ABSTRACT

Title of thesis: **Examining the Association between Acculturation and Hypertension among Asian Americans in the Washington D.C. Metropolitan Area**

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Objective: To evaluate the association between Acculturation and hypertension among Asian Americans in the Washington, D.C. metropolitan area.

Methods: A cross-sectional study was conducted of 600 Chinese, Korean, and Vietnamese adults. Logistic regression was used to investigate the relationship between acculturation variables (years in the U.S., self-rated acculturation, self-rated English fluency) and hypertension, determined from a mean of 3 blood pressure readings taken on site.

Results: Compared to those who resided in the U.S. for 0-5 years, individuals who resided for 6-10 years were about 60% less likely to have hypertension (aOR= 0.36; 95% CI: 0.12, 1.05; p-value=0.06). No significant association was observed between self-rated identity and hypertension. Compared to those with poor English fluency, those who speak "so-so" English have increased odds of hypertension (aOR=1.57; 95%CI: 0.93, 2.64; p-value= 0.09). Disaggregated analysis was conducted for Asian American subgroups, which showed differences in trends of acculturation and hypertension.

Conclusion: Findings suggest an association between acculturation and hypertension, guiding future studies to investigate further into these observed effects. Some subgroup differences were observed among Asian American subgroups, potentially suggesting a subgroup-focused intervention.

EXAMINING THE ASSOCIATION BETWEEN ACCULTURATION AND HYPERTENSION AMONG ASIAN AMERICANS IN THE WASHINGTON D.C. METROPOLITAN AREA

By

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I. Introduction

Asian Americans are the fastest growing ethnic group in the United States (1-3). In 2010, there were about 14.7 million Asian Americans, constituting about 5% of the American population. They are continuing to grow, and it is predicted that by the year 2050, there will be more than 40.6 million Asian Americans, upto 10% of the entire U.S. population (4). Thus, Asian Americans are an important group to observe and research as they increase in number in the United States.

Among Asian Americans, hypertension is a common health issue with prevalence of about 25% (5). Hypertension is the high blood pressure in the arteries, exceeding systolic blood pressure of 140 mm Hg or diastolic blood pressure of 90 mm Hg, and is a very prevalent condition in the United States, affecting 70 million people, about 29% of the whole population (5, 6). Hypertension is sometimes referred to as the silent killer because it has no warning signs or symptoms (7) and if it is left uncontrolled, it can significantly decrease one's life expectancy, by increasing risk for dangerous health conditions such as cardiovascular disease, stroke, and kidney disease (7, 8). Cardiovascular disease is also the leading cause of death among Asian Americans in the United States (6). The prevalence of hypertension in Asian Americans over the age of 20 is currently about 25% (2, 9). The data from the 2011-2012 National Health and Nutrition Examination Survey (NHANES) showed an overall U.S. adult hypertension prevalence of 29.1%. Prevalence was very similar between men (29.7%) and women (28.5%). Hypertension was seen to increase by age group: 7.3% in 18-39 years, 32.4% in 40-59 years, 65% in 60 years and up. Racial differences in hypertension prevalence was found as well: Non-Hispanic white Americans, non-Hispanic black Americans, Hispanic Americans, and non-Hispanic Asian Americans showing 28%, 42.1%, 26%, and 24.7% in prevalence respectively (2). Although this national data may reflect lower

hypertension prevalence in Asian Americans compared to other racial groups, there is a lack of studies that observe Asian Americans specifically, and there are substantial differences among Asian American subgroups that need to be examined in a disaggregated manner.

In a study observing Chinese, Filipino, Hmong, and Vietnamese Americans in Michigan, hypertension prevalence was 29.5% in Chinese, 21.9% in Hmong, 30.0% in Filipino, and 9.6% in Vietnamese Americans, reflecting variations in prevalence among Asian American subgroups (6). A study from the National Center for Health Statistics found a higher proportionate mortality ratio, the proportion of mortality attributable to hypertensive disease, among Asian subgroups compared to non-Hispanic whites; Compared to non-Hispanic white women and men (1.10; 0.90), Chinese (1.69; 1.27), Korean (1.30; 0.94), Japanese (1.23; 0.95), and Filipino (1.50; 1.38) had higher proportionate mortality, reflecting a need to address hypertension in Asian Americans (1).

In looking to address such a health problem in Asian Americans, a topic of interest is acculturation since the majority (84.5%) of Asian Americans are foreign-born (9). Acculturation is the multidimensional process of adapting to a country's cultural norms, values, and lifestyles (10, 11). It is a natural process that immigrants experience as they settle down in their new environment in the United States. It has been hypothesized that acculturation is associated with health outcomes among various ethnic and racial groups, including Asian Americans (11). An individual's acculturation status could determine many aspects of life, such as access to public services, exposure to discrimination, contact with the country of origin, neighborhood environment, and acculturative stress, and more- which can affect their behavior, lifestyle and ultimately their overall health (11). Thus, acculturation is an important factor in considering health of Asian Americans.

There are two theories involving acculturation and health. First is the "healthy immigrant effect (12)" where those who recently immigrate tend to be healthier than their counterparts who

were born in the United States. To explain this, some assert that immigrants tend to be healthier because healthy people are more able to immigrate, showing a different perspective on the healthy immigrant effect as "immigrant selection" (13). Others say that immigrants are healthier because they are less acculturated to health-ruining American culture such as high-fat diet (12, 14). In contrast to the healthy immigrant effect, opposing research propose that more acculturated individuals are healthier, because acculturation can lead to increased access to healthier foods and healthcare and higher income. Also, acculturative stress on new immigrants is seen as a negative influence to health as well (8, 15, 16).

Hence, the Center for Disease Control and Prevention states that the context of health is different for an Asian American than it is for a non-Hispanic white American in that Asian Americans may face numerous factors that may threaten their health, such as "infrequent medical visits due to fear of deportation, language and cultural barriers, and the lack of health insurance," which are barriers that a white American would not typically face (17). Conditions such as hypertension is largely affected by lifestyle choices such as diet, physical activity, and tobacco use (7) and such conditions may be affected by the process of acculturation that Asian Americans experience.

1.1 Research Questions

To contribute knowledge about the influence of acculturation on Asian American health, this thesis aims to examine variables relating to cultural and environmental adaptation process on hypertension in Asian American subgroups, specifically among the 600 Chinese, Korean, and Vietnamese Americans that were surveyed.

The following study aims and hypotheses will be used to guide this study:

1. **Is there an association between acculturation status and prevalence of hypertension among Chinese, Vietnamese, and Korean adults in the Washington Metropolitan Area?**

There are many studies that examine the influence of acculturation on immigrant health. Many support the "healthy immigrant effect," as they observe that the newly arrived immigrants tend to be healthier than those who resided in the U.S. for a longer duration. They hypothesize that this may be due to the worsened life style choices as they assimilate (18-21). However, there is lack of specific studies on Asian American subgroups. As in the Teppala's study, Asian Americans were included, but they were all aggregated into one result (20). Other studies argue that hardships and stress that come with acculturation is heavier on newly arrived immigrants and that it may affect their health in a negative manner (15, 16). Also, certain health behaviors such as engagement in cancer screening and preventive health behaviors were also seen more among acculturated individuals (22-24). In agreement with the healthy immigrant effect (12, 14), I hypothesize that increased acculturation into U.S. society among Asian Americans will be associated with higher prevalence of hypertension.

2. **Do age, education, and income confound the association between acculturation and high blood pressure amongst Asian Americans?**

I hypothesize that age, education, and income are confounders in our model between acculturation and hypertension. The 2011-2012 NHANES have found that the prevalence of hypertension

increases with age and decreases with education in non-Hispanic Asian Americans (9). Also, Income is an important socioeconomic status measure that affects one's access to health education and quality medical care, which is likely to influence their health. Hypertension prevalence and control has been found to be consistently related to an individual's education and income levels in previous studies (25, 26).

II. Background

2.1 Importance of Study

Asian Americans are a rapidly growing minority population group that make up about 5% of the U.S. population and hypertension is an important risk factor for cardiovascular disease, which is the second leading cause of death for Asian Americans (4). In 2009, over 16,000 deaths among Asian Americans were due to cardiovascular disease and 1,871 deaths were linked directly to hypertension (30). Currently, nearly 25% of Asian Americans have hypertension, which is having blood pressure that is above 140/90 mm Hg (31).

For Asian Americans, acculturation is an important variable to observe in relation to health conditions, such as hypertension. Acculturation can affect various stressors, such as decreased social support and increased job demands that are associated with higher blood pressure (25, 32). Changes in health behavior associated with acculturation include unhealthy diet and less physical activity, which are traditional risk factors in the development of hypertension (19). Socioeconomic status is also related to acculturation and is associated with high blood pressure (33, 34). The effect of acculturation has been studied for a long period of time- even in the 1990's, where they state that they found differences in cardiovascular risk factors between Asians who had been born in the U.S. compared to those who were born outside (35). Thus, acculturation has been seen to play a large role in shaping an individual's health and it may influence blood pressure as well through various pathways mentioned above.

III. Existing Knowledge

Acculturation is seen to be one of the most important constructs for individual health in diverse populations (36) because it has a pervasive influence on one's behavior (37). The original definition of acculturation by Redfield et al. is: a phenomena of culture change from intercultural contact (38). It is a fluid process that occurs as an individual's existing cultural and psychological qualities interact with the new cultural and psychological qualities of their new environment. This interaction can lead to biological, social, and physical changes, directly influencing individual health (39). Acculturation does not mean that everyone will simply adapt to the new culture; it is an interaction. Thus, there are four acculturation strategies proposed by John Berry: assimilation, separation, integration and marginalization. Assimilation is when an individual do not wish to maintain their original cultural identity and is open to the new culture. In contrast, separation is when an individual wishes to hold on to their culture and avoid interaction with the new culture. Integration is merging both the original and new culture together. Finally, marginalization is when the individual does not hold to neither the original or new culture (40). The process of acculturation is very complex and dependent on an immigrant's culture and other factors such as language (41).

As this is a complex phenomenon, there is some debate about the effect of acculturation on individual health. The "healthy immigrant effect," is a well-known theory, which hypothesizes that immigrants who recently arrived to the U.S. tend to have better health status than those who have lived in the U.S. longer (12, 13). In accordance with the healthy immigrant theory, increased acculturation has been associated with beliefs, values, and societal norms that could lead to poor health. Acculturation can affect many parts of an individual's life in a negative manner. There are not many Asian American studies done on this topic, but Hispanic research on acculturation and health supports that greater acculturation leads to increased risky behaviors such as smoking and

drinking, and it has been associated with decreased health (42). This contrasts with another view, as it will be discussed later, that the longer one resides in the United States- assuming greater acculturation status- the better their health would be due to increase in access to health education and healthcare (12, 14).

There are some possible explanations to the healthy immigrant effect. Recent immigrants may appear to be healthier because healthy people are more likely to immigrate, because they are more apt to migrate. In support of the healthy immigrant theory, a study showed that disease prevalence, such as arthritis and hypertension was 50% higher in the native-born compared to recent immigrants. This study reasoned that immigrants tend to be younger and healthier when they migrate to the U.S. and sick individuals typically do not migrate (13). Thus, recent immigrants may appear to be healthier than their native born counterparts. When life expectancies of U.S. born Asian male, foreign-born Asian male, and Asian males in their home country were compared, it was found that the foreign-born male's life expectancy was the highest. This suggests that there may be a "health selection" among Asians, where healthy people tend to migrate, rather than those who are ill. Kennedy et al. supports this view of immigrant self-selection, where those who are stable in health and financial status are more likely to immigrate. In countries like Australia, immigrants are required to satisfy certain health requirements. Thus, only healthy people can apply to migrate than those with health issues (43, 44). Another explanation to the healthy immigrant effect is that there is an error in reporting and data collection. It has been observed that immigrants tend to underreport disease and illness, which would falsely represent their overall health in research findings (13).

In support of the healthy immigrant effect, a study by Bauer et al., an analysis of 2,095 Asian American adults, found that increased acculturation was associated with higher self-reported health issues. Subgroups included: Chinese, Vietnamese, Filipino, and the rest were

recorded as "other." It was found that increased acculturation was strongly associated with greater reporting of physical symptoms such as pain in joints, dizziness, shortness of breath, among these Asian Americans (12). Although this is self-reported health issue, it may correlate with the hypertension measurements of this study.

Also, a study by Steffen et al. performed a meta-analysis of studies examining acculturation and blood pressure around the world. Of the 125 studies examined, 29 (23%) were from United States. This study analyzed immigrant data as a whole, and did not analyze separately by racial/ethnic groups. Asian Americans were included, but the study does not state which race/ethnicities or how many were included in the final analysis. Acculturation was defined as changes in behavior and residence, by type of acculturation faced and number of years in the host culture. Results showed that increasing acculturation to western society was associated with higher blood pressure for all immigrants. Blood pressure was measured objectively. More acculturated individuals had an average blood pressure that was 4mm Hg higher than less acculturated individuals. It was argued that stress from the process of cultural adaptation played a large role and the acculturation effect appeared the most within the first 3 years of settling down. They found that the acculturation effect was stronger in men than in women, arguably because they interact in the new culture more than women through their workplace and have fewer social networks to cope with stressors (19). Although this study did not observe Asian Americans specifically, it highlighted an important association of acculturation and hypertension that is found across all immigrants across the world.

Another study by Teppala et al observed the relationship between acculturation and hypertension in a multiethnic sample through the 2007 California Health Interview Survey. Although included Asian Americans, including Chinese, Korean, and Vietnamese, it grouped them in one category of "Asians" and unfortunately subgroup analysis was not performed. However,

they also found that increased acculturation was associated with hypertension with an odds ratio of 1.78 (95% CI: 1.50, 2.11), also in conjunction with the healthy immigrant effect. The acculturation measures in this study were: country of birth of participant, country of birth of parents, language spoken at home, and duration of stay in the United States. An additive acculturation scale was developed from these measures and compared with the blood pressure level of the participants (20). Specifically in Chinese Americans, acculturation has been associated with heart disease risk and heart disease risk factors (29, 45, 46). Therefore, the healthy immigrant theory is widely supported, as prior studies have seen that certain chronic conditions, such as hypertension are more common among acculturated individuals (18-21, 47). A study even stated that "it is no surprise that hypertension and high cholesterol levels are more likely to be found among long-term Asian American residents than among new immigrants" (6). Higher acculturation has been associated with less physical activity and unhealthy dietary changes among Asian American immigrants, which can greatly influence hypertension (48, 49).

However, there are opposing view of the healthy immigrant effect arguing that those who are more acculturated are more likely to be healthy due to increased access to health-promoting factors. A research with Chinese Americans have found that those who are acculturated may have better health due to increased access to healthier foods than those who are less acculturated because higher acculturation is associated with higher level of household income (16). It asserted that higher acculturation led to greater access to resources, having a positive influence on individual health. Supporting this view is that low acculturation can hinder healthcare access and communication with physicians, contributing to low health. Cultural factors such as difference in disease perception can also influence help-seeking behavior and patient-provider interaction (15).

A study by Lee et al performed a cluster analysis of Asian Americans in the Washington D.C. area examining the association between acculturation and health. Specifically, Chinese,

Korean, and Vietnamese Americans were studied and acculturation was measured using multiple measures, including the SL-ASIA scale. This study found that one point increase of the acculturation score was associated with 2.2 greater odds of self- reporting good health with a 95% confidence interval of (1.5, 3.2) among Chinese, Korean, and Vietnamese Americans. Thus, increased acculturation was associated with better self-reported health. It was also observed that health screening behavior increased by acculturation levels as well. Thus, acculturation was associated with better self-reported health and preventive health service utilization (22). A study by Kandula et al., also saw that acculturation was associated with better self-reported health. It found that those with limited English proficiency- typically of lower acculturation status- had a lower probability of reporting good health. It also showed that low acculturation exhibited more sedentary behavior, while higher acculturation was associated with light physical activity, leading to better health (24).

There are two views on acculturation and health. On one side, it observes decreased health with acculturation, and on the other, it argues that acculturation increases one's health, but there is no question that it plays a large role on individual health, affecting various important aspects of life (8). Although we have seen better self-rated health among more acculturated individuals, when looking at hypertension specifically, studies support the healthy immigrant theory (20).

3.1 Gaps in Knowledge

There are not many studies that specifically observed acculturation and blood pressure among Asian Americans. Most existing studies, focused on prevalence of cardiovascular disease (15, 50, 51) and other physical symptoms(12, 52). Acculturation has been examined in relation to obesity (16, 53-55), self rated health (22), drinking (56, 57), smoking(57), stress (58), cancer screening behavior (22, 59), and socioeconomic status (50). Other studies looked at maternal acculturation in relation to childhood obesity as well (16). In studies with other populations, acculturation was found to be positively associated with hypertension (18-21, 47).

There is lack of studies and research that focus primarily on Asian Americans and hypertension. The Powell et al study (1), which was the first study to examine U.S. death certificate data from multiple Asian American subpopulations to characterize cardiovascular disease mortality, examined cardiovascular disease mortality rates from 2003 to 2010 from the National Center for Health Statistics. The results showed that proportionately, more Asian Americans are dying from hypertensive disease compared to non-Hispanic white Americans. This was found among every Asian American subgroup including Chinese, Korean, and Vietnamese Americans. Such findings suggest an urgent need for hypertension treatment and control in Asian Americans. Also, while cardiovascular disease mortality rates are decreasing among non-Hispanic whites, Asian American cardiovascular disease mortality rates are not showing the same rates of improvement. Thus, hypertension prevention and management education may not be reaching the Asian American population effectively (1). .

The population that we will be focusing on, Chinese, Vietnamese, and Korean Americans, make up about 4 million, 1.9 million, and 1.7 million of the U.S. population, respectively (4). Most research on Asian Americans highlight the Chinese population, because they are larger in number. There are many small-scale studies on the Korean population, but there is no nationally

representative data on Korean Americans. There is a lack of research on the Vietnamese population in the U.S. as well (53). In a multiethnic sample study by Teppala et al, hypertension was found to be positively associated with acculturation, but Asians were aggregated in one category and no subcategory analysis was performed (20). Explicit disaggregation of Asian American subgroups in studies started recently. Thus, there is lack of data on certain Asian American subpopulations (1). The current study overcomes this weakness by observing three Asian subgroups, Chinese, Korean, and Vietnamese Americans, separately.

The Barnes et al study took the 2004-2006 National Health Interview Survey to determine health characteristics among Asian Americans in the United States. The results of this study suggest that grouping all Asian Americans into a single category can conceal the differences that exist among Asian American subgroups. For example, Vietnamese, Korean, and Chinese adults were twice as likely as Filipino adults to be poor. Significant disparities in health care utilization, health behaviors, and health status were present among Asian American subgroups as well. 4 in 10 Koreans lacked health insurance. 1 in 4 Koreans lacked a usual place for care. Korean adults were more likely to drink and smoke than other Asian subgroups. Findings of this study communicate the heterogeneity among Asian American subgroups (60). Asian subgroups also vary in educational attainment, religion, and culture, which may influence health outcomes as well (32).

Also, Asian communities are very diverse in many social and cultural areas. Conclusions based on aggregated data of Asian Americans may be misleading and may result in greater gaps in our knowledge of health conditions and health needs of Asian Americans. Asian ethnicities are generally associated with lower risks for cardiovascular disease, but certain risk factors were particularly strong among some groups. We must consider the high degree of heterogeneity among subgroups (3). In conclusion, due to this heterogeneity observed in many studies, it is important to account for Asian American subgroups for analysis. By observing each Asian

American subcategory: Chinese, Korean, and Vietnamese Americans separately in this study, we will consider differences that may exist among Asian American subgroups that other studies have overlooked because they grouped Asian Americans into one single category.

Another gap in literature is the use of subjective measurements of hypertension (3, 22, 24, 61). For example, in a study by Ye et al., it had found that Asian Americans scored lower in cardiovascular risk factors compared to non-Hispanic whites, but all their risk factor assessments were based on self-reported measurements (3). Self-reported data may reflect good insight into one's perceived health, but it can lack in accuracy if the individual is not fully aware of their health condition. Thus, it is important that this study used objective measurements instead of self-reported data of hypertension. This study also used an average of three blood pressure measurements taken at site for increased accuracy.

IV. Methods

4.1 Study Design and Data Source

For this study, we used data from a randomized control trial of lay health worker intervention study that aimed to increase hepatitis B vaccinations in the Washington DC Metropolitan Area. In the parent study a total of 600 foreign born Asian American adults 18 years of age and older who did not have hepatitis B were drawn from the community. The study period was from April 2013 to March 2014.

All the participants were recruited from the Asian American community. Connections with local community-based organizations (CBOs) and faith-based organizations (FBOs), Hepatitis B Initiative of DC (HBI-DC) and the Asian American Healthcare Center (AAHC), and other links through the community advisory board that has been established since 2008 were used as main sources for obtaining recruitment locations. First, print advertisements describing the study were placed in local Chinese, Korean, and Vietnamese newspapers and local Asian grocery stores. Those who contacted after seeing the advertisements were screened by phone for their eligibility to participate and were invited to the study. Second, church and temple leaders were contacted to arrange recruitment days in which participants were recruited on the spot at churches and temples. In some cases, recruitment days were planned ahead of time at churches or a temple in which participants were "signed up" ahead of time. Also, throughout the recruitment period, specific Saturdays were assigned for the research team members to visit the Asian American Health Care (AAHC) clinic in Maryland to recruit potential participants.

After obtaining the informed consent, all the participants were asked to complete a self-administered questionnaire in English, Chinese, Korean, or Vietnamese, with the assistance of a bilingual interviewer when necessary. Acculturation specific questions were included in the baseline survey and participant blood pressure was measured and recorded three times

throughout the survey. In total, 201 Chinese, 201 Vietnamese, and 198 Koran Americans took the survey and participated in this study.

3.2 Variables

3.2.1 Independent Variable

The independent variable for this study is level of acculturation. Acculturation is a fluid, complex, multi-dimensional process and it is very difficult to capture in full (10, 23, 41). It is often debated what variables should be measured and how they should be captured to account for an accurate indication of an individual's acculturation status (11). Questions that were asked in the survey in regards to acculturation are listed in the appendix, and it asks the participant's year of arrival, self-rated identity, and self-rated English proficiency. The variable "year of arrival", which was measured as a continuous variable. However, when normality was assessed using the Shapiro-Wilk test, both Shapiro-Wilk statistic p-values were less than 0.0001, indicating non-normal distributions of this variable. This variable has been recoded to indicate years of residency in the U.S. in 5 categories: 0-5 years, 6-10 years, 11-20 years, 21-30 years, and more than 30 years. For self-rated identity participants were asked to choose between 5 responses: "very Asian", "mostly Asian", "bicultural", "mostly westernized" and "very westernized". Due to low cell counts, the last two self-rated identity categories were combined as one category: "westernized". For self-rated English fluency, participants were asked to rate their English proficiency on the scale: fluent, well, so-so, poorly, or not at all. Due to low cell counts, we combined categories to three levels: native fluency/well, so-so, and poorly/not at all. Since it is difficult to capture one's acculturation status in full, these three measures were observed separately to estimate acculturation among participants, for these measures have been used as effective proxy measures for acculturation in previous studies (11, 12, 14, 57, 62, 63).

3.2.2 Dependent Variable

The dependent variable is measured hypertension. The mean of the three systolic and diastolic blood pressure readings measured throughout the survey was used to determine participant hypertension. A CDC study that used NHANES data to examine hypertension amongst U.S. adults also used an average of three blood pressure readings for accuracy (64). Hypertension will be used as a binary variable (yes or no), where a participant would be considered hypertensive if the mean systolic blood pressure exceeds140 mm Hg or if the mean diastolic blood pressure exceeds 90 mm Hg, based on the American Heart Association's definition of hypertension. The Vaeth study also used this standard to determine hypertension status as well (65).

3.2.3 Potential Confounders

Based on existing literature, the following confounders were included in the analysis: age, gender, ethnicity, education, income and health insurance status. The normality of the continuous variable age was assessed using the Shapiro-Wilk test. Both Shapiro-Wilk statistic p-values were less than 0.0001, indicating non-normal distributions of these two variables. Age was not linearly related to the logit based on lowess analysis (66, 67). Thus, age was categorized into 5 categories: less than 30 years, 30-39 years, 40-49 years, 50-59 years, and 60 years and over. Ethnicity was divided into Chinese, Korean, and Vietnamese. Education was categorized as: less than high school, high school, vocational school or some college, college graduate, and graduate school. Income categories were: less than $10,000, $10,000-$29,999, $30,000-$49,000, $50,000-$99,999, and more than $100,000. Health insurance status was dichotomous: yes or no.

3.3 Data Analysis

This study employed secondary data analysis. First, descriptive analysis was performed to assess the distribution of the independent variable, dependent variable, and covariates and to check for missing values. Individuals with missing responses for the education question (n=6), income question (n=15), health insurance question (n=4), and identity question (n=3) were excluded, leaving the final analytic sample to be 572 individuals. For the "years in the U.S." variable, which is one of the acculturation variables, a separate missing category was created for the 77 missing responses.

Table 1 shows the characteristics of the study sample by hypertension status. Since all variables were categorical, chi-square tests were used to test significance of differences between groups for categorical variables. Bivariate analyses were conducted to see which variables were independently associated with the outcome. Binary logistic regressions were run between each variable (acculturation variables and covariates) against hypertension status, showing the odds ratios and 95% confidence intervals for each category (table 2). Logistic regressions were performed to test for confounding by including covariates (gender, ethnicity, education, income, and health insurance) one by one to age-adjusted acculturation variables. We identified the confounders based on the 10% coefficient change criteria.

The final three models (table 3), one for each acculturation variable, included all covariates as a result of checking significance through analysis and based on theory from the literature. Multicollinearity was tested in a model including all covariates and all three acculturation variables and variance inflation factors (VIFs) were examined using 10 as a cutoff value. All VIFs were between 1.02 and 1.88, showing no collinearity between variables, but we decided to report each acculturation variables separately because the three acculturation variables "years in the U.S.", "self-rated identity", and "self-rated English fluency" are different types of variables that

may not be presented together to give a combined comprehensive score of acculturation. It makes more sense conceptually to keep them separate in models.

Disaggregated data analysis by Asian American subgroups were performed. Table 5 shows the characteristics of the study sample by hypertension status separated by ethnicity: Chinese, Korean, and Vietnamese. Binary logistic regressions separated by ethnicity were run between each variable (acculturation variables and covariates) against hypertension status (Table 6). Confounding was tested in each ethnic group, by including covariates (gender, ethnicity, education, income, and health insurance) one by one to age-adjusted acculturation variables. Table 7 shows odds ratios for acculturation and hypertension adjusted by covariates separated by each ethnic group to observe subgroup differences. The statistical software SAS 9.3 was used to perform all analysis.

V. Results

The sociodemographic characteristics of the sample are shown in Table 1. The age of the participants ranged from 18 to 91 with the mean of 47. Of the 572 participants 58% (n=333) were female and 42% (n=239) were male. Chinese, Korean, and Vietnamese ethnic composition was about the same, each making up about one third of the sample. About 26% were high school graduates and 48% received a college education or higher. About 62% of the sample had less than $50,000 for annual household income. 14% had less than $10,000, 28% had $10,000-$29,999, and 20% had $30,000- $49,999. Only about half the sample had health insurance.

As for the acculturation variables, about half of the sample had 11-30 years of residency in the U.S. 13% (n=77) responses were missing for this question. The majority of the sample (57%) answered "very Asian" for their self-rated acculturation question. Due to low number of responses, we combined the "mostly westernized" and "very westernized" categories into one "westernized" category. Even after collapsing categories, only 8 people (1.4%) rated themselves as "westernized". Since sample participants were all immigrants, most participants (77%) rated their English fluency as "so-so", "poorly", or "not at all."

Bivariate logistic regressions were run to calculate the unadjusted odds ratios (ORs) and 95% confidence intervals (CIs) for each variable (acculturation variables and covariates) and hypertension status in Table 2. Age effect was significant; Compared to those aged less than 30 years, individuals aged 40-49 years twice the odds of developing hypertension (OR=2.15, CI: 0.91, 5.11). For those 50 and over, it was found to have almost 3 times the odds of having hypertension. Gender effect was also significant; males were almost 2.5 times likely to have hypertension than females (OR=2.48; 95%CI: 1.65, 3.72). We did not find any significant differences in hypertension among the three ethnic groups. For education, those with less than high school education were 2.36 times more likely to have hypertension than those with graduate school education (OR= 2.36;

95%CI: 1.21, 4.58). Other education categories were not significant. We did not find any significant differences in income. For the years in the U.S., there was an overall trend of positive association to hypertension with increased years of residency in the U.S. except for "6-10 years" category. Compared to those who resided in the U.S. for 0-5 years, those who resided for more than 30 years was significantly associated with hypertension (OR=2.42, 95%CI= 1.17, 4.98). Even after age-adjustment the trend still existed, but the strength of the association decreased because hypertension may occur not due to increased years of residency in the U.S., but because those who resided in the U.S. longer tend to be older. Variable self-rated acculturation was not significant. There may be a lack of power in the "westernized" category because out of 8 individuals in that category, only one person had hypertension. Self-reported English fluency was not significant either.

We tested for confounding for all covariates in each of these models. Any changes in acculturation variable odds ratios over 10% were considered as confounding effect. We compared all OR to age-adjusted acculturation variables because hypertension increases significantly as age increases and age can play an influential role in acculturation variables, especially for "years in the U.S.". In the first model, education and income exhibited confounding effects for age-adjusted years in the U.S. and hypertension. When education was added to the model, OR for "6-10 years" in the U.S. became significant as it decreased from 0.36 to 0.31 (p-value=0.03). Also, when adding income to the model, all OR for "years in the U.S." categories 11 years and over increased slightly. When examining years in the U.S., we did not find any confounding effects with covariates in the relationship between self-rated acculturation and hypertension. When examining self-rated English fluency, gender, education, and income were confounders for self-rated English fluency and hypertension. When gender was added to the model, odds ratio for native English fluency became closer to 1 and was not significant. When education was added to the model the odds

ratios for English fluency categories increased. Although not significant, odds ratio for the "native" English fluency category changed directions slightly, from 0.87 (95%CI: 0.48, 1.57) to 1.16 (95%CI: 0.58, 2.32). Odds ratio for "so-so" English fluency increased from 1.37 (95%CI: 0.87, 2.15) to 1.66 (95%CI: 1.02, 2.72), becoming significant. Education strengthened the association of those who speak "so-so" English being more hypertensive compared to those who do not speak English well. Also, when income was added, the odds ratios for self-rated English fluency increased. Odds ratios for those who speak "so-so" English became marginally significant (OR=1.49; 95%CI: 0.93, 2.41; p-value=0.09). Thus, based on analysis, we identified gender, income and education as potential confounders and adjusted for them in our final models. We also added all other covariates such as ethnicity and health insurance to the models because although it is not apparent in our sample, literature supports adjusting for these covariates. Also, having health insurance is often a covariate adjusted in other studies because it may be associated with acculturation as well as hypertension status.

<u>Table 3</u> shows the final three models, one for each acculturation variable and hypertension, from multivariate logistic regressions. These logistic regression models were adjusted for age, gender, ethnicity, education, income, and health insurance status. In model 1 compared to those who resided in the U.S. for 0-5 years, individuals who resided for 6-10 years were about 60% reduced odds to have hypertension (OR=0.36; 95% CI: 0.12, 1.05; p-value=0.06). Although not significant, the rest of the "years in the U.S." categories showed an overall increasing OR trend with increasing years of residency, with the "more than 30 years" category having an increased OR of 1.79 (95%CI: 0.11, 4.24). Older age categories over 40 showed high odds ratios compared to the reference group of "less than 30 years": "40-49 years" (OR= 2.97; 95% CI: 1.09, 8.11); "50-59 years" (OR=3.25; 95% CI: 1.18, 8.91); "60 years and over" (OR= 3.48; 95% CI: 1.21, 9.99). Males had almost 3 times the odds of having hypertension than females in this model (95% CI: 1.86,

4.55). Compared to those with more than $100,000 in annual income, having less than $10,000 in annual income was significant with an odds ratio of 3.15 (95% CI: 1.12, 8.91). In model 2, self-rated acculturation odds ratios were all close to 1 and no significant findings were found. Only age and gender had significant odds ratios in this model. For self-reported English fluency in model 3, odds ratios for the "so-so" category were marginally significant (OR=1.57; 95%CI: 0.93, 2.64; p-value=0.09), suggesting increased odds of hypertension in those who can speak English at an intermediate level compared to those who cannot speak English at all.

Table 4.1 shows the sociodemographic characteristics of the sample population by ethnicity: Chinese, Korean, and Vietnamese. Gender was similarly distributed across subgroups, with males having more hypertension. Income chi-square was marginally significant (p-value=0.09) in the Chinese. In this sample, there were many high-income Chinese. Up to 32% of the Chinese were in the "over $100,000" category, while only about 5 % in Korean and Vietnamese made over $100,000.Acculturation characteristics varied by ethnicity as well (Table 4.2). Only Koreans had significant findings in the years in the U.S. For self-rated English fluency, only the Chinese showed marginally significant results.

Table 5.1 and 5.2 shows bivariate logistic regressions were run to calculate odds ratios for each variable (acculturation variables and covariates) and hypertension status disaggregated by ethnicity. Only in the Vietnamese, age 60 years and over was marginally associated with hypertension compared to those younger than 30 years (OR=6.92; 95% CI: 0.75, 64.02; p-value= 0.09). In Koreans, compared to those with graduate school education, those with less than high school education had almost 5 times the odds of developing hypertension (OR=4.88; 95%CI: 0.79, 30.29; p-value= 0.09). Amongst the Chinese, compared to those who make more than $100,000 a year, those who made $50,000-$99,999 had increased odds of having hypertension (OR=2.74; 95%CI: 1.09, 6.87; p-value=0.03). For the acculturation variables, there were some differences in

trends. For Koreans, the overall significance of the whole variable years in the U.S. was marginally significant (type 3 p-value=0.08). Throughout the categories, though not statistically significant due to lack of power, the trends in the Korean OR suggest a two-fold increased odds for hypertension for those who resided in the U.S. for more than 11-20 years compared to those who lived in the U.S. for 0-5 years, and 2.5 times the odds for those who resided in the US for 21-30 years and 30+ years. For Chinese, those who resided 21-30 years had a trend of almost two fold increase of odds and 2.7 times the odds for those who resided more than 30 years. For Vietnamese, those who lived more than 30 years showed a trend of two-fold increase in odds for hypertension. All these trends did not result in statistical significance due to small sample size in disaggregated group. All of the ORs for all three subgroups were close to 1 for self-rated identity. For self-rated English fluency, the type 3 p-value for the Chinese was marginally significant: 0.08. The odds ratio trend for Chinese suggests increased odds for hypertension for those who speak "so-so" English, and decreased odds for those who speak fluent/well English compared to those who cannot speak English.

We tested for confounding for all covariates in each of the acculturation models segregated by ethnicity. Any covariate that caused changes in acculturation variable odds ratios over 10% was considered as a confounder. In this analysis, gender, education, income, and health insurance were all found to be confounders in each ethnic group. However, the categories where changes took place or the direction are different. All of the changes yielded insignificant ORs. In the Chinese, adding gender to age-adjusted model with the years in the U.S. variable influenced the OR of "6-10 years" category to be closer to 1, to 0.85. In Koreans, the ORs of categories except "11-20 years" and "more than 30 years" increased closer to 2. In Vietnamese, there were no changes. When adding education to years in the U.S., in the Chinese group, the odds ratio of "6-10 years" category decreased from 0.76 to 0.53, while the other categories 11 years and over

increased in OR. The Vietnamese showed similar patterns as the Chinese: decrease in the "6-10 years" category then increase from 11 years and up. In Koreans, all of the categories except "11-20 years" decreased in OR. When income was added, only "21-30 years" category decreased in OR from 0.70 to 0.79. Amongst Koreans, those who resided in the U.S. 21 years and up showed a trend of increasing OR. The Vietnamese years in the U.S. category ORs increased for 11 years and up when income was added. Only the Vietnamese had health insurance as a confounder for the years in the U.S. All of the category ORs decreased except for "6-10 years".

In the second acculturation variable model with self-rated identity, adding gender decreased the bicultural category OR in the Chinese from 0.83 to 0.72. When education and income were added, the "mostly Asian" category increased in OR to about 1.5 in both cases, but was not significant. When gender was added to self-rated English fluency, the native fluency category OR showed a protective trend in change from 0.75 to 0.60. When education or income was added to self-rated English fluency, the ORs increased. Also, when health insurance was added in this model for the Chinese, the OR decreased from 0.75 to 0.55 in the native fluency category and from 1.90 to 1.5 in the so-so category. These differing trends between ethnicities are reflected in table 6 as well. Through this analysis we identified all the covariates to be confounders between acculturation variables and hypertension by ethnicities. Thus, they were adjusted and accounted for in our final models.

Table 6.1, 6.2, and 6.3 shows the multivariate analysis for each acculturation variable to hypertension by ethnicity. Due to low cell counts for certain categories, some of the odds ratios do not indicate valid results and yield very wide confidence intervals. Table 7.1 models the years in the U.S. and hypertension adjusting for all covariates divided by each ethnic group. There were no significant findings, but when observing the overall trend and direction of the odds ratios for years in the U.S., there are differences among the ethnic groups. In the Chinese group, the trend of

the ORs seems to suggest increased odds of hypertension with increasing years in the U.S., ranging from 0.55 to 1.83. Among the Koreans, the OR pattern suggests increased odds of hypertension for those who resided in the U.S. for more than 11 years compared to those who newly immigrated. However in the Vietnamese group, all of the OR patterns except for "11-20years" are below 1, suggesting decreased odds of hypertension.

Table 7.2 models self-rated identity to hypertension by each ethnic group. There were no significant findings and overall the trend seems similar among all three ethnic groups. However, there was a trend of increased odds among Chinese and Koreans who rated themselves as 'mostly Asian" by about 80%, although not statistically significant. Table 7.3 shows the self-rated English fluency to hypertension by ethnic group. Although not statistically significant, there were some differences in OR patterns. Among the Chinese, those who speak so-so had an odds ratio of 2.76 (95%CI: 0.71, 10.74) compared to who spoke poor English or not at all and those who spoke fluent to well English had an odds ratio of 0.74 (95%CI: 0.17, 3.18). This suggests that compared to those who spoke poor to no English, a slight increase in English fluency may increase odds of hypertension, while a large increase in English fluency decrease odds of hypertension. Koreans showed odds ratios close to 1: 0.98 (95%CI: 0.23, 4.26) and 1.04 (95%CI: 0.44, 2.46) for native/well and so-so categories respectively, suggesting no trends in English fluency and hypertension among Koreans. In the Vietnamese group, the trend seems to suggest increased risk of hypertension with increase in English proficiency. The odds ratio was 3.13 (95%CI: 0.64, 15.41) for the native/well category and 2.11 (95%CI: 0.85, 5.24) for the so-so category.

VI. Discussion

The current study examined acculturation and hypertension among Asian American subgroups that are not typically studied. Disaggregated analysis of acculturation and hypertension in each ethnic subgroup was conducted to account for any subgroup differences that may be present. Objective measurements of blood pressure readings were used to determine hypertension for increased accuracy. The findings of the current study suggest that increase in the years of U.S. residency increases odds of hypertension. No association was observed between self-rated identity and hypertension. We observed increased odds of hypertension among those with moderate English fluency compared to those who cannot speak English. Some differences in association of acculturation and hypertension in subgroups were observed among Chinese, Korean, and Vietnamese.

Majority of the previous literature regarding acculturation and hypertension supports the healthy immigrant theory that increased acculturation leads to worse health outcomes (12, 13, 20, 21). Although marginally significant, the findings of the current study seem to support the healthy immigrant theory as well, as the odds ratio patterns of the "years in the U.S.," increasing from 0.36 to 1.79 with increased years of residency in the U.S., suggest increased odds of hypertension as years of residency increase. The slight increase in English fluency also has a higher odds ratio than those who cannot speak English well, suggesting an increase in odds of hypertension with increased acculturation.

The Teppala et al study which observed a multiethnic sample including Asian American subpopulations observed in this study, had significant odds ratios between acculturation and hypertension (OR=1.78; 95%CI: 1.50, 2.11), indicating that more acculturated individuals are more likely to be hypertensive (20). In the current study, we found that compared to those who resided in the U.S. for 0-5 years, individuals who resided for 6-10 years were less likely to have

hypertension and from 11 years and over, there was an overall trend suggesting increased odds of hypertension as years of residency increased. Also, compared to those with poor English fluency, those who speak "so-so" English were seen to have increased odds of hypertension. The difference in sample and acculturation variables used may account for the observed differences. The composition of the Teppala study sample was different from the current study, as they included whites, non-Hispanic blacks, Hispanics, and Asians together. In the Teppala study, they used country of birth of participant, country of birth of parents, language spoken at home, and duration of stay in the United States as acculturation measures. The only acculturation variable that coincides with the current study is the years in the U.S. Measurement of acculturation may influence the finding of significant results, as accurate assessment of acculturation is necessary.

The study by Steffen et al., a meta-analysis of studies conducted worldwide that examined acculturation and hypertension found that increase in acculturation was positively associated with hypertension- in support of the healthy immigrant theory. However, they saw the greatest association between 0-3 years of immigration and argued that acculturation effect is the strongest during the first 3 years of interaction with the new culture (19). We tried recoding the years in the U.S. variable to capture the odds of hypertension in the first 3 years. The odds ratio of 0-3 years compared to 30 years or more of U.S. residency was 0.62 (95% CI: 0.25, 1.53). When keeping the same interval as before, the odds ratio of 0-5 years compared to 30 years or more of U.S. residency was 0.56 (95% CI: 0.24, 1.33). Thus, in the current study, the trend in OR suggests greater effect in the first 5 years rather than 3, and the trend in OR was opposite of what Steffen et al. found, as the OR increases with years of residency.

The current study found some interesting interactions between acculturation variables and gender, health insurance status, and age. First, there was an effect modification by gender on the association between self-rated identity and hypertension. In the "mostly-Asian" category, the odds

ratios indicated increasing trend of hypertension for males, whereas it reflected a potential protective trend for females. Thus, more acculturation was seen to be harmful (increased association for hypertension) for males, while it indicated less likelihood of hypertension in females. This may be due to health-detrimental male health behavior, such as tobacco and alcohol use. These behaviors have been found to be associated with high blood pressure (27-29). In our study, males had higher proportion of current smokers and binge/heavy drinkers. To explain the observed gender difference, we also examined social support and found that females had higher social support than males. Social support is essential in physical and psychological health and lack of social support may contribute to decreased health (68). Thus, this difference in social support could have accounted for the differences in odds ratios that we saw.

Although the association between acculturation and hypertension has been studied previously, there is lack of knowledge of this relationship for Asian American subgroups. As some studies saw unique differences in hypertension prevalence in Asian subgroups (6), we saw slight variations in hypertension prevalence: 20% in Chinese, 22% in Korean, and 24% in Vietnamese Americans. Disaggregated analysis for subgroups has been conducted in the current study to cover the gaps in literature. In the disaggregated analysis, acculturation variables were not statistically significant mainly due to lack of power, but we observed differences in OR trends for acculturation and hypertension among three ethnic groups. For years in the U.S., The OR trend suggests increased odds of hypertension with increase in years of residency in U.S. for the Chinese; Korean OR do not show a gradual trend as did the Chinese, but Koreans had high ORs across most categories, suggesting increased odds of hypertension with increased years; the Vietnamese ORs did not present a specific trend and ORs were mostly below 1. For self-rated identity, compared to those who rated themselves as "very Asian," those in the "mostly Asian" category had a trend of almost two-fold increased odds of hypertension among the Chinese and

Koreans. For self-rated English fluency, compared to Vietnamese who cannot speak English, Vietnamese who speak "so-so" English had over 2 times the odds of developing hypertension and Vietnamese who speak fluent English showed an OR trend suggesting 3 times the odds of hypertension. The disaggregation of Asian Americans into subgroups revealed important trends in the association of acculturation and hypertension in each ethnic group that were not seen in aggregated analysis.

5.1 Strengths and Limitations

There are several limitations in this study. First, since this is a cross-sectional study, no causal inferences can be drawn from its findings. Second, the study used non-probability sampling methods because the target population is a hard-to-reach population. Therefore, this might have led to self-selection, if those who were more aware of or interested in their hepatitis B status chose to participate. However, hepatitis B is not a main topic of our study, so effect of self-selection might have been small.

A strength of this study is that it examined acculturation status on hypertension prevalence among different Asian subgroups that are not studied in-depth. Heterogeneity within racial groups has been studied less frequently (1, 51). Unlike other studies that aggregate Asian Americans into one group (2, 71), which interferes with making further conclusions about separate subgroups, this study includes under-studied Asian subgroups: Chinese, Korean, and Vietnamese Americans and observes them separately in analysis. Second, instead of using subjective measurements of health such as self-rated health that is often used in other studies (22, 72, 73), we used objective measures for our outcome of hypertension. We used a mean of three blood pressure readings taken on-site at the time of the survey for increased accuracy, rather than taking just one measurement (6).

5.2 Public Health Significance

This study examining the association of acculturation and hypertension is significant because it examines understudied topic of interest among particular Asian subgroups: Chinese, Korean, and Vietnamese Americans. Despite the increase of the Asian American population, there is currently relatively little research about health risks among Asian American subgroups. This study will add to existing knowledge about acculturation and hypertension among Asian subgroups (6). This research will add to existing studies about acculturation and add more objective observation of health- particularly hypertension- among these Asian subgroups while controlling for possible confounding variables (20).

Studies such as this are more prevalent among the Hispanic population (62, 65, 74) but are still lacking in Asian subgroups. If Asian Americans are discussed, much of it focuses on the Chinese population, which is the biggest subgroup among Asian Americans. Also, there are not many studies examining Asian American hypertension disparity. National data mostly over samples of black and Hispanic Americans and in comparison, Asian Americans are sampled much less and thus lacking external validity, results cannot be inferred to the Asian population (1, 61). This study focuses on and provides insightful data about various Asian subgroups that are not typically observed.

It is important to identify any disparities in health to find new means of improvement for the population. Asian Americans are a special minority, where majority are foreign-born. If we could identify the impact of acculturation on health, it would be a step toward any method of health improvement in this population. Clear identification of a problem or disparity is crucial. By examining acculturation and health of Asian Americans, we hope to find an association that could be informative for any future interventions to prevent or decrease hypertension among Asian Americans.

As immigration increases and the immigrant population continue to age, the U.S. health system will need to provide more culturally-adapted services to serve a population that is diverse in language, health beliefs, and health behaviors. It is important that we continue to research under-studied populations to assess their needs. As very few studies examined cardiovascular disease risk factor prevalence in Asian Americans (6), the purpose of this study was to examine one of these cardiovascular disease risk factors, hypertension, among Asian Americans in the Washing DC Metropolitan Area and add to existing knowledge.

This study may present more knowledge to improve awareness, treatment, and control of hypertension in Asian Americans. In future studies, longitudinal analysis would be helpful in developing a clear causal inference (19). Also, although we used 3 separate variables to assess acculturation of participants, we hope that future studies could employ more diverse acculturation measures that capture an individual's acculturation more comprehensively. Acculturation is a complex process that may not be captured in one-dimension (75).

5.3 Conclusion

This study sought to examine the relationship between Asian American acculturation and hypertension. Findings suggest an association between acculturation and hypertension, guiding future studies to investigate further into these observed effects. Some subgroup differences were observed among Asian American subgroups, potentially suggesting a subgroup-focused intervention. This study prompts other future studies to carefully construct acculturation variables, to gain more knowledge and capture the full realm of acculturation by using a longitudinal study design. The information collected from this study can serve as underlying facts for other Asian American studies to examine acculturation and health, potentially decreasing hypertension among Asian Americans.

VII. Appendix

Question number	**Question**
11a	**If you are foreign born, when did you come to the U.S.? Year______**
21	**1.How would you rate yourself?** **1. Very Asian** **2. Mostly Asian** **3. Bicultural** **4. Mostly Westernized** **5. Very Westernized**
22	**22.How well do you speak English?** **1. Fluent like a native speaker** **2. Well** **3. So-So** **4. Poorly** **5. Not at all**

Table 1: Sociodemographic characteristics and acculturation responses of the sample

	Total n = 572	Non-hypertensive n = 447	Hypertensive n = 125	X^2 P-value
Age **				**0.005**
Less than 30 years	59 (10.3)	52 (11.6)	7 (5.6)	
30-39 years	73 (12.8)	66 (14.8)	7 (5.6)	
40-49 years	178 (31.1)	138 (30.9)	40 (32.0)	
50-59 years	189 (33.0)	140 (31.3)	49 (39.2)	
60 years and over	73 (12.8)	51 (11.4)	22 (17.6)	
Gender **				**<.0001**
Male	239 (41.8)	165 (36.9)	74 (59.2)	
Female	333 (58.2)	282 (63.1)	52 (40.8)	
Ethnicity				**0.52**
Chinese	194 (33.9)	155 (34.7)	39 (31.2)	
Korean	187 (32.7)	148 (33.1)	39 (31.2)	
Vietnamese	191 (33.4)	144 (32.2)	47 (37.6)	
Education *				**0.04**
Less than high school	79 (13.8)	53 (11.9)	26 (20.8)	
High school	148 (25.9)	115 (25.7)	33 (26.4)	
Vocational school or some college	68 (11.9)	50 (11.2)	18 (14.4)	
College graduate	155 (27.1)	128 (28.6)	27 (21.6)	
Graduate school	122 (21.3)	101 (22.6)	21 (16.8)	
Income				**0.55**
Less than $10,000	78 (13.6)	57 (12.7)	21 (16.8)	
$10,000- $29,999	161 (28.2)	125 (28.0)	36 (28.8)	
$30,000- $49,999	117 (20.5)	94 (21.0)	23 (18.4)	
$50,000- $99,999	132 (23.1)	101 (22.6)	31 (24.8)	
More than $100,000	84 (14.7)	70 (15.7)	14 (11.2)	
Health Insurance				**0.95**
Yes	296 (51.8)	231 (51.7)	65 (52.0)	
No	276 (48.2)	216 (48.3)	60 (48.0)	
Years in the US **				**0.0002**
0-5 years	112 (19.6)	89 (19.9)	23 (18.4)	
6-10 years	55 (9.6)	50 (11.2)	5 (4.0)	
11-20 years	160 (28.0)	123 (27.5)	37 (29.6)	
21-30 years	116 (20.3)	83 (18.6)	33 (26.4)	
More than 30 years	52 (9.1)	36 (9.16)	20 (16.0)	
Missing	77 (13.4)	70 (15.7)	7 (5.6)	
Self-rated Identity				**0.83**
Very Asian	326 (57.0)	253 (56.6)	73 (58.4)	
Mostly Asian	98 (17.1)	75 (16.8)	23 (18.4)	
Bicultural	140 (24.5)	112 (25.0)	28 (22.4)	
Westernized	8 (1.40)	7 (1.6)	1 (0.8)	
Self-rated English Fluency				**0.11**
Native fluency/well	134 (23.4)	113 (25.2)	21 (16.8)	
So-So	223 (39.0)	167 (37.4)	56 (44.8)	
Poorly/not at all	215 (37.6)	167 (37.4)	48 (38.4)	

* $P < 0.05$; ** $P < 0.01$

Table 2: Unadjusted Associations between covariates, acculturation variables and hypertension (N=572)

	OR	95% CI	P-value	Type 3 p-value
Age*				**0.01**
Less than 30 years	Ref	Ref		
30-39 years	0.79	0.26, 2.39	0.67	
40-49 years	2.15	0.91, 5.11	0.08	
50-59 years	2.60	1.11, 6.10	0.03	
60 years and over	3.20	1.26, 8.16	0.01	
Gender*				**<.0001**
Male	2.48	1.65, 3.72		
Female	Ref	Ref		
Ethnicity				**0.52**
Chinese	Ref	Ref		
Korean	1.05	0.64, 1.72	0.86	
Vietnamese	1.30	0.80, 2.10	0.29	
Education**				**0.05**
Less than high school	2.36	1.21, 4.58	0.01	
High school	1.38	0.75, 2.54	0.30	
Vocational school or some college	1.73	0.85, 3.54	0.13	
College graduate	1.02	0.54, 1.90	0.96	
Graduate school	Ref	Ref		
Income				**0.55**
Less than $10,000	1.84	0.86, 3.94	0.12	
$10,000-$29,999	1.44	0.73, 2.85	0.30	
$30,000-$49,999	1.22	0.59, 2.55	0.59	
$50,000-$99,999	1.53	0.76, 3.09	0.23	
More than $100,000	Ref	Ref		
Health Insurance				**0.95**
Yes	Ref	Ref		
No	0.99	0.66, 1.47		
Years in the US*				**0.0005**
0-5 years	Ref	Ref		
6-10 years	0.39	0.14, 1.08	0.07	
11-20 years	1.16	0.65, 2.10	0.61	
21-30 years	1.54	0.84, 2.83	0.17	
More than 30 years	2.42	1.17, 4.98	0.02	
Missing	0.39	0.16, 0.95	0.04	
Self-rated Identity				**0.83**
Very Asian	Ref	Ref		
Mostly Asian	1.06	0.62, 1.81	0.82	
Bicultural	0.87	0.53, 1.41	0.57	
Westernized	0.50	0.06, 4.09	0.51	
Self-rated English fluency **				**0.11**
Native fluency/well	0.65	0.37, 1.14	0.13	
So-So	1.17	0.75, 1.81	0.49	
Poorly/not at all	Ref	Ref		

Table 3: Adjusted association models between acculturation variables and hypertension (N=572)

	Model 1		Model 2		Model 3	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Years in the US						
0-5 years	Ref	Ref				
6-10 years	0.36	0.12, 1.05				
11-20 years	1.17	0.61, 2.29				
21-30 years	1.15	0.56, 2.34				
More than 30 years	1.79	0.75, 4.24				
Missing	0.30	0.11, 0.79				
Self-rated Identity						
Very Asian			Ref	Ref		
Mostly Asian			1.16	0.62, 2.17		
Bicultural			0.89	0.51, 1.57		
Westernized			0.78	0.09, 6.91		
Self-rated English Fluency						
Native fluency/well					1.00	0.48, 2.10
So-So					1.57	0.93, 2.64
Poorly/Not at all					Ref	Ref
Age						
Less than 30 years	Ref	Ref	Ref	Ref	Ref	Ref
30-39 years	1.08	0.33, 3.56	1.20	0.38, 3.85	1.18	0.37, 3.78
40-49 years	2.97	1.09, 8.11	3.33	1.27, 8.77	3.36	1.26, 9.00
50-59 years	3.25	1.18, 8.91	4.00	1.56, 10.27	4.11	1.57, 10.78
60 years and over	3.48	1.21, 9.99	3.84	1.41, 10.44	3.70	1.33, 10.28
Gender						
Male	2.91	1.86, 4.55	2.97	1.92, 4.60	2.99	1.93, 4.64
Female	Ref	Ref	Ref	Ref	Ref	Ref
Ethnicity						
Chinese	Ref	Ref	Ref	Ref	Ref	Ref
Korean	0.96	0.51, 1.81	0.81	0.42, 1.58	0.77	0.42, 1.43
Vietnamese	0.76	0.40, 1.46	0.75	0.40, 1.42	0.70	0.37, 1.33
Education						
Less than high school	2.03	0.81, 5.11	2.12	0.86, 5.21	2.40	0.93, 6.17
High school	1.15	0.50, 2.65	1.23	0.54, 2.76	1.30	0.56, 2.99
Vocational school or some college	1.92	0.80, 4.64	2.04	0.86, 4.81	2.13	0.89, 5.09
College graduate	0.95	0.45, 2.01	0.99	0.47, 2.10	1.03	0.48, 2.18
Graduate school	Ref	Ref	Ref	Ref	Ref	Ref
Income						
Less than $10,000	3.15	1.12, 8.91	2.39	0.88, 6.48	2.45	0.89, 6.74
$10,000-$29,999	2.08	0.85, 5.07	1.66	0.70, 3.94	1.62	0.67, 3.91
$30,000-$49,999	1.79	0.71, 4.50	1.36	0.56, 3.31	1.33	0.54, 3.29
$50,000-$99,999	2.11	0.91, 4.87	1.92	0.84, 4.39	1.75	0.76, 4.04
More than $100,000	Ref	Ref	Ref	Ref	Ref	Ref
Health Insurance						
Yes	Ref	Ref	Ref	Ref	Ref	Ref
No	0.78	0.47, 1.30	0.76	0.46, 1.24	0.79	0.48, 1.29

Table 4.1: Sociodemographic characteristics of the sample by ethnicity

	Total	Non-hypertensive	Hypertensive	X^2 P-value
Chinese **Korean** **Vietnamese**	n = 194 n=187 n=191	n = 155 n=148 n=144	n = 39 n=39 n=47	
Age				0.48 0.33 0.02
Less than 30 years	33 (17.0) 16 (8.6) 10 (5.2)	28 (18.1) 15 (10.1) 9 (6.3)	5 (12.8) 1 (2.6) 1 (2.1)	
30-39 years	28 (14.4) 19 (10.2) 26(13.6)	24 (15.5) 17 (11.5) 25 (17.4)	4 (1.03) 2 (5.1) 1 (2.1)	
40-49 years	49 (25.3) 51 (27.2) 78 (40.8)	41 (26.5) 40 (27.0) 57 (39.6)	8 (20.5) 11 (28.2) 21 (44.7)	
50-59 years	54 (27.8) 81 (43.3) 54 (28.3)	40 (25.8) 60 (40.5) 40 (27.8)	14 (35.9) 21 (53.9) 14 (29.8)	
60 years and over	30 (15.5) 20 (10.7) 23 (12.04)	22 (14.2) 16 (10.8) 13 (9.0)	8 (20.5) 4 (10.3) 10 (21.3)	
Gender				0.005 0.04 0.004
Male	81 (41.8) 74 (39.6) 84 (44.0)	57 (36.8) 53 (35.8) 55 (38.2)	24 (61.5) 21 (53.9) 29 (61.7)	
Female	113 (58.2) 113 (60.4) 107 (56.0)	98 (63.2) 95 (64.2) 89 (61.8)	15 (38.5) 18 (46.1) 18 (38.3)	
Education				0.31 0.10 0.18
Less than high school	13 (6.7) 14 (7.5) 52 (27.2)	10 (6.5) 8 (5.4) 35 (24.3)	3 (7.7) 6 (15.4) 17 (36.2)	
High school	20 (10.3) 49 (26.2) 79 (41.4)	13 (8.4) 38 (25.7) 64 (44.4)	7 (18.0) 11 (28.2) 15 (31.9)	
Vocational school or some college	15 (7.7) 32 (17.1) 21 (11.0)	14 (9.0) 23 (15.5) 13 (9.0)	1 (2.6) 9 (23.1) 8 (17.0)	
College graduate	47 (24.2) 77 (41.2) 31 (16.2)	37 (23.9) 66 (44.6) 25 (17.4)	10 (25.6) 11 (28.2) 6 (12.8)	
Graduate school	99 (51.0) 15 (8.0) 8 (4.2)	81 (52.3) 13 (8.8) 7 (4.9)	18 (46.1) 2 (5.1) 1 (2.1)	
Income				0.09 0.23 0.71
Less than $10,000	16 (8.3) 19 (10.2) 43 (22.5)	12 (7.7) 16 (10.8) 29 (20.1)	4 (10.3) 3 (7.7) 14 (29.8)	
$10,000- $29,999	47 (24.2) 51 (27.3) 63 (33.0)	40 (25.8) 35 (23.7) 50 (34.7)	7 (18.0) 16 (41.0) 13 (27.7)	
$30,000- $49,999	24 (12.4) 53 (28.3) 40 (20.9)	21 (13.6) 42 (28.4) 31 (21.5)	3 (7.7) 11 (28.2) 9 (19.2)	
$50,000- $99,999	44 (22.7) 54 (28.9) 34 (17.8)	29 (18.7) 46 (31.1) 26 (18.1)	15 (38.5) 8 (20.5) 8 (17.0)	
More than $100,000	63 (32.5) 10 (5.4) 11 (5.8)	53 (34.2) 9 (6.1) 8 (5.6)	10 (25.6) 1 (2.6) 3 (6.4)	
Health Insurance				0.46 0.22 0.58
Yes	140 (72.2) 53 (28.3) 103 (53.9)	110 (71.0) 45 (30.4) 76 (52.8)	30 (76.9) 8 (20.5) 27 (57.5)	
No	54 (27.8) 134 (71.7) 88 (46.1)	45 (29.0) 103 (69.6) 68 (47.2)	9 (23.1) 31 (79.5) 20 (42.5)	

Table 4.2: Acculturation characteristics of the sample by ethnicity

Chinese Korean Vietnamese	Total n = 194 n=187 n=191	Non-hypertensive n = 155 n=148 n=144	Hypertensive n = 39 n=39 n=47	X^2 P-value
Years in the US				0.10 0.004 0.29
0-5 years	50 (25.8) 24 (12.8) 38 (19.9)	41 (26.5) 20 (13.5) 28 (19.4)	9 (23.1) 4 (10.3) 10 (21.3)	
6-10 years	14 (7.2) 18 (9.6) 23 (12.0)	12 (7.7) 18 (12.2) 20 (13	2 (5.1) 0 (0.00) 3 (6.4)	
11-20 years	47 (24.2) 62 (33.2) 51 (26.7)	41 (26.5) 43 (29.1) 39 (27.1)	6 (15.4) 19 (48.7) 12 (25.5)	
21-30 years	49 (25.3) 24 (12.8) 43 (22.5)	35 (22.6) 16 (10.8) 32 (22.2)	14 (35.9) 8 (20.5) 11 (23.4)	
More than 30 years	19 (9.8) 15 (8.0) 18 (9.4)	12 (7.7) 10 (6.8) 10 (6.9)	7 (18.0) 5 (12.8) 8 (17.0)	
Missing	15 (7.7) 44 (23.5) 18 (9.4)	14 (9.0) 41 (27.7) 15 (10.4)	1 (2.6) 3 (7.7) 3 (6.4)	
Self-rated Identity				0.63 0.76 0.83
Very Asian	67 (34.55) 168 (89.9) 91 (47.6)	53 (34.2) 133 (89.9) 67 (46.5)	14 (35.9) 35 (89.7) 24 (51.2)	
Mostly Asian	50 (25.8) 5 (2.7) 43 (22.5)	38 (24.5) 4 (2.7) 33 (22.9)	12 (30.8) 1 (2.6) 10 (21.3)	
Bicultural	73 (37.6) 12 (6.4) 55 (28.8)	60 (38.7) 10 (6.8) 42 (29.2)	13 (33.3) 2 (5.1) 13 (27.7)	
Westernized	4 (2.1) 2 (1.1) 2 (1.1)	4 (2.6) 1 (0.7) 2 (1.4)	0 (0.00) 1 (2.6) 0 (0.00)	
Self-rated English Fluency				0.08 0.54 0.81
Native fluency/well	82 (42.3) 29 (15.5) 23 (12.0)	71 (45.8) 25 (16.9) 17 (11.8)	11 (28.2) 4 (10.3) 6 (12.7)	
So-So	71 (36.6) 73 (39.0) 79 (41.4)	51 (32.9) 58 (39.2) 58 (40.3)	20 (51.3) 15 (38.5) 21 (44.7)	
Poorly/not at all	41 (21.1) 85 (45.5) 89 (46.6)	33 (21.3) 65 (43.9) 69 (47.9)	8 (20.5) 20 (21.2) 20 (42.6)	

Table 5.1: Unadjusted Associations between covariates and hypertension by ethnicity

Chinese n = 194 Korean n=187 Vietnamese n=191	OR	95% CI	P-value	Type 3 p-value
Age				0.49 0.39 0.06
Less than 30 years	Ref	Ref		
30-39 years	0.93 1.77 0.36	022, 3.87 0.15, 21.47 0.02, 6.38	0.92 0.66 0.49	
40-49 years	1.09 4.13 3.32	0.32, 3.69 0.49, 34.76 0.40, 27.78	0.89 0.19 0.27	
50-59 years	1.96 5.25 3.15	0.63, 6.07 0.65, 42.21 0.67, 27.14	0.24 0.12 0.30	
60 years and over	2.04 3.75 6.92	0.58, 7.10 0.38, 37.47 0.75, 64.02	0.26 0.26 0.09	
Gender				
Male	2.75 2.09 2.61	1.34, 5.67 1.02, 4.27 1.32, 5.13	0.006 0.04 0.006	
Female	Ref	Ref		
Education				0.36 0.12 0.19
Less than high school	1.35 4.88 3.40	0.34, 5.41 0.79, 30.29 0.39, 29.89	0.67 0.09 0.27	
High school	2.42 1.88 1.64	0.85, 6.93 0.37, 9.63 0.19, 14.36	0.099 0.45 0.65	
Vocational school or some college	0.32 2.54 4.31	0.04, 2.60 0.48, 13.60 0.44, 41.81	0.29 0.28 0.21	
College graduate	1.22 1.08 1.68	0.51, 2.89 0.21, 5.47 0.17, 16.37	0.66 0.92 0.66	
Graduate school	Ref	Ref		
Income				0.11 0.25 0.71
Less than $10,000	1.77 1.69 1.29	0.47, 6.60 0.15, 18.71 0.30, 5.61	0.40 0.67 0.74	
$10,000-$29,999	0.93 4.11 0.69	0.33, 2.65 0.48, 35.28 0.16, 2.99	0.89 0.20 0.62	
$30,000-$49,999	0.76 2.36 0.77	0.33, 2.65 0.27, 20.64 0.17, 3.54	0.69 0.44 0.74	
$50,000-$99,999	2.74 1.57 0.82	1.09, 6.87 0.17, 14.10 0.18, 3.85	0.03 0.69 0.80	
More than $100,000	Ref	Ref		
Health Insurance				
Yes	Ref	Ref		
No	0.73 1.69 0.83	0.32, 1.67 0.72, 3.97 0.43, 1.61	0.46 0.23 0.58	

Table 5.2: Unadjusted Associations between acculturation variables and hypertension by ethnicity

Chinese n = 194 Korean n=187 Vietnamese n=191	OR	95% CI	P-value	Type 3 p-value
Years in the US				0.13 0.08 0.32
0-5 years	Ref	Ref		
6-10 years	0.76 <0.001 0.42	0.14, 4.00 <0.001, >999.999 0.10, 1.72	0.75 0.97 0.23	
11-20 years	0.67 2.21 0.86	0.22, 2.04 0.66, 7.35 0.33, 2.27	0.48 0.20 0.76	
21-30 years	1.82 2.50 0.96	0.70, 4.72 0.64, 9.82 0.36, 2.60	0.22 0.19 0.94	
More than 30 years	2.66 2.50 2.24	0.82, 8.64 0.55, 11.41 0.69, 7.27	0.10 0.24 0.18	
Missing	0.33 0.37 0.56	0.04, 2.80 0.08, 1.79 0.13, 2.35	0.31 0.22 0.43	
Self-rated Identity				0.87 0.80 0.98
Very Asian	Ref	Ref		
Mostly Asian	1.20 0.95 0.85	0.50, 2.88 0.10, 8.77 0.36, 1.97	0.69 0.96 0.70	
Bicultural	0.82 0.76 0.86	0.35, 1.90 0.16, 3.63 0.40, 1.88	0.64 0.73 0.71	
Westernized	<0.001 3.8 <0.001	<0.001, >999.999 0.23, 62.28 <0.001, >999.999	0.99 0.35 0.99	
Self-rated English fluency **				0.08 0.54 0.81
Native fluency/well	0.64 0.52 1.22	0.24, 1.74 0.16, 1.67 0.42, 3.50	0.38 0.27 0.71	
So-So	1.62 0.84 1.25	0.64, 4.10 0.39, 1.79 0.62, 2.53	0.31 0.65 0.54	
Poorly/not at all	Ref	Ref		

Table 6.1: Adjusted association models between years in the U.S. and hypertension for each ethnic group

	Chinese		Korean		Vietnamese	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Years in the US						
0-5 years	Ref	Ref	Ref	Ref	Ref	Ref
6-10 years	0.55	0.08, 3.87	<0.001	>999.999	0.27	0.05, 1.42
11-20 years	0.61	0.15, 2.55	2.13	0.51, 9.97	1.14	0.35, 3.79
21-30 years	1.25	0.33, 4,76	1.89	0.37, 9.76	0.72	0.22, 2.39
More than 30 years	1.83	0.37, 9.01	2.48	0.40, 15.37	0.85	0.16, 4.41
Missing	0.15	0.01, 1.87	0.27	0.04, 1.65	0.38	0.07, 2.13
Age						
Less than 30 years	Ref	Ref	Ref	Ref	Ref	Ref
30-39 years	2.22	0.40, 12.32	1.47	0.09, 23.86	0.96	0.04, 22.82
40-49 years	1.76	0.34, 9.29	7.93	0.62, 101.76	8.64	0.72, 103.68
50-59 years	4.61	0.80, 26.38	6.81	0.55, 83.61	5.94	0.52, 68.31
60 years and over	3.81	0.65, 22.19	4.24	0.27, 66.72	16.91*	1.25, 227.96
Gender						
Male	4.85	1.94, 12.13	3.05*	1.28, 7.29	3.10**	1.38, 6.98
Female	Ref	Ref	Ref	Ref	Ref	Ref
Education						
Less than high school	1.88	0.31, 11.42	4.09	0.41, 40.50	6.02	0.35, 103.36
High school	3.46	0.73, 16.39	1.20	0.18, 7.94	2.65	0.17, 41.13
Vocational school or some college	0.23	0.02, 2.41	2.88	0.37, 22.51	12.59	0.70, 225.50
College graduate	1.19	0.40, 3.56	0.83	0.12, 5.52	3.22	0.21, 49.34
Graduate school	Ref	Ref	Ref	Ref	Ref	Ref
Income						
Less than $10,000	7.27*	1.04, 50.95	4.00	0.23, 68.78	0.98	0.11, 8.90
$10,000-$29,999	2.74	0.66, 11.47	5.67	0.47, 67.73	0.35	0.04, 2.88
$30,000-$49,999	1.72	0.32, 9.28	4.31	0.34, 55.35	0.32	0.04, 2.69
$50,000-$99,999	5.05**	1.49, 17.10	2.08	0.18, 24.21	0.49	0.07, 3.49
More than $100,000	Ref	Ref	Ref	Ref	Ref	Ref
Health Insurance						
Yes	Ref	Ref	Ref	Ref	Ref	Ref
No	0.34	0.11, 1.08	1.23	0.42, 3.64	0.62	0.26, 1.51

Table 6.2: Adjusted association models between self-rated identity and hypertension for each ethnic group

	Chinese		Korean		Vietnamese	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Self-rated Identity						
Very Asian	Ref	Ref	Ref	Ref	Ref	Ref
Mostly Asian	1.82	0.64, 5.17	1.78	0.16, 19.93	1.20	0.44, 3.29
Bicultural	0.78	2.30, 2.05	0.60	0.11, 3.32	0.89	0.36, 2.21
Westernized	<0.001	>999.999	7.25	0.35, 148.72	<0.001	>999.999
Age						
Less than 30 years	Ref	Ref	Ref	Ref	Ref	Ref
30-39 years	1.54	0.31, 7.67	3.55	0.24, 53.63	0.88	0.04, 19.92
40-49 years	1.62	0.37, 7.01	13.82*	1.18, 161.60	6.62	0.57, 76.66
50-59 years	4.42	0.97, 20.17	11.27*	1.03, 122.86	5.25	0.48, 56.95
60 years and over	3.21	0.71, 14.58	5.87	0.44, 78.03	9.79	0.84, 114.13
Gender						
Male	4.82**	1.95, 11.88	3.08**	1.33, 7.10	3.16**	1.44, 6.93
Female	Ref	Ref	Ref	Ref	Ref	Ref
Education						
Less than high school	1.83	0.31, 10.83	6.76	0.85, 53.93	5.43	0.30, 97.13
High school	3.80	0.84, 17.11	2.35	0.40, 13.87	2.49	0.15, 41.54
Vocational school or some college	0.26	0.03, 2.54	5.92	0.90, 38.78	10.40	0.56, 194.36
College graduate	1.37	0.47, 4.04	1.64	0.29, 9.22	3.00	0.19, 48.73
Graduate school	Ref	Ref	Ref	Ref	Ref	Ref
Income						
Less than $10,000	5.55	0.88, 34.86	1.81	0.12, 27.99	0.99	0.12, 8.45
$10,000-$29,999	2.33	0.56, 9.73	3.55	0.32, 38.92	0.38	0.05, 2.92
$30,000-$49,999	1.39	0.26, 7.50	2.50	0.22, 28.51	0.32	0.04, 2.37
$50,000-$99,999	5.01**	1.57, 16.04	1.43	0.13, 15.76	0.54	0.08, 3.80
More than $100,000	Ref	Ref	Ref	Ref	Ref	Ref
Health Insurance						
Yes	Ref	Ref	Ref	Ref	Ref	Ref
No	0.31*	0.10, 0.99	1.35	0.51, 3.58	0.64	0.28, 1.47

Table 6.3: Adjusted association models between self-rated English fluency and hypertension for each ethnic group

	Chinese		Korean		Vietnamese	
	aOR	95% CI	aOR	95% CI	aOR	95% CI
Self-rated English fluency						
Native fluency/well	0.74	0.17, 3.18	0.98	0.23, 4.26	3.13	0.64, 15.41
So-So	2.76	0.71, 10.74	1.04	0.44, 2.46	2.11	0.85, 5.24
Poorly/Not at all	Ref	Ref	Ref	Ref	Ref	Ref
Age						
Less than 30 years	Ref	Ref	Ref	Ref	Ref	Ref
30-39 years	2.05	0.40, 10.65	3.22	0.21, 48.63	1.34	0.05, 35.30
40-49 years	2.26	0.47, 10.77	12.74*	1.00, 162.40	12.17	0.81, 182.66
50-59 years	6.82*	1.32, 35.28	11.22*	0.93, 135.76	8.82	0.66, 117.27
60 years and over	3.44	0.69, 17.10	5.57	0.38, 82.43	17.01*	1.13, 256.17
Gender						
Male	6.16**	2.37, 16.04	2.85*	1.25, 6.47	2.85**	1.29, 6.30
Female	Ref	Ref	Ref	Ref	Ref	Ref
Education						
Less than high school	3.30	0.48, 22.63	5.85	0.70, 48.97	9.03	0.45, 180.02
High school	4.03	0.84, 19.46	2.21	0.36, 13.61	3.43	0.19, 61.37
Vocational school or some college	0.27	0.03, 2.79	5.34	0.79, 36.20	14.57	0.72, 294.25
College graduate	1.68	0.56, 5.06	1.51	0.26, 8.82	3.41	0.20, 58.38
Graduate school	Ref	Ref	Ref	Ref	Ref	Ref
Income						
Less than $10,000	6.64*	1.00, 43.95	2.25	0.15, 34.50	1.56	0.18, 13.37
$10,000-$29,999	2.64	0.59, 11.80	3.35	0.30, 36.86	0.54	0.07, 4.13
$30,000-$49,999	1.34	0.24, 7.37	2.49	0.22, 28.24	0.46	0.06, 3.63
$50,000-$99,999	4.25	1.30, 13.89	1.53	0.14, 17.19	0.58	0.08, 4.01
More than $100,000	Ref	Ref	Ref	Ref	Ref	Ref
Health Insurance						
Yes	Ref	Ref	Ref	Ref	Ref	Ref
No	0.25	0.08, 0.85	1.40	0.53, 3.74	0.66	0.29, 1.52

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