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Health Examination is Not A Priority for Less Acculturated Asian Americans

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Abstract

This study examines the associations between acculturation and three health examination behaviors (physical, dental, and eye exams) among 846 Chinese, Korean, and Vietnamese Americans. The study was part of a randomized, community-based trial on liver cancer prevention that targeted Asian Americans in Washington DC metropolitan area. Acculturation was assessed using Suinn-Lew Asian Self-Identity Acculturation scale (SL-ASIA), acculturation clusters, and length of stay. Health examination behaviors in the last two years were self-reported. Potential confounders such as age, gender, ethnicity, income, marital status, self-rated health status, health insurance, and having a regular physician were adjusted. Increased acculturation was associated with greater receipt of preventive services when acculturation was measured by SL-ASIA and acculturation clusters. Compared to those in the 'Asian' cluster, those in the 'American' cluster and 'Bicultural' clusters were more likely to have physical exams (American: Odds Ratio (OR)=1.83, 95% Confidence Interval (CI): 0.99, 3.88; Bicultural: OR=1.11; 95% CI: 0.72, 1.70); dental exams (American: OR=1.99, 95% CI: 1.09, 3.65; Bicultural: OR=1.83, 95% CI: 1.21, 2.78); and eye exams (American: OR= 4.48, 95% CI: 2.67, 7.66; Bicultural: OR=1.92, 95% CI: 1.31, 2.81). A gradient was observed in these associations with the 'American' cluster having stronger associations than the 'Bicultural' cluster. Interaction was found between acculturation and gender

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COMPLIANCE WITH ETHICAL STANDARDS

Human Subjects

This study involved human subjects. Informed consent was received from all participants. The Institutional Review Boards of the Johns Hopkins School of Public Health and University of Maryland, College Park approved this study.

Conflict of Interest

The authors declare that they have no conflict of interest.

for receipt of a physical exam. Future studies are needed to further explicate how access to health care impacts the association between acculturation and health examinations among Asian Americans.

MeSH Keywords

Asian Americans; Acculturation; Preventive Health Services; Physical Examination; Ophthalmology

INTRODUCTION

Preventive services, including physical, dental, and eye exams, can lead to the early detection of diseases, which enables patients to receive treatment sooner and can help improve morbidity and mortality [1–4]. Focusing on the prevention of disease can help create healthier communities, increase longevity, and reduce healthcare costs [5, 6]. Considering the importance of preventive healthcare, it is concerning that Asian Americans have been found to utilize fewer preventive services than both African Americans and Whites [7]. Previous research examining racial variation in preventive care has found that disparities in the use of these services can in part be explained by acculturation in addition to access to health care [7–9].

Various proxies have been used to measure acculturation including years of U.S. residency, English proficiency, language preference, ethnic identification, and collections of these items among others [10–13]. In general, increased acculturation has been found to be associated with greater utilization of preventive health services including having a physical examination, dental check-up, and eye examination [12, 2, 14]. However, most previous studies examining these health examination behaviors have been among Hispanic Americans. For instance, data from the Hispanic Health and Nutrition Examination Survey (HHANES) showed that preferring to speak English was associated with more recent utilization of the preventive health services, including having a routine physical examination, dental check-up, and vision test, among Mexican Americans [12]. Moreover, the frequencies of receiving a physical, dental, and eye examination have been found to be positively correlated with increased English use in Hispanics [4]. Furthermore, acculturation measures, such as language fluency, have also been found to be important contributors to ethnic disparities in access to health care among Hispanic adults [1].

Few studies have been conducted examining the association between acculturation and these health examination behaviors among Asian Americans and are particularly lacking for eye examination behavior. One previous study examining Hispanic and Asian immigrants, found greater years in the U.S. to be associated with having a physician or dental visit in the last 12 months [10]. Another study examining Korean Americans found insignificant associations between acculturation and having a physical exam when comparing those who lived more than 25% of their lives in the U.S. to those who lived less than 25% of their lives (OR= 1.05, 95% CI: 0.81, 1.38) and when comparing those with good English ability to those with poor ability (OR=0.93, 95% CI: 0.42, 2.05) [15]. Similar results were also found for those who had a physical exam more than 12 months ago. However, this study was limited to only

women in the Los Angeles area. Furthermore, it has been noted that Asian Americans tend to have low priority for preventive care, especially when asymptomatic [16, 17]. It would be interesting to examine changes in the preventive behavior as they acculturate to American culture.

In the present study, we examined and assessed the health examination behaviors of three Asian ethnic groups taking into account acculturation. We included three different types of acculturation measures to incorporate the multi-faceted nature of acculturation and improve interpretation. Chinese, Korean, and Vietnamese Americans in Washington DC metropolitan area were surveyed to determine whether there is an association between acculturation and health examination behaviors, specifically having a physical exam, dental exam, and eye exam in the past two years, after adjusting for the following covariates: age, insurance, having a regular physician, gender, ethnicity, income, marital status, and health status. Given the limited literature pertaining to acculturation and health examination behaviors in Asian Americans, this study will help to elucidate health examination behaviors by ethnic group in regards to acculturation in this population. Findings from the study may help understand low rate of health examination behavior among Asian Americans.

METHODS

Sample

This study was part of the Asian American Liver Cancer Education Program, which consisted of a randomized, community-based trial on liver cancer prevention that targeted Chinese, Korean, and Vietnamese Americans residing in Maryland. Participants were recruited from community-based and faith-based organizations (including churches, temples, and language schools) as well as from Asian grocery markets/restaurants, nail salons, universities, and individual networks. Subjects were eligible for the study if they were self-identified Chinese/Korean/Vietnamese Americans, 18 years of age or older, and had previously never participated in a hepatitis B or liver cancer education program.

This study included a sample of 877 participants, who completed a 51-item questionnaire containing questions on demographic information, general health, acculturation, health care access and utilization, in addition to health examination behaviors. After excluding those who were missing acculturation or health examination information, we achieved an analytic sample of 846 individuals. Within this sample, there were 294 Chinese (34.8%), 285 Korean (33.7%), and 267 Vietnamese Americans (31.6%). The Institutional Review Boards of the Johns Hopkins School of Public Health and University of Maryland, College Park approved this study.

Measures

Acculturation—Multiple measures were used to assess acculturation including a revised version of the Suinn-Lew Asian Self Identity Acculturation (SL-ASIA) scale, acculturation clusters, and length of stay. The revised SL-ASIA scale, developed specifically for Asian immigrants, contained multiple choice questions that incorporated language (what language can you speak, what language do you read, and what language do you prefer), ethnic origin

of contacts (such as of friends/peers up to age 6, friends/peers from ages 6 to 18, and people associated with in the community), music preference, food choice (at home and in restaurants), and self-identity [18]. Each item was measured on a 5-point Likert scale and contained the following response categories: exclusively Asian, somewhat Asian, equal, somewhat American, and exclusively American. Furthermore, the SL-ASIA scale included four additional open ended questions on years of education in the U.S., years of education in their native country (China/Korea/Vietnam), years lived in their native country, and years of residence in the U.S. Using the answers to these open ended questions, we determined the percentages of years lived in the U.S. and years of education in the U.S. A continuous summary score for SL-ASIA was then calculated for each participant by standardizing and then averaging all scale items.

Acculturation clusters were determined using seven of the SL-ASIA items to improve the scale's interpretation. Items included language spoken, language read, language preference, people associated with in the community, music preference, food preference in restaurants, and self-identity. These variables were considered to be critical because they were found to capture more variation in acculturation as compared to the other scale items given that our sample consisted mostly of first generation immigrants (97%). We used a two-step technique to form clusters of those who had similar acculturation patterns. This method consists of creating 'pre-clusters' using hierarchical methods to recommend the number of clusters and then clusters. Partitions were determined using the expectation-maximization algorithm for maximum likelihood, with initial values from agglomerative hierarchical clustering. Models were compared using an approximation to the Bayes Factor based on Schwarz's Bayesian Information Criterion (BIC). Unlike significance tests, this allows for comparison of more than two models at the same time and removes the restriction that the models to be compared be nested [19]. Selection of a similarity measure and the number of clusters were based on the smallest change in BIC values [20]. This resulted in three clusters that characterized participants as being oriented towards an Asian, bicultural, or American culture. More details on these clusters can be found elsewhere [21].

In addition to the SL-ASIA scale and acculturation clusters, we also examined length of stay. Using the information collected from the open ended acculturation question "how many years have you lived in the U.S." and the respondents' current ages, we derived the length of stay in the U.S., categorized as 0–10, 11–20, and 21 years or greater.

Health examinations—Health examination behaviors were self-reported. Participants were asked whether in the last two years they had received any of the following health examinations: a physical exam by a doctor or other health professional, dental exam, and eye exam. All outcomes were coded as dichotomous variables (0=no and 1=yes).

Covariates—Age (continuous), gender, education, annual household income, having health insurance, having a regular physician, marital status, and ethnicity were identified to be significantly associated with acculturation and health examination behaviors and were therefore adjusted in the multivariate logistic regression. Responses to the health care access and utilization questions ("Do you have health care coverage?" and "Is there a physician you see regularly?") were coded as binary variables (yes or no). Marital status was categorized

into married, unmarried (including living with a partner, separated, divorced, remarried, and widowed), and never been married. Annual household income was categorized into five levels (< \$20,000, \$20,000 to \$49,999, \$50,000 to \$74,999, \$75,000 to \$100,000, and \$100,000 or more) with a separate missing category (n=30). Education level was comprised of four categories which included less than high school, high school, some college, and college graduates or higher.

Data analysis

We performed chi-square tests for the categorical covariates (gender, education, household income, having health insurance, having a regular physician, marital status, and ethnicity) and ANOVA for the continuous covariate age to determine whether there were differences based on the acculturation cluster. Adjusting for age, we used multiple logistic regression analysis to assess the relationships between each acculturation variable and health examination separately. Next, we conducted step-wise logistic regression by adding covariates individually into the age-adjusted models. This was performed for each health examination and across all acculturation variables.

To demonstrate how the covariates of interest affect the association between acculturation and each health examination, we performed a series of multiple logistic regressions with each subsequent model building upon the previous one(s). Model 1 is the simplest model and only adjusts for age. Model 2 builds upon Model 1 by adjusting for having health insurance, while Model 3 additionally adjusts for having a regular physician in addition to Model 2. Model 4 adjusts for all of the covariates.

We tested for multicollinearity, but none was found. In addition, we tested for interactions between acculturation variables and the following covariates: ethnicity, gender, health insurance, and having a regular physician and performed stratified analysis when the interaction was significant.

RESULTS

The final sample consisted of 846 participants who were grouped into three acculturation clusters (Asian, bicultural, or American) which were identified by two-step cluster analysis and the BIC criteria. The Asian cluster contained 258 individuals (30.5%), the bicultural cluster consisted of 401 individuals (47.4%), and the American cluster included 187 individuals (22.1%). The sociodemographic characteristics by acculturation clusters are illustrated in Table 1. The characteristics among the clusters differed significantly, with those in the American cluster being younger, having higher annual household income, more likely to be male, Vietnamese, highly educated, and never married as compared to those in the Asian cluster. The percentage of individuals who have health insurance, a regular physician, and good health were also significantly higher in the American cluster than the Asian (82% vs. 48%, 69% vs. 52%, and 87% vs. 38% respectively).

Physical exam

We conducted a series of multiple logistic regression models for each health examination across the three acculturation measures separately. Table 2 shows the models illustrating the

association between acculturation and having had a physical exam in the past two years. Individuals who were more acculturated (had a higher SL-ASIA score and belonged to the American cluster) were more likely to have had a physical exam in the past two years. Using the SL-ASIA summary score, more acculturated individuals were 2.27 times (95% Confidence Interval (CI): 1.62, 3.17) more likely to have a physical exam than less acculturated individuals, adjusting for age. The likelihood was even greater when observing the American cluster, which was 3.64 times (95% CI: 2.21, 5.98) more likely to have had a physical exam in the past two years.

When additionally adjusting for health insurance in Model 2, the estimates decreased in magnitude and significance of association with the bicultural cluster no longer being significant. Having health insurance was strongly associated with having a physical exam. In Model 3, which adds having a regular physician to Model 2, the strength of associations decreased yet again. SL-ASIA (OR=1.40, 95% CI: 0.96, 2.03) became marginally significant, while the American acculturation cluster still showed a strong and significant association with having a physical exam (OR=1.93, 95% CI: 1.11, 3.36). The reduction in the odds ratio was not as great as that from Model 1 to Model 2. Adjusting for all covariates in Model 4 resulted in the American cluster becoming marginally significant (OR=1.83, 95% CI: 0.99–3.38). All other results in Model 4 were similar to those in the previous models. Having health insurance and a regular physician were strongly related to having a physical exam (OR=2.05, 95% CI: 1.37, 3.06, OR=4.26, 95% CI: 2.89, 6.28 respectively).

Dental exam

Table 3 presents the results from the four models for the association between acculturation and having a dental exam in the past two years. The decreasing trend after adjusting for health insurance and having a regular physician was also observed with having a dental exam. After adjusting for only age in Model 1, all acculturation variables were statistically significant. Those who were more acculturated as measured by SL-ASIA (OR= 3.79, 95% CI: 2.63, 5.44) and resided in the U.S. for longer (OR= 1.75 to 2.05, $p<0.05$ respectively) were more likely to have a dental exam as compared to individuals who were less acculturated and had spent less years in the U.S. Similar results were found when comparing the American and Asian clusters (OR= 4.60, 95% CI: 2.77, 7.63). After additionally adjusting for having insurance, a reduction in all other estimates was observed. However, health insurance had a strong association with having a dental exam (OR=3.20, 95% CI: 2.29, 4.49). After adjusting for having a regular physician in Model 3, a less dramatic reduction was observed with length of stay between 11 to 20 years becoming marginally significant. However, having a regular physician had a strong association with having a dental exam (OR=2.13, 95% CI: 1.48, 3.08). When all covariates were adjusted for, SL-ASIA (OR=2.23, 95% CI: 1.48, 3.36) and acculturation clusters (OR=1.83 to 1.99, $p<0.05$ respectively) were associated with a greater likelihood of having had a dental exam in the past two years compared to those with lower SL-ASIA scores and those belonging to the Asian cluster.

Eye exam

Table 4 illustrates the results for the four models on acculturation and eye examination in the past two years. As with the previous health examinations, a similar decreasing trend across models was observed for having an eye exam with the greatest reduction appearing between Models 1 and 2. All acculturation variables were significant in Model 1 when adjusting for only age. Associations were very strong compared to those found for having had a physical or dental exam. After adjusting for having insurance in Model 2, all acculturation variables remained significant from Model 1. Having insurance was strongly associated with having an eye exam (OR=2.20, 95% CI: 1.61, 3.01). After adding having a regular physician in Model 3, length of stay between 11 to 20 years became marginally significant (OR=1.36, 95% CI: 0.97, 1.91). Having a regular physical was strongly associated with having an eye exam (OR=1.57, 95% CI: 1.13, 2.18). In Model 4, where all covariates were adjusted for, SL-ASIA (OR=2.79, 95% CI: 1.91, 4.07) and acculturation clusters (American cluster: OR=4.48, 95% CI: 2.62, 7.66; bicultural cluster: OR=1.92, 95% CI: 1.31, 2.81) remained statistically significant.

We tested for interactions across all acculturation measures and the following covariates: ethnicity, gender, health insurance, and having a regular physician. The only significant interaction identified was between acculturation and gender when examining having had a physical exam. The stratified odds ratios are illustrated in Table 5. As indicated by most acculturation measures, the association between acculturation and having a physical exam was mostly present among women. For instance, women in the American cluster had 4.6 times (95% CI: 1.58, 13.47) the odds of having a physical exam, but an insignificant association was observed among men (OR=1.29, 95% CI: 0.51, 3.21).

DISCUSSION

Preventive services are associated with improved health and help people to be less likely to suffer severe symptoms and emergency treatments, underscoring the importance of early detection of diseases [22, 23]. Preventive health care visits also enable health care providers to counsel patients and to provide health-related information that is not otherwise provided outside of the doctor's office [3, 24, 25]. Moreover, with high health care costs and increased medical expenditures, there is a need for evidence-based clinical preventive services in the U.S. that are cost-saving and deliver substantial health benefits [26, 27, 5].

Few studies have examined behavior for multiple routine health examinations among Asian Americans. In the present study, we examined the associations between three acculturation measures and three health examination behaviors to provide a more comprehensive depiction of this relationship. Overall among the three Asian ethnic groups, greater acculturation was associated with a higher likelihood of having a routine physical exam, dental exam, and eye exam which is similar to findings from previous studies [4, 11, 28, 29]. This was particularly true when we used SL-ASIA or clusters as acculturation measures compared to length of stay. This may be due to the greater comprehensiveness of using SL-ASIA and clusters compared to length of stay which measures only one aspect of acculturation. After adjusting for only age, these associations were found to be the strongest.

However, the associations became weaker when additional covariates, particularly health insurance and having a regular physician, were added to the models.

We found a positive association between acculturation and having a physical exam which is consistent with previous studies among Hispanic and Asian Americans [10, 12]. These previous studies found English preference and proficiency to be associated with receipt of a physical exam [12, 13, 30]. In our study, SL-ASIA, acculturation clusters, and to a lesser degree length of stay were also found to be significantly associated with having a physical exam. After adjusting for all covariates, SL-ASIA was the only factor that had a significant association with having a physical exam (except for the American level for clusters) among the various acculturation proxies. These findings suggest that SL-ASIA may have been the most robust variable in capturing the relationship between acculturation and having a physical exam. A study assessing physical exam behavior in Hispanic and Asian Americans, also found years in the U.S. to be positively linked to visiting a physician [10]. Adding having insurance to Model 2 resulted in large decreases in magnitude for the association between acculturation and physical exam suggesting that healthcare insurance coverage plays a key role in the receipt of physical exams. SL-ASIA for example, illustrated about a 22% decrease once having insurance was added (OR=2.27, 95% CI: 1.62, 3.17 to OR=1.76, 95% CI: 1.23, 2.52). Similarly in a study by Sohn et al., being insured ($p<0.05$) was significantly associated with having a physical exam within the past year [15]. Moreover, findings from the significant interaction between acculturation and gender with physical exam in this study are consistent with the existing literature, which has shown that women are more avid users of preventive services as compared to men [31].

With respect to acculturation and receiving a dental exam, we found similarities as well as some discrepancies between our findings and previous studies which mostly examined Hispanic Americans. One study by Hu et al. found that only about 33% of Spanish only speakers received a dental exam in the past year as compared to about 45% for the bilingual group and 55% for the English speaking group [4]. In another study examining Hispanic Americans, the factors most strongly associated with having had a dental visit for a routine checkup in the last year were sex, education, income, and having health insurance. However in our study, all of these covariates with the exception of income did not have significant associations. We also included health status as an additional covariate and found significantly increased odds of having had a dental exam among those with good health by 54% as compared with those with poor health (OR=1.54, 95% CI: 1.04, 2.27). It may be that individuals who receive preventive services have better health and/or individuals in good health are more health conscious and interested in receiving preventive examinations. In terms of acculturation, we found SL-ASIA and acculturation clusters to have the strongest associations with having a dental exam even after adjusting for covariates.

The association between acculturation and having an eye exam was predominantly examined among Hispanic Americans in the existing literature [4, 12, 13]. One study that included some Asian American participants in a multiethnic sample of individuals with diabetes, found no significant association between receipt of an eye exam and nativity. In our study, SL-ASIA and acculturation clusters had strong positive associations with having an eye exam even after adjusting for potential confounders.

The current study clearly showed that less acculturated Asian Americans were less likely to receive physical, dental, and eye exams. These findings support that health examinations are not a priority for less acculturated Asian Americans. In previous studies conducted by the research team, recent immigrants were found to not receive preventive health services due to a lack of awareness of preventive health care and lack of access to health care [32], including various types of cancer screening [33]. In general, there may not be a strong emphasis on preventive health care in Asian culture, and thus, less acculturated Asian Americans tend to keep these beliefs and practices after immigration [9, 32]. Furthermore, barriers to health care access may amplify the reluctance for preventive care among Asian Americans [34]. More education to raise awareness on the importance of health examinations and preventive care is needed, particularly for less acculturated Asian Americans.

Previous studies found that access to health care factors including having health insurance and a regular doctor were strongly associated with preventive health care services utilization [10, 12, 15, 35]. Similarly, our results showed that those who have health insurance or a regular physician are significantly more likely to have received these health examinations in the last two years. However, acculturation was a strong factor associated with health exams that remained statistically significant even after adjusting for covariates including access to health care.

Our study has several limitations that should be noted. First, we used a non-probability sampling method considering that our population is a hard-to-reach population. Thus, the results produced may not be representative, which may consequently influence the generalizability of our findings. However when we compared our sample to U.S. Census data, we found that our sample closely follows the proportion represented in the Census in terms of age, gender, education, and employment. The majority of our participants were first generation Chinese, Korean, and Vietnamese immigrants in Maryland, which could lead to results that are not applicable to other more acculturated populations. If we had included more acculturated Asian Americans (i.e., second or third generation Asian Americans), variability in acculturation would have been wider and the associations could have been stronger. Second, this study is of a cross-sectional design and therefore cannot be used to deduce causation. No conclusions can be drawn regarding whether the health examination behaviors were a direct result of an individual's level of acculturation. Lastly, participants' health examination behaviors were self-reported, which may result in inaccurate responses. Some participants may mistake other health-related tests to a comprehensive health examination. For instance, receiving vision screening at a primary care office may be mistaken for a complete eye exam [36].

Despite these limitations, this study offers several strengths. For instance, it is one of the first studies to use several acculturation measures when examining the association between acculturation and three different types of health examinations. Furthermore, this study also examines these associations among three different Asian ethnic groups: Chinese, Korean, and Vietnamese, which provides contribution to the field considering that research examining Asian subgroups is sparse [37]. Previous studies examining acculturation and preventive care often excluded Asians and lacked data on Asian ethnic groups [4, 12, 38]. In our study, differences were found among the three ethnic groups for two out of the three

exams: physical exam and eye exam with Vietnamese Americans being more likely to receive both examinations as compared to Korean Americans. These ethnic differences illustrate the need to promote and encourage the receipt of preventive services, especially among Korean Americans. Using a series of regression models, we observed a strong confounding effect on these associations by health care factors, including having a regular source of care and having insurance. However, acculturation remained a strong factor associated with health exams even after adjusting covariates including health care access. With introduction of the Affordable Care Act, it will be informative to compare our results with future studies. Findings from this study also support the need for educating Asian Americans on the importance of preventive care, especially those who are less acculturated.

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Table 1

Participants characteristics by acculturation clusters, n=846

	Total	Acculturation clusters				p-value ^d			
		n=846	Asian n=258	Bicultural n=401	American n=187				
Age (mean, SE)	45.0	13.4	52.4	12.7	43.8	12.3	37.3	11.6	<.0001
Gender (n, %)									0.0004
Male	354	41.8	87	33.7	169	42.1	98	52.4	
Female	492	58.2	171	66.3	232	57.9	89	47.6	
Ethnicity (n, %)									<.0001
Korean	285	33.7	87	33.7	155	38.7	43	23.0	
Chinese	294	34.8	83	32.2	155	38.7	56	29.9	
Vietnamese	267	31.6	88	34.1	91	22.7	88	47.1	
Education (n, %)									<.0001
Less than high school	111	13.1	81	31.4	27	6.7	3	1.6	
High school	173	20.4	84	32.6	72	18.0	17	9.1	
Some college	107	12.6	20	7.8	48	12.0	39	20.9	
College Graduates or higher	455	53.8	73	28.3	254	63.3	128	68.4	
Annual household income (n, %)									<.0001
Missing	30	3.5	14	5.4	11	2.7	5	2.7	
Less than \$20,000	200	23.6	111	43.0	70	17.5	19	10.2	
\$20,000 to \$49,999	254	30.0	85	32.9	131	32.7	38	20.3	
\$50,000 to \$74,999	110	13.0	19	7.4	52	13.0	39	20.9	
\$75,000 to \$99,000	96	11.3	18	7.0	50	12.5	28	15.0	
\$100,000 or more	156	18.4	11	4.3	87	21.7	58	31.0	
Marital status (n, %)									<.0001
Married	647	76.5	215	83.3	321	80.0	111	59.4	
Unmarried	70	8.3	32	12.4	27	6.7	11	5.9	
Never been married	129	15.2	11	4.3	53	13.2	65	34.8	
Health insurance (n, %)									<.0001
Yes	564	66.7	123	47.7	288	71.8	153	81.8	
No	282	33.3	135	52.3	113	28.2	34	18.2	

	Total n=846	Acculturation clusters			p-value ^a
		Asian n=258	Bicultural n=401	American n=187	
Having regular physician (n, %)					
Yes	498 58.9	135 52.3	234 58.4	129 69.0	0.0019
No	348 41.1	123 47.7	167 41.6	58 31.0	
Health status (n, %)					
Good	525 62.1	97 37.6	266 66.3	162 86.6	<.0001
Poor	321 37.9	161 62.4	135 33.7	25 13.4	
Physical exam (n, %)					
Yes	594 70.2	171 66.3	273 68.1	150 80.2	0.002
No	252 29.8	87 33.7	128 31.9	37 19.8	
Dental exam (n, %)					
Yes	626 74.0	158 61.2	314 78.3	154 82.4	<.001
No	220 26.0	100 38.8	87 21.7	33 17.7	
Eye exam (n, %)					
Yes	481 56.9	110 42.6	226 56.4	145 77.5	<.001
No	365 43.1	148 57.4	175 43.6	42 22.5	

^a p-values from chi-square tests or ANOVA.

Table 2

The association between acculturation and physical exam

Physical exam	Model 1		Model 2		Model 3		Model 4	
	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a
SL-ASIA	2.27	(1.62–3.17)	1.76	(1.23–2.52)	1.40	(0.96–2.03)	1.50	(0.99–2.28)
American	3.64	(2.21–5.98)	2.29	(1.34–3.9)	1.93	(1.11–3.36)	1.83	(0.99–3.38)
Clusters	1.49	(1.04–2.13)	1.03	(0.7–1.52)	1.01	(0.67–1.52)	1.11	(0.72–1.70)
Asian	REF	REF	REF	REF	REF	REF	REF	REF
21+	1.21	(0.82–1.78)	0.95	(0.63–1.44)	0.63	(0.4–0.99)	0.57	(0.35–0.93)
Length of Stay	1.47	(1.04–2.08)	1.18	(0.82–1.71)	0.80	(0.53–1.19)	0.68	(0.44–1.04)
11–20	REF	REF	REF	REF	REF	REF	REF	REF
0–10	1.04	(1.02–1.05)	1.04	(1.03–1.05)	1.03	(1.01–1.04)	1.03	(1.01–1.04)
Age^b								
Insurance^b (yes vs. no)			4.50	(3.21–6.30)	2.52	(1.73–3.66)	2.05	(1.37–3.06)
Regular Physician^b (yes vs. no)					4.28	(2.98–6.16)	4.26	(2.89–6.28)
Gender^b (Female vs. male)							1.49	(1.04–2.14)
Ethnicity^b							1.57	(1.00–2.45)
Chinese							1.8	(1.15–2.81)
Vietnamese							REF	REF
Korean							0.58	(0.23–1.46)
Missing							0.89	(0.46–1.73)
Income^b							1.00	(0.49–2.03)
More than \$100,000							1.00	(0.52–1.91)
\$75,000–\$99,999							0.59	(0.36–0.96)
\$50,000–\$74,999							REF	REF
\$20,000–\$49,999							1.07	(0.61–1.89)
Less than \$19,999							1.22	(0.51–2.93)
Marital status^b							REF	REF
Married							1.25	(0.83–1.86)
Unmarried								
Never been married								
Health status^b (good vs. poor)								

^a Likelihood of having had a physical exam in the past 2 years as calculated by OR odds ratio (95 % confidence intervals) in different logistic regression models. Each acculturation variable was run separately with covariates.

$\hat{\eta}$ Estimates based on the model using cluster as acculturation measure

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Table 3

The association between acculturation and dental exam

Dental exam	Model 1		Model 2		Model 3		Model 4	
	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a
SL-ASIA	3.79	(2.63–5.44)	3.15	(2.16–4.59)	2.86	(1.95–4.17)	2.23	(1.48–3.36)
American	4.6	(2.77–7.63)	3.22	(1.89–5.47)	2.97	(1.74–5.07)	1.99	(1.09–3.65)
Clusters	2.96	(2.04–4.30)	2.34	(1.58–3.45)	2.37	(1.59–3.53)	1.83	(1.21–2.78)
Asian	REF	REF	REF	REF	REF	REF	REF	REF
21+	1.75	(1.16–2.62)	1.44	(0.94–2.18)	1.23	(0.80–1.89)	1.06	(0.66–1.69)
Length of Stay	2.05	(1.42–2.95)	1.71	(1.17–2.51)	1.47	(0.99–2.18)	1.31	(0.87–1.98)
11–20	REF	REF	REF	REF	REF	REF	REF	REF
0–10	1.03	(1.02–1.04)	1.03	(1.02–1.04)	1.02	(1.01–1.04)	1.03	(1.01–1.05)
Age^b								
Insurance ^b (yes vs. no)	3.20	(2.29–4.49)	3.20	(2.29–4.49)	2.30	(1.59–3.35)	1.95	(1.31–2.90)
Regular Physician^b (yes vs. no)					2.13	(1.48–3.08)	1.83	(1.24–2.71)
Gender^b (Female vs. male)							1.26	(0.88–1.80)
Chinese							0.83	(0.53–1.32)
Ethnicity^b							0.83	(0.54–1.29)
Vietnamese							REF	REF
Korean							0.87	(0.38–2.00)
Income^b							5.37	(2.3–12.52)
Missing							1.85	(0.93–3.72)
More than \$100,000							1.32	(0.71–2.44)
\$75,000–\$99,999							1.08	(0.68–1.72)
\$50,000–\$74,999							REF	REF
\$20,000–\$49,999							0.90	(0.52–1.56)
Less than \$19,999							0.77	(0.34–1.74)
Marital status^b							REF	REF
Married							REF	REF
Unmarried							1.54	(1.04–2.27)
Never been married								
Health status^b (good vs. poor)								

^a Likelihood of having had a dental exam in the past 2 years as calculated by OR odds ratio (95 % confidence intervals) in different logistic regression models. Each acculturation variable was run separately with covariates.

β Estimates based on the model using cluster as acculturation measure

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Table 4

The association between acculturation and eye exam

Eye exam	Model 1		Model 2		Model 3		Model 4	
	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a
SL-ASIA	3.58	(2.58–4.97)	3.07	(2.20–4.28)	2.89	(2.07–4.05)	2.79	(1.91–4.07)
American	7.36	(4.56–11.85)	5.81	(3.56–9.48)	5.51	(3.37–9.00)	4.48	(2.62–7.66)
Clusters	2.25	(1.60–3.16)	1.88	(1.32–2.68)	1.87	(1.31–2.67)	1.92	(1.31–2.81)
Asian	REF		REF		REF		REF	
21+	1.94	(1.35–2.78)	1.68	(1.16–2.43)	1.52	(1.04–2.22)	1.31	(0.87–1.98)
Length of Stay	1.73	(1.26–2.38)	1.50	(1.08–2.09)	1.36	(0.97–1.91)	1.14	(0.80–1.63)
11–20	REF		REF		REF		REF	
0–10	1.03	(1.02–1.04)	1.03	(1.02–1.04)	1.02	(1.01–1.04)	1.03	(1.02–1.05)
Age^b								
Insurance ^b (yes vs. no)	2.20	(1.61–3.01)	2.20	(1.61–3.01)	1.79	(1.27–2.53)	1.62	(1.12–2.35)
Regular Physician^b (yes vs. no)	1.57	(1.13–2.18)	1.57	(1.13–2.18)	1.50	(1.05–2.13)	1.50	(1.05–2.13)
Gender^b (Female vs. male)								
Chinese	1.38	(1.01–1.90)	1.38	(1.01–1.90)	1.38	(1.01–1.90)	1.38	(1.01–1.90)
Ethnicity ^b	1.19	(0.80–1.75)	1.19	(0.80–1.75)	1.19	(0.80–1.75)	1.19	(0.80–1.75)
Vietnamese	1.61	(1.09–2.39)	1.61	(1.09–2.39)	1.61	(1.09–2.39)	1.61	(1.09–2.39)
Korean	REF		REF		REF		REF	
Income^b								
Missing	1.52	(0.65–3.52)	1.52	(0.65–3.52)	1.52	(0.65–3.52)	1.52	(0.65–3.52)
More than \$100,000	2.00	(1.13–3.54)	2.00	(1.13–3.54)	2.00	(1.13–3.54)	2.00	(1.13–3.54)
\$75,000–\$99,999	1.30	(0.73–2.34)	1.30	(0.73–2.34)	1.30	(0.73–2.34)	1.30	(0.73–2.34)
\$50,000–\$74,999	1.29	(0.73–2.28)	1.29	(0.73–2.28)	1.29	(0.73–2.28)	1.29	(0.73–2.28)
\$20,000–\$49,999	0.84	(0.54–1.30)	0.84	(0.54–1.30)	0.84	(0.54–1.30)	0.84	(0.54–1.30)
Less than \$19,999	REF		REF		REF		REF	
Marital status^b								
Married	0.50	(0.29–0.84)	0.50	(0.29–0.84)	0.50	(0.29–0.84)	0.50	(0.29–0.84)
Unmarried	0.61	(0.29–1.31)	0.61	(0.29–1.31)	0.61	(0.29–1.31)	0.61	(0.29–1.31)
Never been married	REF		REF		REF		REF	
Health status^b (good vs. poor)	0.91	(0.64–1.29)	0.91	(0.64–1.29)	0.91	(0.64–1.29)	0.91	(0.64–1.29)

^a Likelihood of having had an eye exam in the past 2 years as calculated by OR odds ratio (95 % confidence intervals) in different logistic regression models Each acculturation variable was run separately with covariates.

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Table 5

The association between acculturation and physical exam by gender

Physical exam	Crude n=846		Male n=354		Female n=492	
	OR	(95% CI) ^a	OR	(95% CI) ^a	OR	(95% CI) ^a
SL-ASIA	1.50	(0.99, 2.28)	1.20	(0.62, 2.32)	1.70	(0.96, 3.02)
American	1.83	(0.99, 3.38)	1.29	(0.51, 3.21)	4.62	(1.58, 13.47)
Bicultural	1.11	(0.72, 1.70)	1.41	(0.66, 2.99)	0.90	(0.52, 1.56)
Asian	REF	REF	REF	REF	REF	REF

^a Likelihood of having had a physical exam in the past 2 years as calculated by OR odds ratio (95 % confidence intervals) in different logistic regression models