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Rural Veterans' Dental Utilization, BRFSS, 2014

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Abstract

Introduction—Rural residents are overrepresented in the military; however access to Veteran services is limited in rural areas. There is a need to identify rural Veteran healthcare utilization. This study addresses that need and has two purposes: 1) to determine if there is an association between rural dwelling and Veteran utilization of dental services; and, 2) to determine if there is an association between rural dwelling and the oral health outcome of missing teeth.

Methods—Data from the 2014 Behavioral Risk Factor Surveillance Survey (BRFSS) were used in this study. Chi square and logistic regression analyses were conducted.

Findings—Rural Veterans were less likely to have a dental visit during the previous year as compared with metropolitan Veterans in unadjusted analysis (Odds Ratio = 0.71, 95% Confidence Interval, 0.64, 0.77) and in adjusted analysis (0.87 [95% Confidence Interval, 0.78, 0.96]). In cases in which all teeth were missing, rural Veterans had an unadjusted odds ratio of 1.79 [95% Confidence Interval, 1.55, 2.08] and an adjusted odds ratio of 1.37 [95% Confidence Interval, 1.17, 1.62] as compared with metropolitan Veterans.

Discussion and Policy Implications—The Veterans Health Administration develops policies for establishing centers for care for Veterans. The policy development should take into consideration that rural veterans have not been as likely as urban Veterans to utilize dental services and have poorer oral health outcomes.

Keywords

Rural Health; Veterans; Dental Care; BRFSS; 2014

Introduction

The U.S. Department of Veterans Affairs estimates that there are 21.68 million Veterans; 9.11 million of whom are enrollees in the Veterans Health Administration (VHA).¹ There are 150 VHA medical centers, and approximately 1,400 community-based outpatient clinics in the U.S.² Although the VA provides a medical, dental, and social care safety net, many Veterans may not, cannot, or do not wish to take advantage of the services. Some Veterans have faced difficulty in receiving needed care^{3,4} and/or receiving information about Veterans' services.⁵ Travel, distance, and age are also barriers which impede access to care for some Veterans.^{6,7}

People living in urban areas often have several healthcare resources and options from which to choose. Researchers indicated that overall, Veterans living in urban areas were less likely to use VHA services, whereas, Veterans who were black, or had a higher VHA priority (ie., who were evaluated to have a higher rating of Veteran benefit need/service-connected disability) were more likely to use VHA services.⁵ Nevertheless, many healthcare needs of Veterans go unmet,⁸ particularly for rural Veterans.⁹ Researchers indicated that there were significantly more prevalent diseases in rural settings compared to urban settings and the odds ratios persisted upon adjustment for sociodemographic factors.¹⁰ Additionally, health-related quality of life was lower for rural Veterans than for suburban or urban-dwelling Veterans.¹¹

It is difficult to provide a complete array of medical services in a rural setting due to the expense of some of the technologies, reluctance of some physicians in selecting a rural practice, and the financial considerations of the limited number of people needing specialized services to make a specialized practice successful in a rural setting.¹² As a result, people living in rural areas, even with insurance, may not have access to essential services and may substitute emergency department care for routine care.¹³

Among the many healthcare services which are needed by Veterans are oral health-related services. Neglected oral health maintenance often results in the need for additional restoration of natural dentition, implant placement,¹⁴ extractions, or fabrication of removable dental prostheses. Failures in patient recall, failures in professional maintenance, and failures in at-home maintenance are risk factors for failure of tooth and implant-borne restorations.¹⁵ Recent clinical practice guidelines for recall and maintenance of patients with tooth-borne dental restorations re-affirmed routine patient recalls and professional maintenance at least every 6 months as a lifelong regimen.¹⁵ Although, a set of VA researchers conducted a systematic review to address recall interval for periodontal maintenance and concluded that any specific recall interval, such as 3 or 6 months, is not beneficial leading to the thought that "one size does not fit all" with clinical need driving recall timeframes.¹⁶ None-the-less, poor oral health and lack of recall or maintenance can lead to periodontal disease and impact glycemic control; both have been associated with increased mortality in individuals with diabetes.^{17,18}

Veterans have extremely limited dental health coverage, in fact, they must be 100% disabled, be a former prisoner of war, or have a service-related injury to their mouths to qualify for

services.¹⁹ VHA dental health services are limited to residents of VA domicilaries, VA Community Living Centers, hospitalized patients with a dental need which could impact medical care, or hospital discharged patients who had care VHA dental initiated in the hospital, humanitarian emergency dental care, and outpatient Veterans who are Class I-VI beneficiaries.¹⁹ If clinic capacity is available, dental care may be provided to inpatient active duty personnel or retirees in VA facilities as per VA Department of Defense or TRICARE agreements and designated inpatients and outpatients as per approved sharing agreements.¹⁹ There are over 200 VHA dental centers across the U.S.¹⁹ Each state has at least one VHA dental center; the states with the most dental centers are: Texas, with 15 centers; California with 16 centers; and Florida with 19 centers.¹⁹ Despite these programs, the Veteran must be enrolled for VA services; over 400,000 veterans are receiving dental services each year in the VA.²⁰

The concern for oral health in rural Veterans is significant. The VHA Office of Rural Health was established in an effort to improve the access to care for rural Veterans. Rural Veterans have challenges involving distance to care, travel concerns due to road conditions and weather, and wait time for appointments.¹⁹ Often receiving care requires financial burdens associated with the cost of gasoline, overnight stays in hotels, and most significantly, loss of income. While people living in rural areas value health, they recognize these challenging circumstances intrinsically as part of living in an area which is not densely populated. Additionally, health services provided by some VA sites are limited in scope and may not include dental services. As a result, oral care may be neglected by many Veterans. Rural residents are overrepresented in the military,¹³ therefore there is a need to identify rural Veteran healthcare utilization. There are two purposes of this study: 1) to determine if there is an association between rural dwelling and Veteran utilization of dental services; and, 2) to determine if there is an association between rural dwelling and the oral health outcome of missing teeth. Our research hypotheses are that rural Veterans will be less likely to have utilized dental services within the previous year and that rural Veterans will be more likely to have missing teeth than non-rural Veterans.

Methods

This study received West Virginia University Institutional Review Board study acknowledgement (protocol number 1602007654). Strengthening the reporting of observational studies in epidemiology (STROBE) guidelines were followed in this study. The theoretical framework used was the Andersen Model of Health Service Use. In the model, predisposing characteristics, enabling resources, personal health practices and need are factors which influence health service utilization.²²

Data

Data from the 2014 Behavioral Risk Factor Surveillance Survey (BRFSS) were used in this study. BRFSS is the largest telephone survey in the world consisting of a cross-sectional telephone survey in which there are landline and cellular telephone calls conducted by researchers at state health departments.²³ The researchers have the assistance of the Centers for Disease Control and Prevention (CDC) in conducting the survey and ask questions from

a standardized questionnaire. The responses are sent to the CDC and made public. Data weights and tabulations are included in the data release.

Study Population

Participants selected from the BRFSS data for this study were individuals who reported as having served in the armed services (our definition of Veteran), who had complete data in BRFSS 2014 on age, state, dental visit within the past year, number of missing teeth, and who were not pregnant. Data from Guam and Puerto Rico were not available. BRFSS 2014 was chosen as it is a national database in which researchers had collected recent data which included metropolitan/rural status as well as Veteran status and dental utilization. We conducted cross-sectional, secondary data analyses of the BRFSS data to determine the associations between 1) rural dwelling and Veteran utilization of dental services; and, 2) rural dwelling and the oral health outcome of missing teeth.

Variable Definitions

The two key health outcome variables considered were: 1) a dental visit during the past year, and 2) the number of missing teeth. Participants were asked how long it had been since their last dental visit. We dichotomized the responses to within the previous year (yes, no). Participants were asked as to how many teeth were extracted for reasons of dental caries or periodontal disease. The responses were categorized by the BRFSS researchers to: none; 1 to 5; 6 but not all; and all teeth. The same categories were used in this study as the cut point of using 6 or more missing teeth has been established in previous research.^{24–29}

The key independent variable was the predisposing characteristic, rural/metropolitan status. BRFSS statisticians identified Veterans as living in a central city of a metropolitan statistical area (MSA); outside of the central city of an MSA but in the county containing the central city; in a suburban county; or living outside of a MSA. The categories were determined by BRFSS statisticians using the county and ZIP code provided by the participant. We dichotomized the MSA to rural (based on living outside of a MSA) and metropolitan (living in a central city of a MSA, living outside of the central city of a MSA but in the county containing the central city, or living in a suburban county). Due to the number of Veterans with missing data concerning rural/metropolitan status, a missing category was also included for sensitivity analyses.

Other variables of interest in the analyses were the predisposing characteristics of sex (male, female); race/ethnicity (white, African-American, Latino, Other); and age in years (18–34, 35–44, 45–54, 55–64, 65–74, 75 and older) (Note, this age categorization was based on the World Health Organization basic method.³⁰); the enabling characteristics of marital status (married, divorced/separated/widowed, never married); education (less than high school, high school graduate, some college or above); health insurance (yes, no); usual source of care (yes, no); activity limitation (yes, no); personal health behavior reflected in: body mass index (underweight/normal, overweight, obese); physical activity (exercise, no), smoking (current, former, never), and alcohol use (heavy drinker, moderate, no alcohol use).

Analytic Strategy

The BRFSS has a complex study design; BRFSS uses a geographic stratification in sampling design so that the selected participants are nationally representative. Because of the weights, one cannot divide the unweighted numbers and derive a percentage and such calculations are inaccurate and will differ from the weighted percentages. The BRFSS researchers provided weights to account for the strata, primary sampling unit, as well as a final weight for each participant. We used the sampling weights provided by BRFSS to ensure that our results can be generalized to the national population and representative of the population on a number of demographic characteristics including sex, age, race, education, marital status, home ownership, phone ownership (landline telephone, cellular telephone or both) and sub-state region.³¹ The weights were used in the descriptive characteristics, bivariate analyses, and logistic regressions. SAS© version 9.3 (Cary, NC) was the software used in the analyses.

Findings

There were 36,594 participants in the study; 24,537 lived in metropolitan areas (79.3%) and 12,057 (20.7%) lived in rural areas. There were 17,520 metropolitan participants (70.2%) who had a dental visit within the past year and 7,676 rural participants (62.6%) who had a dental visit during the past year. For participants who lived in metropolitan areas, there were 37.5% who had no missing teeth, 34.7% who had 1 to 5 missing teeth, 18.9% who had 6 or more (but not all) missing teeth, and 8.9% who had all of their teeth missing. The respective percentages for participants who lived in rural areas were 31.6%, 33.2%, 21.8%, and 13.3%. There were no significant differences in the sample distribution between metropolitan or rural participants in the categories of sex, age, marital status, health insurance, body mass index, and with missing data. The sample had fewer rural Latino and African American participants than metropolitan participants. Rural participants were less likely to have attended college, to exercise, and to have a usual source of health than metropolitan participants; however, they were less likely to have activity limitations than metropolitan participants. Rural participants were more likely to smoke and to have no alcohol use than metropolitan participants. Details are presented in Table 1.

Table 2 has the Chi Square results of participants who responded “yes” to having a dental visit within the past year. Overall, participants living in metropolitan areas were more likely to have dental visits in the previous year than participants living in rural areas (70.2% versus 62.6%). Other significant factors associated with having dental visits in the past six months for metropolitan Veterans over rural Veterans were with sex, white, black, age categories from 45 and older, marital status, education, health insurance, usual source of care, body mass index, physical activity, smoking, and no or moderate alcohol use.

Several logistic regression models were created to compare rural/metropolitan Veteran dental visits during the past year (Table 3). In the adjusted analysis, rural Veterans were less likely to have a dental visit during the past year as compared with metropolitan Veterans (Odds Ratio = 0.69, 95% Confidence Interval, 0.63, 0.76). Five models were presented and the relationships remained significant throughout. In sensitivity analyses with missing data included, the results remained the same (When sex, age, race, marital status, education, health insurance, employment, income, usual source of care, health status, and personal

healthcare practices were added, the adjusted odds ratio was 0.86 [95% Confidence Interval, 0.78, 0.96]).

The positive results of the bivariate Chi Square analyses of missing teeth and rural/metropolitan status are presented in Table 4. There were significantly more metropolitan participants who had all of their teeth than rural participants (37.5% versus 31.6%). Other significant associations with participants who had all of their teeth were with sex, race/ethnicity, age, marital status, education, usual source of care, activity limitation, body mass index, physical activity, smoking, and alcohol use.

In multinomial logistic regression with the categories of tooth loss on rural/metropolitan status, rural Veterans were more likely to have missing teeth than were metropolitan Veterans in unadjusted analysis. Similar results remain in the provided adjusted analyses (Table 5). In cases where all teeth were missing, rural Veterans had an adjusted odds ratio of 1.81 (95% Confidence Interval, 1.56, 2.09). When sex, age, race/ethnicity, marital status, education, health insurance, employment, income, usual source of care, and health status were included, the adjusted odds ratio was 1.38 (95% Confidence Interval, 1.17, 1.63).

Discussion and Policy Implications

The results of this study were that there is an association between rural Veterans and the decreased likelihood of having a dental visit during the previous year as compared with Veterans who lived in metropolitan areas (the association remained in the presence of the known individual factors that explain dental utilization). Additionally, rural Veterans were more likely to have missing teeth than metropolitan Veterans. There have been few dental studies of national scope specifically on utilization by U.S. Veterans,^{32,22} and data and studies concerning rural Veteran dental utilization similar to this study (i.e. public use data) are not available in the current literature with which to compare results. There is a persistence of a dearth of knowledge concerning rural Veterans and dental needs.

However, in a study evaluating factors considered to impact dental utilization in older Veterans, researchers showed that “need” factors accounted for the greatest degree of explained variance in use of dental services ($R^2 = .15$).³⁴ Healthcare was studied in rural Veterans living in Alabama and 33.5% reported a delay for dental care services among delays with other services.³⁵ There is a need for more studies concerning Veteran oral health, particularly that of rural veterans. The need for this knowledge has been a concern for administrators of the VHA for over two decades: why do eligible Veterans not utilize dental care; what are the needs; what is optimal care; are cost-efficient programs in place; and what is the best setting for the provision of dental care?³⁶ In 2007, the VA established the Office of Rural Health. The VHA Office of Rural Health administrators are working to adequately reach out to rural Veterans and establish/improve rural Veterans’ access to care, including dental care. Additionally, the Veterans Access, Choice and Accountability Act of 2014 has improved access by permitting qualified Veterans to utilize community health care facilities’ services.³⁷ This Act provides Veterans who are enrolled in VA health care (i.e. meaning they meet the general eligibility criteria) with a Veterans Choice Card. With this card, Veterans who are unable to schedule a visit not more than 30 days from the date on

which a veteran requests an appointment or the clinically appropriate date, or due to the distance from their place of residence (i.e. more than 40 miles) to a VA program for care to choose to receive care from eligible non-VA health care/private care entities or providers.³⁸ Given that our data came from BRFSS 2014, Veterans may now be accessing more non-VA care sources for dental care in the years later than 2014 than we found in the current study.

This study has several limitations. We were focused on the utilization of dental services by Veterans, but the BRFSS data set is limited in that we could identify veterans but we were unable to distinguish Veterans eligible and enrolled for VA-based dental care versus Veterans who were not eligible. Eligibility and enrollment status would need to be assessed using a VA dataset, but then we would miss the Veterans who are not enrolled in the VA for services. Thus, this is a limitation in our study, however we were still able to characterize utilization by Veterans as whole in the community regardless of care system. Furthermore, we were limited by the choice of questions posed in the BRFSS data set. Also, there were a significant number of participants who did not have data concerning rural/metropolitan status. However, the study has several strengths as well. The sample size is large. The sample is nationally representative and many variables were used in the analyses. Sensitivity analyses were conducted to identify the impact (which was negligible) of missing rural/metropolitan status. We evaluated individual factors which had the potential to impact the rural/metropolitan relationship with dental visit during the previous year as well as the relationship with tooth loss and determined that those individual factors did not further explain the relationship. Research is needed to determine if community or cultural influences are factors. Also, research is needed to determine if rural status is a proxy for the number of available dentists.

The VA develops policies for establishing centers for care for enrolled Veterans. The policy development should take into consideration that rural Veterans are not as likely as urban Veterans to utilize dental services¹² and since rural Veterans are overrepresented in current conflicts there is a need to reach out to these Veterans. Rural Veterans are a priority for the VA and we believe this study has shed some light on oral health care for Veterans overall, and not just the ones who receive care within a VA setting.

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Description of Study Sample – Selected Characteristics Individuals who Served on Active Duty in the United States Armed Forces Behavioral Risk Factor Surveillance System, 2014

Table 1

	Total		Metropolitan		Rural		Sig
	N	Wt %	N	Wt %	N	Wt %	
ALL	36,594	100.0	24,537	100.0	12,057	100.0	
Rural/Metropolitan Status							
Metropolitan	24,537	79.3					
Rural	12,057	20.7					
Sex							
Women	3,038	7.5	2,173	7.7	865	6.9	
Men	33,556	92.5	22,364	92.3	11,192	93.1	
Race/Ethnicity							
White	31,692	81.5	20,898	79.6	10,794	88.9	***
African American	2,330	10.2	1,984	11.6	346	4.8	
Latino	931	4.6	704	5.1	227	2.4	
Other	1,641	3.7	951	3.7	690	3.9	
Age in Years							
18–34 years	684	4.6	447	4.6	237	4.5	
35–44 years	1,443	7.4	1,023	7.5	420	6.7	
45–54 years	3,289	13.0	2,307	12.9	982	13.2	
55–64 years	6,406	18.4	4,256	18.4	2,150	18.7	
65–74 years	12,593	28.9	8,260	28.6	4,333	29.8	
75, and Older	12,179	27.8	8,244	28.0	3,935	27.1	
Marital Status							
Married	23,022	71.1	15,456	71.1	7,566	71.0	
Div/Sep/Widowed	11,091	22.6	7,331	22.4	3,760	23.5	
Never Married	2,481	6.3	1,750	6.5	731	5.5	
Education							
Less than HS	1,686	6.7	961	5.9	725	9.8	***
High School	20,658	65.2	13,067	63.6	7,591	71.4	

	Total		Metropolitan		Rural		Sig
	N	Wt %	N	Wt %	N	Wt %	
ALL	36,594	100.0	24,537	100.0	12,057	100.0	
College	14,250	28.1	10,509	30.5	3,741	18.8	
Health Insurance							
Yes	35,506	96.3	23,890	96.4	11,616	95.7	
No Health Insurance	1,005	3.7	593	3.6	412	4.3	
Usual Source of Care							*
Yes	32,889	89.2	22,383	89.5	10,506	87.8	
No USC	3,572	10.8	2,064	10.5	1,508	12.2	
Activity Limitation							***
Yes	11,811	30.1	7,746	29.4	4,065	32.9	
No	24,536	69.9	16,631	70.6	7,905	67.1	
Body Mass Index							
Underwt/Normal	9,469	23.8	6,381	23.8	3,088	23.8	
Overweight	16,101	43.8	10,789	43.5	5,312	44.8	
Obese	10,584	31.2	7,070	31.5	3,514	30.3	
Missing	440	1.1	297	1.1	143	1.1	
Physical Activity							***
Exercise	27,643	75.8	18,833	76.8	8,810	72.2	
No	8,893	24.2	5,661	23.2	3,232	27.8	
Smoker							***
Current	4,698	13.9	2,996	13.5	1,702	15.7	
Former	17,990	48.0	11,935	47.6	6,055	49.9	
Never	13,694	38.0	9,478	38.9	4,216	34.4	
Alcohol Use							***
Heavy Drinker	1,818	5.3	1,205	5.3	613	5.4	
Moderate	17,324	49.4	12,099	51.2	5,225	42.4	
No Alcohol Use	16,748	45.3	10,761	43.5	5,987	52.1	

Note: Based on 36,594 participants, aged 18 years or older, who served on Active Duty in the United States Armed Forces and who did not have missing data on the following variables: missing teeth, metro status, state, dental care visits, and age. Additional exclusion criteria were: adults who lived in Gaum or Puerto Rico and women who were pregnant.

Wt=weighted; Div/Sep/Widowed=divorced, separated or widowed; Underwt=underweight

50' > *P* 10'
*
'10' > *P* 100'
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N and Weighted Percent of Participants who responded “yes” to having a dental visit within the past year by Metropolitan/Rural Status Individuals who Served on Active Duty in the United States Armed Forces Behavioral Risk Factor Surveillance System, 2014

Table 2

	Metropolitan		Rural		
	N	Wt %	N	Wt %	Significance
ALL	17,520	70.2	7,676	62.6	***
Sex					
Women	1,627	77.3	581	65.9	**
Men	15,893	69.6	7,095	62.4	***
Race/Ethnicity					
White	15,159	70.8	6,966	63.8	***
African American	1,274	67.2	186	49.6	***
Latino	484	72.6	128	62.6	
Other	603	63.4	396	52.3	
Age in Years					
18–34 years	326	71.6	151	65.2	
35–44 years	774	75.0	282	68.4	
45–54 years	1,636	71.3	601	58.4	***
55–64 years	2,958	67.9	1,333	61.8	**
65–74 years	6,063	71.9	2,811	64.4	***
75, and Older	5,763	67.9	2,498	61.6	***
Marital Status					
Married	11,739	74.6	5,238	67.4	***
Div/Sep/Widowed	4,625	58.4	2,022	50.9	***
Never Married	1,156	62.5	416	51.1	*
Education					
Less than HS	371	40.3	276	38.2	
High School	8,444	66.4	4,458	61.8	***
College	8,705	84.0	2,942	78.4	***
Health Insurance					
Yes	17,231	71.2	7,497	63.6	***

	Metropolitan		Rural		Significance
ALL	N	Wt %	N	Wt %	
No Health Insurance	262	46.3	156	39.9	***
Usual Source of Care					
Yes	5,004	63.5	2,317	54.2	***
No USC	12,412	73.2	5,304	66.7	***
Activity Limitation					
Yes	7,746	29.4	4,065	32.9	
No	16,631	70.6	7,905	67.1	
Body Mass Index					
Underwt/Normal	4,558	70.7	1,900	60.9	***
Overweight	7,896	72.4	3,514	64.9	***
Obese	4,870	66.9	2,168	60.8	**
Missing	196	65.3	94	61.5	
Physical Activity					
Exercise	14,155	74.2	5,998	67.7	***
No	3,339	57.1	1,670	49.4	***
Smoker					
Current	1,518	51.6	723	42.4	**
Former	8,442	69.7	3,864	63.4	***
Never	7,470	77.2	3,031	70.6	***
Alcohol Use					
Heavy Drinker	807	65.2	379	57.7	
Moderate	9,405	75.0	3,727	71.1	*
No Alcohol Use	6,980	65.2	3,442	56.6	***

Note: Based on 36,594 participants, aged 18 years or older, who served on Active Duty in the United States Armed Forces and who did not have missing data on the following variables: missing teeth, metro status, state, dental care visits, and age. Additional exclusion criteria were: adults who lived in Gaum or Puerto Rico and women who were pregnant.

Div/Sep/Widowed=divorced, separated or widowed; Underwt=underweight; USC= Usual Source of Care; Wt=weighted

*** $P < .001$;

** $P < .01$;

50' > d
P < .10'
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Table 3

Adjusted Odds Ratios (AOR) and 95% Confidence Intervals (CI) of Rural/Metropolitan Status from Logistic Regressions on Any Dental Visit During the Past Year Individuals who served on Active Duty in the United States Armed Forces Behavioral Risk Factor Surveillance System, 2014

	Odds Ratio	95% CI	Significance
Model 1 Only Rural/Metropolitan Status			
Rural Metropolitan (Reference)	0.70	[0.64, 0.77]	***
Model 2 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status			
	Adjusted Odds Ratio	95% CI	Significance
Rural Metropolitan (Reference)	0.69	[0.63, 0.76]	***
Model 3 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status Education, Health Insurance, Employment, Income, Usual Source of Care			
Rural Metropolitan (Reference)	0.85	[0.77, 0.94]	**
Model 4 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status, Education, Health Insurance, Employment, Income, Usual Source of Care, Health Status			
Rural Metropolitan (Reference)	0.85	[0.77, 0.95]	**
Model 5 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status, Education, Health Insurance, Employment, Income, Usual Source of Care, Health Status, Personal Healthcare Practices			
Rural Metropolitan (Reference)	0.86	[0.78, 0.96]	**

Note: Based on 36,594 participants, aged 18 years or older, who served on Active Duty in the United States Armed Forces and who did not have missing data on the following variables: missing teeth, metro status, state, dental care visits, and age. Additional exclusion criteria were: adults who lived in Guam or Puerto Rico and women who were pregnant.

 $P < .001$;

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 $.001 \leq P < .01$;

*
 $.01 \leq P < .05$

Weighted Percent of Permanent Teeth Removed Categories Individuals who Served on Active Duty in the United States Armed Forces Behavioral Risk Factor Surveillance System, 2014

	None	1-5	6 or more	All	Significance
Total	36.3	34.4	19.5	9.9	
Rural/Metropolitan Status					***
Metropolitan	37.5	34.7	18.9	8.9	
Rural	31.6	33.2	21.8	13.3	
Sex					***
Women	51.4	29.2	11.8	7.6	
Men	35.1	34.8	20.1	10.0	
Race/Ethnicity					***
White	35.7	34.0	19.8	10.5	
African American	34.4	36.8	21.5	7.3	
Latino	47.3	37.0	11.5	4.2	
Other	41.2	33.5	15.8	9.6	
Age in Years					***
18-34 years	80.9	14.8	4.0	0.3†	
35-44 years	72.6	22.6	3.7	1.0	
45-54 years	53.0	32.2	9.9	5.0	
55-64 years	35.2	38.0	18.7	8.1	
65-74 years	27.1	38.5	23.4	11.0	
75, and Older	21.8	35.1	27.1	16.0	
Marital Status					***
Married	38.1	35.8	18.0	8.1	
Div/Sep/Widowed	27.2	31.2	25.2	16.4	
Never Married	49.2	29.3	14.9	6.6	
Education					***
Less than HS	13.7	26.8	30.6	28.9	
High School	33.3	34.7	21.6	10.5	
College	48.7	35.5	11.9	3.9	

	None	1–5	6 or more	All	Significance
Total	36.3	34.4	19.5	9.9	
Health Insurance					
Yes	36.2	34.5	19.5	9.8	
No Health Insurance	38.0	31.3	19.9	10.8	
Usual Source of Care					***
Yes	35.0	35.0	20.0	10.0	
No USC	46.7	29.8	14.6	8.9	
Activity Limitation					***
Yes	26.7	33.7	26.2	13.4	
No	40.4	34.8	16.5	8.3	
Body Mass Index					*
Underwt/Normal	36.6	32.9	19.4	11.1	
Overweight	37.0	34.9	19.0	9.1	
Obese	34.8	34.9	20.4	9.9	
Missing	43.6	31.5	13.8	11.1	
Physical Activity					***
Exercise	39.1	35.5	17.6	7.8	
No	27.7	30.9	25.2	16.2	
Smoker					***
Current	27.6	29.3	26.0	17.0	
Former	27.9	35.6	24.1	12.5	
Never	49.9	34.8	11.3	4.0	
Alcohol Use					***
Heavy Drinker	37.0	33.9	21.2	7.9	
Moderate	41.2	36.2	16.4	6.2	
No Alcohol Use	30.7	32.5	22.6	14.1	

Note: Based on 36,594 participants, aged 18 years or older, who served on Active Duty in the United States Armed Forces and who did not have missing data on the following variables: missing teeth, metro status, state, dental care visits, and age. Additional exclusion criteria were: adults who lived in Gaum or Puerto Rico and women who were pregnant.

[†] – Unweighted N less than 5

Div/Sep/Widowed=divorced, separated or widowed; HS: High School; Underwt=underweight; USC: Usual Source of Care; Wt. = Weighted

P < .001;

50' > P 10'
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'10' < P 100'
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Table 5

Adjusted Odds Ratios and 95% Confidence Intervals (CI) of Rural/Metropolitan Status From Multinomial Logistic Regression on Missing Permanent Teeth Categories Individuals who Served on Active Duty in the United States Armed Forces Behavioral Risk Factor Surveillance System, 2014

Independent Variable: Rural Status			
Dependent Variable			
Model 1 Rural/Metropolitan Status Only			
	Odds Ratio	95% CI	Significance
1–5 teeth missing	1.15	[1.03, 1.28]	*
6 or more and not all	1.37	[1.21, 1.56]	***
All	1.81	[1.56, 2.09]	***
<i>None (Reference)</i>			
Model 2 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status			
	AOR	95% CI	Significance
1–5 teeth missing	1.23	[1.10, 1.37]	***
6 or more and not all	1.49	[1.30, 1.70]	***
All	1.91	[1.64, 2.22]	***
<i>None (Reference)</i>			
Model 3 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status Education, Health Insurance, Employment, Income, Usual Source of Care			
1–5 teeth missing	1.11	[0.99, 1.25]	
6 or more and not all	1.21	[1.05, 1.39]	**
All	1.42	[1.21, 1.66]	***
<i>None (Reference)</i>			
Model 4 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status, Education, Health Insurance, Employment, Income, Usual Source of Care, Health Status			
1–5 teeth missing	1.11	[0.99, 1.25]	
6 or more and not all	1.20	[1.04, 1.38]	**
All	1.41	[1.20, 1.65]	***
<i>None (Reference)</i>			
Model 5 Rural/Metropolitan Status, Sex, Age, Race/ethnicity, Marital Status, Education, Health Insurance, Employment, Income, Usual Source of Care, Health Status, Personal Healthcare Practices			
1–5 teeth missing	1.12	[1.00, 1.26]	
6 or more and not all	1.21	[1.05, 1.39]	**
All	1.38	[1.17, 1.63]	***
<i>None (Reference)</i>			

Note: Based on 36,594 participants, aged 18 years or older, who served on Active Duty in the United States Armed Forces and who did not have missing data on the following variables: missing teeth, metro status, state, dental care visits, and age. Additional exclusion criteria were: adults who lived in Guam or Puerto Rico and women who were pregnant.

 $P < .001$;

**
 $.001 \quad P < .01$;

*
 $.01 \quad P < .05$

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