Trends of Edentulism Among Middle-Aged and Older Asian Americans

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As a result of immigration and high fertility rates, Asian Americans are one of the fastest-growing segments of the US population, with an estimated growth rate from 2010 to 2011 of 2.2%, compared with 0.9% for the nation as a whole.[1] However, Asian Americans are not a homogeneous group, but rather consist of a number of distinctly separate groups. Chinese Americans, estimated at 3.8 million in 2010, constitute 23% of Asian Americans, making them the largest ethnic group of Asian origin in the United States. They are followed by Asian Indians and Filipino Americans, who constitute 19% and 17% of the Asian population, respectively. Together, these 3 groups account for 60% of the Asian population in the United States.[2] Most Asian Americans (69%) are immigrants,[3] and they represent distinct cultural beliefs and customs, incomes, levels of education, geographic locations, religions, languages, immigration patterns, and levels of acculturation.

Despite the increasing numbers of Asian Americans from diverse backgrounds and experiences in the United States, very little is known about their oral health. Edentulism, or complete tooth loss, is one of the most important indicators of oral health. Edentulism reflects both the accumulated burden of oral diseases and conditions and the results of dental extraction treatment.[4] Studies suggest that edentulism significantly affects quality of life, self-esteem, and nutritional status.[5–8] According to national data, studies show that Asians have the lowest rate of edentulism among racial/ethnic groups in the United States.[9,10] After adjustment for demographic characteristics and education, the rate of edentulism for Asians aged 50 years and older was 14.22% in 2008, lower than for many of the other racial/ethnic groups in the United States (for Blacks, 19.39%; Native Americans, 23.98%; Whites, 16.90%).[10]

Given the heterogeneity of the Asian population, further research on oral health across

Objectives. We estimated national trends of the prevalence of edentulism (complete tooth loss) for Asian American subgroups in the United States and investigated factors that could contribute to improvements in edentulism across populations over time.

Methods. We used 10 waves of the National Health Interview Survey data collected from 1999 to 2008. Eligible respondents were those aged 50 years and older who completed the question on tooth loss. We contrasted the odds and probabilities of edentulism over time in Chinese, Filipinos, Asian Indians, and other Asians with those in Whites, Blacks, and Hispanics.

Results. The rates of edentulism differed substantially across Asian subgroups. Compared with Whites, Chinese and other Asians had a lower risk of being edentulous, whereas being Filipino increased the odds. The rate for Asian Indians was similar to that for Whites. Nonetheless, rates of decline were similar across the Asian population groups.

Conclusions. Asian Americans are heterogeneous in edentulism. Innovative and sustainable public health programs and services are essential to prevent oral health diseases and conditions. (*Am J Public Health.* 2013;103:e76–e82. doi:10.2105/AJPH.2012.301190)

the subgroups of Asian Americans is warranted. Currently, research on oral health among Asian Americans is sparse. One study found that in New York City, Indian immigrants had a higher number of missing teeth and more periodontal disease than Chinese respondents.[11] Another study conducted among low-income elderly residents in Seattle and Vancouver found that compared with White adults, Chinese immigrants had a higher risk of periodontitis.[12] Although these studies provide useful information on oral health among Asian subgroups, the generalizability of the findings is limited by factors such as small sample size, nonprobability sampling design, and geographic constraints. To date, there are no national estimates of edentulism for Asian subgroups based on a nationally representative sample.

According to several studies, edentulism rates in the United States have declined for adult populations, including Asian Americans.[10,13,14] However, these studies have left unanswered the question of whether this trend is consistent across subgroups of Asian American adult populations and, if not, what factors

contribute to oral health disparities among the subgroups of older Asian Americans.

We examined the trend of edentulism among adults aged 50 years and older in 3 large Asian American ethnic groups (Chinese, Filipinos, and Asian Indians) and other Asians, compared with 3 major racial/ethnic groups in the United States (non-Hispanic Whites, Blacks, and Hispanics). Our objectives were (1) to estimate national trends of the prevalence of edentulism for Asian American subgroups in the United States and (2) to investigate factors that could contribute to improvements in edentulism across populations over time.

METHODS

We used the National Health Interview Survey (NHIS), which is a cross-sectional household interview survey conducted annually. The main objective of the NHIS is to monitor the health of the US population through the collection and analysis of data on a broad range of health topics. The multistage area probability design provides a representative sample of the civilian noninstitutionalized

population residing in the United States at the time of the interviews. We aggregated 10 waves of NHIS data collected from 1999 to 2008. Eligible respondents were those aged 50 years and older who completed the question on tooth loss.

Measures

Dependent variable. To determine edentulism, we used self-reported responses to a question on whether the individual had lost all upper and lower natural teeth. We coded edentulism as 1 and otherwise as 0.

Independent variables. We measured race/ethnicity using dichotomous variables for Asian Indians, Chinese, Filipinos, other Asians, Blacks, Hispanics, and non-Hispanic Whites. Time ranged from 1 to 10 as measured by the number of years of the NHIS data included in the study beginning in 1999.

Covariates. The sociodemographic variables included age measured in years (50–85; age was top coded as 85), gender (1 = female, 0 = male), marital status (1 = married or living with partner, 0 = otherwise), and immigration status (1 = born in the United States, 0 = otherwise). We measured socioeconomic status (SES) by educational level (1 = 1st–11th grade, 2 = high school graduate, 3 = some college, 4 = bachelor's degree, 5 = graduate or professional).

Health status included self-reported medical conditions, functional status, and memory problems. The medical conditions were measured by asking the respondents whether they had been told by a doctor that they had had a heart attack, coronary heart disease, diabetes, hypertension, emphysema, asthma, or chronic bronchitis. For the analyses, we created the variable "lung disease" by combining emphysema, asthma, and chronic bronchitis into 1 medical condition variable. We treated each medical condition as a dichotomous variable. Functional status was measured by reported limitations in activities of daily living and limitations in the ability to complete routine activities, or instrumental activities of daily living. We calculated the activities of daily living scale as the sum (range = 0–6) of 6 self-reported items that asked about needing help eating, dressing, bathing, using the toilet, getting around in the home, and getting in and out of bed. We defined an instrumental activity of daily living, measured by a single item, as

a dichotomous measure of whether respondents needed help with routine needs (1 = needed help with routine needs, 0 = otherwise). We measured memory problems by respondent's report of being limited by difficulty remembering (1 = difficulty remembering, 0 = otherwise). We assessed self-reported smoking status (1 = current smoker, 0 = otherwise). We also included the presence or absence of dental insurance and time of last dental checkup as covariates.

Data Analysis

We used SAS version 9.3 (SAS Institute, Cary, NC) and Stata version 11 (StataCorp LP, College Station, TX) to estimate logistic regression models for the effects of predictors on edentulism, a dichotomous dependent variable. To generate population prevalence estimates, we used a pooled survey weight in all analyses. We adjusted weighting for differential selection probabilities, missing data, and census-based age, race/ethnicity, and gender distributions at each time point. In supplemental analyses, unweighted models controlling for age, race/ethnicity, and gender produced near-identical results. To take sample stratification and clustering into account, we analyzed the data with SAS PROC SURVEYLOGISTIC and Stata SVY: LOGISTIC.

When testing time–race/ethnicity interactions, we centered time at the mean to reduce collinearity. Given our very large sample, and to adjust for multiple contrasts between Asian subgroups and other ethnic groups, we used a P value of .0025 (derived from a Bonferroni correction) to identify significant effects. Missing data were minimal, with missing values on individual items less than 2% and missing data across all items taken together at about 6%. We imputed 5 values for each missing data point using SAS PROC MI. We used SAS PROC MIANALYZE and Stata MI: ESTIMATE to estimate parameters and standard errors based on these multiple imputations.

We performed the following 2 sets of analyses.

Analysis 1: ethnic differences in the odds of edentulism averaged over time. We used a hierarchical block design in multivariate analyses. The first logistic model included time, age, gender, and 6 dummy variables for race/ethnicity. In initial analyses, time squared was significant and added to the model, whereas

race/ethnicity by time product terms were not significant and were excluded. We added education in model 2, marital status, smoking, and chronic conditions in model 3, and dental visits and dental insurance in model 4. Although we present results from model 1 and model 4 only, we used changes in the effects of race/ethnicity at each step in interpreting differences between model 1 and model 4.

Analysis 2: change in probability of edentulism over time. Studies have shown that when the dependent variable is dichotomous, estimates of whether the effect of 1 risk factor varies across levels of another should be assessed on an additive scale (effects on the probability of disease) rather than on a multiplicative scale (effects on the odds of disease).[15-17] After plotting the logistic-predicted probability of edentulism over time separately for each ethnic group, we used methods described by Landerman et al.[18] and Mustillo et al.[19] to test, on an additive scale, whether changes over time in the probability of edentulism varied by race/ethnicity.

RESULTS

Asian Americans exhibited distinct sociodemographic and health attributes compared with White, Black, and Hispanic Americans (Table 1). Compared with White, Black, and Hispanic respondents, a higher proportion of Asians were married, had dental insurance coverage, and had a college degree or above. The majority of Asians were immigrants. The percentage of those who were native born was 1.5%, 6.1%, 22%, and 30% for Asian Indians, Chinese, Filipinos, and other Asians, respectively. Asians had a lower rate of smoking than Whites, Blacks, and Hispanics. Filipinos had the highest rate of hypertension of all ethnic groups except Blacks. Asian Indians had the highest rate of diabetes. Asians (except Filipinos) had a lower rate of lung disease than Whites, Blacks, and Hispanics. The same was the case for the rate of edentulism. Filipinos had a higher rate of edentulism than Whites and Hispanics, but a lower rate than Blacks.

Ethnic Differences in the Odds of Edentulism Averaged Over Time

Model 1 in Table 2 gives the effects of race/ethnicity on the odds of edentulism, controlling for time, age, gender, and whether a

TABLE 1—Characteristics of Aggregate Sample, by Racial/Ethnic Group: National Health Interview Survey, United States, 1999–2008

Characteristics	White[a] (n = 87 088), Mean (SD) or %	Black[b] (n = 15 392), Mean (SD) or %	Hispanic (n = 13 719), Mean (SD) or %	Asian Indian (n = 339), Mean (SD) or %	Chinese (n = 669), Mean (SD) or %	Filipino (n = 709), Mean (SD) or %	Other Asian (n = 1302), Mean (SD) or %
Sociodemographic							
Age, y (range = 50–85)	65.49 (10.77)	63.65 (10.20)	62.85 (9.85)	60.46 (8.25)	64.12 (10.68)	62.79 (9.68)	64.60 (10.64)
Female	57.77	61.44	58.52	38.05	53.06	58.67	59.60
Married[c]	53.56	32.45	50.85	74.26	67.02	61.28	58.71
Educational level							
1st–11th grade	15.45	32.17	50.41	13.90	20.34	10.82	19.51
High school graduate	34.99	32.32	24.85	17.22	22.52	20.78	30.76
Some college	25.33	22.14	15.56	13.29	13.82	26.84	19.83
Bachelor's degree	13.95	7.64	5.73	24.17	25.47	33.33	20.54
Graduate or professional	10.27	5.73	3.44	31.42	17.86	8.23	9.36
Has dental insurance	10.26	7.31	6.52	16.22	14.69	15.18	14.42
Born in the United States	95.24	93.38	40.86	1.47	16.59	21.72	30.19
Health							
Current smoker	16.52	21.03	14.89	6.57	6.06	10.62	11.54
ADL score (range = 0–6)	0.09 (0.58)	0.21 (0.41)	0.41 (0.49)	0.16 (0.37)	0.14 (0.80)	0.10 (0.63)	0.10 (0.69)
IADL: routinely needs help	8.34	12.82	9.44	3.54	7.62	6.06	6.91
Memory problem	4.95	8.44	6.90	2.36	6.59	4.24	5.15
Heart attack	8.14	6.67	6.14	5.31	2.10	5.93	3.84
Coronary heart disease	9.75	8.17	7.48	6.49	7.26	8.33	5.78
Diabetes	12.01	22.07	21.12	25.15	11.57	17.63	12.87
Hypertension	45.54	62.81	45.33	37.46	38.70	50.92	42.53
Lung disease	15.67	15.21	13.45	8.55	7.55	14.55	11.06
Time since last dental checkup							
Never had dental checkup	0.27	0.81	2.20	3.35	2.94	0.58	1.97
> 5 y	17.66	24.47	20.96	9.45	10.82	13.15	12.23
2–5 y	9.41	15.38	14.71	10.67	11.44	11.56	10.97
1–< 2 y	9.10	14.21	13.73	14.94	9.43	11.71	11.44
6 mo–< 1 y	14.07	16.6	16.89	19.82	17.62	18.21	16.73
< 6 mo	49.49	28.54	31.52	41.77	47.76	44.8	46.65
Edentulous	18.85	22.12	16.60	10.71	11.76	20.06	13.20

Note. ADL = activity of daily living; IADL = instrumental activity of daily living.
[a]White, Non-Hispanic.
[b]Black, Non-Hispanic.
[c]"Married" includes respondents who were either married or living with partner.

respondent was born in the United States. The coefficient for time in model 1 indicates that, on average (at the centered mean on time), the odds of edentulism declined by 3% per year. The significant positive coefficient for time squared is evidence of steeper decline in the rate of edentulism at the start of the study, followed by a slower rate of decline.

Blacks, Hispanics, and Filipinos all had increased odds of edentulism compared with Whites, with the largest increase associated with being Filipino, which increased the odds by 58%. Being Chinese lowered the odds of

edentulism by 39%, whereas the other Asians group had a 26% lower odds. The odds for Asian Indians were not significantly different from those for Whites. Additional contrasts (not shown) indicated that the odds of edentulism for Chinese (odds ratio [OR] = 0.61) and other Asians (OR = 0.74) were significantly lower than for Blacks (OR = 1.35) and Hispanics (OR = 1.09), whereas the odds for Asian Indians (OR = 0.72) were significantly lower than for Blacks ($P<.001$). Filipinos had significantly higher odds of edentulism (OR = 1.58) than Asian Indians, Chinese, other Asians,

Whites, and Hispanics, but not Blacks. Older respondents and those born in the United States were at increased risk of edentulism.

In model 4, we included controls for education, marital status, smoking, physical health, dental insurance, and time since last dental visit. Odds of edentulism remained significantly lower for Chinese Americans than for Whites (OR = 0.57), and similar trends were evident for Asian Indians (OR = 0.65) and other Asians (OR = 0.73). With the additional covariates, Blacks and Hispanics had lower rates of edentulism than Whites. We conducted additional analyses using

TABLE 2—Logistic Regression Effects of Race/Ethnicity on Edentulism Among Respondents Older Than 50 Years: National Health Interview Survey, United States, 1999–2008

	Model 1[a]		Model 4[b]	
Variables	OR (99% CI)	P	OR (99% CI)	P
Intercept	0.003 (0.003, 0.004)	< .001	0.075 (0.058, 0.096)	< .001
Time	0.970 (0.959, 0.980)	< .001	0.976 (0.965, 0.987)	< .001
Time square	1.006 (1.003, 1.010)	< .001	1.006 (1.002, 1.010)	< .001
Race/ethnicity				
White (Ref)	1.000		1.000	
Black	1.346 (1.243, 1.457)	< .001	0.751 (0.690, 0.818)	< .001
Hispanic	1.087 (0.974, 1.213)	.049	0.583 (0.508, 0.670)	< .001
Asian Indian	0.720 (0.460, 1.127)	.059	0.645 (0.372, 1.118)	.04
Chinese	0.610 (0.425, 0.876)	< .001	0.569 (0.355, 0.912)	.002
Filipino	1.578 (1.132, 2.200)	< .001	1.775 (1.187, 2.654)	< .001
Other Asian	0.736 (0.551, 0.984)	.007	0.727 (0.533, 0.992)	.008
Born in the US	1.115 (1.011, 1.228)	.004	1.013 (0.893 1.150)	.787
Age	1.062 (1.060, 1.065)	< .001	1.053 (1.050, 1.056)	< .001
Female	1.026 (0.979, 1.075)	.157	1.115 (1.051, 1.182)	< .001
Education			0.748 (0.727, 0.769)	< .001
Married			1.004 (0.946, 1.066)	.866
Health				
Smoker			1.816 (1.678, 1.965)	< .001
ADL			0.997 (0.955, 1.040)	.839
IADL			1.116 (1.005, 1.238)	.007
Memory problem			1.155 (1.026, 1.300)	.002
Heart attack			1.201 (1.079, 1.337)	< .001
Coronary heart disease			1.110 (1.000, 1.233)	.01
Diabetes			1.296 (1.203, 1.396)	< .001
Hypertension			1.100 (1.040, 1.163)	< .001
Lung disease			1.345 (1.249, 1.449)	< .001
Dental insurance			0.824 (0.711, 0.955)	< .001
Last dental checkup			0.511 (0.501, 0.522)	< .001

Note. ADL = activity of daily living; CI = confidence interval; IADL = instrumental activity of daily living; OR = odds ratio. The total sample size was n = 119 442.
[a]Model 1 controls for time, age, gender, and being born in the United States. Models 2 and 3 were intermediate models where education, marital status, smoking, and health were added sequentially to the regression equation.
[b]Model 4 adds controls for dental insurance and dental visits.

Blacks and Hispanics as a reference group (instead of Whites) to contrast the differences between the estimated odds of these 2 groups and Asian Indians, Chinese, and other Asians (data not shown). The results of these comparisons were no longer significant. In these analyses, Filipinos had a significantly higher edentulism rate than all other racial/ethnic groups.

Changes in Probability of Edentulism Over Time

We generated the predicted probabilities of edentulism from a logistic model, with edentulism predicted by time, time squared, age gender, and birth status. The data show a decline between 1999 and 2005 (from 19% in 1999 to 15% in 2005) and a leveling off between 2005 and 2008 (not shown). Overall, the predicted probability of edentulism declined by about 4% over 10 years. For Figure 1 (based on model 1, Table 2), we added race/ethnicity (dummied) to the predictive model, and calculated separate changes in the probability of edentulism by race/ethnicity from the logistic model. In general, the predicted probabilities showed different baseline values by

race/ethnicity but similar patterns of decline, with perhaps slightly less decline among Whites, other Asians, Asian Indians, and Chinese. This impression is confirmed in Table 3, which shows substantial racial/ethnic differences in 1999 and 2008 but a similar rate of decline (between 0.3% and 0.5% per year) in all racial/ethnic groups.

DISCUSSION

Using the NHIS, we found that the edentulism rate for middle-aged and older Asian Americans declined in the period from 1999 to 2008, although the decline was slower in recent years (after 2005). The rates substantially differed across Asian subgroups, and they remained significant after controlling for population heterogeneity (i.e., SES, health behaviors, physical health, function status, and regular dental checkups). Compared with Whites, Chinese and other Asians had a lower risk of being edentulous, whereas Filipinos had a higher risk. For Asian Indians, the rate was similar to that of their White counterparts. Comparing the rate of change in edentulism, our study showed that there was a similar rate of decline for the 4 Asian population groups.

Previous studies have reported that Filipino Americans have a high prevalence of diabetes and hypertension than non-Hispanic Whites.[20–22] The association between these health conditions and oral health may be a product of shared risk factors, such as lifestyle and diet. Some evidence suggests that the Filipino diet may contain relatively greater amounts of fat and cholesterol than that of other Asian Americans because of frequent consumption of fried foods, pastries and other dessert goods, soft drinks, and high-fat snack foods.[23] Specifically, high sugar intake, associated with consumption of fatty foods, may negatively affect oral health among Filipino American adults. For this reason, diet may contribute to the significantly higher rate of both deleterious health conditions and edentulism among Filipino Americans compared with Whites and other racial/ethnic groups.

Cultural beliefs and prior dental experience may also be contributing factors. Findings from one study showed that Filipino parents and younger immigrants associated fear and other
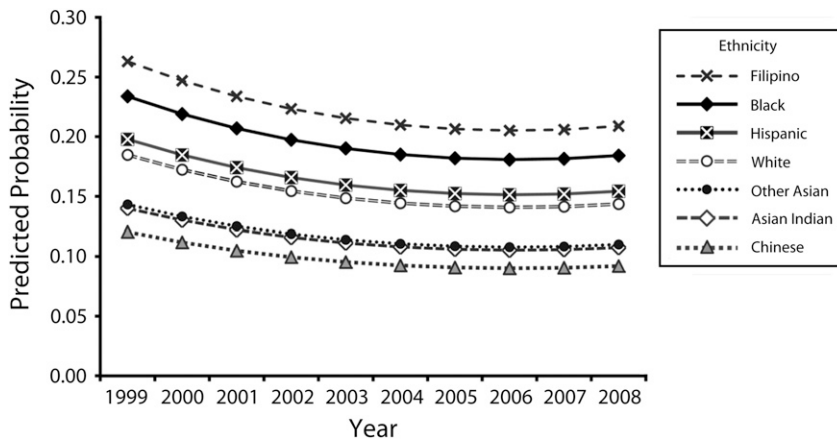
FIGURE 1—Changes in the logistic-predicted probability of edentulism, by racial/ethnic group: National Health Interview Survey, United States, 1999–2008.

negative attributes with dental care, because of previously painful experiences and the routine extraction of teeth for dental problems during visits to the dentist in the Philippines.[24] Although our analyses controlled for dental care use, the higher rate of edentulism among Filipino Americans may derive from a negative cultural attitude toward dental visits and inadequate regular use of preventative dental care for some Filipinos. Given the paucity of research on oral health among Filipinos, further research is warranted to investigate oral health status and its related risk factors in this segment of the population.

Our study found that Chinese Americans had a significantly lower rate of edentulism than did other racial/ethnic groups, including Whites, Hispanics, and Blacks. This finding differs from those of 2 previous studies, which found that Chinese Americans had worse clinical oral health and poorer oral health–related quality of life than Whites.[12,25] These variations could be attributed to the different sampling data collection methods. These previous studies used convenience samples and the data were collected in either Mandarin or Cantonese for Chinese Americans. The Chinese participants had a lower level of income and education than their White counterparts. In our study, we used a nationally representative sample of individuals in the United States; however, only those individuals who spoke English were included in the sample. Thus, the NHIS sample likely excluded many immigrants with low SES, low access to dental care, and poor oral health status since oral health and SES is highly correlated.

Our study found that Asian Indians are more homogenous than Chinese Americans regarding immigrant history and SES. Although Asian Indians had a lower risk of edentulism than Whites, Blacks, and Hispanics, these differences were not significant when population heterogeneity was controlled. Asian Indians were the youngest and had the highest SES (as measured by education, income, and dental coverage). These characteristics are positive factors related to oral health. On the other

hand, 99% of the Asian Indians were immigrants, a higher rate than for other racial/ethnic groups. Immigrants were less likely to become edentulous. Nonetheless, this correlation was no longer significant when SES, health status, and health behaviors were taken into account. The finding suggests that rather than immigrant status alone, the many characteristics associated with being an immigrant affect health status. Immigrants bring with them particular cultural values and attitudes, health behaviors, dietary practices, and biological characteristics that, along with their exposure to environmental and sociopolitical factors, may influence their oral health.

Our study found that edentulism has continued to decline for major Asian American subpopulations and other major racial/ethnic groups in the United States. This finding is consistent with previous studies of edentulism among adult populations collected in earlier time periods (from the 1970s to 2004) and across major racial/ethnic groups in the United States.[9,13,14,26] Our study found that education and dental checkups are negatively associated with edentulism, whereas smoking increases the risk. Previous studies have attributed the declining edentulism rate to the decrease in smoking, increasing years of education, and more regular use of preventive dental care among more recent cohorts.[13,27] Many other factors for which data were not available in this study could also contribute to the decreased edentulism rate, such as the introduction of fluoridation through community water treatment[28] and fluoridated toothpaste and mouth rinse.[29,30] Health practices such as use of dietary supplements and professionally applied or prescribed gel, foam, and varnish may also contribute to improved tooth retention.[28,30,31] Others point to advancements in dental technologies and treatment modalities, changes in patient and provider attitudes and treatment preferences, improved oral hygiene, and regular use of dental services.[7,32]

It is worth noting that in model 1, Blacks and Hispanics had a higher risk of being edentulous than Whites. Blacks and Hispanics were less educated, more likely to smoke and have chronic health problems, and less likely to have had a recent dental visit. After we controlled for lower education, more chronic conditions, and fewer dental visits, Blacks and Hispanics

TABLE 3—Overall Change in the Logistic-Predicted Probability of Edentulism, by Time and Race/Ethnicity: National Health Interview Survey, United States, 1999–2008

Race/Ethnicity	Predicted Probability		
	1999	2008	Change
White	0.185	0.144	−0.041
Black	0.234	0.184	−0.050
Hispanic	0.198	0.154	−0.044
Asian Indian	0.140	0.107	−0.033
Chinese	0.121	0.092	−0.029
Filipino	0.263	0.209	−0.054
Other Asian	0.143	0.110	−0.033

had significantly lower rates of edentulism than did Whites. In addition, when we controlled for these covariates, the rates of edentulism for Blacks and Hispanics became similar to those of Asian subgroups (except for Filipinos, who still had a significantly higher rate of edentulism than other groups). The results suggest that the disparities in edentulism for Blacks and Hispanics, in contrast to the majority of the Asian groups and Whites, can be explained by an individual's SES, health status, and dental care. These findings suggest that interventions to improve oral health should not be limited to improving dental care for minority populations, but that SES, health conditions, and health behaviors should also be improved.

Limitations

There are some limitations inherent in the NHIS survey data. The survey was conducted only in English; individuals who did not speak English were more likely to have lower SES and thus be at higher risk of poor oral health. The sample was drawn from the community-dwelling population, which excluded individuals residing in institutions (e.g., nursing homes or other long-term care facilities). It is likely that many unmeasured factors, such as dietary behaviors, oral health knowledge, cultural beliefs and practices toward oral health, and quality of dental care, play a role in edentulism.[32,33]

Conclusions

There was a downward trend in edentulism rates between 1999 and 2008 for all racial/ethnic groups. The rates of edentulism differed substantially across Asian subgroups. Although the rate of change differed across the Asian subpopulations, the differences were small. Given the increasing numbers of adults retaining their natural teeth—who have a higher risk of dental caries and periodontal diseases—interventions designed to assist individuals in maintaining healthy teeth become more critical. Innovative and sustainable public health programs and services are essential for the prevention of oral disease among elderly populations in general and minority populations in particular. Examples include working with interdisciplinary teams to develop dental care delivery models to meet the diverse needs of older Americans; implementing effective and inexpensive preventive services at clinical and community sites by local outreach to older adults; encouraging stakeholders to participate in creating policies and organizational changes that support healthy behaviors; improving oral health knowledge by launching a national education and awareness program for older adults; and developing new methods and technologies (e.g., nontraditional settings, nondental professionals, new types of dental professionals, and telehealth) to improve access of dental care for older adults.[34–37] ■

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