1 (9.3, 10.8)
35–54	9.0 (8.3, 9.6)	11.1 (9.2, 13.0)	8.6 (8.0, 9.2)
55–64	6.7 (5.7, 7.7)	10.3 (6.7, 13.9)	6.0 (5.1, 6.9)
65–74	3.5 (2.8, 4.3)	4.2 (2.0, 6.3)	3.4 (2.6, 4.2)
75 plus	1.8 (1.2, 2.3)	*	1.9 (1.3, 2.6)
Sex			
Men	6.8 (6.3, 7.2)	9.3 (7.7, 10.8)	6.3 (5.9, 6.8)
Women	8.8 (8.3, 9.3)	10.9 (9.6, 12.3)	8.5 (8.0, 9.0)
Race/ethnicity			
Non-Hisp. white	7.7 (7.3, 8.1)	9.7 (8.4, 10.9)	7.3 (6.9, 7.7)
Non-Hisp. black	8.8 (7.8, 9.8)	12.6 (8.1, 17.1)	8.5 (7.5, 9.5)
Hispanic	8.0 (7.1, 8.9)	12.1 (6.4, 17.8)	7.9 (7.0, 8.8)
Education			
< High school	9.9 (9.1, 10.8)	12.2 (9.9, 14.6)	9.5 (8.6, 10.4)
High school	7.9 (7.1, 8.6)	9.7 (8.1, 11.2)	7.6 (6.8, 8.5)
> High school	5.7 (4.8, 6.7)	6.9 (5.3, 8.4)	5.6 (4.6, 6.7)
Poverty			
Poor	17.9 (16.3, 19.4)	21.9 (17.6, 26.2)	17.1 (15.4, 18.7)
Near poor	15.5 (14.1, 16.8)	16.9 (13.6, 20.3)	15.2 (13.7, 16.7)
Nonpoor	5.7 (5.2, 6.1)	6.1 (4.8, 4.3)	5.6 (5.2, 6.0)

*Unreliable data, relative SE greater than 30% of the point of estimate.
Data source: National Health Interview Survey, 1999.

too young" to visit the dentist may also indicate lower dental literacy in rural areas. It is possible that the lower availability of providers may reinforce the negative effects of low literacy among rural residents. However, an additional consideration for a child being "too young" to have had a dental visit could reflect the lack of providers able to treat pre-cooperative children in rural areas.

Reducing underutilization of dental services in rural areas should not be limited to the rubric of providing treatment, but also should include the practice of providing preventive care. The proportion of rural Americans residing in nonfluoridated areas is greater than for urban populations. Consequently, improving dental utilization among children will create more opportunities for topical fluoride applications in the dental office.

Increasing dental service use and dental literacy in rural communities may have an important impact in reducing oral-pharyngeal cancer mortality in the United States, which is a national objective as described by the Healthy People 2010 objectives (2). Because most oral cancers respond favorably to early treatment (17), it has been suggested that dentists routinely conduct oral cancer screenings among high-risk individuals (18). Given that rural adults underutilize dental services, there may be fewer opportunities for them to receive a periodic oral cancer exam.

A limitation of this study refers to the power of the estimates derived from NHIS 1999 to allow analyses by rural residence; the low percentage of rural residents yielded small sample sizes for analyses for small subgroups such as people with or without a dental visit in the past year. Consequently, some of the differences in dental care utilization between rural and urban residents may not have reached statistical significance because the estimates did not have enough power.

This is the first report to document dental utilization practices by rural/urban residency in the United States. Our findings suggest that disparity in dental care utilization exists between urban and rural residents, with rural residents in the United States utilizing less dental care. Although increasing dental utilization in the United States may require innovative approaches involving many stake holders—such as dental practitioners, policy makers, and rural health advocates—additional research in dental health services and health promotion fields is required to identify, monitor, and promote effective strategies that target an increase in the utilization of dental services by rural residents.

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Appendix

Text of oral health-related questions and answers in NHIS 1999:

Earlier it was mentioned that you are covered by *[name(s) of private health plans]. [Do any of these plans/Does this plan]* pay for any part of the cost of dental care?

(1) Yes
(2) No
(7) Refused
(9) DK

About how long has it been since you last saw or talked to a dentist? Include all types of dentists, such as orthondotists, oral surgeons, and all other dental specialists, as well as dental hygienists.

0. Never
1. 6 months or less
2. More than 6 months, but not more than 1 year ago
3. More than 1 year, but not more than 2 years ago
4. More than 2 years, but not more than 5 years ago
5. More than 5 years
6. Refused
7. Don't know
8. Not ascertained
9. Don't know

During the past 12 months, that is, since *[Fill in 12-month date]* a year ago, about how many visits did you make to a dentist?

(1-96) 1–996 visits
(97) Refused
(99) DK

What was the MAIN REASON that you last went to the dentist?

(1) Went in on own for check-up, examination, or cleaning
(2) Was called in by the dentist for check-up, examination, or cleaning
(3) Something was wrong, bothering or hurting you
(4) Went for treatment of a condition that dentist discovered at earlier check-up or examination
(5) Other, specify _____
(7) Refused
(9) DK

What are the reasons that you have not visited a dentist in over 12 months/never gone to a dentist? *[Mark all that apply]*

(1) Afraid
(2) Nervous
(3) Needles
(4) Cost
(5) DK dentist
(6) Dentist too far
(7) Can't get there
(8) No problems
(9) No teeth
(10) Not important
(11) Didn't think of it
(12) Other, specify _____
(97) Refused
(99) DK

During the past 12 months, was there any time when you needed any of the following, but didn't get it because you couldn't afford it?

Prescription medicines?
Mental health care or counseling?
Dental care (including check ups)?
Eye glasses
1. Yes
2. No
7. No
9. Don't know

Have you lost all of your upper AND lower natural (permanent) teeth?

1. Yes
2. No
7. Refused
8. Not ascertained
9. Don't know