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Tooth Loss Among Older Adults by Poverty Status in the United States from 1999-2004 to 2009-2014

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Abstract

Background: As tooth loss declines in an ageing America, retaining enough natural teeth for function is important for quality of life.

Methods: Data from the 1999-2004 and 2009-2014 National Health and Nutrition Examination Survey (NHANES) were used to assess changes in tooth loss in adults age 50 and older. Changes in edentulism, retaining all teeth, and having a functional dentition (21 or more natural teeth) by poverty status were evaluated.

Results: Edentulism was lower in 2009-2014 compared to 1999-2004 (11% vs. 17%) for adults age 50 and older, but this decrease was not significant among the poor. Complete tooth retention improved from 14% to 21% between 1999-2004 and 2009-2014 for persons age 50 and older. Gains were mostly attributed to non-poor adults. More older adults had a functional dentition in 2009-2014 compared to 1999-2004 (67% vs. 55%), although the increases generally were significant only for those not living in poverty.

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Bruce A. Dye made substantial contributions to the concept, design, data analysis, drafting and review of the manuscript; and provided supervision of the project. Darien Weatherspoon made substantial contributions to the concept, writing and review of the manuscript. Gabriela Lopez Mitnik made substantial contributions to the design, data analysis and review of the manuscript.

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Conclusion: Complete tooth loss has declined by more than 75% for those age 65-74 years over the past five decades in the US. Tooth loss measures improvements, such as edentulism and complete tooth retention, have been most significant among the non-poor, while poor have experienced less improvements.

Practice Implications: With an aging population that is experiencing less edentulism and more tooth retention, older adults may need more regular dental care and prevention services to address concerns such as dental root caries and periodontal disease.

Keywords

Edentulism; functional dentition; poverty; oral health; epidemiology; dental public health; NHANES; health disparities; adults

INTRODUCTION

The population of older adults in the United States continues to grow over time, with the number of individuals age 65 years and older expected to double by the year 2050¹. This trend has been propelled by the aging baby-boomer population, and it will result in an increased geriatric population for whom the healthcare system will need to care for. As it relates to oral health, older adults possess unique risk factors for tooth loss including: the lack of a routine oral health benefit in Medicare; side effects of taking multiple medications, such as xerostomia; and less access to oral healthcare ^{2,3}.

The complete loss of natural teeth represents the cumulative aftereffect of severe dental caries and periodontal disease, both of which share recurring exposure to risk factors (e.g. unhealthy diet or tobacco use) commonly associated with other chronic diseases. Globally, edentulism affects approximately 30% of adults age 65-74 years with prevalence accelerating in low-to-mid-income countries ⁴. Although 2.5 billion people world-wide have untreated dental caries and accounts for much of the overall burden of prevalent adverse oral health conditions ⁵, edentulism constitutes a substantial amount of the overall global burden when the disability adjusted life year (DALY) measure is used ⁶.

Among adults age 65-74 in the United States, the prevalence of edentulism has declined by more than 75% in the past 5 decades with social-determinants accounting for sizeable differences among population groups ^{7,8}. Edentulism also varies substantially by geographical area in the United States. In 2014, the Centers for Disease Control and Prevention (CDC) estimated that edentulism among adults age 65 and older was highest in West Virginia (34%) and lowest in Hawaii (7%) (Fig. 1). Nevertheless, older adults are retaining more of the natural dentition longer which is likely due to increased exposures to fluoride, better preventive modalities, and an increased desire for tooth preservation ^{3,8,9,10,11}.

Understanding the prevalence of complete tooth retention (no natural tooth loss) and functional dentition (having at least 21 natural teeth) in older adults is also important because as the number of missing natural teeth increases, chewing function decreases ^{12,13}. Poorer chewing function can subsequently result in decreased dietary quality and nutrient

intake^{14,15} and older adults with 10 or fewer teeth are less likely than those with 11 or more teeth to meet dietary recommendations¹⁶. Generally, older adults who are either edentulous, have fewer natural teeth, or fewer pairs of posterior teeth are less likely to eat fruits and vegetables like fresh apples, oranges, pears, carrots, tomatoes, and dark yellow and green leafy vegetables including salads, nuts, cooked meats, and well-done steaks^{17,18,19,20,21,22}. Overall, tooth loss can have a negative effect on individual's oral health-related quality of life^{23,24}.

Disparities have been observed based on poverty status for edentulism^{25,26,27}. National survey data from 2005-2008 found that adults age 65 and older living below 100% of the FPL had over twice the prevalence of complete tooth loss (37%) as those living at 200% of the FPL or higher (16%)²⁶. However, little information is known regarding observed disparities for tooth retention among older adults by poverty status. For working-age adults, those aged 20-64 living at 200% of the poverty level or higher had a significantly higher prevalence of complete tooth retention (52%) than near poor adults (44%) or poor adults (40%)²⁶. This suggests that inequalities in tooth retention for older adults (age 65 and older) exist by poverty status. To the authors' knowledge, national estimates for the prevalence of missing teeth by tooth type (i.e. tooth number) in older adults currently are not available. Moreover, there is no contemporary information on individual tooth loss by poverty status.

The purpose of the current study is to understand the changes related to tooth loss among older adults by poverty status in the United States from 1999-2004 to 2009-2014. Specifically, we aim to: (1) ascertain the prevalence of edentulism, complete dentition, and functional dentition among older adults by selected demographics from 1999-2004 to 2009-2014; and (2) to assess the prevalence of individual missing teeth in older adults and to explore patterns of tooth loss by poverty status from 1999-2004 to 2009-2014.

METHODS

Data source

Data from National Health and Nutrition Examination Survey (NHANES) 1999-2004 and 2009-2014 were used for this study. The NHANES is a cross-sectional survey that uses a stratified, multistage sampling design to obtain a representative probability sample of the civilian, noninstitutionalized population of the United States. Multiple two-year periods can be combined to form a national probability sample for a longer time period to improve estimation, power, and reliability. Oral health data collection protocols were approved by the CDC's National Center for Health Statistics (NCHS) Ethics Review Board (an Institutional Review Board equivalent) and all survey participants provided written informed consent.

Participants were interviewed in their homes and received a health examination in mobile examination centers (MEC). All oral health examinations were conducted in a MEC by trained dental examiners who were general dentists, except for in 2009-2010 when the examiners were registered dental hygienists. All dental examiners were trained and calibrated by the survey's reference examiner. Examination techniques and criteria for assessing tooth presence were consistent throughout the entire study period. Overall, data quality and examiner reliability analyses indicated that examiner performance was similar

between the two survey periods being compared (1999-2004 and 2009-2014)^{28,29,30,31}. Additional information about NHANES can be located at <http://www.cdc.gov/nchs/nhanes.htm>.

Study population

For our study, data on persons age 50 and older who participated in either NHANES 1999-2004 or NHANES 2009-2014 with information on poverty were included in the analytical sample. There were 16,006 older adults participating in the home interview during 1999-2004 and 2009-2014. Among these individuals, 13,480 completed an oral health exam. After excluding persons with no information on poverty status and not including persons identified as multi-racial or “other” race, we had 11,476 older adults in our analytical sample. Detailed information on the demographic distribution of the study population is presented in eTable 1.

Variables

All three key outcome variables were based on the presence or absence of natural, permanent teeth only. Edentulism was defined as the complete loss of all permanent teeth (32 teeth in all), tooth retention (complete dentition) was defined as having all 28 permanent teeth present (excluding third molars), and a functional dentition was defined as having 21 or more permanent teeth (excluding third molars). Age was categorized into three groups: age 50-64 years, 65-74 years, and 75 years and older. Race/ethnicity was categorized as non-Hispanic white, non-Hispanic black, and Hispanic to reflect the survey’s sampling strategy and to follow the NHANES analytical guidelines³². Hispanics include Mexican Americans and other Hispanics.

Poverty status was defined as the ratio of family income to The Department of Health and Human Services’ poverty guidelines (FPG), and varies by family size and calendar year. This measure was used instead of reported family income to provide a consistent measure independent of changing monetary value over time. For example, in 2014 the poverty threshold for a family of four was \$23,850. This means that a 2014 survey participant with this family income and this family size was classified to be at 100% of the poverty level. In 2004, the poverty threshold for a family of four was \$19,223. Additional information can be located at <http://aspe.hhs.gov/poverty/11poverty.shtml>. For our study, poverty status was defined as poor (0-99% FPG), near-poor (100-199% FPG), and non-poor (200% FPG and higher).

Data Analysis

The analytical approach used in this report was comparable to methods previously published³³. Estimates were age adjusted to the 2010 US population to account for changes in population distribution between the two periods of data collection. Population estimates and standard errors using Taylor Series Linearization were calculated. Differences between groups were evaluated using a t-statistic at the $p < 0.05$ significance level. All results with a relative standard error (RSE) equal to or greater than 30% but less than 40% were reported but should be interpreted with caution. Estimates with a $RSE > 40\%$ were considered data statistically unreliable (DSU) and not reported. The RSE is equal to the standard error of a

survey estimate divided by the survey estimate and then multiplied by 100 for expression to a percentage. Tests were conducted without adjustment for other socio-demographic factors, except for age adjustment as previously described. All analyses were undertaken using SAS 9.4 Survey Procedures (SAS Institute Inc.) except for the graphs illustrating individual tooth loss, which were conducted in STATA/SE 14.2 and the Heatmaps, which were conducted in R. All differences discussed are statistically significant unless otherwise indicated.

RESULTS

In 2009-2014, 11% or about 6.2 million Americans age 50 and older were edentulous and complete tooth loss was lower compared to 1999-2004 (11% vs. 17%) (Table 1). Although edentulism was lower in 2009-2014 (23%) compared to 1999-2004 (30%) for adults living in poverty, the difference was not statistically significant. However, men living in poverty experienced a substantial decrease in edentulism (29% vs. 20%), whereas women living in poverty did not (30% vs. 26%). Overall, 1.7 million adults age 65-74 years were edentulous in 2009-2014. Edentulism declined from 23% to 13% for those age 65-74 years between 1999-2004 and 2009-2014 and was substantially lower for the non-poor and those living near poverty. For these older adults living in poverty, edentulism was lower, but the difference was not significant (37% vs. 29%). Among those age 65-74 years, edentulism declined substantially for men living in poverty (50% vs. 26%) but remained unchanged for women in poverty (28% vs. 31%).

There were important improvements in edentulism by race/ethnic groups between 1999-2004 and 2009-2014 too. Overall edentulism was lower for all Hispanics age 50 and older (18% vs. 9%). Among older Hispanics age 65 and older living in poverty, edentulism declined from 36% to 19%. Although complete tooth loss was also lower for all non-Hispanic blacks age 50 and older during the same period (20% vs. 16%), this decline mostly affected adults age 50-64 years, particularly among non-Hispanic blacks living in poverty (21% vs. 11%). Edentulism declined from 16% to 11% for non-Hispanic whites age 50 and older between 1999-2004 and 2009-2014. Although poor non-Hispanic whites generally had higher estimates of edentulism compared to similar-aged non-Hispanic blacks and Hispanics, non-Hispanic whites living at 200% or higher of the federal poverty guidelines continued to experience a decline in edentulism. For example, non-poor adults age 65-74 years, edentulism declined from 16% to 7%.

Table 2 shows the prevalence of a complete tooth retention (i.e., no natural tooth loss) for persons age 50 and older. Overall, 11.8 million adults age 50 and older have a complete natural dentition and complete tooth retention improved from 14% to 21% between 1999-2004 and 2009-2014. Gains were mostly attributed to non-poor adults across the various age groups evaluated, with some of the more substantial gains observed for those age 50-64 years. Among these adults, complete tooth retention improved for those living near poverty and the non-poor (5% vs. 14% and 23% vs. 35%, respectively). Overall, complete tooth retention improved from 14% to 23% for women. Generally, improvement was observed across all the age groups for women and mostly for those living near poverty and the non-poor. Although the prevalence of complete tooth retention improved for non-Hispanic blacks and whites (16% to 24% for non-Hispanic whites) between 1999-2004 and

2009-2014, non-Hispanic blacks continued to experience lower tooth retention (4% vs. 7%). There was no change in complete tooth retention for Hispanics during this period (8% vs. 9%).

More adults had a functional dentition (i.e., having 21 or more natural teeth) in 2009-2014 compared to 1999-2004 (67% vs. 55%) (Table 3). Although 37.7 million adults age 50 and older have a functional dentition, 18.6 million adults lacked a functional dentition in 2009-2014. Although increases in retaining a functional dentition were observed across all age groups, these increases generally were significant only for the near poor and non-poor. However, for poor adults age 65-74, having a functional dentition increased significantly from 18% to 31%. Overall, the prevalence of having a functional dentition increased from 43% to 62% for this age group. Overall, more men age 50 and older had a functional dentition in 2009-2014 (67%) than in 1999-2004 (55%); but for poor men, prevalence remained unchanged at 37-38%. Among women, prevalence increased from 55% to 67% as well, but unlike men, there was a substantial increase among poor women (28% vs. 40%) in having a functional dentition. Overall, functional dentition increased for non-Hispanic blacks (35% to 43%), for Hispanics (46% to 55%), and for non-Hispanic whites (58% to 71%). However, prevalence varied greatly by age and poverty.

The mean number of teeth increased from 20.9 to 22.5 among all adults age 50 and older between 1999-2004 and 2009-2014 (Table 4). Among women living in poverty, the mean number of teeth increased from 17.3 to 19.1. However, poor men did not experience an increase in mean number of teeth (18.3 to 17.1) during the same period. The mean number of teeth for non-Hispanic blacks and whites increased from 17.6 and 21.4 to 18.9 and 23.1 respectively. Although the mean number of teeth was higher for Hispanics between 1999-2004 and 2009-2014 (19.1 vs. 20.1), this difference was not statistically significant.

Prevalence of missing teeth was higher for third molars than for any other tooth type (Fig 2). Among adults age 50 and older, more than 80% had either tooth #1, 16, 17, or 32 missing in 1999-2004. The prevalence was lower (approximately 60%) for missing third molars in 2009-2014. For both periods, those living above 200% of the federal poverty guidelines (the non-poor) had the highest proportion of missing third molars compared to the near poor and the non-poor. Mandibular canines (#22 and #27) had the highest retention prevalence among adults age 50 and older. About 1 in 5 people were missing their mandibular canines in 1999-2004 and this decreased to about 1 in 10 in 2009-2014. Among all missing mandibular canines, about 26-27% can be attributed to those living in poverty, about one-third to the near poor, and about 38-39% to the non-poor in 2009-2014. About half of adults were missing their first and second molars in 1999-2004 and this decreased to about a quarter of adults in 2009-2014. The majority of missing first and second molars can be attributed to the non-poor. Individual tooth loss becomes higher in the older age groups and the influence of poverty on tooth loss changes in the older age cohorts (eFigs 1-3). For example, among those age 75 and older, the near poor generally have the highest proportion missing teeth.

Figure 3 shows changing patterns from 1999-2004 to 2009-2014 in tooth loss. The most notable areas of improvement (changing from pink to teal color tones) for retaining teeth is among the near poor (199-200% FPG) in the maxillary dentition. This shows that gains in

tooth retention between the two survey periods, particularly for the upper anterior teeth, was the most substantial among the near poor. Among the poor, there was some modest improvement (changing from light to darker teal) in retaining teeth in both the maxillary and mandibular dentition and there was little change in tooth retention among the nonpoor (color tones remained consistent between the two survey periods).

DISCUSSION

Overall, the prevalence of edentulism in adults age 50 and older in the United States has significantly declined from 1999-2004 through 2009-2014 (17% vs. 11%). Likewise, the prevalence of both complete tooth retention (14% vs 21%) and functional dentition (55% vs 67%), and the mean number of permanent teeth (21 vs 22) in adults age 50 and older in the US significantly increased during the same period. Taken together, our analyses of permanent dentition status indicate that older adults in the US have retained more of their natural teeth over the past decade, although important differences in these findings were noted based on some socio-demographic factors, including poverty status. Although the overall change among adults age 50 and older was for a significant improvement in the retention of a natural dentition, this was predominately experienced by adults not living in poverty. The only measure with a significant improvement affecting adults living in poverty was for a functional dentition among older adults age 65-74.

Similar to previous reports on edentulism^{33,34}, our analyses indicated that while the overall prevalence of edentulism declined for all older adult age groups over the 1999-2004 through 2009-2014 time periods, the decrease tended to only be significant for non-poor and near poor adults. Poor older adults in the total sample, irrespective of their age group, did not experience significant declines in edentulism prevalence. Likewise, as the prevalence of complete tooth retention increased significantly for adults age 50 and older from 1999-2004 through 2009-2014, in general, only non-poor older adults experienced an increase that was significant across socio-demographic factors. However, the increase in complete tooth retention was not significant for adults age 75 or older in the total sample, regardless of poverty status. Compared to an earlier report examining the mean number of permanent teeth in dentate adults age 65 and older from 1988-1994 through 1999-2004³³, which found that only non-poor experienced a significant increase; our more recent data found that both non-poor and near-poor adults age 65 and older in the overall sample experienced a significant increase in complete tooth retention prevalence. Not surprisingly, our analyses also found that the poorest individuals (those living <100% FPL) in each age category of the total sample, did not experience significant increases in the prevalence of functional dentition or mean number of teeth, where as their near-poor and non-poor counterparts did.

While some improvements in the dentate status of the poorest older adults were observed, they tended to not be significant, and their overall oral health status tended to be worse than their non-poor and near poor counterparts. A recent systematic review and meta-analysis conducted by Seerig and coauthors found that individuals with lower income levels displayed a greater chance of tooth loss compared to those with higher incomes (pooled Odds Ratio of 2.52 (95% CI 2.11–3.01))³⁵. Poorer oral health outcomes in lower socioeconomic groups is not surprising, and points to the need for continued efforts to

increase access to oral healthcare and to better understand the vast array of social determinants of health that can impact oral health status^{36,37,38,39}. The association between lower income and poorer oral health behaviors can lead to the progression of oral diseases, and ultimately result in tooth loss³⁵.

Cost has been cited as the primary barrier for adults and older adults to access dental care⁴⁰. The negative impact of poverty on oral health status in older adults may be magnified because Medicare does not contain a routine oral health benefit, and comprehensive oral health benefits for adults are not covered by Medicaid in all states². Additionally, access to oral healthcare may be even more challenging for older adult populations^{2,3}. While it was encouraging to see improvements in dentate status of poor older adults, even if not significant, the fact that these improvements tended to be less than those observed in their nonpoor and near poor counterparts indicates the potential for disparities in dentate status by poverty status to worsen and the need for population-based oral health promotion in older adults to focus more on older adults living in poverty. Additionally, changes that incorporate more comprehensive oral health benefits into public programs may be necessary to help reduce disparities in tooth loss in older adults observed by poverty level, since poor adults and older adults rely more heavily on these programs to access dental care⁴¹.

Both men and women aged 65 and older showed significant declines in the prevalence of edentulism over the 1999-2004 through 2009-2014 time periods, and in 2009-2014 both groups showed a prevalence of approximately 17%. This is an important finding because previous national data comparing changes in edentulism prevalence in adults 65 and older from 1988-1994 through 1999-2004 found that only men experienced a significant decline over the period, and had a substantially lower prevalence than women³³. Findings from the current study suggest that the gender disparity in edentulism in adults age 65 and older has been nearly eliminated. It is important to note that gender differences in edentulism prevalence based on poverty status were noted. Only poor males age 50 and older (and age 65 and older) experienced a significant decline while poor females did not. Additionally, among adults age 75 and older, although both gender groups showed a decline over the period, females (24%) displayed a higher prevalence than males (20%) in 2009-2014.

Adults 50 and older of all race/ethnicity groups experienced significant declines in the prevalence of edentulism from 1999-2004 through 2009-2014; however, racial/ethnic disparities in edentulism were still found to exist. For example, non-Hispanic blacks aged 50 and older displayed a higher prevalence (16%) than both non-Hispanic whites (11%) and Hispanics (9%). Additionally, among adults 65 and older and 75 and older, both Hispanics and non-Hispanic whites showed significant declines in prevalence over the same period, while non-Hispanic blacks did not. Non-poor non-Hispanic blacks and non-Hispanic whites 50 and older showed a significant decline in edentulism prevalence, while non-poor Hispanics did not. However, poor Hispanics (65 and older, and 75 and older) did see significant declines over the same period. Both non-Hispanic blacks and non-Hispanic whites age 50 and older showed significant increases in the prevalence of complete tooth retention, while Hispanics did not. It is important to note that non-Hispanic whites in this age category displayed a substantially higher prevalence of complete dentition than their racial/ethnic counterparts during 2009-2014, especially among the non-poor and near-poor.

Racial/ethnic disparities in edentulism prevalence in older US adults have been widely reported previously. Although our findings indicated that disparities based on race/ethnicity still exists, particularly affecting African Americans, it was encouraging to see that the prevalence of edentulism decreased significantly among non-Hispanic blacks, particularly among the non-poor aged 50-64. Similarly, non-Hispanic blacks aged 50 and older displayed a significant increase in the prevalence of complete tooth retention, driven by those in the 50-64 age group.

Both men and women aged 50 and older showed a significant increase in complete tooth retention prevalence from 1999-2004 through 2009-2014; however, this increase was greater for women. Near poor and non-poor females of all age groups except for those over the age of 75, also experienced significant increases in complete tooth retention prevalence, whereas only non-poor males tended to experience an increase prevalence over the same period. Poor women age 50 and older, were found to have significant increases in the prevalence of functional dentition and mean number of teeth over the 1999-2004 through 2009-2014 time periods, in contrast to poor men who did not. Sex/gender differences seen in edentulism and tooth retention are thought to be related to a complex interplay of genetic, physiological, behavioral, and socioeconomic factors that impact dental diseases and ultimately tooth loss and tooth retention ⁴². For example, gender differences related to tobacco use, smoking, oral health behaviors, and socioeconomic status are some factors that likely affect edentulism and tooth retention changes that were observed in our study ^{42,43,44}.

Among the factors that are most likely responsible for contributing to the increase in tooth retention and subsequent decrease in edentulism that have been observed, smoking is probably the leading determinant. Smoking, a significant risk factor for periodontal disease (which subsequently increases the risk for eventual tooth loss), has continued to decline over time ^{11,45}. For example, in 1965 the prevalence of smoking was 42.4% and has declined to nearly 15.5% in 2015 ^{11,45}. Moreover, there continues to be increase exposure to fluoride at the population-level from a variety of sources, including community water fluoridation, fluoride-containing oral hygiene products, and professionally-applied fluoride products ^{3,11}. Additionally, there has been an emphasis on primary and secondary prevention of oral diseases in general, well-before they lead to irreversible morbidity, such as tooth loss ⁴⁶. These factors and others, including patients' increasing desire to retain their natural dentition, likely help explain the improvements in tooth retention measures observed at the population-level.

Edentulism is a global public health issue. It is estimated that at least 4% (276 million) of the global population is edentulous and among the adverse oral health conditions measured by Global Burden of Disease (GBD) study, edentulism is the leading cause of DALYs (7.6 million) resulting from an oral condition ⁵. This substantially impacts quality of life, especially for older adults. An "adequate" dentition is important for well-being and ageing ⁴⁷ and we used the concept of a "functional dentition" as a proxy for an adequate dentition. There have been many attempts to identify a minimum dentition required to maintain oral function and generally, that number has been around no less than 20 natural teeth remaining ⁴⁸. As part of an ambitious set of global oral health goals for 2020, the FDI, WHO, and IADR defined a functional dentition as having 21 or more natural teeth ⁴⁹. The current study

presents the first findings on a functional dentition in the US. Although the prevalence of a functional dentition has increased significantly to where more than half of the population age 65 and older currently has a functional dentition, substantial disparities persist by poverty status. The persistence of this large disparity has the potential to contribute to a myriad of significant public health problems as the US population ages.

Our study had several strengths. This included the use of nationally representative data of the United States, study participants were not selected based on any pre-existing conditions, examination methodology was unchanged between both study periods, and examiner reliability and data quality were high. An important limitation of our study was the inability to assess why changes were observed or not observed, but this limitation is common to all cross-sectional studies.

CONCLUSION

Overall, 6.2 million Americans age 50 and older are edentulous. Reflecting backwards, the prevalence of edentulism has declined by more than 75% among adults age 65-74 in the US in the past five decades as the population of older Americans has more than doubled (Fig4 32,50,51). As edentulism continues to decline among adults age 50 and older, the percent of adults retaining all of their natural teeth continues to increase in the US. With an aging population that is experiencing less edentulism and more tooth retention, older adults may need more regular dental care and prevention services to address concerns such as dental root caries and periodontal disease. Equally important, there are 18.6 million older Americans lacking a functional dentition. Although older Americans have experienced some improvements in their dentate status over the past decade (1999-2004 through 2009-2014), differences persist based on poverty status. Overall, poor older adults continue to experience more natural tooth loss than their counterparts. The changes observed in this study highlight that for many older Americans, important aspects of their oral health continue to improve, but this improvement is not resulting in a substantial reduction in oral health disparities. This suggests that an emphasis on oral health prevention and promotion efforts should focus on poor and racial/ethnic minority older adults to facilitate the reduction of these disparities.

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Figure 1.
Complete tooth loss among adults 65 years of age and older by states, United States 2014

Figure 2.
Prevalence of each tooth missing for adults 50 years of age and older with contribution to missing by poverty status: United States, 1999-2004 and 2009-2014

Figure 3.

Heat map of missing teeth for adults 65 years of age and older with contribution to missing by poverty status: United States, 1999-2004 and 2009-2014

Figure 4.
Estimated total population and prevalence of edentulism among adults 65-74 years of age
United States, 1960 to 2014

eFigure 1.

Prevalence of each tooth missing for adults 50-64 years of age with contribution to missing by poverty status: United States, 1999-2004 and 2009-2014

eFigure 2.

Prevalence of each tooth missing for adults 65-74 years of age with contribution to missing by poverty status: United States, 1999-2004 and 2009-2014

eFigure 3.

Prevalence of each tooth missing for adults 75 years of age and older with contribution to missing by poverty status: United States, 1999-2004 and 2009-2014

Table 1.

Prevalence of edentulism among people 50 years of age and older, by selected characteristics: United States, 1999-2004 and 2009-2014

AGE	Poverty Status	All						Male						Female						Hispanic						Non-Hispanic Black						Non-Hispanic White					
		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014					
		%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE						
50-64 [£]	1 Poor	22.02	3.10	17.16	3.21	21.28	4.16	17.58	2.84	22.14	2.85	17.76	2.98	17.16	6.17 ^{††}	7.60	2.12	21.10	3.82	10.97	2.72 [*]	23.92	4.18	22.88	4.34												
	2 Near Poor	17.68	2.20	10.53	1.99 [*]	15.59	2.98	9.73	2.51	19.91	3.32	11.55	2.83	DSU	DSU	DSU	DSU	16.82	3.06	8.80	2.60	20.72	2.97	13.80	2.34												
	3 Non-Poor	7.70	0.74	3.39	0.68 [*]	9.49	1.15	3.83	0.98 [*]	5.82	0.92	2.88	0.81 [*]	DSU	DSU	3.11	0.95 ^{††}	10.44	1.53	4.51	1.03 [*]	7.85	0.83	3.38	0.79 [*]												
	Total	10.68	0.93	6.30	0.96 [*]	11.39	1.28	6.17	1.05 [*]	9.95	1.13	6.62	1.24	7.47	2.24	3.80	0.80	14.29	1.43	7.47	1.27 [*]	10.75	1.07	6.51	1.13 [*]												
		37.27	5.00	29.22	3.37	49.61	4.91	25.94	5.08 [*]	27.62	5.62	31.30	3.15	35.39	6.49	26.02	5.06	29.99	3.36	28.95	4.82	46.70	6.32	33.99	6.22												
65-74 [£]	2 Near Poor	33.18	2.58	22.95	3.87 [*]	36.53	3.51	33.55	5.38	29.66	3.08	15.89	3.33 [*]	18.18	4.61	12.06	3.36	28.31	5.18	20.61	3.43	35.83	3.13	27.82	5.57												
	3 Non-Poor	16.97	1.56	7.75	1.14 [*]	13.73	1.92	9.28	1.98	20.09	2.29	6.39	1.59 [*]	16.60	3.26	10.76	3.39 ^{††}	23.66	4.06	14.88	3.46	16.41	1.83	7.23	1.30 [*]												
	Total	23.26	1.52	13.33	1.67 [*]	21.59	1.93	15.13	2.39 [*]	24.35	2.06	11.94	1.63 [*]	25.27	5.16	14.71	2.28	24.53	2.43	20.38	2.23	22.84	1.73	12.60	2.14 [*]												
		47.11	3.86	36.44	3.91	34.32	5.71	30.53	7.40	50.70	4.49	36.83	5.67	36.44	5.19	DSU	DSU	47.01	8.37	47.27	10.56	49.12	5.21	39.63	6.61												
		39.52	3.05	30.08	2.53 [*]	39.39	2.68	29.06	3.73 [*]	39.50	3.76	30.21	3.62	50.44	8.30	DSU	DSU	40.69	4.61	40.93	8.16	38.50	3.22	29.47	2.76 [*]												
75 or more [£]	3 Non-Poor	18.01	1.70	14.91	2.68	17.37	2.25	15.72	3.27	18.48	2.18	14.87	2.89	20.20	7.16 ^{††}	DSU	DSU	36.62	6.99	23.30	5.16	17.10	1.83	14.29	2.95												
	Total	30.57	1.86	22.49	2.19 [*]	26.49	1.87	19.84	2.54 [*]	33.02	2.20	24.38	2.62 [*]	41.32	4.31	21.39	3.86 [*]	40.84	4.57	36.05	4.87	29.10	2.04	21.50	2.53 [*]												
		42.04	3.90	33.53	3.25	41.54	3.45	29.30	4.45 [*]	40.00	5.59	35.48	4.19	36.31	7.53	18.60	2.75 [*]	35.68	5.00	39.13	5.06	46.60	5.06	36.10	5.18												
		36.50	1.94	25.96	2.82 [*]	37.84	2.67	28.83	3.11 [*]	35.60	2.12	23.46	3.28 [*]	37.54	6.34	17.86	3.97 [*]	32.51	3.46	31.71	3.95	37.44	2.20	26.93	3.65 [*]												
		17.31	1.30	11.11	1.71 [*]	15.44	1.82	11.98	2.14	19.14	1.56	10.20	1.78 [*]	24.99	7.93 ^{††}	15.27	3.69	26.39	4.08	17.43	3.30	16.63	1.52	10.52	1.84 [*]												
65 or more [¶]	3 Non-Poor																																				
	Total	26.51	1.41	17.61	1.67 [*]	23.67	1.66	17.10	1.82 [*]	28.55	1.53	17.83	1.80 [*]	34.11	4.91	16.79	1.75 [*]	31.09	2.79	27.67	2.54	25.64	1.58	16.66	2.05 [*]												
		30.02	2.47	23.43	2.55	29.28	3.55	20.26	2.28 [*]	29.59	3.14	25.63	3.53	25.52	6.93	11.97	1.76	25.95	3.10	22.72	3.38	33.20	3.16	27.68	3.40												
		25.59	1.62	16.86	1.66 [*]	24.36	2.01	18.26	2.45	26.70	2.36	15.65	2.16 [*]	18.96	2.91	8.06	1.71 [*]	23.87	3.19	18.51	2.54	28.35	1.91	18.70	2.09 [*]												
		11.24	0.75	6.54	0.86 [*]	11.33	1.03	7.02	1.06 [*]	11.11	0.97	6.04	0.99 [*]	11.14	3.17	7.87	1.38	16.26	1.90	9.76	1.50 [*]	11.07	0.85	6.26	0.94 [*]												
50 or more [±]	3 Non-Poor																																				
	Total	16.68	0.99	10.88	1.10 [*]	15.75	1.11	10.54	1.22 [*]	17.30	1.12	11.09	1.16 [*]	17.62	3.05	8.98	0.90 [*]	20.26	1.37	15.69	1.47 [*]	16.38	1.13	10.57	1.33 [*]												

Notes: Edentulism is complete tooth loss (32 teeth)

([£]) Estimates from NHANES 1999-2004 and 2009-2014 were adjusted by single years of age from the 2010 US population

([¶]) Estimates were adjusted by grouped age (65-74 and 74 and more) from the 2010 US population

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^(±) Estimates were adjusted by grouped age (50-64, 65-74 and 74 and more) from the 2010 US population

^(*) statistical significance: $p < 0.05$.

^{††} Does not meet standards of statistical reliability and precision (relative standard error $\Rightarrow$ 30% but $<$ 40%). DSU: Data statistically unreliable (relative standard error $\Rightarrow$ 40%).

Table 2.

Prevalence of a complete dentition among people 50 years of age and older, by selected characteristics: United States, 1999-2004 and 2009-2014

AGE	Poverty Status	All				Male				Female				Hispanic				Non-Hispanic Black				Non-Hispanic White				
		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		
		%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	
50-64£	1 Poor	7.81	2.27	4.92	0.93	6.63	2.09††	5.19	1.40	5.07	1.72††	4.48	1.13	7.17	2.71††	7.61	2.05	6.37	2.43††	DSU	DSU	8.16	2.93††	4.95	1.51††	
	2 Near Poor	5.16	1.31	13.67	2.20*	4.18	1.21	7.40	2.39††	4.96	1.65††	17.82	2.89*	6.60	2.38††	14.60	3.84	DSU	DSU	DSU	DSU	4.67	1.59††	16.50	2.23*	
	3 Non-Poor	22.66	1.49	34.73	2.24*	22.24	1.69	33.70	2.78*	22.83	1.76	35.37	2.67*	11.37	2.10	15.97	2.53	5.72	1.28	16.49	1.85*	25.02	1.69	38.12	2.43*	
	Total	18.86	1.31	27.46	1.84*	18.89	1.49	26.03	2.11*	18.55	1.45	28.40	2.26*	8.78	1.35	12.69	1.67	5.18	1.08	9.80	1.08*	21.74	1.64	32.01	2.08*	
	1 Poor	DSU	DSU	6.37	1.90	DSU	DSU	DSU	DSU	DSU	DSU	8.52	2.47	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU
65-74£	2 Near Poor	3.16	1.07††	7.79	2.47††	DSU	DSU	DSU	DSU	DSU	DSU	10.82	2.89*	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	3.36	1.25††	7.83	3.07††	
	3 Non-Poor	11.11	1.09	18.84	2.26*	9.64	2.00	17.22	2.65*	12.67	1.90	21.63	3.70*	25.34	5.48	9.15	3.12*††	DSU	DSU	DSU	DSU	11.08	1.19	20.74	2.57*	
	Total	8.48	0.79	15.39	1.86*	7.57	1.27	13.84	2.34*	9.42	1.24	17.13	2.44*	9.96	2.87	5.29	1.68††	DSU	DSU	DSU	DSU	8.97	0.89	17.83	2.29*	
	1 Poor	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU
	2 Near Poor	2.56	0.83††	DSU	DSU	4.28	1.23	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	2.77	0.92††	DSU	DSU	DSU
75 or more£	3 Non-Poor	7.00	1.41	8.84	1.69	7.17	1.92	5.97	1.93††	7.05	1.89	11.84	2.78	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	7.55	1.51	9.66	1.88	
	Total	4.59	0.65	6.48	1.04	5.39	1.11	4.95	1.37	4.12	0.83	7.58	1.40*	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	5.07	0.73	7.42	1.23	
	1 Poor	DSU	DSU	4.28	1.39††	DSU	DSU	DSU	DSU	DSU	DSU	5.86	1.90††	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU	DSU
	2 Near Poor	3.08	0.72	6.43	1.85	4.18	0.97	5.53	2.15††	2.45	0.88††	7.05	1.90*	2.45	0.85††	DSU	DSU	DSU	DSU	DSU	DSU	3.41	0.84	7.08	2.46††	
	3 Non-Poor	9.21	0.81	14.31	1.70*	8.35	1.17	12.08	1.95	10.06	1.37	16.56	2.27*	14.15	5††	5.67	1.79*††	DSU	DSU	DSU	DSU	0.00	0.00	9.45	15.64	1.93*
65 or more¶	Total	6.79	0.55	11.23	1.15*	6.60	0.79	9.85	1.56	7.04	0.82	12.37	1.36*	6.77	2.48††	3.09	0.92	DSU	DSU	DSU	DSU	7.31	0.62	12.84	1.42*	
	1 Poor	6.67	1.89	4.55	0.67	DSU	DSU	3.45	0.87	6.30	2.07††	5.02	0.76	DSU	DSU	5.18	1.36	DSU	DSU	DSU	DSU	7.94	2.97††	4.73	1.28	
	2 Near Poor	4.49	1.01	10.96	2.10*	4.95	1.33	6.96	2.62	4.22	1.17	14.16	2.68*	4.64	1.55††	7.61	1.90	DSU	DSU	DSU	DSU	4.84	1.36	13.01	2.69*	
	3 Non-Poor	17.34	0.96	26.48	1.62*	16.78	1.01	24.49	1.99*	17.90	1.22	28.49	2.05*	13.15	2.78	12.09	1.68	4.12	0.85	9.79	1.29*	18.78	1.06	28.88	1.72*	
	Total	14.11	0.86	20.93	1.35*	14.23	0.95	19.27	1.63*††	14.03	1.00	22.46	1.63*	8.28	1.46	8.86	1.06	3.62	0.75	7.14	0.85*	16.00	1.05	24.18	1.50*	

Notes: Complete dentition is missing no teeth (28 teeth)

(£) Estimates from NHANES 1999-2004 and 2009-2014 were adjusted by single years of age from the 2010 US population

(¶) Estimates were adjusted by grouped age (65-74 and 74 and more) from the 2010 US population

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^(±) Estimates were adjusted by grouped age (50-64, 65-74 and 74 and more) from the 2010 US population

^(*) statistical significance: $p < 0.05$.

^{††} Does not meet standards of statistical reliability and precision (relative standard error $\Rightarrow$ 30% but $< 40\%$). DSU: Data statistically unreliable (relative standard error $\Rightarrow$ 40%).

Table 3. Prevalence of people with a functional dentition among people 50 years of age and older, by selected characteristics: United States, 1999-2004 and 2009-2014

AGE	Poverty Status	All						Male						Female						Hispanic						Non-Hispanic Black						Non-Hispanic White					
		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014					
		%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE						
50-64 [£]	1 Poor	39.02	3.88	47.36	3.83	39.49	4.65	45.99	4.21	33.54	3.38	48.94	3.96 [*]	39.13	5.06	61.23	3.76 [*]	35.83	5.46	41.50	4.08	37.85	4.88	43.98	5.95												
	2 Near Poor	43.89	2.87	61.24	2.19 [*]	37.88	2.48	59.76	3.29 [*]	46.95	4.15	61.84	3.34 [*]	59.56	3.02	64.35	4.36	48.18	3.88	52.07	2.42	38.76	3.72	61.30	2.74 [*]												
	3 Non-Poor	71.89	1.72	82.95	1.44 [*]	67.04	2.04	80.82	2.13 [*]	76.70	1.92	85.07	1.98 [*]	68.53	4.57	79.09	2.86	49.06	3.20	63.71	2.73 [*]	74.32	1.81	85.04	1.56 [*]												
	Total	64.94	1.75	74.96	1.87 [*]	61.82	1.99	73.26	2.06 [*]	67.80	1.93	76.35	2.29 [*]	59.89	3.14	69.97	2.35 [*]	45.41	2.57	55.66	1.84 [*]	67.99	2.10	78.36	2.30												
	1 Poor	18.39	3.95	30.76	4.31 [*]	15.07	3.26	25.06	4.78	20.88	4.98	33.58	4.41	25.58	4.61	28.99	4.55	21.64	4.88	18.28	6.79 ^{††}	DSU	31.23	5.92 [*]													
65-74 [£]	2 Near Poor	25.82	3.18	38.43	3.86 [*]	25.43	3.83	28.82	6.05	26.24	4.48	45.59	4.42 [*]	34.01	4.78	39.49	4.90	20.05	4.42	33.26	3.73 [*]	26.14	3.86	37.33	5.06												
	3 Non-Poor	53.34	2.16	73.69	1.94 [*]	55.19	3.26	73.57	3.39 [*]	51.29	2.80	72.94	2.88 [*]	48.15	5.63	57.20	4.49	25.66	3.92	35.25	4.13	55.34	2.42	76.92	2.04 [*]												
	Total	42.78	2.29	61.76	2.53 [*]	45.10	3.04	61.14	3.59 [*]	40.47	2.79	61.77	2.74 [*]	34.28	5.08	43.93	3.36	21.46	2.05	30.65	2.35 [*]	45.74	2.65	67.07	2.99 [*]												
	1 Poor	15.98	4.11	21.30	4.28	15.85	3.08	30.49	7.38	14.36	4.52 ^{††}	20.33	5.51	9.86	3.54 ^{††}	DSU	DSU	10.15	3.76 ^{††}	DSU	18.94	4.99	27.67	7.29													
	2 Near Poor	25.38	2.49	34.67	3.29 [*]	28.23	3.21	36.48	4.08	23.36	2.98	34.06	3.91 [*]	12.89	3.72	DSU	DSU	19.13	4.29	DSU	26.88	2.73	37.41	3.59 [*]													
75 or more [£]	3 Non-Poor	44.69	2.51	58.57	3.17 [*]	43.53	3.50	60.23	3.31 [*]	45.68	2.98	55.79	4.41	32.28	9.06	DSU	DSU	18.17	4.75	21.69	6.96 ^{††}	46.10	2.65	62.22	3.37 [*]												
	Total	33.04	1.99	46.40	2.97 [*]	35.94	2.63	51.90	3.00 [*]	30.79	2.18	42.30	3.66 [*]	13.64	2.53	18.91	4.70	16.27	2.66	14.94	3.26	35.52	2.13	50.85	3.35 [*]												
	1 Poor	17.56	3.42	25.53	3.45	16.50	3.10	24.55	5.60	18.68	4.93	26.20	3.91	19.45	6.61 ^{††}	23.24	3.11	15.67	2.30	16.80	6.54 ^{††}	15.57	4.72 ^{††}	29.08	5.15												
	2 Near Poor	25.60	2.30	37.70	2.76 [*]	26.71	3.01	34.57	4.25	25.08	2.68	40.38	3.30 [*]	20.79	3.65	33.31	4.26 [*]	16.84	3.20	20.95	3.46	26.75	2.67	39.49	3.41 [*]												
	3 Non-Poor	49.01	1.66	67.24	2.01 [*]	49.68	2.62	69.09	2.73 [*]	48.33	2.20	65.39	2.59 [*]	36.06	7.16	42.99	4.23	23.68	2.85	30.06	3.79	50.75	1.82	70.68	2.08 [*]												
65 or more [¶]	Total	38.22	1.69	54.90	2.33 [*]	41.01	2.29	57.94	3.01 [*]	36.10	1.89	52.67	2.50 [*]	23.94	4.24	33.36	2.77	19.10	1.58	24.07	2.25	40.96	1.88	59.78	2.74 [*]												
	1 Poor	31.72	2.83	39.22	2.86	37.24	4.16	37.98	3.89	27.76	3.51	40.29	3.25 [*]	32.09	4.42	45.93	3.04 [*]	29.00	3.86	33.01	3.61	31.77	4.02	39.06	4.52												
	2 Near Poor	36.63	2.30	52.26	1.90 [*]	34.60	2.02	48.76	2.42 [*]	38.48	3.51	55.15	2.78 [*]	44.35	2.95	49.96	3.68	30.89	3.84	38.89	2.09	34.29	2.94	54.67	2.48 [*]												
	3 Non-Poor	63.46	1.37	76.39	1.33 [*]	61.20	1.73	75.88	1.52 [*]	65.82	1.50	76.93	1.77 [*]	56.91	4.09	64.88	2.67	39.53	2.54	50.43	2.45 [*]	65.51	1.47	78.96	1.44 [*]												
	Total	54.93	1.53	66.81	1.81 [*]	54.62	1.75	66.89	1.94 [*]	55.49	1.61	67.03	2.02 [*]	46.44	2.89	55.12	2.11	35.18	1.66	43.02	1.70 [*]	57.82	1.82	70.81	2.18 [*]												

Notes: Functional dentition is having 21 or more natural teeth (28 teeth)
([£]) Estimates from NH 1999-2004 and 2009-2014 were adjusted by single years of age from the 2010 US population

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^(¶) Estimates were adjusted by grouped age (65-74 and 74 and more) from the 2010 US population

^(±) Estimates were adjusted by grouped age (50-64, 65-74 and 74 and more) from the 2010 US population

^(*) statistical significance: $p < 0.05$.

^{††} Does not meet standards of statistical reliability and precision (relative standard error $\Rightarrow$ 30% but $< 40\%$). DSU: Data statistically unreliable (relative standard error $\Rightarrow$ 40%).

Table 4. Mean number of permanent teeth among dentate people 50 years of age and older, by selected characteristics: United States, 1999-2004 and 2009-2014

AGE	Poverty Status	All						Male						Female						Hispanic						Non-Hispanic Black						Non-Hispanic White							
		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014		1999-2004		2009-2014			
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE				
50-64 [£]	1 Poor	19.08	0.41	19.63	0.38	19.24	0.47	19.14	0.63	17.87	0.47	20.41	0.43 [*]	19.48	0.73	20.98	0.47	18.16	0.86	18.26	0.54	18.74	0.55	19.86	0.55														
	2 Near Poor	18.86	0.48	21.54	0.31 [*]	17.62	0.58	21.07	0.41 [*]	19.60	0.45	21.65	0.45 [*]	20.45	0.49	21.68	0.51	DSU	DSU	19.59	0.39	18.24	0.57	21.89	0.40 [*]														
	3 Non-Poor	22.91	0.26	24.49	0.25 [*]	22.33	0.33	24.12	0.43 [*]	23.39	0.26	24.83	0.19 [*]	21.61	0.71	23.46	0.38 [*]	DSU	DSU	21.79	0.33	23.32	0.28	24.83	0.30 [*]														
	Total	22.08	0.24	23.51	0.24 [*]	21.65	0.33	23.11	0.34 [*]	22.42	0.24	23.84	0.21 [*]	20.76	0.47	22.26	0.34 [*]	19.29	0.30	20.45	0.31 [*]	22.59	0.29	24.11	0.28														
	1 Poor	15.76	0.89	16.52	0.86	15.73	1.09	12.78	1.07	16.04	0.98	17.69	0.80	16.83	0.63	16.85	0.93	DSU	DSU	14.99	1.36	13.79	1.01	15.76	1.02														
65-74 [£]	2 Near Poor	16.82	0.66	19.00	0.53 [*]	17.21	0.57	17.34	0.85	16.39	0.88	19.86	0.58 [*]	17.51	0.73	17.12	0.75	DSU	DSU	17.74	0.67	17.05	0.81	19.61	0.58 [*]														
	3 Non-Poor	20.60	0.29	23.15	0.24 [*]	20.73	0.41	23.21	0.42 [*]	20.25	0.49	23.02	0.32 [*]	20.20	0.93	20.90	0.62	DSU	DSU	17.86	0.74	20.90	0.30	23.58	0.25 [*]														
	Total	19.39	0.30	21.84	0.25 [*]	19.71	0.39	21.70	0.44 [*]	18.93	0.43	21.91	0.29 [*]	18.15	0.68	18.89	0.69	15.32	0.61	17.14	0.53 [*]	19.88	0.34	22.64	0.26 [*]														
	1 Poor	15.45	0.87	15.78	0.97	12.77	0.94	16.22	1.74	15.80	0.79	15.88	1.12	13.46	0.93	14.05	1.24	13.71	1.01	DSU	DSU	16.28	1.19	17.51	1.08														
	2 Near Poor	17.11	0.47	18.27	0.56	16.61	0.67	18.29	0.93	17.28	0.53	18.31	0.61	15.56	1.19	DSU	DSU	14.48	1.32	DSU	DSU	17.43	0.49	18.66	0.60														
75 or more [£]	3 Non-Poor	19.50	0.36	20.99	0.40 [*]	19.10	0.58	21.07	0.56 [*]	19.89	0.42	20.72	0.65	16.72	1.78	DSU	DSU	14.53	1.02	DSU	DSU	19.73	0.38	21.52	0.43 [*]														
	Total	18.27	0.31	19.75	0.39 [*]	18.03	0.48	20.08	0.51 [*]	18.39	0.34	19.34	0.50	14.43	0.72	14.16	0.57	14.53	0.94	15.49	0.67	18.69	0.31	20.44	0.41 [*]														
	1 Poor	15.55	0.79	16.05	0.75	14.49	0.98	14.56	1.40	16.01	0.99	16.89	0.79	15.65	1.07	15.07	0.83	15.03	0.72	15.01	1.45	15.24	1.38	16.69	1.09														
	2 Near Poor	17.07	0.51	18.85	0.40 [*]	17.02	0.54	18.21	0.80	17.09	0.61	19.25	0.48 [*]	15.88	0.81	18.05	0.67 [*]	14.78	1.02	15.81	0.72	17.39	0.61	19.24	0.48 [*]														
	3 Non-Poor	20.08	0.22	22.24	0.20 [*]	19.97	0.32	22.43	0.28 [*]	20.17	0.36	22.04	0.30 [*]	18.55	1.08	18.01	0.66	15.23	0.58	17.14	0.65 [*]	20.35	0.22	22.71	0.21 [*]														
65 or more [¶]	Total	18.88	0.24	20.90	0.25 [*]	19.01	0.31	21.12	0.38 [*]	18.76	0.30	20.73	0.29 [*]	16.50	0.69	16.98	0.52	14.99	0.51	16.36	0.46 [*]	19.35	0.26	21.61	0.26 [*]														
	1 Poor	17.84	0.41	18.23	0.40	18.31	0.60	17.13	0.78	17.34	0.56	19.07	0.48 [*]	17.89	0.68	18.76	0.43	17.22	0.67	17.14	0.72	17.86	0.64	18.42	0.66														
	2 Near Poor	18.26	0.39	20.59	0.27 [*]	17.69	0.47	20.02	0.41 [*]	18.76	0.44	21.01	0.33 [*]	18.48	0.47	19.94	0.43 [*]	17.08	0.56	18.02	0.39	18.16	0.52	21.18	0.32 [*]														
	3 Non-Poor	21.87	0.17	23.56	0.16 [*]	21.57	0.21	23.43	0.22 [*]	22.17	0.21	23.70	0.19 [*]	20.57	0.57	21.26	0.35	17.89	0.37	19.99	0.36 [*]	22.21	0.17	23.94	0.18 [*]														
	Total	20.91	0.19	22.45	0.21 [*]	20.78	0.24	22.30	0.27 [*]	21.03	0.21	22.62	0.22 [*]	19.16	0.40	20.14	0.30	17.58	0.30	18.85	0.29 [*]	21.40	0.22	23.08	0.23 [*]														

Notes: Dentate is based on 28 permanent teeth, excluding 3rd molars

(£) Estimates from NHANES 1999-2004 and 2009-2014 were adjusted by single years of age from the 2010 US population

(¶) Estimates were adjusted by grouped age (65-74 and 74 and more) from the 2010 US population

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(±) Estimates were adjusted by grouped age (50-64, 65-74 and 74 and more) from the 2010 US population

(*) statistical significance: $p < 0.05$.

†† Does not meet standards of statistical reliability and precision (relative standard error $\Rightarrow$ 30% but $<$ 40%). DSU: Data statistically unreliable (relative standard error $\Rightarrow$ 40%).

eTable 1.

Number of sampled persons 50 years of age or older participating in NHANES by selected demographics: United States, 1999-2004 and 2009-2014

	1999-2004			2009-2014		
	HIQ	MEC	OHX	HIQ	MEC	OHX
Total	7,493	6,776	6,316	8,513	8,206	7,164
Age						
50-64 yrs	3,144	2,966	2,777	4,434	4,315	3,843
65-74 yrs	2,085	1,942	1,816	2,233	2,162	1,864
75 yrs or more	2,264	1,868	1,723	1,846	1,729	1,457
Gender						
Female	3,845	3,436	3,175	4,350	4,187	3,608
Male	3,648	3,340	3,141	4,163	4,019	3,556
Race / Ethnicity						
Non-Hispanic White	4,331	3,851	3,644	3,908	3,784	3,314
Non-Hispanic Black	1,262	1,168	1,065	1,918	1,853	1,655
Mexican American	1,415	1,324	1,213	1,034	994	827
Other Race	286	257	239	834	792	687
Other Hispanic	199	176	155	819	783	681
Poverty Status[§]						
Poor (<100%FPG)	1,063	971	893	1,534	1,472	1,246
Near Poor (100-199%FPG)	1,926	1,738	1,616	2,091	2,006	1,765
Non-Poor (≥ 200%FPG)	3,635	3,369	3,197	4,046	3,945	3,494

Notes

([§]) Based on federal poverty guidelines; HIQ is number of sampled persons completing a Home Interview Questionnaire; MEC is a Mobile Examination Center; and OHX is an Oral Health Examination.