Published in final edited form as:

Popul Res Policy Rev. 2015 February ; 34(1): 49–76. doi:10.1007/s11113-014-9344-7.

The Relationship Between Duration of U.S. Residence, Educational Attainment, and Adult Health Among Asian Immigrants

Jing Li and

Department of Sociology, One Bear Place #97326, Baylor University, Waco, Texas 76798-7326

Robert A. Hummer

Department of Sociology, 1 University Station A1700, University of Texas, Austin, Texas 78712-0118

Abstract

There is substantial educational heterogeneity among Asian immigrants to the United States, suggesting that the association between duration of U.S. residence with their health outcomes and behaviors may vary considerably by educational attainment. Using data from the 2003 New Immigrant Survey (N=2,373), we find strong evidence that the detrimental associations between duration of U.S. residence and self-reported health, activity limitation status, chronic health conditions and current smoking are concentrated among Asian immigrants with less than a high school education; in contrast, the health outcomes and behaviors of Asian immigrants who have at least a high school degree exhibit very few differences by duration of U.S. residence. These distinct duration-health patterns by educational attainment are not explained by duration related differences in country of origin, class of admission, or English speaking skills. We also find a stronger duration relationship with current smoking than those with the health status measures among the least educated Asian men, indicating a potential behaviorally-based explanation for poorer health among Asian immigrant men with longer duration of residence.

Keywords

Asian immigrants; education; health; health behaviors; socioeconomic status; duration of U.S. residence

Introduction

There is compelling evidence for the “healthy immigrant effect” such that U.S. immigrants have more favorable health profiles than native-born Americans (Akresh and Frank 2008; Cunningham, Ruben and Venkat Narayan 2008; Huang et al. 2011; Kandula, Kersey and Lurie 2004). Nevertheless, research also finds that this immigrant health advantage does not seem to last. The longer immigrants live in the U.S., the worse their health seems to become (Antecol and Bedard 2006; Cho et al. 2004; Frisbie, Cho and Hummer 2001). One of the

*Direct correspondence to Jing Li, telephone: (512) 466-9766, fax: (254) 710-1175, jing_li1@baylor.edu.

major explanations is that exposure to the U.S. social context is associated with immigrants adopting harmful health behaviors that have negative health implications (Antecol and Bedard 2006; Singh and Siahpush 2002). Substantial evidence shows that recent arrivals are highly unlikely to smoke or drink heavily, use illegal drugs, be sedentary, or eat an unhealthy diet (Landale et al. 1999; Lopez-Gonzalez, Aravena, and Hummer 2005). However, the longer that immigrants live in the United States, the more likely they are to smoke, drink alcohol, eat less nutritious food, and be overweight (Akresh 2007; Antecol and Bedard 2006; Lara et al. 2005; Lauderdale and Rathouz 2000; Lopez-Gonzalez, Aravena and Hummer 2005).

The vast majority of this literature has focused on Hispanics, while relatively little specific attention has been devoted to Asian immigrants. The relative lack of research on Asian immigrants is especially concerning given the changing demographics of immigration to the United States. According to the Pew Research Center (2012), one of the most important trends in U.S. immigration is that the number of newly arrived Asian immigrants has surpassed the number of newly arrived Hispanic immigrants since at least 2009. Earlier studies on this topic usually included both U.S.-born and foreign-born Asian Americans and often found that both (Asian immigrants, in particular) have very favorable health profiles and health behaviors compared with other ethnic groups (e.g., Frisbie et al. 2001; Singh and Siahpush 2002). More recent scholarship has looked at Asian immigrants specifically (Kimbrow, Gorman and Schachter 2012; Schachter, Kimbro and Gorman 2012), but some basic questions with regard to the health adaptation of this group remain unanswered. Most important, it is unclear what happens to the health and health behavior patterns of Asian immigrants as they reside in the U.S. for a longer length of time. Is their health worse and are their health behaviors riskier among those with longer duration, patterns resembling what have been observed among Hispanic immigrants?

Some scholars have suggested that all subgroups of immigrants may experience similarly worse health and health behaviors with increased duration in the United States, regardless of their socioeconomic background. For instance, Turra and Goldman (2007) speculated that, at least for Hispanic immigrants, those with higher socioeconomic status may be as likely or even more likely to experience increased stress and racism and adopt unhealthy behaviors as their counterparts in lower socioeconomic positions. However, this speculation is in contrast with literature that emphasizes the fundamental link between high socioeconomic status and positive health and health behavior in the United States (Link and Phelan 1995; Phelan et al. 2010). Thus, our second question is the following: do duration-based patterns in Asian immigrants' health and health behavior vary according to educational level?

Overall, our primary objective is to analyze the extent to which the association between duration of residence and health status varies by educational attainment for Asian immigrants. Utilizing a national representative data set of immigrants, we investigate health differences by duration of residence among Asian immigrants with a special focus on the moderating effect of education. We also examine variations in two health behaviors, smoking status and physical inactivity, in a parallel fashion in order to provide more insight into the health of this understudied population. With one exception, our evidence shows that

the association between duration and health/health behaviors varies significantly by education among Asian immigrants.

Asian Immigrants and the Duration-Health Relationship

Previous studies have shown that foreign-born Asians have superior health than U.S.-born whites and U.S.-born Asians. Asian immigrants most often display better self-reported health and lower risks of disability, activity limitation, chronic conditions, and mortality (Cho and Hummer 2001; Frisbie et al. 2001; Singh and Siahpush 2002; Zhang and Ta 2009). Compared to their native-born co-ethnics, Asian immigrants are also less likely to smoke cigarettes and more likely to maintain a healthy body weight (Lauderdale and Rathouz 2000; Singh and Siahpush 2002). Most of these studies also examined the relationship between duration of U.S. residence and health among Asians. A typical analysis plan involves categorizing duration in combination with nativity and comparing the health of immigrants with varying length of U.S. residence to that of native-born Americans (e.g., Cho and Hummer 2001; Frisbie et al. 2001). These studies often reveal a gradient such that Asian immigrants' health is less favorable with longer duration in the United States, which is consistent with what has been observed among Hispanics. Specifically, long-term Asian immigrants tend to become more stressed, ill, and obese (Bratter and Eschbach 2005; Lauderdale and Rathouz 2000; Singh and Siahpush 2002). Compared with recent arrivals, they are also more likely to adopt detrimental health behaviors, spend more days in bed, and have higher risks of hypertension, activity limitations, chronic diseases, and mortality (Frisbie et al. 2001; Singh and Siahpush 2002).

A primary explanation for the negative association between duration of U.S. residence and Asian immigrant health, developed from studies on Hispanic health, is "negative acculturation." Assuming that length of residence positively correlates with higher levels of acculturation, this perspective suggests that as immigrants become more acculturated, their protective culture of origin dissipates and thus their health deteriorates (Abraído-Lanza et al. 2005; Jasso et al. 2004; Scribner 1996). However, the use of simple measures, such as the number of years lived in the U.S., as proxies for acculturation has been criticized for not tapping into the multi-dimensionality of the construct and depends on assumptions that are largely untested (Hunt, Schneider and Comer 2004; Kimbro et al. 2012; Lopez-Class, Castro and Ramirez 2011; Palinkas and Pickwell 1995). It is not surprising that scholars have expressed doubt in interpreting duration of residence as a simple process of negative acculturation (e.g., Abraído-Lanza et al. 2006; Cho et al. 2004; Kimbro et al. 2012). For instance, although they found that Asian immigrant health declines with longer U.S. duration, Cho et al. (2004) questioned the conclusion that American culture is toxic and offered alternative explanations. More recently, Kimbro, Gorman and Schachter (2012) found no significant association between age at migration and self-rated health among Asian immigrants, indicating that researchers' choice of acculturation measure can exert strong influence on findings.

We agree with this group of scholars that a single measure of duration as a proxy for acculturation is insufficient. However, as the most well studied aspect of "acculturation" in the immigrant health literature, duration of residence is undoubtedly one of the important

dimensions of acculturation (Abraído-Lanza et al. 2006). A methodologically more advanced approach is to combine duration with other indicators, such as citizenship and English language use, to better represent acculturation as a latent construct (Abraído-Lanza et al. 2006; Gorman, Read, and Krueger 2010; Kimbro et al. 2012). Among these indicators, English language use is particularly useful in signifying the extent to which first-generation immigrants are integrated into U.S. culture (Kandula, Lauderdale and Baker 2007). Compared to Hispanic immigrants with the same level of education, mastering English for Asian immigrants is a more difficult skill because Asian languages are more linguistically distant from English than is Spanish (Espenshade and Fu 1997). Empirical evidence attests that English language usage often has a strong positive association with favorable health and better health behaviors among Asian Americans, including better self-reported physical and mental health, lower risks of disability and smoking, higher likelihood of meeting leisure-time physical activity recommendations, and a greater increase in consumption of fruits after migration (Akresh and Frank 2008; An et al. 2008; Kandula and Lauderdale 2005; Zhang and Ta 2009).

Furthermore, we also strongly agree with Kimbro and colleagues (2012) that researchers should not assume that acculturation is either entirely positive or negative with regard to the health of immigrants. Indeed, despite the negative acculturation hypothesis, prior research on immigrant adaptation has found that longer U.S. residence renders some potential health benefits (e.g., Franzini and Fernandez-Esquer 2004; Salant and Lauderdale 2003). Classic assimilation theory suggests that time spent in the U.S. is positively correlated with higher levels of social incorporation and economic advancement (Alba and Nee 1997; Gordon 1964). Labor economists also confirm that the earnings of immigrants who have resided in the United States for many years are substantially greater than the earnings of recent immigrants (Batalova, Fix and Creticos 2008; Borjas and Friedberg 2009). As immigrants spend more time in the United States, they are more likely to develop English language skills, employment networks, and social contacts. The resources and experiences they accumulate over time also facilitate access to medical insurance and formal health care, which are generally associated with better health behaviors and outcomes (Lara et al. 2005). Unsurprisingly, sufficient evidence demonstrates that, compared to recent arrivals, long-term immigrants are more apt to report regular health screenings and receive employer-sponsored health insurance or government coverage (Akresh 2009; Echeverria and Carrasquillo 2006; Frisbie et al. 2001; Lara et al. 2005). Moreover, although longer U.S. residence or acculturation is usually linked with risky health behaviors, evidence shows that they are also associated with several healthy behaviors such as greater exercise and leisure-time physical activity, as well as a lower likelihood of smoking among at least some immigrant men (Abraído-Lanza, Chao and Florez 2005; An et al. 2008; Choi et al. 2008; Crespo et al. 2001; Kandula and Lauderdale 2005; Shelley et al. 2004). Among Asian immigrants, for example, Kandula and Lauderdale (2005) found that Asians who have lived in the U.S. for more than 10 years tend to be more physically active than recent arrivals.

Clearly, educational attainment can modify the process of acculturation and help produce divergent health outcomes for immigrants. For instance, immigrants who participate in the U.S. education system or who through their education are employed in a work setting where English is spoken and interactions with non-immigrants are required are more likely to build

relationships with native-born teachers, classmates and coworkers and be exposed to a broader array of what the host society offers. Conversely, immigrants who live in an ethnic enclave and work in occupations that are predominantly with co-ethnics have minimal need or opportunity to meet people outside of their immediate group (Salant and Lauderdale 2003). As a result, their exposure to broader U.S. society may be limited. Over time, distinctive patterns of immigrant adaptation are likely to emerge. On the one hand, immigrants with higher levels of education may experience a quicker process of social integration and, with longer duration, are likely to speak better English, expand their social networks and develop a more comprehensive understanding of the host society. On the other hand, for poorly educated immigrants who often work in low skill jobs, their adaptation may be quite delayed, frustrating, and difficult, perhaps regardless of how many years they have lived in the United States.

A recent study on Korean immigrants using data from California found empirical support that is consistent with this idea. Ra, Cho and Hummer (2013) showed that low educated Korean immigrants with a higher proportion of life spent in the U.S. tend to have poorer overall health, a higher level of psychological distress, and higher risks of disability, physical inactivity and smoking than their more educated counterparts at similar levels of duration. Chinese immigrants with longer U.S. residence have also been found to increase intake of both healthy food items (such as vegetables and fruits) and unhealthy food items (such as fats and sweets), but higher education and higher income levels are associated with a larger increase in consumption frequency of healthy food items (Lv and Cason 2004). Interestingly, Akresh (2007) also found similar divergent patterns of dietary changes among Hispanic immigrants. However, both aforementioned studies on Asians were based on samples of immigrants residing in one state (California or Pennsylvania) while Akresh's study (2007) had an exclusive focus on Hispanics, so it is unknown whether these findings can be generalized to all Asian immigrants.

Nevertheless, the studies on diverse adaptation patterns of health behaviors shed light on what may contribute to observed health decline among some immigrant groups. In the United States, lower socioeconomic status is closely associated with unhealthy lifestyles, including heavy smoking, binge drinking, being sedentary, and having a diet high in saturated fat, sugar and refined foods (Link and Phelan 1995; Mirowsky and Ross 2003). If Asian immigrants with fewer socioeconomic resources are more likely to adopt these detrimental behaviors, they may also be more likely to experience worse health with increasing duration of U.S. residence. On the other hand, recent decades have also witnessed increasing institutional and individual efforts to develop healthy lifestyles in the U.S., with an emphasis on nutritional habits and physical exercise (Popkin 2002). The changes have thus far mainly encompassed highly educated native-born adults (Pampel, Krueger and Denney 2010). However, given that this segment of the population is what professional and highly educated immigrants assimilate into, foreign-born Asians with high SES may be more likely to experience exposure in this manner. Empirical studies show that Asian American smoking rates decrease as a function of educational attainment (Ma et al. 2002), and Asian American men who use more English in their daily life tend to have lower current smoking prevalence, higher quit rates and a history of never smoking (An et al. 2008; Shelley et al. 2004). Immigrants with higher social status may also quickly learn how to read

nutrition fact labels, deliberately avoid processed food and thus have a more healthy diet (Lv and Cason 2004). Meanwhile, they may be more likely to have extra income, discretionary time and recreational resources to engage in physical exercise. Moreover, evidence shows that higher family income is inversely related to body mass index for Asian American women (Lauderdale and Rathouz 2000), and that higher education is strongly associated with less physical inactivity among Asian Americans (Kandula and Lauderdale 2005).

With low and high SES immigrants adapting their health behaviors in such different ways, long-term immigrant health is likely to differ depending on socioeconomic status (Akresh 2007; Ra et al. 2013). Moreover, the changes in health behaviors may occur first – before any health outcome differences can be observed – given that immigrants are generally in optimal health upon arrival. If evidence shows that behavioral changes precede changes in health outcomes, which requires longitudinal data, we are one step further towards establishing causality. However, due to a lack of available data, few studies have investigated these temporal relationships. Alternatively, researchers can use cross-sectional data to examine whether the association between duration of U.S. residence and health behaviors is larger than that between duration and health outcomes at one point in time. Evidence obtained in this manner is only suggestive, but may indicate that health behavior changes tend to unfold more quickly with longer U.S. duration than do health outcomes. This is the approach we take in the analysis that follows.

Hypotheses

Based on the above reasoning, two key hypotheses guide our study. First, we expect that [H1]: the relationship between duration of U.S. residence and Asian immigrant health status and health behavior varies by education. Specifically, we anticipate that the deleterious association between longer duration and health is relatively large for immigrants with low levels of education but is absent or even reversed for highly educated immigrants. Second, because duration is essentially a temporal measure, it is likely that greater exposure to life in the U.S. is associated with health behavior adaptation first, followed by changes in health outcomes. Therefore, we hypothesize that [H2]: the relationships between duration, education, and health behavior will be stronger than the relationships between duration, education, and health.

Data, Measures and Methodology

Data

We use the first wave (2003) of the New Immigrant Survey (NIS), a nationally representative survey of immigrants with newly acquired legal permanent residence (LPR). The sampling frame of the NIS was based on electronic administrative records compiled by the Citizenship and Immigration Services and consisted of all adults admitted to LPR between May and November of 2003. The response rate was 69% (Jasso et al. 2005). Because of its exclusive focus on new LPR immigrants, the NIS was stratified in order to obtain reliable information on the visa categories of interest. In the adult sample, four strata were identified: spouses of U.S. citizens, employment principals, diversity principals, and other immigrants, with the first two strata oversampled. Although the sampling design dictated that only legal

permanent residents were included, some respondents had lived in the U.S. before being granted LPR. As a result, the NIS included immigrants from a variety of backgrounds, including previously unauthorized immigrants and those previously holding temporary employment/student visas.¹

The unique data collection process has a direct impact on the characteristics of our sample. First, compared with other nationally representative datasets that include foreign-born Asians with different legal/naturalization statuses, Asian immigrants in the NIS are uniformly current LPRs. This eliminates one important source of population heterogeneity that may be associated with health-related outcomes (Singh and Siapush 2002). Second, because individuals in the NIS are all new LPRs, a sizable proportion of them have less than one year of U.S. residence. Although there are also plenty of long-term immigrants in the NIS who adjusted their status to LPR, on average Asians in our sample tend to have shorter duration than those in other nationally representative datasets. Last, because employment-principals tend to have more years of formal schooling than immigrants who enter with other visas, and previous studies also showed that the spouses of U.S. citizens tend to report high levels of education (Jasso et al. 2000), our sample has a sizable proportion of respondents with high levels of education.

The NIS has rich questions that are not available in other national data sets that include both the foreign-born and the native-born, which makes it especially desirable for immigrant studies.² Specifically, the NIS covers a variety of topics including migration history, schooling, marriage and family, language skills, health, and health behaviors. NIS interviews were conducted in the language of the respondent's choice to ensure data quality. More than half (52%) of the interviews were conducted in languages other than English, which helps reduce the concern of differential reporting across ethnic/language groups.

We restrict the sample to Asian origin adults aged 25 and above. Limiting the age range helps make the educational measure more meaningful because most people finish their education by age 25. Response rates for variables in our analysis were very high: there are no incomplete data on key variables except for the two health behavior measures (i.e., current smoking and physical inactivity), which have less than 3% missing cases. The final analytic sample sizes are 2,373 for health outcomes, 2,306 for current smoking, and 2,305 for physical inactivity.

Outcome Measures

We focus on three dimensions of health status: self-rated health, activity limitation status and chronic medical conditions. The NIS allows the respondents to self-report their overall health as poor, fair, good, very good or excellent. We code self-rated health as a dichotomous variable (1= fair or poor, 0 = good, very good or excellent). In comparison to self-rated health, activity limitation status is a more objective health measure and less subject to reporting differences across social/cultural groups. The NIS does not have a

¹As a result, the NIS excludes current unauthorized immigrants, those who are on temporary employment/student visas, as well as naturalized citizens and long-term immigrants who gained permanent residency before 2003.

²The first wave of the NIS is cross-sectional in nature, but the New Immigrant Survey is a longitudinal study. Future longitudinal analysis will shed more light on immigrant health change.

comprehensive variable for activity limitation status. Instead, it includes 10 individual questions about activity limitations that are due to specific chronic diseases. We consolidate these questions into one dummy variable and code it as 1 if the respondents indicated any degree of activity limitation and 0 for those with no limitations. The NIS also asks respondents whether they were ever diagnosed with life-threatening or costly medical conditions including cancer, emphysema/lung disease, heart disease (inclusive of coronary heart disease, angina pectoris, heart attack and other heart condition/disease), stroke, diabetes, arthritis and asthma. Information on the presence or absence of these conditions offers an alternative view of respondents' overall health and disease burden. Because immigrants are on average quite healthy and the proportion of having any particular chronic disease is very low, this variable is also coded as 1 if respondents have any of the chronic diseases and 0 otherwise.

Health behaviors include current smoking and physical inactivity. We create a dichotomous variable for current smoking; we include those who report smoking at least 100 cigarettes in their lifetime and who currently smoke as current smokers. Respondents who have never smoked or who have quit smoking are the reference category. Physical inactivity is defined as a lack of regular participation in any light (such as walking, dancing, gardening, golfing or bowling) or vigorous (such as aerobics, running, swimming or bicycling) physical activities during exercise and recreation. It is also a dichotomous variable, measured as 1 for respondents do not regularly partake in physical activity and 0 otherwise.

Key Predictors

One advantage of the NIS is its measurement of duration of U.S. residence. Most studies on duration and immigrant health are based on a single question asking the respondents to report their length of U.S. residence. Because the question is not based on concrete migration behaviors, it is ambiguous and problematic (Redstone and Massey 2004). The NIS asks respondents' date of arrival for all trips beginning with the first time when immigrants left their country of birth. Taking advantage of this detailed information, we measure U.S. duration by the sum of time (expressed in years) immigrants have spent in the United States (mean=2.88, min=0, max=37).

We specify educational attainment as our key measure of socioeconomic status because it is most often established in early adulthood and remains constant thereafter. Thus, it can be considered as a precursor to health outcomes measured beyond early adulthood as well as other socioeconomic indicators such as occupation, income and wealth. In contrast, "reverse causation" – pathways from health to changes in occupational status, income levels and wealth accumulation – makes a causal interpretation of the health-SES association problematic (Smith 2004). Information about education level is also readily available for most NIS respondents. This consideration is particularly important for recent immigrants who moved to the United States for reasons other than employment (i.e., family immigrants, refugees and diversity immigrants) in that they are less likely to participate in the labor market immediately after arrival. Meanwhile, prior research using the New Immigrant Survey Pilot (NIS-P) suggested that some highly skilled immigrants also experience temporary downward occupational mobility after moving (Akresh 2006). Compared to other

measures such as current occupation and income, education may thus serve as a more robust indicator in reflecting the socioeconomic group that immigrants will eventually assimilate into (Batalova et al. 2008). Lastly, education is less sensitive for respondents than questions on occupation, income and wealth. This distinction has important implications for immigrants, who may not trust the process of survey data collection because of their background and pre-migration experiences. We specify years of completed schooling in our study. We choose a continuous measure because dichotomized or trichotomized education levels often lead to a loss of information and possibly a poorer model fit (Ross and Mirowsky 1999).³ We also use three particular levels of education (9 years, 12 years, and 16 years) as examples in our graphs to best illustrate the education-based patterns in our data; note, though, that all of our statistical models use the continuous measure of education in years.

Demographic and Explanatory Variables

Demographic control variables include age, gender, national origin, and marital status. Age is measured in years. Gender is coded 1 for male and 0 for female. Respondents are classified into six mutually exclusive countries of origin: China (reference category), India, Korea, Philippines, Vietnam, and other Asian. Marital status is coded as currently married or living as married (reference category), formerly married and never married.

We further include two immigration/acclimation-related variables – visa admission category and English speaking skills – that may potentially be responsible for the relationships between duration and health. Visa admission categories are collapsed into four categories: employment preference (reference category),⁴ family preference, refugees, and diversity/others. We use a binary variable to measure English-speaking skills. Those who speak English “not well” or “not at all” are coded 1; those who speak English “well” or “very well” are coded 0.

Analytic Design

We begin by presenting descriptive characteristics for the sample as a whole and by duration of U.S. residence; we also present the weighted percentage distributions of age-standardized health outcomes and health behaviors, again both for the sample as a whole and by duration of U.S. residence. Then we use binomial logistic regression for our modeling exercises since all our health and health behavior outcome variables are dichotomous. The regression models include duration, education and a duration-by-education interaction term to appropriately test our two hypotheses. We use a nested modeling approach to best assess the duration-health relationships. Model 1 for each outcome includes demographic variables (i.e., age, gender, national origin and marital status), as well as education and duration. We

³Walton et al. (2009) demonstrated the importance of place of education for understanding the relationship between education and health among Asian Americans. Thus, we performed additional analysis on the effect of having a U.S. education on Asian immigrant health. Our results show that whether the respondents had at least one year of U.S. education does not have a statistically significant association with health status or behaviors among Asian immigrants (results available upon request). Furthermore, limiting the sample to Asian immigrants whose highest degree was not obtained in the United States results in 306 (12.9%) cases being dropped from the analysis. The findings are consistent when these cases are either included or excluded (results available upon request).

⁴Although family immigrants have the largest sample size, we set employment immigrants (second largest group) as the reference group because they are usually the most positively selected for good health (Akresh and Frank 2008).

then add the two immigration/acculturation-related variables, visa admission category and English speaking skills, in the second model and lastly, the duration-by-education interaction in Model 3. In this way, we are able to determine what (if any) independent effects education, duration and the other two acculturation-related variables have. More importantly, we can clearly assess whether, net of visa admission category and English speaking skills, introducing the duration-by-education interaction term modifies the overall relationship between duration and health status/health behavior and improves overall model fit. All analyses are adjusted for the sampling design, which includes using weighted estimates and takes strata and clusters into account when calculating the standard errors (Jasso et al. 2005).

In order to facilitate interpretation of the duration-by-education interaction effects with health and health behavior, a series of graphs is presented in Figures 1–2, which demonstrate the predicted probabilities of health or health behavior for Asian immigrants with varying education levels at the median age of the sample (39).⁵ With one exception, all predicted probabilities are calculated based on a model that has only age, education, duration, and the education-duration interaction (detailed results available upon request). The results for current smoking are graphed separately for men and women due to a striking statistically significant gender difference, which is not found for the other outcome variables. Together, these figures enable readers to visualize the results of the education-duration interactions.⁶

Additionally, in order to better draw inferences on the differences shown in the figures, we calculate Average Marginal Effects (AMEs) of duration of residence on the five outcome variables. The marginal effects provide a good approximation of the amount of change in the dependent variable that is produced per unit change in a predictor (Cameron and Trivedi 2009). AMEs are useful in summarizing model results, particularly for interaction terms and generalized linear models such as logistic regression (Long 1997). We use Stata's margins command to compute the AMEs of duration separately by education at 9 years, 12 years, and 16 years (detailed results available upon request).

Results

Descriptive Results

The weighted descriptive statistics in Table 1 show that our sample has a mean age of 42.8, is about 60% female and is overwhelmingly (84.3%) married. Although the mean years of schooling is 13.2, about a quarter of the respondents do not have a high school degree or its equivalent. Overall, nearly a quarter of the Asian immigrants are from India, almost one in five is Chinese, and Filipinos account for 16.6% of the sample. More than one in ten is Vietnamese, while Koreans are the smallest national origin group (5.3%). Nevertheless, except for Koreans, long-term immigrants and their short-term counterparts have significantly different profiles of national origin. For example, Asian Indians are most likely to have spent 5 to 10 years in the United States, followed by Chinese, while Vietnamese are least likely to be in this group. This shift of composition in national origin also coincides

⁵Estimated probabilities for ages 32 and 50 (the lower and upper age quartiles of the sample) are similar to those at age 39 (results available upon request).

⁶In order to best present the data, results for the three health status measures in Figure 1 use the same scale on the axes. The graphs for the two health behavior measures in Figure 2 use a different but consistent scale on their axes.

with the fact that a high concentration of Asian Indians and Chinese are employment immigrants, who are most likely to be in the United States for 5 to 10 years before adjusting their status to LPR. Furthermore, the overall sample means mask substantial variation in admission class by duration of residence. Almost three in five immigrants entered the U.S. based on family preferences, but only about a third (34.1%) of those with a 5 to 10 year of stay are family immigrants. Employment immigrants and refugees, in particular, are much smaller groups among individuals with less than 5 years of duration, but they make up considerably larger proportions among LPRs with 5 to 10 years of residence. Indeed, over half of all the LPRs with 5 to 10 years of U.S. residence gained their legal permanent residency through employment preferences, suggesting more U.S. exposure for this admission category. These highly educated, professional immigrants also seem to have a direct impact on the percentage distribution of education variables: Asian LPRs with 5 to 10 years of residence have the most years of formal schooling (15.5 years), and are more likely to have a college degree compared with recent arrivals and those with more than 10 years of U.S. residence. Additionally, almost half (48%) of the sample has poor English speaking skills. As expected, Asians with over 10 years of residence are significantly more likely to speak better English than the two more recent immigrant duration groups.

The bottom part of Table 1 displays differences in age-standardized health outcomes and health behaviors by length of U.S. residence. Consistent with a negative acculturation perspective, these descriptive results show that long-term Asian immigrants tend to have a much higher proportion in worse health categories than do their short-term counterparts; for example, 14.2% of Asians with 10+ years of duration report being activity-limited compared to just 7.5% of those with <5 years of duration and 10.2% of those with 5–10 years of duration. However, the patterns for the two health behaviors are not as expected. Although Asian immigrants with the longest U.S. residence have the highest proportions of current smokers and physical inactivity, those with 5–10 years of duration are much less likely to be current smokers or report being physically inactive than the recent arrivals. These results may also be due to the fact that those with 5–10 years of stay are more likely to be employment immigrants; they have more education than new arrivals or long-term immigrants.

Multivariate Results

Tables 2 and 3 report results from multivariate logistic regression models for the three health status measures and two health behavior measures, respectively. In the first panel in Table 2, Model 1 shows that, as expected, longer duration of residence is associated with worse self-reported health. Further, also as expected, more years of education is associated with lower odds of poor/fair health. Model 2 includes immigration-related variables and shows that refugees exhibit more than twice the odds of reporting poor/fair health than employment immigrants. However, compared to Model 1, improvement of model fit due to the inclusion of visa admission category and English skills is not statistically significant ($p=0.109$). In Model 3, we see that adding the education-duration interaction improves the overall model fit ($p=0.019$); however, the inclusion of the interaction term results in no significant changes in the direction or significance level of the main effects of duration and education. The duration effect in Model 3 is larger than unity ($OR=1.183$) and the duration-by-education

interaction effect is smaller than unity ($OR=0.991$), suggesting that at higher levels of education, the detrimental association between duration and self-reported health is weaker in comparison to that at low levels of education.

Figure 1a draws from the results of Table 2 (Model 3) and demonstrates how the pattern of reporting poor/fair overall health with increasing U.S. duration varies by level of education. Low educated Asian immigrants are characterized by negligible health disadvantages upon arrival, and the health differentials by education are larger for those with longer durations in the United States. Among immigrants with 10 years of residence, the estimated probability of reporting poor/fair health is 0.120 for those with 9 years of education, compared with 0.077 for those with 12 years of education, and 0.042 for those with 16 years of education. Among immigrants with 15 years of duration, the predicted probability of poor/fair self-rated health 0.176 for the least educated group, compared with 0.101 for high school graduates and 0.046 for college graduates. However, our results from the bottom of Table 2 also demonstrate that the AMEs of duration for immigrants with 9 years of education and for those with 12 years of education are 0.008 ($p<0.001$) and 0.004 ($p=0.002$), respectively, suggesting that with 10 years of U.S. residence, those with 9 years of education have a 7 percent higher probability of reporting poor/fair health than those with 0 years of duration, whereas those with a high school diploma have a 3 percent higher probability of reporting poor health than immigrants with zero years of duration. Although these effect sizes may seem small, given that only 13.5 percent of immigrants with 9 years of education and less than 5 years of stay report poor/fair overall health (results not shown), an increase of 7 percent in the probability from 0 to 10 years of stay is a relatively large effect. In contrast, the AME for immigrants with 16 years of education is not significantly different from zero, indicating that duration exhibits no association with reporting poor/fair health among those with 16 years of education. Overall, the results from Table 2 (and as illustrated in Figure 1a) provide strong evidence in support of [H1].

Models 1 and 2 in the middle panel of Table 2 show that the main effect of duration on activity limitation status is not significant, whereas more years of schooling is negatively associated with the odds of activity limitations. Model 2 also demonstrates that none of the acculturation-related variables is statistically significant and that including them only marginally improves the model fit. However, the inclusion of the education-duration interaction in Model 3 not only results in a better fitting model ($p=0.004$), but also results in changes in the duration effect. The odds ratio of duration increases and becomes statistically significant in Model 3, while the main effect of education is insignificant in Model 3. At the same time, the interaction term between duration and education is statistically significant, indicating that the association between duration of U.S. residence with activity limitation status varies strongly by education.

Bearing a strong resemblance to Figure 1a, Figure 1b shows that Asian immigrants with 16 years of education enjoy an almost unchanging low risk of having any activity limitations with longer U.S. duration, but less educated Asians have elevated risks of activity limitation with increasing duration. This pattern is confirmed by the AME results at the bottom of Table 2. The AME of duration for immigrants with 9 years of education is 0.005 ($p=0.012$), suggesting that for low educated immigrants, duration of 10 years in the U.S. is associated

with a 5 percent higher probability of reporting at least one activity limitation compared with duration of 0 years. The AME for immigrants with 12 years of education is 0.003, but this effect is only marginally significant ($p=0.077$). The AME for immigrants with 16 years of education is not significantly different from zero, indicating that longer duration is not associated with activity limitation status for Asian immigrants with a college degree. Overall, these findings also support [H1]; the relationship between duration and activity limitations varies by education.

Across Models 1 and 2 in the last panel of Table 2, neither duration nor education exhibits a significant relationship with the odds of chronic health conditions. Again, Model 2 shows that being a refugee is associated with more than twice the odds of reporting any chronic health conditions than employment immigrants. However, adding visa admission category and English speaking skills only improves the model fit marginally ($p=0.065$). After introducing the education-duration interaction in Model 3, we see that the effect of duration again increases and becomes significant while the main effect of education remains unchanged. The interaction term between duration of U.S. residence and education is also statistically significant, again demonstrating that the effect of duration of residence varies strongly by education.

Figure 1c again uses the results from Table 2 to demonstrate that upon arrival, more educated Asians have a slightly higher risk of having a chronic health condition than less educated Asians, which may be due to the fact that they are more likely to be diagnosed than their less educated counterparts. However, the figure also shows that, after a certain period of time (approximately 4 years), less educated immigrants begin to exhibit a higher probability of reporting chronic conditions than their highly educated counterparts. In all, the relationship between duration of U.S. residence and chronic health conditions depicted in Figure 1c is indeed very similar to the patterns shown in Figures 1a and 1b for the other health outcomes. Meanwhile, the AME results for chronic health conditions are similar to those for activity limitation status, too. The AME of duration for chronic health conditions among immigrants with 9 years of education is 0.005, which is also the only statistically significant marginal effect ($p=0.023$). This result suggests that with 10 years in the U.S., the least educated Asian immigrants exhibit a 5 percent higher probability of having at least one chronic health condition than similarly educated immigrants with 0 years of duration. In turn, those with at least a high school education do not experience a significant increase in the risk of chronic conditions with longer duration. Overall, the results for chronic conditions provide further evidence in support of [H1].

Turning to health behaviors, both Models 1 and 2 in the first panel of Table 3 show a significant, negative relationship between education and the odds of current smoking, but an insignificant relationship between duration and smoking. However, in Model 3 we find that adding the education-duration interaction, which itself is statistically significant, also results in a significant duration-smoking relationship and reduces the education main effect to insignificance. Therefore, longer duration is associated with higher odds of current smoking, but this association varies by education. It also suggests that the effect of education on smoking only works through its interaction with duration. Additionally, across Models 1–3

we see a striking gender differences in the odds of smoking; Asian males exhibit around 10 times the odds of current smoking compared with their female counterparts.

Figure 2a again looks familiar. The predicted probability of current smoking for the two groups of less educated Asian men slope upward, indicating an increasing probability of being a current smoker with longer U.S. residence. In contrast, Asian male immigrants with a college degree have an almost flat slope. Figure 2b presents similar smoking patterns for Asian women, albeit with considerably smaller probabilities of smoking at each educational level. At the bottom of Table 3, we find that for Asian men with only 9 years of education, each year of living in the U.S. is associated with a 1.3 percent higher probability of being a current smoker. This is the largest AME that we have found so far; it is much stronger than the AME for self-reported health and more than double the effect sizes for activity limitations and chronic health conditions. The AME for Asian males with a high school education is also sizable (0.006), but only marginally significant ($p=0.094$). For Asian men with a college degree, longer duration is not significantly associated with the risk of current smoking. The AMEs for women's smoking tell a similar story, but again with much smaller magnitudes compared to men. The AME is only significant for Asian women with 9 years of education, while the effect of duration on smoking is essentially nonexistent for those with at least a high school education. Taken together, these results are highly consistent with those for the three health outcomes; they provide additional evidence in support of [H1]. However, since only the male AME for duration on smoking is larger than those for the three health status measures, [H2] is only partially supported.

Similar to the results for smoking, Models 1 and 2 on the right panel of Table 3 show significant, negative relationships between education and physical inactivity, but non-significant, negative relationships between duration and physical inactivity. Again, the inclusion of the education-duration interaction in Model 3 results in a better fitting model ($p=0.028$) and in a positive relationship between duration and physical inactivity. The interaction term between duration and education is also significant in Model 3, but the main education effect is no longer significant. These results follow a similar pattern as the previous results for health status and smoking: more time spent in the U.S. is associated with individuals being less likely to participate in physical exercise, but this duration association with inactivity varies by education.

Figure 2c shows that college educated Asians seem to exhibit a decrease in physical inactivity with longer duration, those with high school education have a nearly constant duration slope, and the least educated Asians may experience a heightened risk of physical inactivity with more time spent in the United States. However, this interpretation is muted by the AME results on the bottom of Table 3, which demonstrates that regardless of education level, none of the duration AMEs on physical inactivity is statistically different from zero. Put another way, although both the odds ratios and Figure 2c provide suggestive evidence that the duration association with physical inactivity varies by education, the relationship between duration and physical inactivity does not reach statistical significance at any education level. Thus, duration is not associated with physically inactivity, which supports neither [H1] nor [H2].

Discussion

Asian immigrants exhibit substantial socioeconomic heterogeneity. Thus, we question whether the commonly reported “negative duration” effect on health applies to all educational subgroups of Asian immigrants. We hypothesized a varying association between duration and health outcomes and behaviors such that the duration-health relationship is weak or non-existent among highly educated immigrants, while less educated immigrants are more likely to have worse health status and health behaviors with increasing duration. We also expected that the duration-education interaction effect would be larger for health behaviors than for health status.

Most of the empirical evidence strongly supported our first hypothesis that the relationship between duration of U.S. residence and health and health behavior varies by education. With one exception (physical inactivity), the detrimental duration relationship with health is mostly concentrated among Asian immigrants with less than 12 years of education; with longer residence in the United States, they are more likely to report poor/fair overall health, be activity-limited, have at least one chronic health condition and be current smokers. In contrast, the health and health behavior of Asian immigrants who have at least 12 years of education exhibits little change with duration. The distinct duration relationships with health and health behavior by education are robust; they are not explained by confounding variables such as country of origin, class of admission, or English skills. Furthermore, we also found partial support for our second hypothesis; among poorly educated Asian immigrant men, the duration relationship with smoking is much larger than those of the three health status measures.

In all, our study presents an important qualification to the conclusions of prior literature on the relationship between duration and health among Asian immigrants. Most straightforward and consistent with previous studies on Asian Americans (Bratter and Eschbach 2005; Cho and Hummer 2001; Frisbie et al. 2001; Singh and Siahpush 2002; Zhang and Ta 2009), we observe an overall association between longer duration of residence in the United States and higher odds of reporting poor/fair health. However, our findings highlight the importance of taking socioeconomic heterogeneity into consideration. We demonstrated evidence that the negative duration-health relationship is typically only significant among one subpopulation of Asian immigrants – the least educated. For Asian immigrants with at least 12 years of education, length of U.S. residence is generally not associated with health or health behavior. This pattern indicates that a negative acculturation argument may be far too simplistic to be generalized to all socioeconomic subgroups of immigrants (Akresh 2007; Ra et al. 2013).

Our study also demonstrates the value of integrating multiple health outcomes and connecting health status with health behaviors. Results for the different health indicators help provide a broad view of the health adaptation of Asian immigrants. The significant interaction effect between duration and education for four of our five health measures signifies a systematically patterned relationship between duration, education and Asian immigrant health. Furthermore, our finding of a considerably larger duration effect for smoking than for the health status measures among the least educated Asian men indicates a

potentially behavior-based explanation for health declines over time, especially among poorly educated immigrant men. Finally, we found a huge gender disparity in Asian immigrant smoking, also confirming prior studies (An et al. 2008; Choi et al. 2008; Kim, Ziedonis and Chen 2007; Ma et al. 2004; Zhang and Wang 2007). Other research has uncovered extensive gender differences in other health measures, including BMI, exercise, and medical care access and utilization (Antecol and Bedard 2006; Gorman et al. 2010; Kandula and Lauderdale 2005). Thus, it will be important for future research to conduct gender-specific analysis when studying immigrant health adaptation.

Our exclusive focus on Asians makes a significant contribution to the immigrant health literature, which is often focused on Hispanic immigrants. Our study provides timely documentation of the relationship between duration, education and health among this rapidly growing but understudied segment of the population. Compared to Asians, a substantially larger proportion of Hispanic immigrants are poorly educated, so a negative association between duration and health may be more likely to be observed (e.g., Cho et al. 2004; Lopez-Gonzalez et al. 2005). However, it is also possible that highly educated Hispanic immigrants do not experience health declines or worse health behaviors with longer U.S. residence, either; empirical testing awaits that conjecture. Furthermore, as expected, we found that both country of origin and visa admission category exhibit some strong associations with Asian immigrant health. For example, compared to employment immigrants, refugees exhibit a strong disadvantage in self-reported health and chronic conditions, while family immigrants exhibit a significantly higher risk of smoking compared to employment immigrants. Although Koreans are less likely to report worse health than Chinese, they are substantially more likely to smoke, which corroborates the findings from previous studies (Ma et al. 2002; An et al. 2008). Meanwhile, we find that Filipinos and Vietnamese are both more likely to report chronic health conditions than the Chinese, but the Vietnamese also have a much lower risk of activity limitation. However, like Ra, Cho and Hummer (2012), who found no English language proficiency effect on Korean immigrant health status or behaviors, we found no significant effect of English skills, a commonly employed proxy for acculturation status. Our auxiliary analysis indicates that this is mostly due to high collinearity between years of education and poor English-speaking skills ($p = -0.53$). In addition, prior research has noted that, especially among Asian immigrants, English proficiency may not be a valid acculturation measure for country-of-origin subgroups; for example, Asian Indians and Filipinos often speak English prior to immigration whereas Chinese and Koreans have much less exposure to English (An et al. 2008; Salant and Lauderdale 2003). Thus, future research on Asian immigrant health should be aware of this problem; more nuanced measures of English proficiency may be needed for studying Asian immigrants.

Several limitations of our study should be acknowledged. First and foremost, this study suffers from the cross-sectional nature of the data. To clearly sort out the relationship between duration of U.S. residence, education and immigrant health, longitudinal data are needed. At the time of writing this manuscript, wave 2 of the NIS had just been publicly released. However, our analysis only includes the first wave, so although this study brings a new perspective to understanding duration and immigrant health, the evidence is only suggestive. Second, a related methodological problem is that our acculturation measures are

rather limited. To directly examine the effect of acculturation on Asian immigrant health, detailed information on the changes of individuals' norms, values, attitudes, beliefs and behaviors is needed; unfortunately, such information is not available in the NIS. Therefore, the duration-health association that we have observed only partially reflects the relationship between acculturation and health among Asian immigrants. Third, it is difficult to assess differentials in reporting behaviors across Asian ethnic subgroups. Past literature indicates that immigrants may be affected by different interpretations of the question on self-reported health (Bzostek, Goldman and Pebley 2007). A related issue is that our measures of activity limitation status and chronic health conditions may depend on clinical diagnoses. However, this is less of a concern because poorly educated immigrants are less likely to have access to preventive health care and thus more likely to underreport chronic conditions, which creates a conservative bias. Fourth, the relatively small sample sizes for specific Asian national origin groups, in concert with the fairly low percentage of respondents who reported negative health conditions, precluded the separate examination of national origin subgroups. This is an important topic for future research with a larger data set. Last, more work is needed to better understand how other socioeconomic factors play a role in influencing Asian immigrant health over time. One of the reasons that we choose education over other SES variables is due to the fact that our sample is only comprised of new LPRs, and a considerable proportion of them are out of the labor force. However, the Asian immigrant population in general has substantial heterogeneity not only in educational attainment, but also in labor force participation, self-employment and household income. Thus, additional SES measures may be useful in tapping into the socioeconomic diversity of Asian immigrants.

As the Asian immigrant population in the United States continues to grow, further study of their health outcomes and behavior patterns is necessary for understanding the impact of international migration on the health of the nation. Our results clearly demonstrated that, like for the native-born population, education plays an essential role in influencing the health outcomes and behaviors of Asian immigrants. Thus, longer U.S. exposure is not necessarily negative for the health of every immigrant or subgroup of immigrants; foreign-born Asians with at least a high school education are likely to maintain their health and refrain from smoking even many years after migration. However, our research also showed that the picture is not nearly as positive for the health status or behaviors of Asian immigrants in the lowest education category, especially those who have been in the U.S. for a long time. Therefore, social policies aimed at promoting immigrant health may need to be especially concerned with low educated Asians, among whom longer duration was associated with worse health and less positive health behaviors than their more highly educated counterparts.

Appendix

1: Detailed Questions for the Activity Limitation Status Measure

1. How much does high blood pressure limit your normal daily activities?
2. How much does diabetes or high blood sugar limit your normal daily activities?

3. How much does cancer limit your normal daily activities?
4. How much does chronic lung disease limit your normal daily activities?
5. Does your lung condition limit your usual activities, such as household chores or work?
6. How much does the heart problem limit your normal daily activities?
7. How much does the psychiatric condition limit your normal daily activities?
8. How much does arthritis limit your normal daily activities?
9. How much does asthma limit your normal daily activities?
11. Do you have any physical or nervous condition that limits the type of work or the amount of work you can do?

References

- Abraído-Lanza AF, Armbrister AN, Flórez KR, & Aguirre AN (2006). Toward a theory-driven model of acculturation in public health research. *American Journal of Public Health*, 96(8), 1342–1346. [PubMed: 16809597]
- Abraído-Lanza AF, Chao MT, & Florez KR (2005). Do healthy behaviors decline with greater acculturation?: Implications for the Latino mortality paradox. *Social Science & Medicine*, 61(6), 1243–1255. [PubMed: 15970234]
- Akresh IR (2006). Occupational mobility among legal immigrants to the United States. *International Migration Review*, 40(4), 854–884.
- Akresh IR (2007). Dietary assimilation and health among Hispanic immigrants to the United States. *Journal of Health and Social Behavior*, 48(4), 404–417. [PubMed: 18198687]
- Akresh IR (2009). Health service utilization among immigrants to the United States. *Population Research and Policy Review*, 28(6), 795–815.
- Akresh IR, & Frank R (2008). Health selection among new immigrants. *American Journal of Public Health*, 98(11), 2058–2064. [PubMed: 18309141]
- Alba RD, & Nee V (1997). Rethinking assimilation theory for a new era of immigration. *International Migration Review*, 31(4), 826–874. [PubMed: 12293207]
- An N, Cochran SD, Mays VM, & McCarthy WJ (2008). Influence of American acculturation on cigarette smoking behaviors among Asian American subpopulations in California. *Nicotine & Tobacco Research*, 10(4), 579–587. [PubMed: 18418780]
- Antecol H, & Bedard K (2006). Unhealthy assimilation: why do immigrants converge to American health status levels? *Demography*, 43(2), 337–360. [PubMed: 16889132]
- Batalova J, Fix M, & Creticos PA (2008). Uneven progress: the employment pathways of skilled immigrants in the United States. Available via Migration Policy Institute Website: <http://www.migrationpolicy.org/pubs/BrainWasteOct08.pdf>. Accessed 18 Jan 2011.
- Borjas GJ, & Friedberg RM (2009). Recent trends in the earnings of New Immigrants to the United States. NBER working paper 15406: <http://www.nber.org/papers/w15406>
- Bratter JL, & Eschbach K (2005). Race/ethnic differences in nonspecific psychological distress: Evidence from the National Health Interview Survey. *Social Science Quarterly*, 86(3), 620–644.
- Bzostek S, Goldman N, & Pebley AR (2007). Why do Hispanics in the USA report poor health? *Social Science & Medicine*, 65(5), 990–1003. [PubMed: 17574713]
- Cameron AC, & Trivedi PK (2009). *Microeconomics Using Stata*. Lakeway Drive, TX: Stata Press Books.
- Cho Y, & Hummer RA (2001). Disability status differentials across fifteen Asian and Pacific Islander groups and the effect of nativity and duration of residence in the U.S. *Social Biology*, 48(3–4), 171–195. [PubMed: 12516223]
- Cho Y, Frisbie WP, Hummer RA, & Rogers RG (2004). Nativity, duration of residence, and the health of Hispanic adults in the United States. *International Migration Review*, 38(1), 184–211.

- Choi S, Rankin S, Stewart A, & Oka R (2008). Effects of acculturation on smoking behavior in Asian Americans: a meta-analysis. *Journal of Cardiovascular Nursing*, 23(1), 67–73. [PubMed: 18158512]
- Colón-López V, Haan MN, Aiello AE, & Ghosh D (2009). The effect of age at migration on cardiovascular mortality among elderly Mexican immigrants. *Annals of Epidemiology*, 19(1), 8–14. [PubMed: 18922703]
- Crespo CJ, Smit E, Carter-Pokras O, & Andersen R (2001). Acculturation and leisure-time physical inactivity in Mexican American adults: results from NHANES III, 1988–1994 *American Journal of Public Health*, 91(8), 1254–1257. [PubMed: 11499114]
- Cunningham SA, Ruben JD, & Venkat Narayan KM (2008). Health of foreign-born people in the United States: A review. *Health & Place*, 14(4), 623–635. [PubMed: 18242116]
- Echeverria SE, & Carrasquillo O (2006). The roles of citizenship status, acculturation, and health insurance in breast and cervical cancer screening among immigrant women. *Medical Care*, 44(8), 788–792. [PubMed: 16862042]
- Espenshade TJ, & Fu H (1997). An analysis of English-language proficiency among U.S. immigrants. *American Sociological Review* 62(2), 288–305.
- Franzini L, & Fernandez-Esquer ME (2004). Socioeconomic, cultural, and personal influences on health outcomes in low income Mexican-origin individuals in Texas. *Social Science & Medicine*, 59(8), 1629–1646. [PubMed: 15279921]
- Frisbie WP, Cho Y, & Hummer RA (2001). Immigration and the health of Asian and Pacific Islander Americans in the United States. *American Journal of Epidemiology*, 153(4), 372–380. [PubMed: 11207155]
- Gordon MM (1964). *Assimilation in American life: the role of race, religion, and national origins*. New York: Oxford University Press.
- Gorman BK, Read JG, & Krueger PM (2010). Gender, acculturation, and health among Mexican Americans. *Journal of Health and Social Behavior*, 51(4), 440–457. [PubMed: 21131620]
- Huang C, Mehta NK, Elo IT, Cunningham SA, Stephenson R, Williamson DF, & Venkat Narayan KM (2011). Region of birth and disability among recent U.S. immigrants: evidence from the 2000 Census. *Population Research and Policy Review*, 30(4), 399–418. [PubMed: 21666828]
- Hunt LM, Schneider S, & Comer B (2004). Should “acculturation” be a variable in health research? A critical review of research on U.S. Hispanics. *Social Science & Medicine*, 59(5), 973–986. [PubMed: 15186898]
- Jasso G, Massey DS, Rosenzweig MR, & Smith JP (2000). Assortative mating among married new legal immigrants to the United States: Evidence from the New Immigrant Survey Pilot. *International Migration Review*, 34(2), 443–459.
- Jasso G, Massey DS, Rosenzweig MR, & Smith JP (2004). Immigrant health: selectivity and acculturation In Anderson NB, Bulatao RA & Cohen B (Ed.), *Critical perspectives on racial and ethnic differences in health in later life* (pp. 227–266). Washington, DC: National Academies Press.
- Jasso G, Massey DS, Rosenzweig MR, & Smith JP (2005). The U.S. New Immigrant Survey: overview and preliminary results based on the new immigrant cohorts of 1996 and 2003 In Morgan B & Nicholson B (Ed.), *Immigration Research and Statistics Service Workshop on Longitudinal Surveys and Cross-Cultural Survey Design* (Workshop Proceedings: 29–46). London, UK: Crown Publishing.
- Kandula NR, Kersey M, & Lurie N (2004). Assuring the health of immigrants: what the leading health indicators tell us. *Annual Review of Public Health*, 25, 357–76.
- Kandula NR, & Lauderdale DS (2005). Leisure time, non-leisure time, and occupational physical activity in Asian Americans. *Annals of Epidemiology*, 15(4), 257–265. [PubMed: 15780772]
- Kandula NR, Lauderdale DS, & Baker DW (2007). Differences in self-reported health among Asians, Latinos, and non-Hispanic whites: The role of language and nativity. *Annals of Epidemiology*, 17(3), 191–198. [PubMed: 17320786]
- Kim SS, Ziedonis D, & Chen KW (2007). Tobacco use and dependence in Asian Americans: a review of the literature. *Nicotine & Tobacco Research*, 9(2), 169–184. [PubMed: 17365748]

- Kimbro RT, Gorman BK, & Schachter A (2012). Acculturation and self-Rated health among Latino and Asian immigrants to the United States. *Social Problems*, 59(3), 341–363.
- Landale NS, Oropesa RS, Llanes D, & Gorman BK (1999). Does Americanization have adverse effects on health?: stress, health habits, and infant health outcomes among Puerto Ricans. *Social Forces*, 78(2), 613–641.
- Lara M, Gamboa C, Kahramanian M, Morales LS, & Bautista DE (2005). Acculturation and Latino health in the United States: a review of the literature and its sociopolitical context. *Annual Review of Public Health*, 26(1), 367–397.
- Lauderdale DS, & Rathouz PJ (2000). Body mass index in a U.S. national sample of Asian Americans: effects of nativity, years since immigration and socioeconomic status. *International Journal of Obesity*, 24, 1188–1194. [PubMed: 11033989]
- Link BG, & Phelan JC (1995). Social conditions as fundamental causes of disease. *Journal of Health and Social Behavior*, 35(extra issue), 80–94.
- Long JS (1997). *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage Publications.
- Lopez-Class M, Castro FG, & Ramirez AG (2011). Conceptions of acculturation: a review and statement of critical issues. *Social Science & Medicine*, 72(9), 1555–1562. [PubMed: 21489670]
- Lopez-Gonzalez L, Aravena VC, & Hummer RA (2005). Immigrant acculturation, gender and health behavior: a research note. *Social Forces*, 84(1), 581–593.
- Lv N, & Cason KL (2004). Dietary Practices and Acculturation of Chinese Americans in Pennsylvania. *Journal of the American Dietetic Association*, 104(5): 771–778. [PubMed: 15127063]
- Ma GX, Shive S, Tan Y, & Toubbeh J (2002). Prevalence and predictors of tobacco use among Asian Americans in the Delaware Valley region. *American Journal of Public Health*, 92(6), 1013–1020. [PubMed: 12036798]
- Ma GX, Tan Y, Toubbeh JI, Su X, Shive SE, & Lan Y (2004). Acculturation and smoking behavior in Asian-American populations. *Health Education Research*, 19(6), 615–625. [PubMed: 15199009]
- Mirowsky J, & Ross CE (2003). *Education, social status, and health*. New Brunswick, N.J.: Aldine Transaction.
- Monsivais P, Aggarwal A & Drewnowski A (2011). Following federal guidelines to increase nutrient consumption may lead to higher food costs for consumers.” *Health Affairs*, 30 (8), 1471–1477. [PubMed: 21813865]
- Palinkas LA, & Pickwell SM (1995). Acculturation as a risk factor for chronic disease among Cambodian refugees in the United States. *Social Science & Medicine*, 40(12), 1643–1653. [PubMed: 7660177]
- Pampel FC, Krueger PM, & Denney JT (2010). Socioeconomic disparities in health behaviors. *Annual Review of Sociology*, 36, 347–370.
- Pew Research Center. (2012). The rise of Asian Americans. Available via Pew Social and Demographic Trends website: http://www.pewsocialtrends.org/files/2013/01/SDT_Rise_of_Asian_Americans.pdf, accessed 28 July, 2012.
- Phelan JC, Link BG, & Tehranifar P (2010). Social conditions as fundamental causes of health inequalities: Theory, evidence, and policy implications. *Journal of Health and Social Behavior*, 51(extra issue), S28–S40. [PubMed: 20943581]
- Popkin BM (2002). An overview on the nutritional transition and its health implications: the Bellagio meeting. *Public Health Nutrition*, 5(1A), 93–103.
- Ra CK, Cho Y, & Hummer RA (2013). Is acculturation always adverse to Korean immigrant health in the United States? *Journal of Immigrant and Minority Health*, 15(3): 510–516. [PubMed: 23054540]
- Redstone I, & Massey DS (2004). Coming to stay: an analysis of the U.S. Census question on immigrants’ year of arrival. *Demography*, 41(4), 721–738. [PubMed: 15622951]
- Ross C, E., & Mirowsky J (1999). Refining the association between education and health: the effects of quantity, credentials, and selectivity. *Demography*, 36(4), 445–460. [PubMed: 10604074]

- Schachter A, Kimbro RT, & Gorman BK (2012). Language proficiency and health status: Are bilingual immigrants healthier? *Journal of Health and Social Behavior*, 53(1), 124–145. [PubMed: 22382721]
- Salant T, & Lauderdale DS (2003). Measuring culture: a critical review of acculturation and health in Asian immigrant populations. *Social Science & Medicine*, 57(1), 71–90. [PubMed: 12753817]
- Scribner R (1996). Editorial: paradox as paradigm - the health outcomes of Mexican Americans. *American Journal of Public Health*, 86(3), 303–305. [PubMed: 8604751]
- Shelley D, Fahs M, Scheinmann R, Swain S, Qu J, & Burton D (2004). Acculturation and tobacco use among Chinese Americans. *American Journal of Public Health*, 94(2), 300–307. [PubMed: 14759946]
- Smith JP (2004). Unraveling the SES: health connection. *Population and Development Review*, 30, 108–132.
- Singh GK, & Siahpush M (2002). Ethnic-immigrant differentials in health behaviors, mortality, and cause-specific mortality in the United States: an analysis of two national data bases. *Human Biology*, 74(1), 83–109. [PubMed: 11931581]
- Turra CM, & Goldman N (2007). Socioeconomic differences in mortality among US adults: insights into the Hispanic paradox. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 62(3), S184–S192.
- Walton E, Takeuchi DT, Herting JR, & Alegría M (2009). Does place of education matter? Contextualizing the education and health status association among Asian Americans. *Biodemography and Social Biology*, 55(1), 30–51. [PubMed: 19835099]
- Zhang W, & Ta VM (2009). Social connections, immigration-related factors, and self-rated physical and mental health among Asian Americans. *Social Science & Medicine*, 68(12), 2104–2112. [PubMed: 19427087]
- Zhang J, & Wang Z (2008). Factors associated with smoking in Asian American adults: A systematic review. *Nicotine & Tobacco Research*, 10(5), 791–801. [PubMed: 18569752]

Figure 1:
Duration in the United States, Education Attainment, and Health among Asian Immigrants aged 25 and above, NIS 2003

Figure 2:
Duration in the United States, Education Attainment, and Health Behavior among Asian Immigrants aged 25 and above, NIS 2003

Weighted Descriptive Statistics by Duration of U.S. Residence, Asian Immigrants Aged 25 and above, 2003

Table 1:

Characteristics	Total sample	Duration in the United States		
		<5 years	5 to <10 years	>=10 years
Age (mean & sd)	42.84 (13.46)	44.04 (13.28)	38.47** (12.89)	42.13 (12.59)
Duration (mean & sd)	2.88 (4.24)	\	\	\
Male (%)	39.75	37.44***	42.53*	52.86
Years of school completed (mean & sd)	13.18 (4.86)	12.38*** (4.52)	15.46 (4.70)	14.99 (5.65)
Education level (%)				
Less than high school	24.57	29.41***	9.95	15.20
High school graduate, GED, associate degree or some college	25.21	27.52	15.96*	25.46
College degree or more	50.22	43.07***	74.09**	59.34
Poor English speaking skills (%)	48.00	57.87***	24.18*	16.56
National Origin (%)				
China	18.99	19.16***	22.32***	10.70
India	24.27	22.62***	36.88***	11.76
Korea	5.29	4.35	7.35	8.77
Philippines	16.64	18.93	6.07***	19.81
Vietnam	11.07	13.42*	2.99*	8.55
Other Asia	23.74	21.53***	24.39***	40.41
Marital status (%)				
Married or cohabitating	84.33	83.69	89.68***	78.51
Never married	8.62	8.75	6.02**	12.91
Formerly married	7.05	7.56	4.30	8.58
Visa admission category (%)				
Employment preference	22.65	13.76***	52.90***	32.81
Family preference	59.97	67.50***	34.13***	51.89

Characteristics	Total sample	Duration in the United States		
		<5 years	5 to <10 years	>=10 years
Refugee	3.36	0.94 ***	10.73	7.91
Diversity and others	14.01	17.80 ***	2.24 *	7.38
Health Status (%) ^a				
Poor/fair self-reported health	8.39	5.55	10.15	13.86
At least one activity limitation	10.58	7.49	9.19	14.21
At least one chronic health condition	13.18	9.73	13.15	19.44
Health Behavior (%) ^a				
Current smoker	8.29	9.22	5.79	13.04
Physically inactive	20.46	21.49	17.47	22.61
N	2,373	1,578	558	237

Note: Estimated subpopulation standard deviations in parentheses.

^a Age-adjusted weighted percentage distributions are calculated by using the direct method of standardization with the 2000 US census population as the standard population. The confidence intervals calculated with the method based on the gamma distribution indicate that all measures are significantly different across duration groups at the $p < .05$ level.

*
p .05.

**
p .01.

p .001. (two-tailed test, compared with the group with at least 10 years of U.S. residence).
(two-tailed test, compared with the group with at least 10 years of U.S. residence).

Source: New Immigrant Survey, 2003

Table 2:
Odds Ratios Depicting the Relationship Between Duration and Health Status for U.S. Asian Immigrants Aged 25 and Above, 2003

	Poor/Fair Self-Reported Health			Activity Limitation Status			Chronic Health Conditions		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Age	1.057 ***	1.057 ***	1.059 ***	1.056 ***	1.051 ***	1.052 ***	1.061 ***	1.058 ***	1.059 ***
Gender (ref.=Male)	0.799	0.792	0.789	0.848	0.893	0.896	0.811	0.834	0.836
Duration	1.060 **	1.056 **	1.183 **	1.015	1.019	1.150 **	1.012	1.005	1.108 *
National Origin (ref.=China)									
India	0.756	0.819	0.831	0.855	0.972	0.981	1.440	1.479	1.477
Korea	0.382 *	0.396 *	0.334 *	1.670	1.692	1.612	1.603	1.650	1.563
Philippines	0.690	0.833	0.832	1.399	1.771	1.753	2.507 ***	2.814 ***	2.768 ***
Vietnam	0.485	0.483	0.482	0.323 **	0.310 **	0.310 **	1.072	1.027	1.033
Other Asia	0.837	0.899	0.932	1.289	1.433	1.472	1.689 *	1.768 *	1.797 *
Marital status (ref.=Married)									
Never married	0.980	1.020	0.976	1.110	1.438	1.421	1.013	1.254	1.248
Formerly married	0.560 *	0.580	0.617	1.134	1.193	1.259	1.036	1.076	1.132
Years of education	0.908 ***	0.923 ***	0.947 *	0.951 **	0.969	0.991	1.005	1.015	1.033
Visa admission category (ref.=Employment)									
Family		0.918	0.837		1.246	1.156		1.092	1.037
Refugee		2.272 *	1.799		1.830	1.441		2.134 *	1.805
Diversity and others		0.908	0.819		0.711	0.647		0.626	0.587
English speaking skills (ref.=poor)		1.411	1.412		1.498	1.497		1.122	1.128
Duration X Years of education			0.991 *			0.991 *			0.993 *
AIC	1047.510	1025.301	1021.756	1216.780	1216.271	1212.584	1443.657	1442.814	1440.694
-2 Log likelihood	1000.871	993.301	987.756	1192.780	1184.271	1178.584	1419.657	1410.814	1406.694
LR test (p value)		0.109	0.019		0.075	0.004		0.065	0.042
AME: 9 years of education		0.008 ***			0.005 *			0.005 *	
AME: 12 years of education		0.004 ***			0.003			0.003	

	<u>Poor/Fair Self-Reported Health</u>			<u>Activity Limitation Status</u>			<u>Chronic Health Conditions</u>		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
AME: 16 years of education		0.001			0.000			0.000	
Two-tailed tests:									
***		p<.001							
**		p<.01							
*		p<.05							
N=2,373									
Source: New Immigrant Survey, 2003									

Table 3:

Odds Ratios Depicting the Relationship Between Duration and Health Behavior for U.S. Asian Immigrants Aged 25 and Above, 2003

	<u>Current Smoker</u>			<u>Physical Inactivity</u>		
	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>	<u>Model 1</u>	<u>Model 2</u>	<u>Model 3</u>
Age	0.962 ***	0.957 ***	0.958 ***	0.990	0.989	0.991 *
Gender (ref.=Male)	9.559 ***	10.515 ***	10.740 ***	0.826	0.822	0.824
Duration	1.024	1.044	1.192 **	0.987	0.991	1.119 *
National Origin (ref.=China)						
India	0.492 *	0.588	0.568	1.081	1.163	1.154
Korea	4.792 ***	4.826 ***	4.629 ***	1.119	1.090	1.047
Philippines	1.937 *	2.127 *	2.000 *	0.954	1.106	1.059
Vietnam	1.043	0.875	0.868	0.788	0.780	0.784
Other Asia	1.299	1.292	1.291	1.284	1.371	1.397
Marital status (ref.=Married)						
Never married	0.878	0.998	1.003	0.504 **	0.494 **	0.491 **
Formerly married	1.355	1.461	1.518	0.872	0.875	0.916
Years of education						
Visa admission category (ref.=Employment)	0.906 ***	0.927 **	0.964	0.949 ***	0.960 *	0.985
Family		2.308 **	2.141 **		0.894	0.835
Refugee		1.386	1.086		1.145	0.917
Diversity and others		1.658	1.485		0.926	0.853
English speaking skills (ref.=poor)		1.278	1.305		1.366	1.371
Duration X Years of education			0.990 *			0.991 **
AIC	1017.725	1012.807		2062.869	2066.012	
-2 Log likelihood	993.725	980.807	974.542	2038.869	2034.012	2024.755
LR test (p value)		0.012	0.012		0.302	0.028
	<u>Male</u>		<u>Female</u>			
AME: 9 years of education	0.013 **		0.003 *		0.005	
AME: 12 years of education	0.006		0.001		0.000	
AME: 16 years of education N	-0.001		0.000		-0.005	
N	2,306			2,305		

Note: Sample sizes vary because of missing value on the response variables.

Two-tailed tests:

p<.001

**
**p<.01

*
p<.05

Source: New Immigrant Survey, 2003

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript