

Differentiation of self-rated oral health between American non-citizens and citizens

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Background: Oral health disparities exist in the USA. However, little is known of the relationship between oral health disparity and citizenship. The aims of this study were: (i) to describe the differences in self-rated oral health (SROH) between adult American citizens and non-citizens (>20 years of age); and (ii) to test whether factors such as frequency of dentist visits and socio-economic status (SES) are differently associated with SROH in these two groups. **Methods:** The data used in this study were drawn from the National Health and Nutrition Examination Survey conducted in 2011–2012. Weighted logistic regression models were used to detect the strengths of the association between a series of predictors and SROH. **Results:** More non-citizens (59.54%) than their citizen peers (26.24%) rated their oral health as fair/bad. All factors analysed in this study were differently associated with SROH based on citizenship. More specifically, natural characteristics, such as ethnicity and age, were significantly associated with SROH among non-citizens, and SES was significantly associated with American citizens. Among non-citizens, Hispanic, Non-Hispanic Black and Asian subjects were more likely than Non-Hispanic White subjects to report their oral health as being 'good'. Family poverty level, education and the frequency of dentist visits were significantly associated with SROH among citizens. **Conclusion:** The findings of this study indicate that American immigrants report their oral health across most dimensions as being worse than do American citizens. Each explanatory factor may have a different strength of association with SROH in immigrants and citizens, which implies that different steps should be taken within these groups to reduce disparities in oral health.

Key words: Self-rated oral health, citizenship, oral health disparities, logistic regression

INTRODUCTION

Health disparities have existed between non-minority and minority populations in the USA for a long time^{1, 2}, and many factors, such as ethnicity, age, disability and socio-economic status (SES), affect an individual's ability to improve or maintain good health status. Healthy People, a nationwide programme on health promotion and disease prevention, has focussed on reducing and eliminating health disparities over the past two decades³. Healthy People 2020 has aggressive goals toward eliminating disparities and improving the health of the American population³. Oral health disparities, akin to general health disparities, are complex and exist widely in the USA, to some extent because of the very diverse population. The hypothesis here is that disparities exist in oral health among American citizens and non-citizens and that the factors influencing oral health are

different based on citizenship status. The expectation for this study is to provide insight into what policies and infrastructure are needed to improve the oral health of immigrants.

The American immigrant population has increased rapidly since the 1970s and, in particular, the number of immigrants in the USA has doubled from 1990 (19.8 million) to 2012 (40.8 million). On a worldwide basis, about 20% of the total number of immigrants live in the USA and immigrants accounted for 13% of the American population in 2012⁴. Most of these immigrants were from Latin America and Asia⁵. They inevitably face a number of stressors and challenges that accompany resettlement in a new country. These challenges usually include communication barriers, changes in SES, social network disconnection and culture shock, all of which negatively impact their ability to achieve good oral health^{6,7}. Studies indicate that immigrants have encountered health-related challenges

in the USA⁶. For example, immigrant children and adults have high rates of untreated caries^{7–9} probably because of failure to obtain adequate oral health care as a result of economic or cultural barriers^{10–13}.

Among many indicators used in the assessment of oral health status, self-rated oral health (SROH) is a convenient, cost-effective measure which reflects an individual's oral health status and needs¹⁴. SROH data can be obtained easily and quickly at a variety of locations and do not require a clinical assessment. Previous studies have indicated that SROH has a significant association with dental clinical assessment results and reflects oral health problems, such as the status of the dentition and periodontal disease. Therefore, SROH is a very efficient way to evaluate, and should be used for monitoring the oral health status of populations^{15,16}.

MATERIALS AND METHODS

This study combined several data sets from the National Health and Nutrition Examination Survey (NHANES) 2011–2012, which used a well-designed, stratified, multistage probability sample. A total of 9,756 civilian non-institutionalised adults, who were ≥ 20 years of age and had completed an interview at home and examination in a mobile examination centre (MEC), were included. In this survey, an oversample of Asian American subjects was included.

Outcome variables

Responses to the question “how would you rate the health of your teeth and gums?” were categorised as a dichotomous variable, and SROH (as being excellent, very good and good vs. fair and bad), was used as the categorical dependent variable in the regression analyses reported here.

Other health-related variables

Four health-related variables were included in this study: (i) health insurance, which is a binary variable with yes/no responses; (ii) diabetes status, which has three levels (yes, no and borderline); (iii) dental visits, which consist of the response to the question “when did you last visit a dentist: (1) 6 months or less, (2) more than 6 months, but not more than 1 year ago, (3) more than 1 year, but not more than 2 years ago, (4) more than 2 years, but not more than 3 years ago, (5) more than 3 years, but not more than 5 years ago, (6) more than 5 years ago or (7) never have been”; and (iv) four ordinal levels of *Recommendations for Follow up Dental Care*: “(1) see the dentist immediately; (2) see a dentist within the next 2 weeks (3); see a

dentist at your earliest convenience; and (4) continue your regular routine care” (however, only the last three were actually used in this study).

Socio-economic variables

Family Poverty Income Ratio (PIR), adjusted for family size and composition, as well as appropriate year and state, was utilised to indicate the poverty level. The three mutually exclusive categories of PIR that were used are: poor ($PIR < 1$); near poor ($1 \leq PIR < 3$); and non-poor ($PIR \geq 3$). Education reflects how many years of education were received by the participant, and were described as < 12 years, 12 years and > 12 years.

Demographic variables

Four demographic variables – age, gender, race/ethnicity and citizenship – were considered in this study. Citizenship was dichotomised into citizen and non-citizen. Race/ethnicity includes Mexican, Other Hispanic, White, Black, Asian and Other, where Asian was separated, for the first time, from the category “Other” in the 2011–2012 NHANES survey.

Data analysis

Descriptive statistics were used to help identify differences between American citizens and non-citizens. The Rao–Scott chi-square statistic, calculated from the Pearson's chi-square statistic and corrected for the design effects of the proportions, was utilised to evaluate the relationship between oral health-related factors and citizenship. The relationship between citizenship status and SROH was explored by comparing the effects of a set of predictors. As a significant interaction was found between citizenship and ethnicity, two weighted logistic regression models were separately applied to citizens and non-citizens to examine whether the factors have the same association pattern in these two populations. Odds ratios were used to assess the strengths of association between factors and SROH in this study. The C statistic, which is equivalent to the well-known receiver–operating characteristic (ROC), was used to measure the ability of the independent variables to predict SROH using a series of weighted logistic regression models. The values for this measure ranged from 0.5 to 1.0. Models are typically considered reasonable when the C-statistic is > 0.7 ¹⁷. All data analyses were performed using SAS 9.3 (Statistical System Software, Cary, NC, USA), and *proc survey family* procedures were used to accommodate the complexity of the design of the NHANES survey.

RESULTS

Demographic and socio-economic characteristics

Table 1 shows demographic and socio-economic characteristics for both citizenship groups. More than half of the immigrants ranged from 20 to 39 years of age. There were almost equal numbers of female and male subjects among immigrants. Latino immigrants were the major ethnic group, accounting for more than 60% of all immigrants. Approximately 19% of immigrants were from Asia. More than 72% of citizens were Non-Hispanic White. Overall, citizens had a high SES [around 50% were above 300% of the Federal Poverty Level (FPL) and 60% had more than 12 years of education]. In contrast, immigrants were disadvantaged, particularly in terms of poverty (45% were living in poverty) and education (43.73% had less than a high school education).

Health-related factors

Table 2 indicates that there are strong relationships between citizenship and several health-related factors, including health insurance, SROH, frequency of dental visits and dental recommendations ($P < 0.0001$). As seen in Table 2, there are substantial differences in SROH and health insurance between American citizens and immigrants. Approximately 74% of the citizens reported their oral health as “Excellent,” “Very good”

or “Good,” compared with only 40.47% of non-citizens. Just under 84% of citizens had health insurance compared with less than half of immigrants. American citizens were more likely to visit a dentist regularly (48.14% reported that their last visit had been within 6 months) than non-citizens (28.14% reported that their last visit had been within 6 months). Furthermore, 7.3% of immigrants had never visited a dentist. Around 45% of citizens had received recommendations to visit a dentist at their earliest convenience, or within 2 weeks, compared with just over 64% of immigrants.

Results from separate logit models on citizenship

Table 3 indicates that the factors included in this study differently influence SROH in American citizens and non-citizens. There was no statistically significant difference in SROH among different races and age groups of citizens. However, Latino, Black and Asian immigrants were less likely than their White peers to evaluate their oral health as “Fair” or “Bad” (all odds ratios < 0.5). Older immigrants (> 60 years of age) were more likely than young immigrants (20-39 years of age) to report their oral health as being worse (odds ratio = 2.17; 95% confidence interval: 1.22–3.86). Poor or near poor citizens were more likely than their non-poor peers to rate their oral health as being worse. However, poverty level did not significantly differentiate SROH among immigrants. For citizens, individuals with less education were more likely to have worse SROH compared with those

Table 1 Weighted distributions of demographic and socio-economic characteristics according to American citizenship status

Variables	American citizenship		American citizenship		P-value
	Weighted per cent		Real frequency (weighted frequency)		
	Yes (%)	No (%)	Yes	No	
Age (years)					
20–39	34.49	52.67	1515 (69,428,457)	347 (11,358,621)	<0.0001
40–59	38.00	38.10	1440 (76,513,390)	300 (8,215,879)	0.96
60+	27.51	9.22	1522 (55,383,701)	139 (1,989,982)	<0.0001
Gender					
Male	47.66	50.69	2191 (95,941,644)	398 (10,931,233)	0.12
Female	52.34	49.31	2288 (105,383,904)	388 (10,633,248)	0.12
Race					
Mexican American	4.56	35.37	278 (9,186,052)	225 (7,670,683)	<0.0001
Other Hispanic	4.56	24.72	350 (9,187,569)	181 (5,330,093)	<0.0001
Non-Hispanic White	72.33	13.45	1902 (145,610,481)	36 (2,900,459)	<0.0001
Non-Hispanic Black	12.31	5.7	1326 (24,430,714)	69 (1,228,875)	<0.0001
Asian	3.66	19.77	479 (7,366,271)	270 (4,268,120)	<0.0001
Other race	2.75	0.77	144 (5,544,460)	5 (166,251)	<0.0001
Family PIR					
Poor	20.25	45.40	1302 (40,762,079)	346 (9,791,033)	<0.0001
Near poor	33.07	33.31	1617 (66,578,920)	291 (7,184,845)	0.90
Non-poor	46.68	21.28	1560 (93,984,550)	149 (93,984,550)	<0.0001
Education (years)					
<12	13.37	43.73	899 (1,224,625)	341 (544,629)	<0.0001
12	20.46	17.37	977 (1,752,327)	123 (415,745)	0.05
>12	65.81	38.90	2602 (2,985,511)	322 (614,814)	<0.0001

PIR, Poverty Income Ratio.

Table 2 Relationship between health status and citizenship groups

Variables	American citizenship		P-value
	Yes (%)	No (%)	
Health insurance			
Yes	83.77	46.63	<0.0001
No	16.23	53.37	
Self-rated oral status			
Excellent/Very good/Good	73.76	40.47	<0.0001
Fair/Poor	26.24	59.54	
Visit dentist			
6 months or less	48.14	28.14	<0.0001
<1 year but >6 months	14.24	14.61	
<2 years	12.28	13.75	
<3 years	6.07	9.67	
<5 years	6.50	11.85	
>5 years	12.10	14.67	
Never have been	0.67	7.30	
Recommendation			
See a dentist within the next 2 weeks	2.84	5.21	<0.0001
See a dentist at your earliest convenience	42.40	59.14	
Continue your regular routine care	54.76	35.65	
Diabetes			
No	88.47	91.76	0.03
Borderline	2.04	1.13	
Yes	9.49	7.11	

with more education ($P < 0.0001$). Models 3.1 and 3.2 indicate that individuals without health insurance were more likely to self-rate oral health as being worse compared with health insurance holders, regardless of the citizenship status ($P < 0.05$). As presented in Model 3.1, a citizen whose last dental visit was more than 1 year ago was more likely to self-rate their oral health as being worse than were those whose last visit was <1 year ago ($P < 0.001$). After adjusting for other factors, dental recommendations were highly associated with SROH among both citizens and immigrants. The people who were recommended to see a dentist within 2 weeks were approximately seven times more likely to self-rate worse oral health than were individuals who just needed to continue regular routine care. C-statistics indicated that both Model 3.1 (citizens' model) and Model 3.2 (immigrants' model) were adequate for predicting SROH.

DISCUSSION

This study used the national data from NHANES 2011–2012. Asian subjects were separated from Native Hawaiian or other Pacific Islander subjects, which reduced the heterogeneity of the group called "Other" that constitutes the Native Hawaiian or other Pacific Islanders (NHOPI) population. Therefore, this study may be more valuable in understanding the variation in SROH compared with the data collected in NHANES cycles before 2011. This study examined the differentiation of immigrant status in

Table 3 Two binary logit models of self-rated oral health (SROH) for American citizens and non-American citizens

Variables	Model 3.1	Model 3.2
	(Citizenship = Yes)	(Citizenship = No)
Gender		
Reference (Male)	1	1
Female	1.028 (0.84–1.26)	0.96 (0.64–1.44)
Ethnicity		
Reference (Non-Hispanic White)	1	1
Mexican American	1.16 (0.81–1.66)	0.32 (0.11–0.90)*
Other Hispanic	1.32 (0.94–1.84)	0.34 (0.13–0.89)*
Non-Hispanic Black	1.20 (0.97–1.47)	0.05 (0.04–0.20)***
Asian	0.96 (0.70–1.32)	0.17 (0.07–0.44)***
Other race	1.22 (0.71–2.09)	0.24 (0.03–2.0)
Age (years)		
Reference (20–39)	1	1
40–59	1.27 (0.99–1.62)	1.29 (0.84–1.99)
60+	0.96 (0.73–1.25)	2.17 (1.22–3.86)**
Family PIR		
Reference (Non-poor)	1	1
Poor	1.48 (1.12–1.95)**	0.94 (0.48–1.87)
Near poor	1.52 (1.17–1.98)**	1.03 (0.53–2.0)
Education		
Reference (>12)	1	1
<12	2.03 (1.54–2.66)***	1.48 (0.84–2.59)
12	1.55 (1.20–1.99)***	1.3 (0.71–2.38)
Health insurance		
Reference (Yes)	1	1
No	1.42 (1.09–1.86)**	2.09 (1.31–3.33)*
Visit dentist		
Reference (6 months or less)	1	1
<1 year but >6 months	1.34 (0.97–1.84)	1.01 (0.51–2.01)
<2 years	1.80 (1.29–2.52)***	1.01 (0.48–2.12)
<3 years	1.85 (1.21–2.83)**	2.29 (1.15–4.58)*
<5 years	1.84 (1.26–2.69)**	1.57 (0.74–3.27)
>5 years	2.37 (1.74–3.23)***	1.32 (0.66–2.64)
Never have been	2.44 (0.95–6.29)	0.81 (0.33–2.0)
Recommendation		
Reference (Continue regular routine care)	1	1
See a dentist within the next 2 weeks	6.78 (3.68–12.49)***	7.68 (3.11–18.97)***
See a dentist at your earliest convenience	4.37 (3.48–5.48)***	5.15 (3.01–8.81)***
C-statistic	0.757	0.773

Values are given as reference (which has a value of 1), odds ratio (95% confidence interval of the odds ratio) or C-statistic.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

PIR, Poverty Income Ratio

SROH for different SES groups. As expected, American citizens are better educated and have better economic conditions than their non-citizen counterparts. The results demonstrate that SES and oral health access are important factors in accounting for differences in SROH between immigrants and citizens. Around 60% of immigrants reported that their oral

health was fair/bad, and about 64% of immigrants received a recommendation to visit a dentist at their earliest convenience or within 2 weeks, which indicates that immigrant adults were at a significant disadvantage in terms of SROH and dental care as a result of their lower SES status. Previous studies have indicated that non-citizen status inversely affected the ability to access health insurance and health care^{18–20}.

This study examined differential factors of SROH, and the magnitude of the effect size of each factor was calculated. Previous studies have shown many differences between American immigrants and citizens, such as SES and English proficiency^{21–23}. This study further investigated the determinants of SROH in immigrants in order to provide an explanation for the observed discrepancy between immigrants and citizens. Among citizens, race/ethnicity was not found to be statistically significant, which may indicate that minorities and White people have equal access to dental care. But SES and frequency of dental visits were more salient than other factors considered in this study. For immigrants, ethnicity and age were more important factors than the others. The above findings could be essential in helping to identify steps for future interventions to reduce or eliminate oral health disparities^{24,25}. The diversity among ethnicities in term of SES, English proficiency, religion, etc., exist and will not disappear in the short term. Therefore, different emphases should be placed on immigrant groups according to their ethnicity to obtain information on related health issues and access to health care.

Many factors cause immigrants to have less regular dental care and/or a lower quality of life related to oral health. It has been shown that many immigrants have a lower SES. The unemployment rate is higher among immigrants than among citizens and some jobs are only open to citizens. Many immigrants who are or have been employed, were forced to take a low-paying job or to accept a job requiring skills much lower than their training, experience and educational background would command if they were citizens^{1,22,26}. Most immigrants experience a challenge to stay in the US legally or to obtain documents allowing them to work. Beside these issues, they also face many daily life challenges, including barriers to communication, disruption of their social network and some discrimination and prejudice, which makes them more likely to be exposed to a higher level of stress than their citizen counterparts. Negative psychological states, such as stress and hopelessness, have been associated with poor oral health^{27–29}. Therefore, interventions related to psychological problems and social isolation should be intensified for disadvantaged immigrants^{27–29}. After a substantial length of time in the USA, factors associated with oral health should be similar for American citizens and non-citizens, with the disparities gradually shrinking. This point deserves further investigation in the future.

SROH, a complement to the clinical oral examination, is an effective and time-saving approach to estimate or predict the oral health status of large populations. SROH is a subjective measure and may deviate from a clinical assessment to some degree because it reflects an individual's perception and may be affected by physiological and psychological factors. Other factors, such as culture and beliefs, may also have an impact on an individual's ability to estimate their quality of life as it relates to oral health. Recent findings suggest that Latinos have an "epidemiological paradox" in self-reported health. Specifically, Latinos are more likely to self-rate many health measures as higher than their White counterparts — although in fact they have similar rates of good health indicators³⁰. In terms of SROH, they also rate this higher than do Whites, even though they have a lower level of dental care and a higher prevalence of dental disease¹⁴. Their overly optimistic beliefs can be passed on from one generation to the next^{14,30}. On the other hand, Asian people are more likely to avoid reporting extreme ratings compared with their American peers. For instance, Japanese people tend to select midpoints for their emotions. Asian people grow up in a collective cultural environment in which self-criticism is emphasised and personal virtues are understated^{31,32}. Accordingly, individuals in this culture seldom tend to use extreme positive or negative ratings. The above differences suggest that different cultural backgrounds may affect the results of self-rated measures³¹. Despite the aforementioned factors, recent evidence verified that SROH has a significantly positive association with clinical oral health³³. Therefore, SROH is a valuable and cost-effective way to estimate the oral health status of a large population quickly, and can be a part of a routine diagnostic procedure¹⁵. SROH, along with oral health measures, can potentially allot the limited clinical resources to the individuals in high-risk groups and also engage in preventive oral health care.

CONCLUSIONS

Differences in SROH were found based on American citizenship status. The explanatory factors in this study have different strengths of association with SROH based on citizenship status, which implies that different steps should be taken for American citizens and immigrants to improve and reduce disparities in oral health in these groups. Differences in SROH among populations of different race/ethnicity reflect differences in culture and beliefs about health. These findings have important implications for improving the oral health-care infrastructure, and formulating changes in policies that impact oral health care. Further research will be necessary to understand the

complex nature of oral-health disparities among different groups of immigrants.

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Conflict of interest

None.

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