


RESEARCH ARTICLE

Oral Health Disparities Among Asians in the U.S.: The Role of Household Language

Chengming Han and Nan Zhou 

This study aimed to explore the oral health disparities between Asian Americans and Whites by examining the roles of household language, immigrant status, and socioeconomic status (SES) in access to dental care and their effects on oral health status. Data were drawn from the 2011–2018 National Health and Nutrition Examination Survey (NHANES). All analyses were stratified by Whites, Asians who speak English at home, and Asians who do not speak English at home. Coefficient tests were employed to reveal differences between Asians and Whites. The results suggested that Asians who speak English at home presented higher SES and better oral health status than Whites, whereas Asians who do not speak English at home presented fewer dentist visits, more missing teeth, and lower SES. Higher education and family income played more significantly protective roles in dental care access and oral health status for Whites than for each Asian language group.

Key Words: household language ■ Asians ■ immigrant status ■ SES ■ oral health disparities

Immigrant status is a source of vulnerability.¹ Previous studies examined the associations of being foreign-born, non-United States (US) citizens, and speaking language other than English and barriers to health care and/or worse health status. This article focuses on the role of household language in oral health disparities. A household language other than English means a lack of English proficiency or respondents cannot speak English or respondents are bilingual speakers and their primary language is not English. There are several studies on health outcomes of bilingual respondents. For instance, Schachter and his colleagues² presented that bilingual respondents reported better self-rated health than those who speak English or other languages only. There is seldom research on the effects of bilingual language speaking and other health outcomes.

Studies achieved an agreement that a lack of English proficiency was associated with less access to health care, unmet health care needs and worse health status compared with respondents with fluent English or English as the primary Language.^{1,3,4,5} On the other hand,

however, scholars displayed mixed roles of household language in health outcomes. Flores and his colleagues⁴ reported that proficiency of English is a better measurement than household language because they found significant association between lack of English proficiency, fair/poor health status and unmet health care needs, whereas household language or primary language in household did not play a significant role in oral health outcomes among Hispanic children. Despite the intersections and collinearity of English proficiency and household language in Flores et al.'s article,⁴ scholars presented evidence that non-English household language was also associated with worse health and less access to health care.

Scholars have found that in the United States, children from non-English families are more likely to report limited access to health care. Children in English-speaking households present similar rates of health insurance, access to health care and chronic conditions among different races/ethnicities.⁶ Children from non-English-speaking households are four times more likely

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POPULAR SCIENTIFIC SUMMARY

- Asian Americans who do not speak English at home report lower SES and worse oral health compared to Asian Americans who speak English at home; Furthermore, Asian Americans who speak English at home report higher SES and better oral health compared to both Whites and Asian Americans who do not speak English at home.
- Despite high SES among Asian Americans, college education and high family income show weaker protective effects on oral health and dentist visits for this group compared to Whites.

to lack insurance, have less access to health care and have lower rates of care satisfaction.^{7,8,9} Children from Spanish-speaking families presented poorer health knowledge.¹⁰

When it comes to oral health, evidence showed that people who were born overseas and spoke a language other than English at home were more than twice as likely to have poor oral health.^{11,12,13} In the United States, adult Hispanics from Spanish speaking households were less likely to access health care or preventative care (e.g. dentist visit, flu shot, or pap smear).¹⁴ Hispanic children from English-speaking households presented similar overall health and oral health status as non-Hispanic White children.¹⁵ Scholars have found that children from non-English homes were less likely to receive routine or preventive dental care, make no dentist visits, and presented more early childhood caries.^{16,17} Bramlett and his colleagues also found that children from non-English households were more likely to present fair/poor oral health. When parents' income and education were controlled for, the language-related disparities in dental insurance and access to dental care were particularly significant.¹⁸

The major target population of these studies mainly involved Hispanics who speak Spanish, especially children from Spanish preferred households. Very few studies ever touched the association of household language and health among Asian Americans except Yu and her colleagues,¹⁹ who presented that Asian adolescents who do not speak English at home reported a higher proportion of risky health behaviors. Nothing is known about household language and adults' oral health outcomes and dental care access among Asian Americans.

Asians have been considered to be model citizens or model immigrants since the 1960s.^{20,21} This label has overshadowed the complicated disparities among Asians. Moreover, diversity in language covered the fact that Asians were more likely to report immigrating as adults and a lack of English language environments.²² For

Asians who have stayed in the United States for years, the language discrimination was correlated with chronic health conditions.²³ Researchers have reported that Asians who do not speak English were less likely to access needed health services,²⁴ despite high levels of education and insurance.²⁵

In addition, as the most rapidly growing subpopulation of the United States, Asians have received little attention regarding their oral health disparities. This study aims to explore the effects of household language on oral health disparities among Asians. This study intends to answer three questions about household language and oral health among Asian Americans: first, is there any difference in characteristics in Asian Americans' dental care access, immigrant status, and socioeconomic status (SES) between different language groups? Second, what are the intersectional effects of immigrant status (citizenship and foreign-born status) and household language on oral health outcomes for Asians with different language preference? Third, are there differences of the roles of immigrant status and SES in oral health outcomes between each Asian language group and Whites?

METHODS

Data

Data were drawn from the National Health and Nutrition Examination Surveys (NHANES). NHANES intends to investigate the health and nutritional status of both adults and children across the United States. Asian Americans were included since 2011.* The number of Asian respondents in each wave of NHANES was limited, in order to obtain an adequate sample size, four waves were pooled together in this study: wave 2011–2012, 2013–2014, 2015–2016, and 2017–2018. In each wave, the demographic data, the questionnaire data, and the examination data are included.

Sample

This study restricted the analytical sample in several ways. Firstly, only Whites and Asians were included and the Whites were the reference group. Secondly, only adults older than 20 were included. Thirdly, among all qualified respondents, those whose information included any missing data in dependent variables or independent variables were excluded (see the flow diagram). The final interview sample consisted of 7806 Whites who speak English only at home, 1394 Asians who speak English at home, and 1286 Asians who do not speak English at home.

*Introduction to NHANES is available at https://www.cdc.gov/nchs/nhanes/about_nhanes.htm.

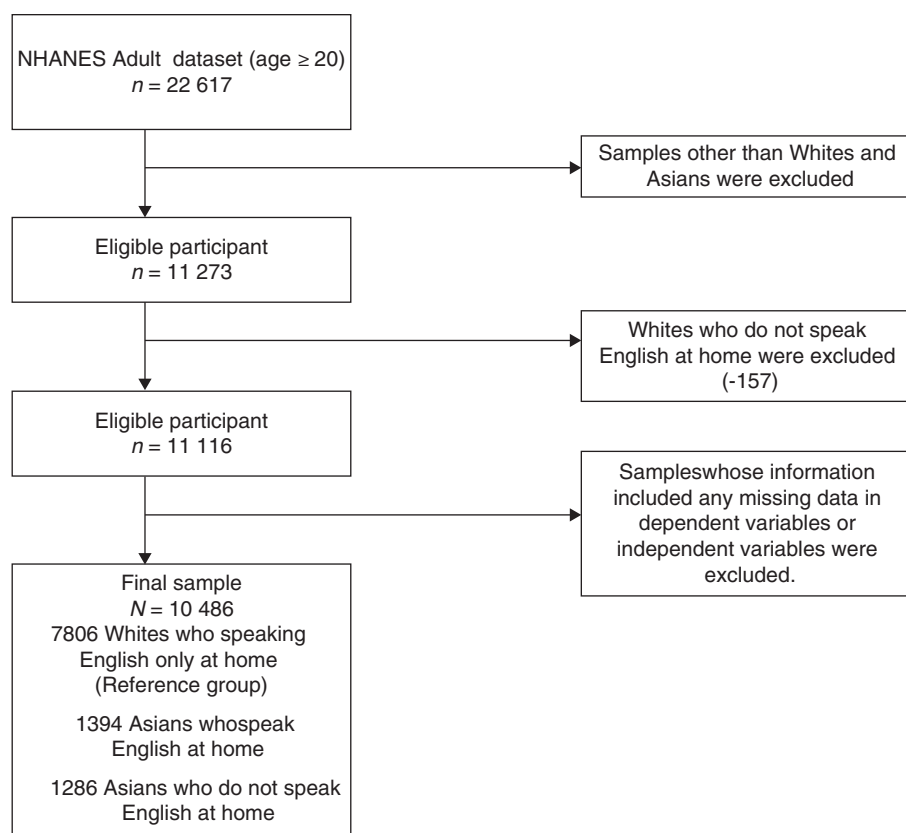


Figure 1. Flow diagram demonstrating the numbers excluded at each step.

Measurements

Dependent variables

Irregular dentist visits. Respondents were asked, ‘when did you last visit a dentist?’ In this study, the responses were recoded as a binary variable: visit a dentist no more than one year ago (0); all other categories are coded as 1.

Number of missing teeth. The information about the number of missing teeth was obtained from the examination datasets of NHANES. If a tooth was completely present, it was coded as 1, otherwise, all decayed or lost teeth were coded as 0. Then, the values of all teeth were added up together except the four third molars. The final number of missing teeth was calculated as 28 minus the number of complete teeth.

Independent variables

Respondents who speak only other languages at home were coded as non-English at home (1) and those who speak some English (less than other language) to those who speak only English at home were coded as English at home (0).

The analysis included three types of independent variables: immigrant status, SES, and demographic characteristics. Other than the household language, immigrant status was measured by citizenship and

foreign-born status. Citizenship status is recoded as non-citizens (1) and citizens (0). Country of birth is coded as foreign born (1) and born in the United States (0).

To capture SES, this article measured education and family income. Education was measured in four ordinal categories: no high school (1), high school (2), some college or AA degree (3), and college graduate or above (4). Family income is collapsed into these 4 groups: \$0–19 999 (1); \$20 000–44 999 (2); \$45 000–74 999 (3); \$75 000–\$ 100 000 and over (4).

Demographic characteristics included marital status, gender and age. Marital status was coded as married or living with partners (0), and single (1, which includes divorced, widowed, and those who never got married). Gender was coded as female (1) and male (0). Age was recoded as three age groups: 20–39 (1), 40–59 (2), and older than 60 (3).

Statistical analysis

The data analyses were performed using the STATA software version 14.0. Three stages were employed to process the analysis. Firstly, the authors reported the percentages, as well as mean and standard deviation (only for the number of missing teeth) of Whites, and Asians stratified by household language: no English at home and English at home. Secondly, the authors applied

multivariate logistic regression models for the irregular dental visits for three groups. Thirdly, multivariate negative binomial regression models were used to estimate the effects of independent variables on the number of missing teeth. The analyses were also stratified by three groups. The sample weight was not applied since analyses focused on the comparison between household English sample and non-English sample. We tested contrasts in odds ratios with equality of coefficients tests ('suest' command in STATA) to determine if differences in effect of immigrant status, SES, or any covariates differed significantly between Asian samples and the White sample. The significant differences were reported in Tables 2 and 3 by bolding the odds ratios.

Ethical approval

The data collection of NHANES was issued by the NCHS Research Ethics Review Board (ERB), who changed the title to NCHS Ethics Review Board in 2018. The NCHS IRB/ERB Protocol Number is 'Protocol #2011-17' for wave 2011-2012, 'Continuation of Protocol #2011-17' for wave 2013-2014 and 2015-2016. For wave 2017-2018 wave, the NCHS IRB/ERB Protocol Number is 'Continuation

of Protocol #2011-17' before October 26, 2017, and 'Protocol #2018-01' after October 26, 2017.

RESULTS

Table 1 presented percentages and means of study variables for Whites and each language sample of Asians. The percentage of irregular dental visits for Whites was 42.36%. The percentage of irregular dentist visits for Asians who speak English at home was 30.63%, which was lower than the percentage of Whites. Asians who do not speak English at home reported 46.66% irregular dentist visits, which was higher than that of Whites. The average number of missing teeth for Whites was 8.23 (standard deviation [SD] = 10.47), which was greater than both Asian groups. The average number of missing teeth of Asians who speak English at home was 5.95 (SD = 9.45), and 7.79 (SD = 10.52) of the non-English speaking Asian sample. Only 0.79% of Whites did not have citizenship. Nearly half of the non-English speaking Asian sample did not have citizenship (49.07%). There are 22.02% of Asians who speak English at home and are not US citizens. A total of 24.49% of Whites were born outside the United States, whereas 73.64% of Asians who do not speak English at home and 61.05% of

Table 1. Descriptive results of Whites and Asians in United States in NHANES 2011-2018 (N = 10486).

Variables	Whites (n = 7806)		Asians who speak English at home (n = 1394)		Asians who do not speak English at home (n = 1286)		P-value
Irregular dentist visits	42.36 ^a		30.63		46.66		0.000 ^d
Number of missing teeth	8.23 ^b	10.47 ^c	5.95	9.45	7.79	10.52	0.000 ^e
Non-citizen	0.79 ^a		22.02		49.07		0.000
Foreign-born	24.49		61.05		73.64		0.000
Education							0.000
No high school	13.41		6.17		24.42		
High school	23.94		9.11		17.34		
Some college	34.71		21.66		17.26		
Bachelor and higher	27.94		63.06		40.98		
Annual family income							0.000
<\$19999	22.91		9.61		18.04		
\$20000-44999	31.13		19.01		27.53		
\$45000-74999	17.78		19.01		21.31		
\$75000+	28.09		52.37		33.13		
Age groups							0.000
20-39	30.82		42.75		32.19		
40-59	29.82		40.24		36.08		
60+	39.36		17.00		31.73		
Female	50.56		53.01		51.24		0.243
Single	39.78		32.14		23.09		0.000

^a percentage

^b mean

^c standard deviation

^d all tested by chi-square except the number of missing teeth

^e tested by analysis of variance (ANOVA).

Asians who speak English at home were born outside of the United States. Education was different among the three samples: 27.94% of Whites had a bachelor degree, 63.06% of Asians who speak English at home and 40.98% Asians who do not speak English at home had a bachelor or higher degree. A total of 13.41% of Whites did not attend high school, compared with 6.17% Asians who speak English at home and 24.42% Asians who do not speak English at home. Asians who speak English at home reported much higher family income than Whites, with 52.37% reporting their family income as above \$75 000. Asians who do not speak English at home reported a slightly higher family income than Whites.

Table 2 displays the effects of social status on irregular dentist visits across three groups. Citizenship did not affect dentist visits for Whites. For both Asian groups, non-citizens were associated with higher odds ratios of irregular dentist visits (Odds Ratio [OR]_{English} = 2.036, OR_{non-English} = 1.691). The coefficient test suggested significantly different protective effects of citizenship between each Asian group and Whites. Foreign born status was associated with higher odds ratios of irregular dentist visits for Whites (OR_{White} = 1.155), but showed no effects on dentist visits for two Asian groups. Educational gradients acted differently across three groups: for Whites, compared with respondents who did not go to high school,

Table 2. Multivariate logistic regression on irregular dentist visits of Whites and Asians in United States in NHANES 2011–2018 (N = 10486).

Variables	Whites (n = 7806)	Asian-English speaking at home (n = 1394)	Asian -non-English speaking at home (n = 1286)
Non-US citizen	0.666^a	2.036***	1.691***^b
	[0.377–1.175]	[1.533–2.704]	[1.320–2.165]
Foreign-born	1.155*	0.889	0.831
	[1.031–1.293]	[0.692–1.141]	[0.638–1.082]
Education (ref = lower than high school)			
High school	0.650***	0.664	0.813
	[0.552–0.764]	[0.370–1.193]	[0.565–1.169]
Some college	0.520***	0.681	0.958
	[0.445–0.607]	[0.406–1.143]	[0.657–1.397]
College and above	0.265***	0.517**	0.516***
	[0.223–0.316]	[0.318–0.840]	[0.371–0.716]
Family annual income (ref: <\$19999)			
\$20 000–44 999	0.745***	0.891	0.893
	[0.654 - 0.849]	[0.575 - 1.382]	[0.629 - 1.268]
\$45 000–74 999	0.492***	0.682	0.789
	[0.421–0.574]	[0.435–1.069]	[0.545–1.142]
\$75 000+	0.243***	0.401***	0.442***
	[0.208–0.285]	[0.263–0.613]	[0.308–0.634]
Age group (ref = 20–39)			
40–59	1.029	0.518***	0.747
	[0.908–1.166]	[0.390–0.688]	[0.552–1.011]
60+	0.603***	0.630**	0.758
	[0.536–0.678]	[0.444–0.895]	[0.546–1.052]
Female	0.677***	0.759*	0.653***
	[0.614–0.747]	[0.596–0.966]	[0.517–0.825]
Single	1.070	0.989	1.463**
	[0.963–1.188]	[0.752–1.301]	[1.099–1.949]
Constant	3.567***	1.852	2.055**
	[2.957–4.302]	[0.955–3.595]	[1.190–3.546]
Log-likelihood	-4728	-791.7	-829.0
Chi-square	1184	134.4	119.1

^a odds ratio and 95% CI in brace

^b bold cells indicated significantly different between Asian and whites.

*p<0.05, **p<0.01, ***p<0.001.

each higher level of education presented protective effects on irregular dentist visits. For both Asian groups, only college degree and higher education reduced the odds of dentist visits. The coefficient test suggested a significant difference between each Asian group and Whites in the effect of college education, which means college education was associated with higher protective effects against irregular dentist visits for Whites than for Asians. Annual family income presented a similar style: compared with respondents with a family income lower

than \$20,000, each higher level income reduced the odds of irregular dentist visits for Whites. For both Asian groups, only those with family income higher than \$75,000 showed protective effects against irregular dentist visits ($OR_{\text{English}} = 0.401$, $OR_{\text{non-English}} = 0.442$). The coefficient test presented significantly higher protective effects of family income at \$75,000 against irregular dentist visits for Whites than for Asians.

Table 3 presented the effects of SES on the number of missing teeth. Citizenship did not show effects on the

Table 3. Multivariate negative binomial regression on the number of missing teeth of Whites and Asians in United States in NHANES 2011–2018 (N = 10486).

Variables	Whites (n = 7806)	Asians (English speaking at home, n = 1394)	Asian (non-English speaking at home, n = 1286)
Non-US citizen	1.362 [0.935–1.984]	1.161 [0.915–1.474]	1.024 [0.857–1.224]
Foreign born	1.061 [0.983–1.146]	1.149 [0.939–1.405]	1.357**b [1.117–1.650]
Education (ref = lower than high school)			
High school	0.723*** [0.647–0.807]	0.624 [0.382–1.021]	1.058 [0.809–1.383]
Some college	0.594*** [0.535–0.660]	0.684 [0.442–1.056]	0.721* [0.546–0.953]
College and above	0.422*** [0.375–0.474]	0.676 [0.449–1.016]	0.657*** [0.515–0.836]
Family annual income (ref: <\$19999)			
\$20,000–44,999	0.814*** [0.743–0.891]	0.869 [0.590–1.279]	0.906 [0.697–1.178]
\$45,000–74,999	0.691*** [0.621–0.770]	0.988 [0.668–1.461]	0.876 [0.664–1.157]
\$75,000+	0.564*** [0.507–0.627]	0.818 [0.566–1.183]	0.746* [0.572–0.973]
Age group (ref = 20–39)			
40–59	1.894*** [1.739–2.063]	1.328* [1.061–1.661]	1.650*** [1.321–2.061]
60+	3.084*** [2.846–3.342]	2.289*** [1.736–3.020]	2.995*** [2.367–3.789]
Female	0.922* [0.863–0.984]	1.188 [0.982–1.438]	1.109 [0.931–1.320]
Single	1.102** [1.026–1.183]	0.892 [0.711–1.120]	1.097 [0.886–1.360]
Constant	1.987*** [1.913–2.064]	6.034*** [3.461–10.52]	4.120*** [2.773–6.121]
Constant	7.684*** [6.787–8.700]	3.020*** [2.762–3.302]	2.221*** [2.027–2.433]
Log-likelihood	-22619	-3583	-3658
Chi-square	1376	56.36	169.5

^a odds ratio and 95% CI in brace

^b bold cells indicated significantly different between Asians and Whites.

*p<0.05, **p<0.01, ***p<0.001.

number of missing teeth. Foreign-born Asians who do not speak English at home were likely to report more missing teeth ($OR_{\text{non-English}} = 1.357$, 95% CI = 1.117–1.650), which is significantly different from the effects of foreign-born status on missing teeth for Whites ($OR_{\text{White}} = 1.061$, $P = 0.076$). Compared with respondents who did not go to high school, college and higher education was associated with fewer missing teeth for Whites ($OR_{\text{White}} = 0.442$, 95% CI = 0.375–0.474). For Asians who do not speak English at home, respondents with some college education and higher education reported fewer missing teeth ($OR_{\text{non-English}} = 0.657$, 95% CI = 0.515–0.836). The coefficient test suggested that the protective effect of high school was more significant for Whites than for Asians who do not speak English at home and a more significantly protective effect of college degree for Whites than for both Asian groups. Asians who do not speak English at home reported fewer missing teeth if their annual family income is \$75 000 and above ($OR_{\text{non-English}} = 0.746$, 95% CI = 0.572–0.973). The coefficient test detected greater protective effects of high family income (> \$75 000) on missing teeth for Whites than for Asians. All social gradients did not show significant effects on the number of missing teeth for Asians who speak English at home.

CONCLUSION AND DISCUSSION

This study presented the impacts of household language on dentist visits and the number of missing teeth across Whites and two language-differentiated samples of Asians. Compared with Whites, being non-US citizen or foreign-born is common among Asians. Moreover, Asians who speak English at home presented the highest percentage of college degrees (63.06%), the highest family income, the lowest risk of irregular dentist visits and fewest missing teeth. In addition, Whites reported the most missing teeth among three groups. It is possible that Whites in the study sample were comparatively older than both Asian groups, whereas Asians who speak English at home are a younger cohort than Whites and Asians who do not speak English at home. On the other hand, Asians who do not speak English at home reported the highest rate of non-citizenship and having less than a high school education, and the highest risk of irregular dentist visits. Despite the fact that Asians who speak English at home presented better oral health outcomes, lower proportion of non-citizens or being foreign-born, and higher levels of education and family income than Asians who do not speak English at home, there is no significant slope difference in the effects of the citizenship, foreign-born status, or SES on dental visits and missing teeth between Asians.

We found that lacking US citizenship was associated with less dental visits for both language groups of Asians.

One possible explanation is that respondents who have no US citizenship were less likely to have access to employer-sponsored health insurance or government coverage.²⁶ However, in terms of the missing teeth reported by Asian Americans, this study did not find a significant difference between non-US citizens and US citizens. Foreign-born Whites reported higher risk of irregular dental visits, where being foreign-born displayed no significant effects on dental visits among Asians. Moreover, foreign-born status did not play a significant role in missing teeth for Whites, but foreign-born Asians who do not speak English at home reported significantly lower risk of irregular dentist visits than their white counterparts.

In addition, although Asians reported higher rates of college degree and family income above \$45 000, college education and higher family income were associated with higher protective effects on irregular dentist visits for Whites than for both Asian groups. The slope test suggested that the protective effect of higher education and household income on missing teeth was also more pronounced among Whites than among Asian Americans.

This article involved three limitations. First, the English-speaking Asian sample included those who speak some English at home and who speak only English at home. It is possible that the difference between non-English and English samples are canceled out because of complex composition in the English sample. Second, it is hard to separate age effects on the number of missing teeth. Asians who were included in NHANES are younger than Whites, especially Asians who speak English at home. Therefore, it is possible that the effects of social gradients changed when people aged. Third, the dental insurance was not available in data, and there are too many missing cases in smoking, alcohol, and employment status. Therefore, the measurement of SES in this study is only limited to education and family income.

NEW CONTRIBUTION TO THE LITERATURE

This study will make three important contributions to the literature. Firstly, this study revealed oral health disparities among Asian Americans using a nationwide database. Previous studies on oral health mainly involved local or clinical databases. NHANES has provided the national wide description of oral health status of Asians in the United States. On the one hand, Asians have been well-known for their high level of education and adequate family income. They were considered as model minorities in the United States in the past decades.^{20,21} This study, on the other hand, has described how household language stratifies Asians' oral health. Compared with those who speak English at home, non-English households presented not only worse oral health outcomes and fewer dentist visits but also higher

proportions of non-citizens and foreign-born status, lower education, and comparatively lower family income.

Secondly, our research design clarified the intersectional effects of household language and citizenship and foreign-born status on dental visits and missing teeth. Asians who are non-US citizens reported fewer dentist visits for both language groups. Foreign-born status was associated with more missing teeth (see Supplementary Table S1), however, the household language clarified that the association of foreign-born status and more missing teeth is true only among those who do not speak English at home.

Thirdly, despite the fact that both Asian groups presented comparatively higher education and family income level, Asians did not benefit for their oral health as much as for Whites, which indicates the effects of minority and immigrant status on oral health outcomes among Asians. Non-citizen Asians were less likely to visit a dentist than Whites, and foreign-born Asians who do not speak English at home presented more missing teeth, despite their high levels of education and family income. In addition, the present article suggested a possibility that the mechanism of oral health or general health disparities among minorities or immigrants may be different from Whites in the United States. Qualitative studies in the future can provide a causal mechanism of how household language stratifies social status, which, in turn, cause health disparities. Moreover, future studies on lifestyles and baseline health status among immigrants can fill up the gap on different roles of social gradients in health outcomes among minorities and immigrants.

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