

COMPARISON OF IDEAL CARDIOVASCULAR HEALTH ATTAINMENT AND ACCULTURATION AMONG ASIAN AMERICANS AND LATINOS

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Objective: To determine the association between language and ideal cardiovascular health among Asian Americans and Latinos.

Design/ Study Participants: Cross-sectional study using 2011-2016 National Health and Nutrition Examination Survey of Asian Americans (n=2,009) and Latinos (n=3,906).

Interventions: Participants were classified according to language spoken at home (only/mostly English spoken, both English and native language spoken equally, or mostly/only native language spoken).

Outcomes: Ideal, intermediate and poor cardiovascular health status for smoking, blood pressure, glucose level, and total cholesterol.

Results: The majority of Asian Americans and Latinos had ideal smoking status, but those who only/mostly spoke English were more likely to smoke compared with those who spoke only/mostly spoke their native language. Approximately one third of Asian Americans and Latinos had intermediate (ie, borderline or treated to goal) levels of cardiovascular health for blood pressure, glucose level and total cholesterol. In adjusted models, those who spoke only/mostly their native language were significantly less likely to have poor smoking or hypertension status than those who spoke only/mostly English. Among Latinos, only/mostly Spanish speakers were more likely to have poor/ intermediate glucose levels (PR=1.35, 95% CI =1.21, 1.49) than those who spoke only/ mostly English, becoming statistically non-significant after adjusting for education and income.

Conclusion: We found significant variation in ideal cardiovascular health attainment by language spoken at home in two of the larg-

INTRODUCTION

Asian Americans and Latinos are the fastest growing population segments of the United States (US) population, yet research on the cardiovascular health of these groups has only recently emerged, particularly for Asian Americans.^{1,2} This limited evidence base has been highlighted in two recent reports from the American Heart Association (AHA), serving as a call to action for more research of these vulnerable populations.^{1,3} When studied in aggregate, Hispanics/Latinos (herein Latinos) and Asian Americans experience lower rates of cardiovascular disease (CVD)

mortality as compared with non-Latino Whites (NLWs).² Among Latinos, this phenomenon has been termed the “Latino health paradox,” referring to the observation that Latinos often fare better than their NLW counterparts on mortality outcomes despite lower levels of income, education, and health care access.⁴⁻⁸ Similarly, people of Asian descent are often described as the “model minority” given, on average, their higher educational attainment and health status.⁹

The findings of lower CVD mortality are not consistent among all Asian Americans and Latinos, and subgroup characteristics differ widely.^{10,11} Additionally, accultura-

est immigrant groups in the United States. Findings suggest the need for language and culturally tailored public health and clinical initiatives to reduce cardiovascular risk in diverse populations. *Ethn Dis.* 2019;29(2):287-296; doi:10.18865/ed.29.2.287

Key Words: Cardiovascular Health; Latinos; Asian Americans; Acculturation

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tion, the process by which an immigrant culture adopts beliefs, norms, and practices of a host culture,¹² is associated with differences in CVD risk and outcomes.⁵ Among both Asian Americans and Latinos, acculturation proxies such as foreign-born status, length of stay in the United States, or language are associated with differences in prevalence of CVD risk factors, socioeconomic position and self-rated health.^{6-8,13,14}

Although studies suggest that foreign-born status confers a sur-

We hypothesized that increased English language use would be associated with a higher prevalence of poor cardiovascular health.

vival advantage for many immigrant groups,¹⁵ studies on the effects of acculturation proxies on major CVD risk factors have been inconsistent for both Latino and Asian immigrants.¹⁶⁻¹⁸ This inconsistency may be due to the globalization of obesity and other cardiovascular risk factors (eg, diabetes) in Latin American and Asian countries,¹⁹⁻²¹ which may be influencing immigrant disparities observed in the United States. Moreover, in contrast to research on cardiovascular risk factors, little is known about the association of acculturation proxies with attain-

ment of *ideal* cardiovascular health in contemporary immigrant populations. The AHA has defined ideal cardiovascular health as living free of cardiovascular disease and being in optimal state for seven cardiovascular health factors and behaviors defined as “Life’s Simple 7,” including: blood pressure, body mass index, glucose levels, total cholesterol, diet, physical activity, and smoking. Yang and colleagues demonstrated that meeting all seven of these criteria may prevent 59% of all deaths, 64% of those from CVD, and 63% of those from ischemic heart disease over a 20-year period.²² Select studies have demonstrated very low levels of ideal cardiovascular health attainment, particularly in ethnically diverse populations.²³⁻²⁶

In our present study, we use a large, nationally representative sample of contemporary Asian Americans and Latinos to examine how language spoken at home, as an acculturation proxy, is associated with prevalence of ideal cardiovascular status for smoking, blood pressure, glucose levels, and total cholesterol. We hypothesized that increased English language use would be associated with a higher prevalence of poor cardiovascular health.

METHODS

Study Population

We used the 2011-2016 cycles of the National Health and Nutrition Examination Survey (NHANES). NHANES is a complex, stratified, multistage probability survey design with a random sampling of

the civilian non-institutionalized population conducted by the National Center for Health Statistics.²⁷ Beginning with the 2011-2012 cycle, NHANES oversampled Asian Americans allowing researchers to examine health data for this population group. We restricted our analysis to participants who self-identified as Latino or Asian American.

Study Outcomes and Predictors

Participants completed a detailed home survey on demographic, socioeconomic, and health interview data followed by a physical examination and laboratory measures in mobile health centers. For our analyses, we were interested in non-behavioral cardiovascular health metrics: smoking (smoking is defined by the AHA as both a cardiovascular behavior and cardiovascular health factor), blood pressure, glucose levels, and total cholesterol level. Smoking status was operationalized as being in ‘ideal’ status if the respondent never smoked, had used fewer than 100 cigarettes in a lifetime, or was a former smoker who quit >1 year ago. Intermediate and poor smoking status included those who smoked ≥100 cigarettes but who quit <1 year ago, and current smokers, respectively. Blood pressure status was defined as ideal blood pressure if systolic blood pressure (SBP) was <120 mm Hg and diastolic blood pressure (DBP) <80 mm Hg and the participant was not using antihypertensive medications. Intermediate status was defined as SBP=120-139 mm Hg or DBP= 80-89 mm

Hg or treated to goal, and poor status was classified as SBP \geq 140 mm Hg or DBP \geq 90 mm Hg.

The AHA definition of cardiovascular health for diabetes risk was originally based on fasting plasma glucose (FPG). However, NHANES only collects FPG on a subset of participants, leading to a reduced study population and possibly biased estimates. Thus, following prior work, we classified diabetes risk using glucose levels obtained from hemoglobin A1C (HbA1c) tests that were administered to nearly all NHANES participants.²⁸ Ideal glucose level included those with HbA1C <5.7% and not taking diabetes medications, intermediate status was defined as those with HbA1C=5.7%-6.4% or treated to goal, and poor status was defined as HbA1C \geq 6.5%. Ideal cholesterol level was based on a total cholesterol reading of <200 mg/dL and not being treated with lipid-lowering medication, intermediate level as total cholesterol between 200-239 mg/dL or treated to goal, and poor status as total cholesterol of \geq 240 mg/dL.

We used language participants most often spoke at home as our main independent variable and proxy for acculturation-related processes hypothesized to influence cardiovascular risk. Language use was categorized similarly for Latinos and Asian Americans as only/mostly speaks English at home, both English or native language (Spanish for Latinos) spoken equally well, or only/mostly native language spoken at home (Spanish for Latinos, and various other languages for Asian

Americans). Additionally, analyses were adjusted for participant age, sex, annual household income (<\$25,000, \$25,000-74,999, or >\$75,000, plus a missing category), and educational attainment level (less than high school, high school, some college, or college or more).

Statistical Analysis

As recommended by NHANES to maximize stability of estimates, we merged three waves of data (2011-12, 2013-14, 2015-16) and divided weights by a factor of three to account for the 6 years of data. Over this time period, a total of 3,398 Asian and 8,350 Latino adults and youth were sampled. After excluding participants who were \leq 20 years of age (n=1,247 for Asians; n= 4,194 for Latinos), pregnant women (n=25 for Asians; n=45 for Latinas) and those missing data on language spoken at home (n=117 for Asians; n=205 for Latinos), our final analytic sample included 2,009 Asian Americans and 3,906 Latinos. We did not impute values for missing data. On average, 5% of data were missing across our key study variables, except for annual household income where 8% of participants had missing data. We conducted sensitivity analyses categorizing income to include a 'missing' category. Model results were substantively the same when either version of income was applied, hence we present data excluding observations missing data for income.

We generated the prevalence (weighted) of having ideal, intermediate or poor status on the four cardiovascular health factors as well

as key covariates by race/ethnicity and language spoken at home. For consistency purposes across all CV factors examined, each cardiovascular health factor was categorized into a binary measure where those in poor and intermediate cardiovascular health were compared with those with ideal health status (ie, referent). We fit log-binomial models to generate prevalence ratios (PR) for each cardiovascular health factor separately for Asian Americans and Latinos. Model 1 represents the crude association between language and each cardiovascular health factor for Latinos and Asians. Model 2 adjusted for age and sex, and Model 3 additionally adjusted for education and income. All analyses were performed in SAS 9.4 and SAS-callable SUDAAN to account for the complex sampling design of NHANES and to generate prevalence ratios. All statistical testing was two-sided at the 5% significance level. This study did not require review by the author's institutional review board given that NHANES is a publicly available dataset with no participant identifiers.

RESULTS

Table 1 shows the weighted characteristics of the study population by race/ethnicity and language spoken at home. Among Latinos and Asian Americans, those who spoke only/mostly English had a mean age (SD) of 39.5 (.5) and 42.2 (.8), respectively, and were younger than those who spoke Spanish or another language only/mostly. Further, La-

Table 1. Distribution of sociodemographic characteristics of study population by language spoken at home in Asians and Latinos, NHANES 2011-2016

Sociodemographic characteristics	Weighted survey results, % (standard error)					
	Asians			Latinos		
	Other language only/ mostly	Both languages equally	Mostly/only English	Spanish only/ mostly	Both languages equally	Mostly/only English
N	1,185	167	657	2,144	565	1,197
Age, mean	47.3 (1.1)	41.8 (1.5)	42.2 (.8)	43.9 (.7)	40.3 (.9)	39.5 (.5)
20-39	36.1 (2.9)	48.8 (5.4)	48.9 (2.7)	43.6 (2.2)	55.7 (3.0)	56.0 (1.5)
40-59	37.8 (1.8)	39.1 (4.6)	36.3 (2.2)	39.7 (1.2)	30.2 (2.6)	32.0 (1.4)
60-79	22.5 (1.9)	11.1 (2.8)	13.2 (1.7)	14.9 (1.4)	12.5 (1.7)	11.1 (.8)
≥80	3.6 (.8)	1.1 (.8)	1.5 (.6)	1.8 (.4)	1.6 (.5)	.9 (.2)
Gender						
Male	47.6 (1.1)	48.7 (3.7)	44.9 (2.0)	52.3 (1.2)	49.8 (1.9)	47.8 (1.2)
Female	52.4 (1.1)	51.3 (3.7)	55.1 (2.0)	47.7 (1.2)	50.2 (1.9)	52.2 (1.2)
Annual household Income						
\$0-\$24,999	19.6 (2.4)	13.2 (3.1)	7.8 (1.5)	39.3 (2.2)	29.8 (3.0)	22.0 (1.7)
\$25,000-74,999	43.7 (2.6)	37.9 (4.2)	30.9 (2.6)	51.4 (2.1)	49.7 (2.5)	44.9 (2.2)
≥\$75,000	36.6 (3.4)	48.9 (5.2)	61.2 (3.0)	9.2 (1.3)	20.5 (2.1)	33.1 (2.9)
Education						
<High school	21.9 (2.6)	5.3 (1.9)	4.7 (1.0)	57.8 (2.4)	32.5 (2.4)	17.6 (1.5)
High school	16.2 (1.6)	8.6 (2.6)	7.8 (1.4)	19.3 (1.1)	22.5 (2.3)	24.0 (1.7)
Some college	18.3 (1.7)	21.6 (3.3)	22.7 (2.2)	15.5 (1.2)	32.1 (2.9)	38.3 (2.1)
College or more	43.5 (2.8)	64.5 (4.2)	64.7 (2.9)	7.5 (1.1)	13.0 (1.8)	20.1 (1.9)

Variables may not equal total sample size due to missing values.

Latinos were generally younger than their Asian American counterparts across all language categories. Asian Americans who only/mostly spoke English at home had higher household incomes and educational attainment compared with those who only/mostly spoke another language, and when compared with all Latinos. For example, nearly 58% of Latinos who predominantly spoke Spanish had less than a high school education, compared with 22% of Asian Americans in the same language group. Further, the majority (87.1%) of Asian Americans were foreign-born compared with 60.1% of Latinos (data not shown).

Figure 1 shows the prevalence of having ideal cardiovascular health for the four factors examined (smoking, blood pressure, glucose levels, and total cholesterol) by language spoken and race/ethnicity. Most Latinos and Asian Americans in our sample (range 78%-94%) met the ideal classification for smoking. However, current smokers were more likely to predominantly speak English at home. There was no statistically significant difference in having ideal blood pressure status when comparing those who spoke their native language at home with those who predominantly spoke English in both groups. However, a

slightly higher percentage of Asian Americans who equally spoke their native language and English had ideal blood pressure compared with Latinos (57% vs 53%, respectively). In both racial/ethnic groups, the prevalence of having ideal blood glucose levels generally increased with increasing English language use at home and was significantly different when compared with those who largely spoke their native language at home among Latinos ($P < .05$). In general, ideal status on total cholesterol levels increased with increased English language use at home for Asian Americans but not among Latinos. Finally, except for smoking,

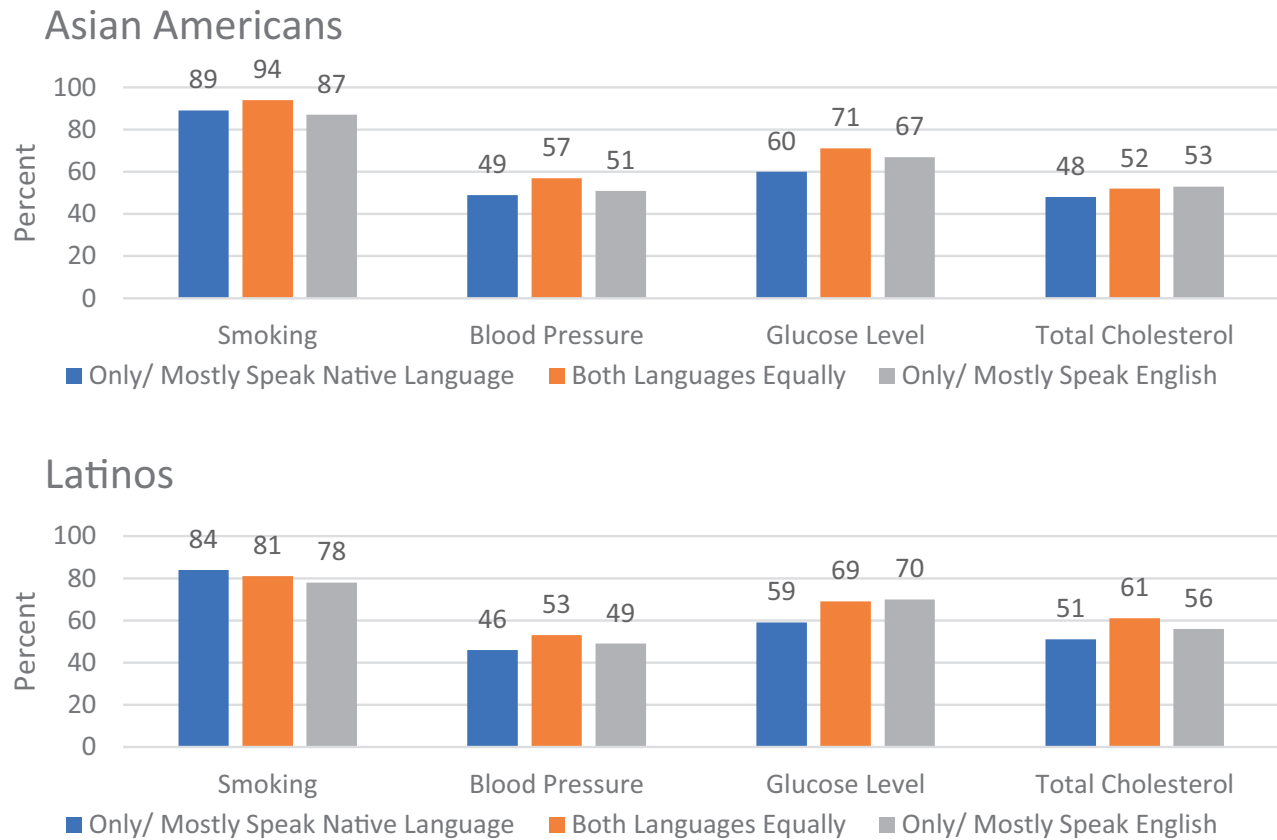


Figure 1. Prevalence of meeting ideal cardiovascular health status by cardiovascular factor and racial/ethnic group, NHANES, 2011-2016

Ideal cardiovascular risk was defined as follows: smoking as never smoked or quit >1 year ago; blood pressure systolic blood pressure <120 mmHg and diastolic blood pressure <80mmHg; glucose by hemoglobin A1c < 5.7%, and total cholesterol < 200mg/dL .

approximately 35% of both Asian Americans and Latinos had intermediate cardiovascular health (ie, borderline or treated to goal) for blood pressure, glucose level, and total cholesterol, constituting the largest segment of cardiovascular risk for both groups (data not shown).

Table 2 highlights the probability of being in poor/intermediate cardiovascular health compared with ideal health for Asian Americans and Latinos. In unadjusted models, Asian Americans who only/most-

ly spoke their native language at home were 19% less likely to smoke (PR=.81, 95% CI=.61, 1.06) when compared with those who only/mostly spoke English, although not statistically significant. This protective association increased to 53% and became significant if they spoke both languages equally (PR=.45, 95% CI=.23,.89). The association between language and smoking persisted in fully adjusted models. Similarly, Asian American individuals who spoke only/mostly their native

language at home were less likely to have intermediate/poor blood pressure than those who spoke English only/ mostly in fully adjusted models (Model 3: PR=.83, 95%CI=.75, .92). In models examining glucose and total cholesterol levels, there were no statistically significant associations or consistent patterns observed among Asian Americans by language spoken at home.

The associations between language and CV risk factors (smoking, blood pressure, and glucose

Table 2. Prevalence ratios (PR) for the association between language spoken at home and poor/intermediate cardiovascular health in Asians and in Latinos, NHANES 2011-2016

Language Spoken at Home ^a	Asians			Latinos		
	Model 1, PR (95% CI)	Model 2, PR (95% CI)	Model 3, PR (95% CI)	Model 1, PR (95% CI)	Model 2, PR (95% CI)	Model 3, PR (95% CI)
Smoking						
Native language only/ mostly	.81 (.61,1.06)	.83 (.64,1.07)	.60 (0.45,0.81)	.73 (.63,.83)	.72 (0.63,0.82)	.56 (.47, .68)
Both languages equally	.47 (.24,.93)	.45 (.23,.89)	.35 (.18,.67)	.84 (.66,1.08)	.83 (.65,1.06)	.73 (.57, .94)
English only/ mostly	1.00	1.00	1.00	1.00	1.00	1.00
Blood Pressure						
Native language only/ mostly	1.03 (.93,1.13)	.88 (.81,.97)	.83 (.75,.92)	1.05 (.98,1.13)	.92 (.87,.97)	.86 (.80, .93)
Both languages equally	.87 (.65,1.15)	.88 (.71,1.09)	.86 (.69,1.07)	.92 (.82,1.05)	.90 (.81,.99)	.88 (.79, .97)
English only/ mostly	1.00	1.00	1.00	1.00	1.00	1.00
Glucose Level						
Native language only/ mostly	1.19 (1.0,1.42)	.96 (.83,1.12)	.91 (.77,1.07)	1.35 (1.21,1.49)	1.15 (1.05,1.25)	.99 (.89,1.11)
Both languages equally	.87 (.62,1.22)	.90 (.69,1.15)	.86 (.66,1.11)	1.03 (.84,1.26)	1.0 (.85,1.18)	.94 (.79,1.11)
English only/ mostly	1.00	1.00	1.00	1.00	1.00	1.00
Total cholesterol						
Native language only/ mostly	1.11 (1.0,1.24)	.99 (.91,1.08)	1.04 (.93,1.16)	1.13 (1.03,1.23)	1.0 (.92,1.08)	.99 (.91,1.08)
Both languages equally	1.02 (.80,1.30)	1.01 (.84,1.22)	1.03 (.85,1.25)	.89 (.77,1.04)	.88 (.78, .98)	.88 (.78,1.0)
English only/ mostly	1.00	1.00	1.00	1.00	1.00	1.00

a. For Latinos, native language was generally Spanish. For Asians, language spoken at home varied depending on country of origin. Model 1: Unadjusted; Model 2: Adjusted for age and sex; Model 3: Adjusted for age, sex, education, and income.

level) among Latinos generally followed the same pattern as Asian Americans. In unadjusted models, those who spoke only/mostly Spanish compared with those who only/mostly spoke English were significantly less likely to smoke (PR=.73, 95% CI=.63, .83) and the magnitude of the association became stronger after adjusting for income and education (Model 3: PR=.56, 95% CI=.47, .68). Although unadjusted models (Model 1) showed no significant association between language and blood pressure, those who spoke only/mostly Spanish were 17% less likely to have poor/intermediate blood pressure than those who spoke only/mostly English in fully adjusted models (Model 3: PR=.83, 95% CI=.75, .92). In con-

trast, only/mostly Spanish speakers were significantly more likely to have poor/ intermediate glucose levels (Model 1: PR=1.35, 95% CI=1.21, 1.49) than those who spoke only/mostly English. However, this association was fully attenuated and became statistically non-significant after adjusting for education and income (Model 3). The associations between language spoken at home and cholesterol among Latinos were largely non-significant.

DISCUSSION

Using contemporary data from a nationally representative population-based survey, we found significant differences in the pattern-

ing of four cardiovascular health factors among Asian Americans and Latinos. In both groups, smoking prevalence was generally lower among those who spoke their native language compared with those who mostly spoke English. However, Asian Americans who spoke both languages had the lowest probability of smoking. In adjusted models, both Asian Americans and Latinos who spoke their native language at home compared with those who largely spoke English were less likely to have intermediate/poor blood pressure status. In contrast, among Latinos only, Spanish language use was associated with increased diabetes prevalence, but this association became statistically non-significant after adjusting for income and

education. We found no significant associations between cholesterol status and language use among Asian Americans and Latinos.

Our study adds new data on cardiovascular risk related to smoking. While national surveillance data has previously shown that immigrant-origin populations have a lower prevalence of smoking than the US-born, these studies typically only consider current smoking status.²⁹ Using definition criteria based on the Life's Simple 7 framework, we additionally included those who quit smoking more than 1 year ago in the non-smoking category, thereby reflecting more sustained smoking abstinence, and showed a similar pattern of lower smoking prevalence across all language categories for both Asian Americans and Latinos. However, Latinos in general were more likely to smoke than their Asian American counterparts.

The role of language use in shaping cardiovascular risk appears to differ based on the outcome investigated. Spanish language use has been associated with worse control of cardiovascular risk factors including hypertension and hypercholesterolemia.^{14,30,31} It is possible that language barriers among Latinos and Asian immigrants result in less access to health care and translate to worse risk factor control among those diagnosed. In fact, limited English proficiency has been associated with less access to preventive care and satisfaction with care.^{32, 33} Teppala and colleagues documented a similar independent effect of increased prevalence of hypertension among Asians and Latinos with in-

creasing acculturation.³⁴ One possible explanation for these findings is that behavioral risk factors such as poor dietary patterns or decreased physical activity increases with increased English language use resulting in increased cardiovascular risk. In regression models, we found that more frequent use of Spanish or a native language at home compared with increased English language use was associated with more favorable blood pressure status (ie, decreased probability of having poor status) among Latinos and Asian Americans. This finding persisted after adjusting for sociodemographic factors. Hypertension is a major cardiovascular risk factor that is readily managed with aggressive primary and secondary prevention. Future research is needed to determine if specific mediators such as diet or physical activity explain these associations, or if other individual, interpersonal or community factors protect from hypertension risk in immigrant populations.

Additional research is also needed to elucidate how socioeconomic factors shape diabetes risk in Latino populations. Our study showed that use of Spanish language at home was associated with increased prevalence of poorly controlled glucose among Latinos. However, findings were attenuated and became non-significant after adjusting for income and education. Some recent studies have similarly shown that language-diabetes associations are explained by socioeconomic position, with a clear gradient observed in diabetes risk by educational attainment.³⁵

Other studies find that accul-

turation or acculturation proxies remain independently associated with diabetes after adjusting for socioeconomic factors.³⁶ One potential explanation for this discrepancy in study findings is that more recent cohorts of Latinos migrating to the United States (ie, foreign-born) may no longer exhibit lower diabetes risk compared with the US-born due to the globalization of the obesity epidemic, thereby blunting socioeco-

In both groups, smoking prevalence was generally lower among those who spoke their native language compared with those who mostly spoke English.

nomic gradients in diabetes. Another explanation is that we still know very little about the interplay of socioeconomic position and culture/acculturation proxies on health.³⁷ For example, approximately 60% of Latinos who predominantly spoke Spanish at home had less than a high school education, compared with 19.5% of Asian Americans in the same language group. This difference in educational attainment may in part explain why language-diabetes associations differed in each group. However, it is important to note that few studies have examined how more comprehensive measures

of socioeconomic position affect the health of immigrant-origin groups.

Although we merged three waves of nationally representative data for both groups, to determine how cardiovascular health patterns in Asian Americans compares with Latinos, our study had some limitations that warrant mention. The sample sizes for some associations between language use and cardiovascular health factors were small and thus need to be replicated in larger studies. Further, we also were not able to conduct subgroup analyses in each racial/ethnic population. There is significant heterogeneity among Asian Americans and Latinos based on country of origin and admixture but disaggregated subgroups are not available in NHANES. Asian Americans and Latinos include various ethnic and cultural groups that have distinct migration, socioeconomic, political backgrounds, all of which can result in varying health risks across subgroups. Some of our previous work has highlighted differences in CVD mortality by both Asian¹⁰ and Latino subgroups.¹¹ As a cross-sectional study, we also were not able to determine if language use is prospectively associated with cardiovascular risk, which would strengthen causal interpretations on the role of language on health. Similarly, language spoken at home is only one measure of language use and does not necessarily indicate limited English proficiency. However, our middle category consisting of individuals who speak both English and another language equally well at home allowed us to capture bilingual proficiency.

CONCLUSION

Our study is one of the first to systematically examine patterns in major cardiovascular health factors in a contemporary sample of Latinos and Asian Americans. We showed significant variation in cardiovascular health risk in each group by language spoken at home, an important acculturation proxy. We further found a large burden of intermediate cardiovascular risk present in both populations. These findings suggest the need to implement what the AHA has defined as ‘primordial’ prevention efforts focused on policy and public health interventions that can stem the development of cardiovascular health factors to begin with, and ultimately result in decreased cardiovascular disease burden.

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CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Rodriguez, Pentakota, Hastings, Palaniappan; Acquisition of data: Rodriguez, Echeverría, Pentakota, Hastings; Data analysis and interpretation: Rodriguez, Echeverría, Pentakota, Amadi; Manuscript draft: Rodriguez, Echeverría, Pentakota, Amadi, Hastings, Palaniappan; Statistical expertise: Pentakota, Amadi; Administrative: Rodriguez, Echeverría, Pentakota, Hastings; Supervision: Rodriguez, Echeverría, Palaniappan

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