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English Language Proficiency and Complete Tooth Loss in Older Adults in the United States

Item Type	Master's Thesis
Authors	Foiles Sifuentes, Andriana M.
DOI	10.13028/macr-w027
Publisher	University of Massachusetts Medical School
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Download date	2024-12-26 09:38:21
Link to Item	https://hdl.handle.net/20.500.14038/31295

ENGLISH LANGUAGE PROFICIENCY AND COMPLETE TOOTH
LOSS IN OLDER ADULTS IN THE UNITED STATES

A Masters Thesis Presented

By

Andriana M Foiles Sifuentes

Submitted to the Faculty of the

University of Massachusetts Graduate School of Biomedical Sciences, Worcester

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 6, 2020

Health Services Research

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Master of Science in Clinical Investigation

May 6, 2020

Acknowledgements

Thank you to all staff and faculty in PQHS. I have deeply appreciated the opportunity to learn from your amazing skillsets. I would like to thank my Thesis Research Advisory Committee Members, Drs. Kate Lapane, William Jesdale, Sharina Person, and Jennifer Tjia, for their guidance, direction, and mentorship in this research topic and throughout my Masters curriculum.

I would like to thank the wonderful students in PQHS, particularly Maira A Castaneda-Avila and Nien Chen Li. I would also like to thank Sonoma State University's Associate Vice President for Faulty Affairs Dr. Deborah Roberts, and the Dean of Social Sciences, Dr. Maureen Buckley, for allowing me to take time from my faculty appointment to pursue my interests in acquiring formal training in epidemiology and biostatistics.

Abstract

Objectives

To provide contemporary, national population-based estimates of complete tooth loss of older adults by English language proficiency.

Methods

We conducted a cross-sectional analysis of the 2017 Medical Expenditure Panel Survey among participants ≥50 years of age (n=10,452, weighted=111,895,290).

Results

The prevalence of complete tooth loss was higher among those with limited English proficiency (Spanish speaking: 13.7%; Other languages: 16.9%) than those proficient in English (Spanish speaking: 5.0%; Other languages: 6.0%). After adjusting for education, complete tooth loss was less common among participants for whom Spanish was their primary, with limited English proficiency relative to English only (adjusted odds ratio: 0.56; 95% confidence interval: 0.42-0.76). Among those without complete tooth loss, dental visit in the past year were less common among participants with primary languages other than English as compared to those who only speak English.

Discussion

Research is needed to examine the relationship of aging, oral health, and access to care.

Key words: limited English proficiency, Spanish, edentulism

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List of Third Party Copyrighted Material:

All materials (Figures, Tables, etc.) in this thesis represent original work.

List of Abbreviations:

Medical Expenditure Panel Survey (MEPS)

Limited English Proficiency (LEP)

Spanish-Speaking Limited English Proficiency (Spanish, LEP)

Other Language Limited English Proficiency (Other, LEP)

Spanish-Speaking English Proficiency (Spanish, EP)

Other Language English Proficiency (Other, EP)

English Only (EO)

95% Confidence Interval (95% CI)

OR (Odds Ratio)

aOR (adjusted Odds Ratio)

Chapter 1: Introduction

Limited English Proficiency

People with limited English proficiency (LEP), for whom English is a second language, and those who possess limited function of reading, writing, or speaking English have decreased access to health care and related services (Ponce et al., 2006). Lack of access to oral health care services has been noted for persons with limited English proficiency, particularly among aging populations (Shelley et al., 2011).

Dental providers report feeling underprepared to care for persons with LEP (Simon et al., 2017). Unfortunately, not all safety net dental clinics recognize their legal obligation to care for persons with LEP, further marginalizing a vulnerable population (Hammersmith & Lee, 2009). For aging persons with LEP, access to dental care is a pressing concern given the relationship of biological aging with oral health decline (Griffin et al., 2012). Oral health is also linked to behavioral and social factors, and persons from vulnerable communities are at a higher risk of oral disease and tooth loss (Hybels et al., 2016; Shelley at al., 2011). Research examining oral health among aging persons with LEP is scant. Globally, populations are aging rapidly, making the intersection of oral health, aging, and persons with LEP a critical focal point (Bloom et al., 2015). Further, persons with LEP in the US come from myriad global communities and differentiate language will allow for better targeted interventions (Schachter et al., 2012). Because the population of aging persons with LEP is growing (Pandya et al., 2011), research on this topic is sorely needed.

Our study contributes to the literature that examines the intersection of LEP, aging, and oral health in two ways. First, we provide population-based estimates of complete tooth loss by LEP status among older adults in the US. We hypothesized that we would observe greater

prevalence of complete tooth loss among non-English speaking adults in the US. Second, we describe the relationship between LEP and dental healthcare utilization including visiting a dental care provider.

Chapter 2: Methods

The Westat Institutional Review Board by the Office for Protection from Research Risk approved the original study design (Hill et al., 2011). Data were de-identified, anonymized, and released as publicly available data.

Data Source

Data were drawn from the 2017 Medical Expenditure Panel Survey (MEPS), a nationally representative sample of non-institutionalized US civilians. The Agency for Healthcare Research and Quality and the Centers for Disease Control sponsored the data collection for MEPS 2017. Persons were randomly selected to participate in the household report questionnaire and medical and dental providers received questionnaires based on the randomly selected individual responses (Hill et al., 2011). Because provider data was drawn from individual participant responses, MEPS data can be analyzed for individual person-level responses (Griffin et al., 2014).

Study Sample

A total of 31,880 participants were included in MEPS 2017 household component. We excluded participants who were <50 years of age (n=20,969). We then excluded 292 participants who responded no or coded as "refused", "don't know", "not ascertained" on complete tooth loss of upper and lower jaw. Lastly, we excluded 167 participants with missing data, refused or "don't know" responses on language proficiency, education, marital status, years in the US, or born in

the US. We included 10,452 respondents ≥50 years of age (weighted n=111,895,290) as our final analytic sample to evaluate complete tooth loss.

Operational definition of LEP

Participants were grouped into five categories based on two variables: 1) their self-reported English language ability (LEP, proficient), and 2) language spoken at home (Spanish, Other). In the MEPS Household Component, respondents were asked by interviewers: "How well {do/does} {you/person} speak English? Would you say… Very well; well; Not well; Not at all?" (Ponce et al., 2006). We first categorized participants as: 1) having LEP (not well; not at all); English proficient (well; very well)); and English only for those who reported the question as not pertaining to them (not applicable), which was approximately 2/3rds of MEPS participants (Agency for Healthcare Research and Quality). We then used the MEPS Household Component survey question: "What language do you speak at home? Would you say… English, Spanish, Other"[1] to differentiate primary language. For example, those with LEP who reported speaking Spanish at home were categorized as Spanish speaking, with little/no English (SLEP) whereas those reporting speaking other languages at home but had little/no English were classified as Other Language/English Proficient (OLEP). Respondents speaking Spanish at home, but English proficient were classified as SEP and those with Other language-speaking/English proficient were classified as OEP, with English as the only language spoken serving as the reference group.

Operational definitions of outcome variables

For the first aim, the outcome of interest was self-reported edentulism - complete tooth loss of all teeth from upper and lower jawbone. LEP adversely affects access to dental care, and lacking

teeth among older populations serves as a proxy for dental care access across the life course (Nicolau et al., 2007). Participants were asked: "Have you… lost all upper and lower teeth?" (Yes/No) (Meyerhoefer et al., 2019). Self-reported dentition in older adults has been shown to be valid (Kay, 1999).

For the second aim, the outcome of interest was a dental visit within the last year (Any versus none). The MEPS survey included the following question: "How many dental visits in the last 12 months?" (Meyerhoefer et al., 2019; Griffin, et al., 2014). We recoded this variable as any visits versus no visits. Although we were interested in evaluating other dental health care utilization in the previous 12 months (e.g., use of surgical implants, repairing dentures), the number of persons reporting use of these dental services was too low across several of the LEP groups. As such, we did not pursue this line of inquiry.

Covariates

We included demographic variables that could affected an individual's ability to access dental services. These included age, sex, race (Asian, Black, White), marital status (married, divorced/widowed/separated/never married), education (no degree, high school diploma/GED, some college or beyond), and family income as percentage of poverty line (poor/negative, near poor, low income, middle income, high income). We created a variable to describe number of years living in the US by combining information from two questions: 1) "Were you born in the United States (yes/no)"?; and 2) "In what year did you come to the United States to stay?". Using this information and the respondent's age, we categorized participants as: born in the US, <15 years in US, or ≥15 years. This allowed us to make the distinction between new immigrant populations and established persons. We included variables for insurance coverage (private,

public, uninsured), dental insurance coverage (yes/no), and active smokers in the last 12 months (yes/no).

Data Analysis:

Survey weights were provided by MEPS and applied appropriately for all analyses. We applied MEPS recommended approaches for using weighted measurements with single unit datapoints (Wun et al., 2007). For the first study aim, we described the characteristics of the population by complete tooth loss. Age (in years) was a continuous variable and as such mean and standard deviations are shown. Percentages are shown for categorical variables. Two-sided t-tests (continuous) and Chi square tests (categorical) were used to evaluate differences in the characteristics by complete tooth loss. We considered differences of 5% or greater to be potentially clinically relevant. Using the same approach, we further stratified the analysis by English language proficiency categories. We then used logistic regression to quantify the association between edentulism and English language proficiency (Spanish LEP, Other LEP, Spanish-English proficient, Other-English proficient, English only), with English only serving as the reference group. We evaluated (and ruled out) the potential for multicollinearity before developing logistic models. To understand the role of education (a proxy of socioeconomic status in childhood and adolescence) and current family income (a proxy for current socioeconomic status), we built a series of models. First, we show partially adjusted estimates for age, sex, marital status, smoking, and dental insurance. Then, we added family income to the model to the partially adjusted model. Next, we added education (but not family income) to the partially adjusted model. Lastly, we included all the variables in the partially adjusted model, education, and family income. From each model we show the adjusted odds ratios (aOR) and corresponding 95% confidence intervals (CI).

To evaluate the second aim of the study, we conducted a series of analyses stratified by complete tooth loss. English language proficiency remained as our primary determinant of interest. For these analyses, our outcome variable of interest was dental visit in the previous 12 months. We used the same approach to develop crude, partially adjusted models (adding education and family income separately), and a fully adjusted model.

Chapter 3: Results

The overall percent of adults aged ≥ 50 in the United States with self-reported complete tooth loss of the upper and lower jaw was 11.4%. Table 1 shows that on average, those with complete tooth loss were older than those without complete tooth loss (average age: 69.8 years in those with complete tooth loss versus 63.8 years in those without). The distribution of sex and race/ethnicity was similar by edentulism status, but fewer older adults with complete tooth loss were currently married as compared to those without complete tooth loss (46.4% versus 62.0%). Sixteen percent of those with complete tooth loss were current smokers as compared to 7.0% of those without complete tooth loss. Markers of socioeconomic status including education, income, public insurance, and dental insurance all suggested that older adults with complete tooth loss had lower socioeconomic positioning than those without complete tooth loss.

Figure 1 shows the prevalence of complete tooth loss by language proficiency. Among those with English as a primary language, 12.0% had complete tooth loss. The prevalence of complete tooth loss was higher among those with limited English proficiency (Spanish speaking: 13.7%; Other languages: 16.9%) than those proficient in English (Spanish speaking: 5.0%; Other languages: 6.0%).

The characteristics of adults ≥ 50 years of age with and without complete tooth loss stratified by English language proficiency is shown in Table 2. Regardless of language proficiency

status, people with complete tooth loss were older and had less education, were more likely to have public health insurance, less likely to have dental insurance, and less likely to report a dental visit in the past 12 months than those without complete tooth loss. For most LEP categories, those with complete tooth loss were less likely to be married than those without complete tooth loss.

Table 3 shows that relative to English only participants, those proficient in English, but who spoke languages other than English were less likely to have complete tooth loss (aOR Spanish EP: 0.49 (95% CI 0.35-0.68); aOR Other Language, EP: 0.62 (95% CI 0.38-1.02)). These estimates did not vary substantially after adjustment for education and income. For Spanish speaking older adults with LEP, the odds ratio indicated a 23% excess odds of complete tooth loss relative to those who communicate in English only (95% CI: 0.92-1.63). Additional adjustment for education revealed a "reversal of the odds" with complete tooth loss less common among those with Spanish LEP relative to English only (aOR: 0.56; 95% CI: 0.42-0.76).

Figure 2 shows the proportion of adults ≥ 50 years of age who reported a dental visit in the 12 months before their interview by LEP category, stratified by edentulism status. The prevalence of dental visits in the past 12 months was higher among people without complete tooth loss relative to those with complete tooth loss, regardless of LEP category. Those with limited English proficiency were less likely to report a dental visit in the past year (Spanish: 7.4% with and 21.3% without complete tooth loss; Other: 14.7% with and 27.6% without complete tooth loss).

Table 4 shows that among those without complete tooth loss all LEP categories were less likely to report a dental visit in the past year relative to English only participants. Adjustment for age, sex, marital status, smoking, and dental insurance did not materially alter these estimates, nor did additionally adjusting for family income or education. Participants with LEP (Spanish: aOR (0.47, 95% CI: 0.36-0.62); other language: aOR (0.50; 95% CI: 0.29-0.86) had half the odds of

reporting a dental visit in the year previous relative to English only participants. Participants proficient in English (Spanish: aOR (0.60 95% CI: 049-0.74); Other language: aOR (0.68; 95% CI: 0.52-0.88) had reduced odds of reporting a dental visit in the year previous relative to English only participants. Among those without complete tooth loss, the 95% CIs demonstrate that the sample size was not sufficient to yield informative results.

Chapter 4: Discussion

In the United States, the population is aging and becoming more diverse, such that the proportion of people with LEP is growing rapidly. The objective of this cross-sectional study was to analyze the intersection of LEP and aging to provide insight into the oral health status for this important population. We found that complete tooth loss varied by English language proficiency among adults aged $\geq$ 50 years in the United States. For health services planning, unadjusted percentages show that complete tooth loss was higher among those with limited English Proficiency who speak Spanish or Other languages. Analyses adjusted for a variety of factors induced a reversal of the odds with reduced odds of complete tooth loss amongst those who spoke languages other than English, relative to those who reported English only. We also found that the proportion of people reporting a dental visit in the past 12 months was suboptimal and varied by LEP and whether people had complete tooth loss. These findings are important for dental health services planning given increasing diversity among an aging population in the United States.

In 2017, 11.4% of non-institutionalized, civilian persons in the United States ages $\geq$50 reported complete tooth loss, but this varied across categories defined by English language proficiency. Relative to adults aged $\geq$ 50 years who only spoke English, those who were proficient in English yet spoke another language at home were less likely to report complete tooth loss. Conversely, those who spoke another language at home but were not proficient in English were

more likely to report complete tooth loss. Interestingly, English only populations had the highest odds of experiencing complete tooth loss compared to different language populations. These intriguing findings may be viewed as consistent with a large, cross-national study which substantiated the association between socioeconomic conditions in the early years of life and tooth retention (Listl et al., 2018). We viewed educational attainment as a marker for socioeconomic positioning in earlier life. Adjustment for this variable reversed the estimates of the adjusted odds ratios. We further consider the possibility of the "healthy immigrant" phenomena among first generation persons and their children (Sanders, 2010). Unfortunately, the cross-sectional nature of the MEPS data impeded our ability to disentangle these intriguing findings further.

We found that many older adults in the US do not follow recommendations for annual dental visits, and this varied by limited English proficiency (Kay, 1999). Spanish speaking adults were at greatest risk for lack of a dental visit in the previous year. This is consistent with previous research. For example, among older adults ≥ 65 years of age in the US, 34.4% of Latinos had untreated dental caries (compared to 21.8% of non-Hispanic Whites), and many did not have a dental visit in the past year (Centers for Disease Control and Prevention, 2017; Kaiser Family Foundation, 2019). Although cost was noted as a barrier in fewer than 10% (Centers for Disease Control and Prevention, 2017) ethnic minorities were at greater risk for cost-related delayed of foregone dental care (National Center for Health Statistics, 2013).

We also found that the differences in dental visits in the past year varied by edentulism status. People with complete tooth loss were the least likely to report having seen a dental care provider in the last year. The American College of Prosthodontists recommends that persons with complete tooth loss visit a dental care provider annually to evaluate their oral health, because biological changes to the soft and hard tissues of the mouth can alter how dentures fit (American

Dental Association. In addition to decreased maceration capacity or potential concerns with phonetics due to denture fit, the American College of Prosthodontists official statement on dentures highlights that persons with ill-fitting dentures are at a four times as great a risk of developing head and neck cancer (American Dental Association, 2019; American College of Prosthodontists: Position Statement, 2015). Having a functioning dentition for those with complete tooth loss effects food maceration and nutrition intake as well as social acceptance (Ervin & Dye, 2009; Papadaki & Anastassiadou, 2012). Dental providers recommend that persons who use complete dentures or artificial implants routinely visit their dental care provider to prevent ill-fitting dentures, and other potential oral health concerns (American College of Prosthodontists: Position Statement, 2015; Papadaki & Anastassiadou, 2012). While we cannot estimate how many persons with complete tooth loss have the necessary dental prosthetics for a complete dentition, we can say that the population with complete tooth loss is not frequenting dental providers at rates effective for oral, and overall, health maintenance.

Strengths and Limitations

This study provides contemporaneous, population-based estimates of complete tooth loss across categories by English language proficiency. The MEPS data resource allowed us to generate foundational knowledge on oral health care need and utilization among vulnerable populations. Despite the nationally representative estimates provided by MEPS, the study does have some limitations. First, the two primary outcome variables were self-reported may be subject to bias (Manski et al., 2014). However, the validity of self-reported measures of broad measures such as complete tooth loss has been shown (Douglass et al., 1991). Second, MEPS conducts interviews over the phone and communicating with persons who have limited English proficiency maybe a concern. MEPS uses bilingual interviewers and pre-set questions are available in multiple

languages. Because of this, the questions are standardized, and interviewers are fully functional in multiple languages (Agency for Healthcare Research and Quality; Hill et al., 2011). Despite these limitations, our study provides a much-needed insight into language accessibility and oral health care utilization among persons that have complete tooth loss.

<u>Chapter 5: Conclusions</u>

In 2017, 11.4% of the United States population ages ≥50 have complete tooth loss, and those with limited English proficiency are more likely to have complete tooth loss. While overall adherence to recommended annual visits with oral health providers is suboptimal, striking disparities among those with limited English proficiency were observed and exacerbated by complete tooth loss. Among those without complete tooth loss, differences in adherence to annual dental visits across LEP categories were not explained by dental insurance, suggesting that further study of the role of additional barriers such as access to dental clinics, education regarding the importance of regular routine dental care, and dental providers preparedness to meet the care needs of diverse patients is warranted. Further research is sorely needed in this area to meet the needs of older adults as our population ages and diversifies.

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Table 1. Characteristics of adults ≥ 50 years of age with and without complete tooth loss in the United States (2017)

	Complete tooth loss	
	Yes	**No**
N	1,353	9,099
Weighted n	12,733,684	99,161,606
Mean age (years±SD)	69.8±0.4	63.8±0.2
Women	53.0	53.3
Race/Ethnicity		
Non-Hispanic Asian	3.5	4.7
Non-Hispanic Black	12.3	10.3
Hispanic	8.0	11.2
Non-Hispanic multiracial	2.3	3.3
Non-Hispanic White	73.0	71.5
Marital status		
Married	46.4	62.0
Divorced, widowed, separated	46.7	30.4
Never Married	6.8	7.6
Education		
No Degree	27.4	8.9
High School Diploma/GED	54.2	46.1
Some College or Beyond	18.4	45.0
Years living in US		
Born in US	88.1	84.1
<15 years	2.6	1.6
≥15 Years	9.2	14.3
Family income		
Poor/Negative	17.5	8.3
Near Poor	7.0	3.8
Low Income	22.0	10.8
Middle Income	28.8	26.1
High Income	24.7	51.0
Insurance coverage		
Private	42.8	70.6
Public	53.8	25.2
Uninsured	3.5	4.3
Dental insurance	15.3	39.5
Dental visit in the last year	15.7	52.2
Smoker within last year	16.5	7.0

P Values are <0.001 for all variables in Table 1.

Figure 1. Prevalence of complete tooth loss by English language proficiency among adults aged ≥ 50 years in the United States (2017)
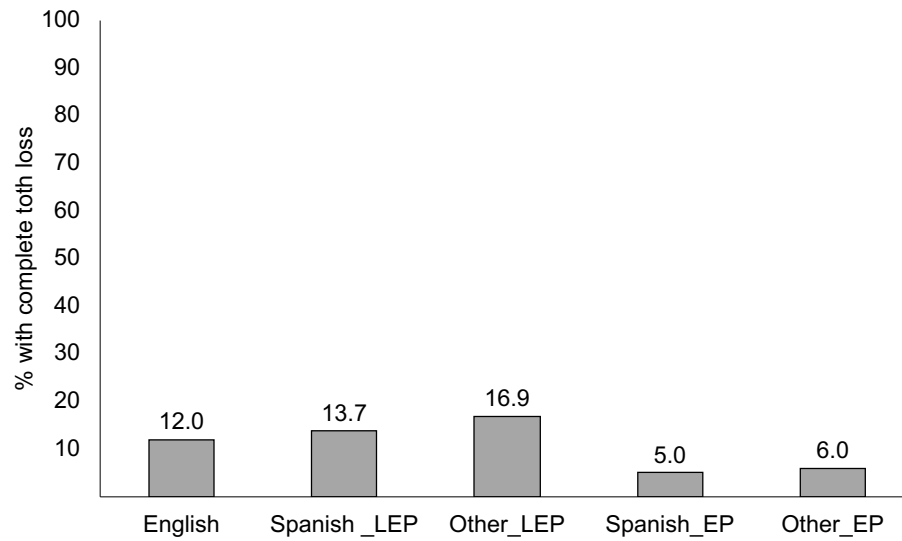
Table 2. Characteristics of adults ≥ 50 years of age with and without complete tooth loss in the United States, stratified by English language proficiency (2017)

Proficiency	English only		Spanish LEP		Other LEP		Spanish EP		Other EP	
Complete Tooth loss	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Unweighted n	1,110	6,793	119	730	26	171	63	871	35	534
Weighted N	98,076,222	92,403,130	4,979,340	4,017,041	2,707,866	1,711,998	3,043,552	7,452,226	3,088,310	6,299,705
Women	47.7	45.9	40.5	41.5	60.9	51.4	29.6	55.4	47.1	46.7
Mean age (years±SD)	69.7±0.4	64.2±0.2	72.8±0.6	61.3±0.3	74.4±0.0	66.0±0.8	67.8±0.6	60.6±0.4	65.9±0.2	62.0±0.4
Race/Ethnicity:										
Non-Hispanic Asian	0.2	1.1	0	0	83.2	78.9	2.6	0.7	43.1	43.6
Non-Hispanic Black	13.9	11.4	0	0.2	0	8.5	2.3	3.0	4.1	9.9
Hispanic	1.8	2.7	95.9	98.9	0	79.4	76.6	2.0	0	11.2
Non-Hispanic Multiracial	3.4	2.6	0	0	0	0.7	3.4	0.9	6.7	2.2
Non-Hispanic White	80.6	82.2	4.1	0.9	16.8	10.5	15.0	16.1	46.2	42.3
Marital status:										
Married	45.6	60.9	45.8	64.6	80.6	73.0	49.6	60.8	42.0	75.0
Divorced, widowed, separated	48.1	31.5	37.7	24.8	19.4	22.2	42.7	30.0	44.9	19.3
Never Married	6.3	7.5	16.5	4.8	0	4.8	7.7	9.3	13.0	5.7
Education:										
No degree	24.6	5.6	72.5	62.7	47.2	36.2	34.8	16.7	19.0	6.3

High School Diploma/GED	57.3	48.2	21.3	25.5	44.4	40.7	44.9	46.7	27.4	29.7
Some College or Beyond	18.2	46.2	6.1	11.7	8.4	23.1	20.3	36.7	53.6	64.0
Years living in US:										
Born in US	97.3	96.1	4.8	5.3	0	2.3	53.6	51.3	40.7	20.4
<15 years	0.1	0.2	18.2	14.1	46.1	29.6	6.7	2.0	18.7	5.3
≥15 Years	2.6	3.7	77.0	80.6	53.9	68.0	39.8	46.7	40.6	74.3
Family income as % of poverty line:										
Poor/Negative	16.8	7.5	28.1	22.2	22.1	22.8	27.2	9.6	9.7	6.7
Near Poor	7.0	3.5	5.8	6.1	12.9	13.7	2.5	5.2	9.3	2.5
Low Income	22.3	10.3	26.4	21.3	11.5	15.9	21.2	13.0	14.5	7.0
Middle Income	29.3	25.5	24.0	35.6	39.4	21.6	26.4	30.5	11.4	24.3
High Income	24.6	53.2	15.7	14.8	14.1	25.9	22.7	41.7	55.1	59.5
Insurance Coverage:										
Private	45.2	73.0	11.9	37.9	3.2	34.0	42.6	62.6	50.8	75.6
Public	51.8	23.8	78.3	40.9	94.0	60.3	55.9	29.3	38.7	20.4
Uninsured	3.0	3.2	9.8	21.2	2.7	5.7	1.5	8.1	10.6	4.0
Dental insurance	15.9	39.8	3.4	21.0	0	16.3	14.6	42.3	28.8	50.6
Dental visit in the last year	15.8	55.3	7.4	21.3	14.7	27.6	18.6	38.1	24.3	49.4
Smoker within last year	18.4	7.6	2.0	4.0	0	5.4	9.6	5.1	1.7	2.7

Table 3. Association between English language proficiency and complete tooth loss among adults aged ≥ 50 years in the United States (2017)

	Spanish, LEP	Other language, LEP	Spanish, EP	Other, EP	English only
% with complete tooth loss	13.7	16.9	5.0	6.0	12.0
Crude odds ratio 95% confidence interval (CI)	1.17 (0.88 – 1.55)	1.49 (0.81 – 2.74)	0.38 (0.27 – 0.54)	0.46 (0.28 – 0.75)	1.0
Partially adjusted OR (95% CI) (age, sex, marital status, smoking status, and dental insurance)	1.23 (0.92-1.63)	1.26 (0.70-2.26)	0.49 (0.35-0.68)	0.62 (0.38-1.02)	1.0
Partially adjusted OR (95% CI) adding **family income**	0.95 (0.71-1.28)	0.94 (0.49-1.79)	0.44 (0.32-0.62)	0.61 (0.36-1.01)	1.0
Partially adjusted OR (95% CI) adding **education**	0.56 (0.42-0.76)	0.80 (0.42-1.53)	0.37 (0.27-0.53)	0.68 (0.40-1.15)	1.0
Partially adjusted OR (95% CI) adding **family income and education**	0.53 (0.39-0.71)	0.72 (0.37-1.39)	0.37 (0.26-0.52)	0.67 (0.39-1.14)	1.0

Our adjusted analyses may provide fuel for additional hypotheses as the data ran counter to our hypotheses.

Figure 2. Percent with dental visit in previous 12 months by English language proficiency and edentulism status among adults aged ≥ 50 years in the United States (2017)
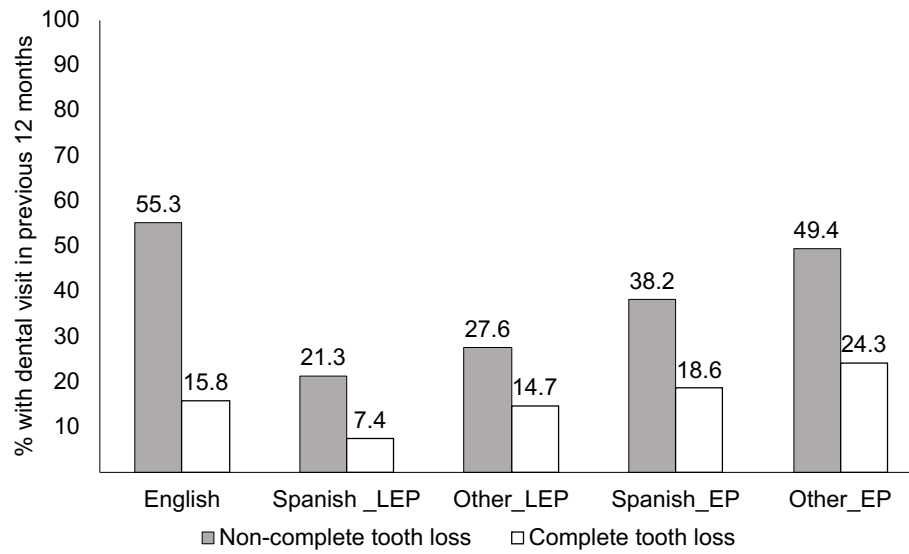
Table 4. Association between English language proficiency and dental visit in past 12 months, stratified by complete tooth loss among adults aged ≥ 50 years in the United States (2017)

	Crude		Partially adjusted (age, sex, marital status, smoking status, dental insurance)		Partially adjusted adding family income		Partially adjusted adding education		Partially adjusted adding family income and education	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI 95% CI*
Among those without complete tooth loss (weighted n=99,161,606)										
Spanish LEP	0.23	1.17-0.29	0.24	0.18-0.32	0.31	0.24-0.41	0.42	0.32-0.55	0.47	0.36-0.62
Other LEP	0.31	0.18-0.52	0.31	0.18-0.54	0.41	0.24-0.70	0.41	0.24-0.73	0.50	0.29-0.86
Spanish EP	0.50	0.41-0.60	0.51	0.42-0.63	0.55	0.43-0.67	0.58	0.48-0.71	0.60	0.49-0.74
Other EP	0.79	0.63-1.00	0.73	0.57-0.94	0.73	0.57-0.94	0.66	0.51-0.87	0.68	0.52-0.88
English only	Referent group									
Among those with complete tooth loss (weighted n=12,733,684)										
Spanish LEP	0.43	0.17 – 1.07	0.49	0.19-1.26	0.50	0.20-1.28	0.66	0.25-1.73	0.66	0.25-1.73
Other LEP	0.92	0.37 – 2.30	1.29	0.51-3.26	1.37	0.53-3.52	1.50	0.58-3.84	1.55	0.61-3.98
Spanish EP	1.22	0.56 – 2.65	1.24	0.56-2.77	1.29	0.57-2.91	1.32	0.60-2.91	1.35	0.61-2.99
Other EP	1.71	0.41 – 7.15	1.33	0.43-4.15	1.22	0.39-3.82	1.11	0.36-3.38	1.06	0.34-3.28
English only	Referent group									