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Abstract

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Background: Immigrants tend to live in areas with higher co-ethnic density, and the effect of neighborhood ethnic composition could be particularly salient for health. This study explored associations between neighborhood ethnic composition and self-rated health among Asian immigrants.

Methods: We analyzed data collected at baseline from 670 Chinese and Vietnamese immigrants enrolled in a lifestyle intervention trial. Residential addresses were geocoded and combined with neighborhood socio-demographic profiles based on census data. We used generalized linear mixed models to examine neighborhood ethnic composition and self-rated health.

Results: Independent of individual-level factors, living in neighborhoods more densely populated by whites was associated with poor/fair self-rated health. Neighborhood household income and density of participants' own ethnic group were not associated with poor/fair self-rated health.

Discussion: More research is warranted to disentangle reasons why Asian immigrants living in white-concentrated neighborhoods reported poorer self-rated health, including investigating effects of discrimination, relative deprivation, and availability of social resources.

INTRODUCTION

Many immigrants initially choose to settle in urban "enclave" or high co-ethnic communities inhabited by large proportions of people with shared ethnic backgrounds (1). Portes defined ethnic enclaves as "immigrant groups which concentrate in distinct spatial locations and organize a variety of enterprises serving their own ethnic market and/or the general population (2)," and much of his work focusing on experiences of Cuban immigrants has largely attributed living in ethnic enclaves with positive outcomes for immigrants (3,4). Additional studies have found that living in ethnic enclaves could protect individuals from stress due to discrimination (5), foster the creation of community resources such as linguistic support services (6), and support the preservation of cultural identity, including retention of language, traditions and other practices of an immigrant's country of origin (7,8).

While there have been documented benefits of living in ethnic enclaves, the direction of the enclave effect remains mixed. A study of immigrant enclaves on diet and physical activity found heterogeneous effects of living in immigrant enclaves on health behaviors (9). Furthermore, while some studies have found that Asian ethnic neighborhoods foster educational and occupational mobility among residents (10), others have found that Asian immigrants working in ethnic enclaves actually have an earning disadvantage compared to those working in the mainstream economy (11).

Self-rated health is a simple measure of general health that is relatively easy to administer, and is commonly used across state, national, and academic settings. Despite the fact that it is a subjective measure, self-rated health is a demonstrated predictor of a variety of important disease outcomes, from cardiovascular disease to mortality (12-15). Particularly, individuals with poor self-rated health have been found to be more likely to have low quality of life and

subsequent health issues (16,17). While previous studies have elucidated potential individual-level factors that impact health for Asian immigrants residing in ethnic enclaves, to our knowledge, none have explored effects of other neighborhood ethnic (white, Black, Hispanic) compositions. This study aims to expand on previous literature exploring the health effects of ethnic enclaves, by investigating associations between various neighborhood ethnic compositions on self-rated health of Chinese and Vietnamese immigrants.

CONCEPTUAL FRAMEWORK

Figure 1 depicts a working conceptual framework of self-rated health for Asian American immigrants. This is not meant to be a comprehensive model of Asian immigrant health, but rather, it is meant to capture the potential relevance of neighborhood-level factors on self-rated health in this population. To further illustrate that neighborhood-level factors are likely to coincide with individual-level characteristics, we have considered three individual-level domains that are particularly relevant to this group: demographic variables, socioeconomic status, and immigration/acculturation related factors. These domains are meant to capture background variables related to health but are differentially related to one's neighborhood residence.

In our framework, the demographic domain comprises of age, marital status, sex, smoking status, and ethnicity. As people get older, the probability of rating one's health as poorer increases (18,19). Marriage has been found to be beneficial for health (20). There are demonstrated gender differences in self-rated health (15,21). Smokers tend to rate their health as poorer compared to non-smokers (22). Finally, Asian Americans have been found to have lower self-rated health compared to non-Hispanic Whites (23), though this particular study did not evaluate difference between Asian ethnic subgroups. The **socioeconomic domain** includes income and educational attainment. Low income and educational attainment have both been demonstrated to predict poorer self-rated health (24-26). **Immigration and acculturation** each negatively predict self-rated health (16). 75% of the studies reviewed in a systematic review found that, for Asians and Hispanics, being born in the United States (an indicator of higher acculturation), and having limited English proficiency (an indicator of lower acculturation) were both associated with lower self-rated health (27). The link between limited English proficiency and poor self-rated health has been further demonstrated elsewhere (28). Finally, at the neighborhood level, we examine **ethnic composition** and **median household income.** The link between neighborhood economic deprivation and poorer health has been well established (29,30). One study examining effects of enclave residence among Asian American adults in New York found that enclave residents had more positive perceptions of their own health compared to non-enclave residents (31). However, to our knowledge, no published studies have examined the effects of non-Asian neighborhood ethnic compositions on the health of Asian immigrants.

The primary objective of this study is to examine whether there is an association between co-ethnic (shared) neighborhood composition, and other neighborhood ethnic compositions on the self-rated health of Chinese and Vietnamese immigrants residing in California. Guided by our conceptual framework, we hypothesize that the self-rated health of

immigrants will be associated with ethnic composition beyond individual-level and other neighborhood characteristics.

METHODS

Participants and Data Collection

This study analyzed baseline data from 670 Chinese and Vietnamese immigrants enrolled in a lifestyle intervention trial in the San Francisco and Santa Clara counties of Northern California (ClinicalTrials.gov registration: NCT02307734). Details on participants and data collection were identical to a previously published study (32). Between 2015-2017, lay health workers recruited participants in pairs consisting of a male daily smoker and a non-smoking family member living within the same household. Participants completed a telephone survey at baseline in their native language and received $25 for completing the survey. The study protocol and survey instrument were reviewed and approved by the institutional review board at the University of California, San Francisco.

Measures

Our main outcome variable was a dichotomous measure of poor/fair self-rated health. Participants were asked "Would you say that in general your health is: excellent, very good, good, fair or poor?". Our choice to dichotomize self-rated health is consistent with other studies (33,34) and an Institute of Medicine report which suggested tracking the percentage of adults reporting either "poor" or "fair" health as an indicator of health in the United States (35).

Individual-level demographic factors included age, ethnicity, sex, and smoking status. Age was modeled as a continuous variable and was scaled per 10-year increase. Ethnicity was a binary variable, with participants identifying either as Chinese or Vietnamese. Sex and smoking status were combined into one variable (male nonsmokers, male smokers, and female nonsmokers) due to the recruitment criteria requiring all smokers to be male, and family members to be nonsmokers. Socioeconomic factors were household annual income and education. Income was defined as five categories ranging from <$20,000 to $60,000, with one additional category for participants who did not report income. Education was dichotomized at high school completion. Immigration/acculturation factors included English proficiency, and percentage of life lived in the United States. Participants were categorized as having very limited English proficiency if they responded either "not at all" or "poorly" to the question, "Would you say you speak English: fluently like a native speaker, well, so-so, poorly, or not at all".

While investigating neighborhood-level factors was not the primary focus of the parent study, this secondary analysis study leveraged the individual-level residential data that were collected at baseline. These data were coupled with data from the U.S. Census to develop neighborhood measures, enabling a novel analysis of neighborhood-level factors on health. For neighborhood-level factors, we defined 335 neighborhoods based on 2000-feet buffers around household addresses, and used the overlay procedure in Maptitude to create the following neighborhood measures: percentage co-ethnic composition, defined as the

percentage of shared ethnicity (i.e., percentage of Chinese or Vietnamese residents living within the buffer zone for Chinese and Vietnamese participants, respectively); white composition, Hispanic composition, and Black composition; and neighborhood median household income. To facilitate interpretation, the ethnic composition measures were scaled per 10% increase, and median household income per $10,000 increase.

Numerous approaches have been used to define neighborhoods. Some studies define neighborhoods based on administrative boundaries such as census tracts, block groups, or metropolitan statistical areas (36-39). This approach of defining neighborhoods is typically used in studies with larger sample sizes and apply hierarchical modeling or structural equation modeling approaches to investigate neighborhood effects (36,38,39). However, our sample size did not lend itself to applying such an approach to assess neighborhood effects. An alternative approach is to define neighborhood at a smaller geographic scale based on fixed distances around a participant's home location. Studies assessing the role of neighborhood in the tobacco, alcohol, and food environment literature have used buffers of varying sizes, ranging from 500 to >6500 feet radius (40-45). While there is no consensus on the definition of neighborhood, the suitability of each type of approach is guided by the availability of the data, context of the study area, and researcher's belief about the underlying spatial processes that affect the health behavior or outcome in question (40).

We created and compared 1000- and 2000-feet radiuses and found that 2000 feet radius buffers provided more variability to allow for testing of potential associations between neighborhood variables and self-rated health. Given that our participants were sampled from relatively homogeneous neighborhoods, we found limited geographic variation using 1000 feet buffers, and therefore found 2000 feet buffer as a reasonable distance that reflected the different ethnic groups which lived in the neighborhood. Additionally, our participants were recruited from three major counties which differed in population density and geographic size. San Francisco county is a densely populated and smaller geographic county relative the Alameda and Santa Clara counties. Therefore, buffers larger than 2000 feet would be too vast for small and densely populated area like San Francisco whereas smaller buffers would not provide enough variation, especially in large and relatively less densely populated counties like Santa Clara and Alameda counties.

Statistical Analysis

Descriptive statistics were computed for all measures. Generalized estimating equations (GEE) were used to examine associations between individual and neighborhood level covariates and poor/fair self-rated health while accounting for clustering by lay health worker recruitment. We first specified GEE for covariates within each of the three individual-level domains: demographic, socioeconomic, and immigration/acculturation factors. Correlates which attained p<0.10 in these analyses were included in the final multivariable analysis. Statistical analyses were conducted using Stata 15.1 (Stata Corp., College Station, TX, USA).

RESULTS

Table 1 presents participant characteristics. More than half of our participants (53%) reported poor/fair self-rated health. The highest average neighborhood ethnic concentrations were Hispanic (27.2%) and co-ethnic (26.6%), followed by white (19%) and Black (5%). Compared to the ethnic concentration of the San Francisco and Santa Clara counties during the study years (46), the ethnic concentrations of the study participants' neighborhoods tended to have lower percentages of whites.

Table 2 presents multivariable logistic regression models for each individual-level domain ([model 1] demographic, [model 2] socioeconomic, and [model 3] immigration/ acculturation).

Within these domains, we found greater odds of poor/fair self-rated health among participants who were Chinese (Odds Ratio, OR, 1.46, 95% Confidence Interval, CI, 1.08-1.97), older (OR 1.24 per 10 year increase, 95% CI 1.07-1.43), and had very limited English proficiency (OR 2.37, 95% CI 1.67-3.37), and who spend a larger percentage of their life in the United States (OR 1.93 per 1% increase, 95% CI 0.89-4.17).

Figure 2 presents results from the multivariable logistic regression model for self-rated health across all individual and neighborhood level domains. At the individual level, compared to male smokers, male nonsmokers were less likely to report poor/fair self-rated health (OR 0.37, 95% CI 0.16-0.87). Participants who were older (OR 1.18 per 10-year increase, 95% CI 1.02-1.36), and who had very limited English proficiency were more likely to report poor/fair self-rated health (OR 1.96, 95% CI 1.35-2.86).

At the neighborhood level, participants who lived in areas with higher white concentration had increased odds of poor self-rated health (OR 1.23, 95% CI 1.04 – 1.47) – for every 10% increase in the neighborhood's density of whites, participants were 23% more likely to report poor/fair self-rated health. We did not find a statistically significant association between any of the other neighborhood factors and self-rated health.

DISCUSSION

Our study used innovative geospatial methods to explore associations between neighborhood ethnic composition and self-rated health among Chinese and Vietnamese immigrants. In addition to examining effects of co-ethnic composition, our study assessed the potential effects of other neighborhood ethnic compositions (white, Black, Hispanic/Latino) on the health of Chinese and Vietnamese immigrants. Over half of our participants reported poor/ fair self-rated health. Consistent with previous literature, we found increased odds of poor/ fair self-rated health among those who were older, male smokers (compared to male nonsmokers), and who had limited English proficiency. After accounting for individual-level factors and neighborhood economic context, Chinese and Vietnamese immigrants living in neighborhoods with higher concentrations of whites had higher odds of poor/fair self-rated health than counterparts living in areas with lower concentration of whites.

It appears that none of the variables examined in the study could explain the deleterious association between living in areas with higher white concentrations and self-rated health. Based on previous research reporting correlations between ethnic concentration and self-rated health, one speculated explanation of the relationship we observed could be perceived discrimination. Previous studies focusing on African Americans have found positive associations between percentage of whites residing in a neighborhood and experiences of racial discrimination (47,48). Other studies have found that the perception of racial discrimination hinders self-rated health, through mechanisms of decreasing neighborhood social capital (49). It is possible that, as racial minorities living in majority white neighborhoods, Chinese and Vietnamese immigrants could have similar experiences of racial discrimination. Another explanation could be that Chinese and Vietnamese immigrants living in neighborhoods with higher percentages of white residents have poorer self-rated health due to relative deprivation. The relative deprivation theory posits that individuals compare their own experiences and situations with more affluent references (50), in this case, neighbors. Although less affluent individuals living in affluent neighborhoods may benefit from the social capital of the neighborhood (51), the heterogeneity of neighborhood effects remain to be disentangled (52). While these explanatory factors were not measured in this study, our findings suggest the need for more research to examine similar mechanisms through which discrimination experiences may be related to self-rated health of Chinese and Vietnamese immigrants living in white neighborhoods.

Our findings on the association between limited English proficiency and poor/fair self-rated health strengthen the current evidence that linguistically isolated Asian Americans experience greater health vulnerability (53). Potential pathways that explain the association between English proficiency and self-rated health include lower use of consistent health care services (54), poor patient-physician relationships (55), and increased perceptions of discrimination in the health care setting (56). Promising approaches and future steps that promote positive healthcare communications and experiences include utilization of interpreter phone systems (57,58), with professional (versus ad hoc) interpreters raising clinical outcomes of patients with limited English proficiency to that of patients without linguistic barriers (59).

Contrary to previous studies conducted in the United States which found protective effects of ethnic density on health (31,60-62), we did not find statistically significant evidence of an ethnic density effect for Chinese and Vietnamese immigrants. Furthermore, we found no evidence for effects of other neighborhood ethnic concentrations (Hispanic and Black) on self-rated health in our sample. Longitudinal studies investigating causal mechanisms underlying neighborhood socioeconomic status and health found that living in disadvantaged neighborhoods predicts poor self-rated health (63). In contrast, we found no statistically significant association between neighborhood household income and self-rated health. One potential explanation is the way that socioeconomic status is measured. While the previous study used an index comprising six measures of socioeconomic status, we used median neighborhood household income. Future studies examining the neighborhood context of self-rated health for Asian Americans could develop robust measurements for neighborhood socioeconomic status.

Our study has several strengths. Our study investigates self-rated health among two of the most populous Asian immigrant communities in California. Another strength was our data collection approach. We employed bilingual and bicultural staff to conceptualize, recruit, and collect data from all participants. As a result of this unique recruitment process that partnered with established community organizations, our sample substantially consisted of immigrants. Our choice in defining neighborhoods is also novel and distinct from existing approaches which have depended solely on census tract or participant zip codes. By defining neighborhoods based on buffer zones surrounding residential addresses, our approach allowed us to assess neighborhood context at a more granular level. Unlike the approach of defining neighborhoods based on fixed administrative boundaries, buffers account for attributes from multiple census tracts, and therefore can account for exposure from adjacent census tracts.

Finally, in addition to examining individual-level factors associated with self-rated health, our study provides unique insight into the effect of neighborhood ethnic composition, including a variety of different ethnic groups, on the self-rated health of Chinese and Vietnamese immigrants.

There are several directions for future research, which we will describe in the context of our study limitations. First, our findings have limited generalizability, largely due to the non-random sampling of participants recruited based on inclusion/exclusion criteria of a larger lifestyle intervention trial. Additionally, considering the heterogeneity of Asian American populations, caution is needed when applying these findings to specific Asian American subgroups. Specifically, our study is relatively homogeneous with regards to specific racial subgroup, income, and other demographic characteristics. Additionally, participants in our study are considered to have very limited English proficiency, as only a small proportion of our study sample reported fluency. We recommend that future research replicate this study using larger, nationally representative datasets. Of interest would be determining whether these findings are consistent in other states with less populous Asian American presence, or among different Asian American subgroups. Second, we did not have data on several potential confounders, including diagnosed health conditions or health insurance coverage. Third, dichotomizing the self-rated health outcome, although well-justified, might have contributed to the null findings including the co-ethnic concentration and income as predictors. Fourth, our use of cross-sectional data was prohibitive toward causal conclusions. Of relevance for future research could be the investigation of causal mechanisms through which different neighborhood ethnic compositions impact self-rated health. For example, future studies could utilize longitudinal datasets to assess trends in self-rated health due to changes in neighborhood ethnic composition. Additionally, as neighborhood effects could potentially differ based on individual characteristics, this could be an important direction for future research. Both qualitative and quantitative research is needed to further untangle the relationship between neighborhood ethnic composition and self-rated health.

CONCLUSIONS

Overall, we found that both individual and neighborhood level factors were associated with poor/fair self-rated health of Chinese and Vietnamese American immigrants. Results of our

study have important implications. Our findings contribute to the growing body of evidence that Asian Americans with limited English proficiency remain an important target for public health interventions. Additionally, we observed poorer self-rated health among Chinese and Vietnamese immigrant participants living in more white-concentrated neighborhoods, which underscores an urgent need to untangle effects of ethnic composition on Asian immigrant health, particularly with the ongoing gentrification of traditionally immigrant communities. Findings from this study could be of importance for legislators, urban planners, and community organizations that serve immigrant communities, and can be used in efforts to promote the health of Chinese and Vietnamese immigrant communities at the structural level.

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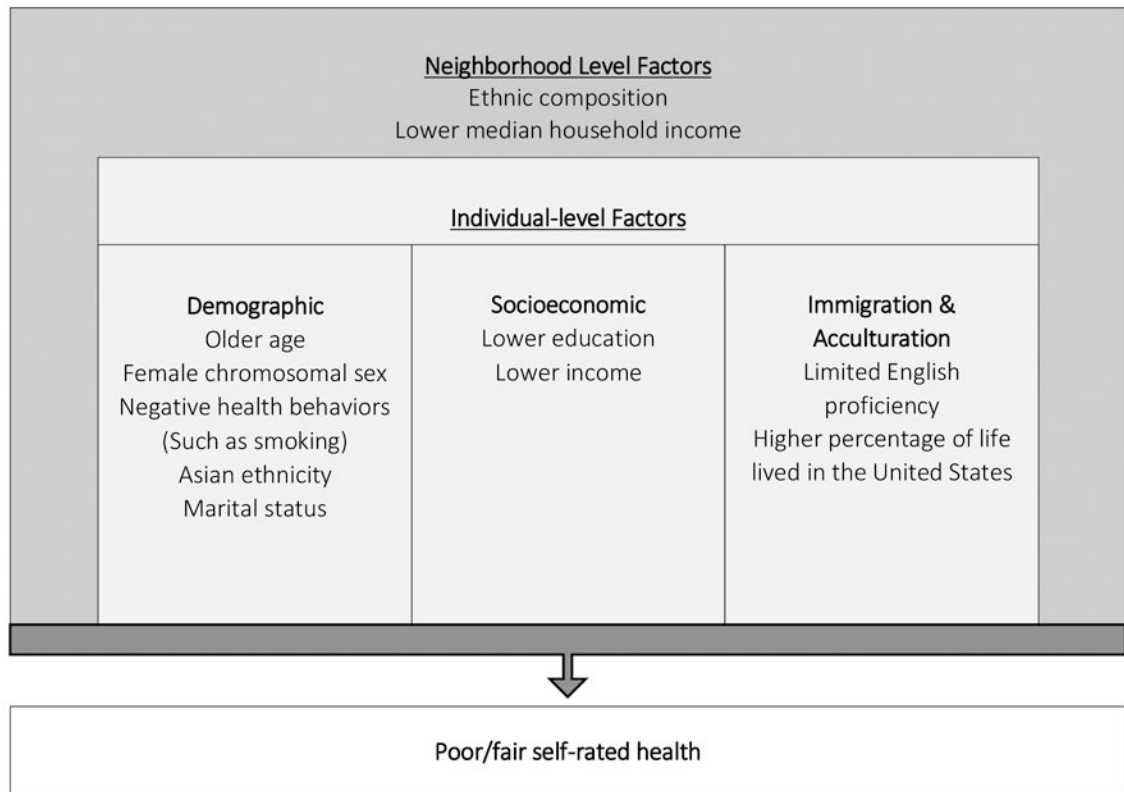
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Figure 1:
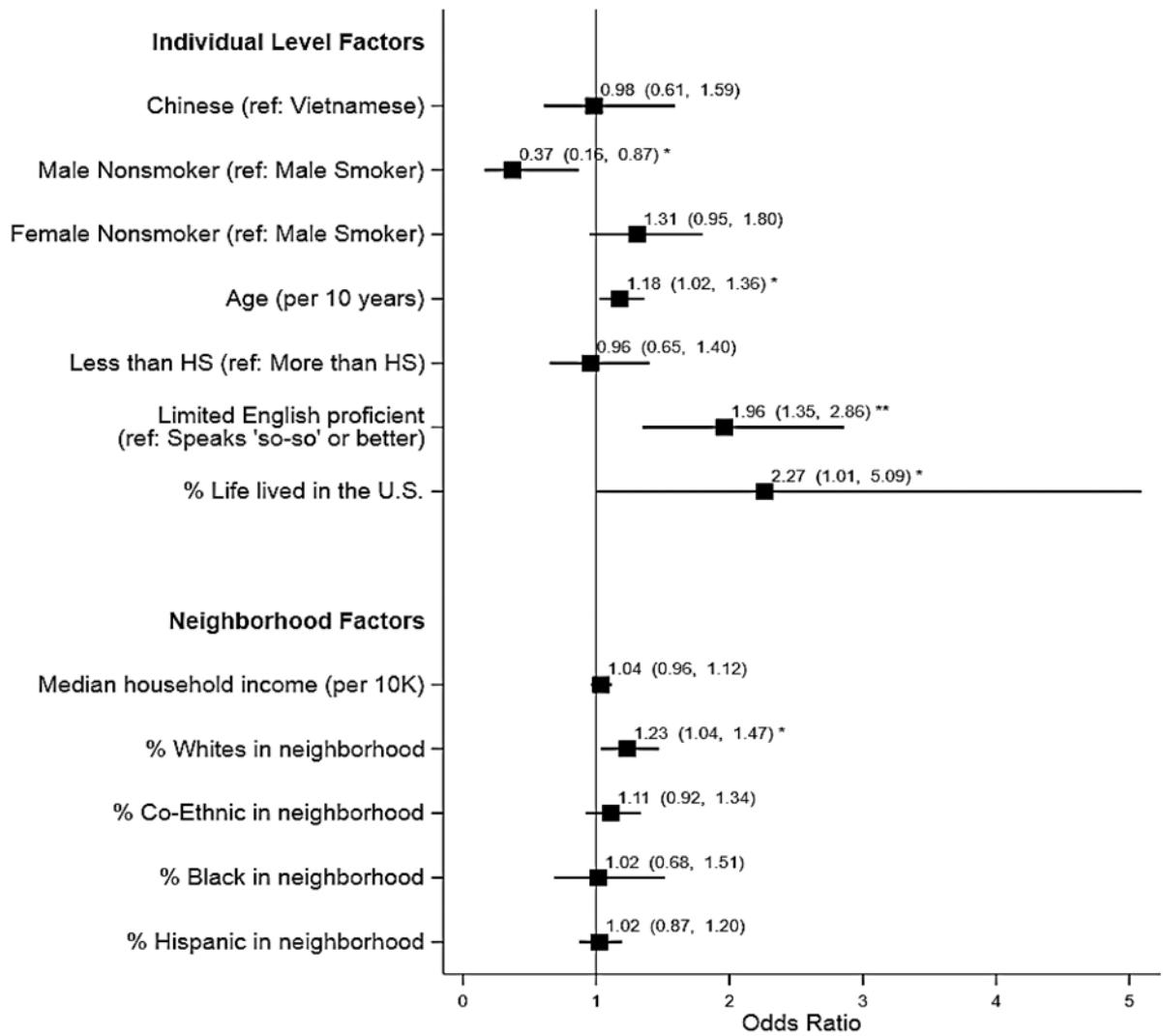Conceptual framework of self-rated health for Asian American immigrants

Figure 2:
Final multivariable logistic regression of poor/fair self-rated health (N=661)
Neighborhood ethnic density variables in the model are scaled per 10% and were measured within a 2000-foot buffer of the participant's residential address.
** p<0.01, * p<0.05

Table 1:

Participant characteristics (N=670)

	N (%)
Poor/fair self-rated health	361 (53.09)
Demographic Characteristics	
Age (mean [SD, range])	52.77 [13.45, 18-90]
Married or living with partner	590 (86.76)
Sex/Smoking Status	
Male nonsmoker	24 (3.53)
Male smoker	340 (50.00)
Female nonsmoker	316 (46.47)
Ethnicity	
Chinese	346 (50.88)
Vietnamese	334 (49.12)
Socioeconomic Factors	
Income (annual)	
Less than $20,000	293 (43.09)
$20,000 to <$40,000	139 (20.44)
$40,000 to <$60,000	100 (14.71)
$60,000 or more	84 (12.35)
Don't know/Refused	64 (9.41)
Less than high school education	283 (41.62)
Immigration and Acculturation Factors	
Very Limited English proficient[a]	490 (72.06)
% Life lived in the U.S. (mean [SD, range])	24.81 [19.94, 0 – 100]
Neighborhood-level characteristics[b]	**Mean [SD, Range]**
% Co-Ethnic in neighborhood	26.56 [16.96, 0.30 – 63.57]
% Whites in neighborhood	19.01 [14.13, 1.45 – 70.33]
% Hispanic in neighborhood	27.18 [17.48, 2.96 – 72.76]
% Black in neighborhood	5.10 [6.53, 0.39 – 53.34]
Median household income	70 [24, 25 – 188]

[a]Spoke English "poorly" or "not at all."

[b]Neighborhood level characteristics were all defined within a 2000-foot buffer surrounding the participant's residential address.

Table 2:

Multivariable logistic regression models of poor self-rated health by each individual-level domain (N=670)

	Odds Ratio	95% CI	p-values
Model 1: Demographic Characteristics			
Age (per 10 years)	**1.24*****	**1.07 - 1.43**	**<0.01**
Married or living with partner Sex/Smoking Status			
Male Smoker (ref)	1.11	0.66 - 1.87	0.69
Male Non-smoker	**0.35***	**0.15 - 0.2**	**0.02**
Female Non-smoker	1.25	0.91 - 1.72	0.16
Chinese (ref: Vietnamese)	**1.46***	**1.08 - 1.97**	**0.01**
Model 2: Socioeconomic Factors			
Income (annual) < $20,000 (ref)			
$20,000 to < $40,000	1.06	0.66 - 1.72	0.80
$40,000 to < $60,000	1.02	0.63 - 1.64	0.95
$60,000 or more	0.76	0.46 - 1.24	0.26
Don't know/Refused	0.72	0.41 - 1.28	0.26
Less than HS Education (ref: more than HS education)	**1.30** †	**0.96 - 1.76**	**0.09**
Model 3: Immigration and Acculturation Factors			
Very Limited English Proficient (ref: speaks English 'so-so,' 'well' or 'fluent')	**2.37*****	**1.67 - 3.37**	**<0.01**
% Life lived in the U.S.	**1.93** †	**0.89 - 4.17**	**0.09**

**
p<0.01

*
p<0.05

†p<0.10