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Education Gradients in Health for Asian Immigrant Adults in the United States

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Education Gradients in Health for Asian Immigrant Adults in the United States

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This dissertation examined the association between education and health among Asian immigrants in the United States. Despite being the second-largest immigrant population and the largest new immigrant group in the United States since 2009, Asian immigrants in the United States have received limited, although growing, attention in the literature on immigrants' health. Asian immigrants have a weaker education gradient in health in comparison to non-Hispanic whites, and this weak gradient raises questions on the role of education for Asian immigrants and, more broadly, on Asian immigrants' health. In this dissertation, I first documented the relationship between education and adult health for Asian immigrants and examined whether the education gradient in health for Asian immigrants' is weaker than that for U.S.-born whites. Second, I studied the underlying reasons for the modest education gradient in health for Asian immigrants.

Using the National Health Interview Survey, the New Immigrant Survey, and the China Health and Nutrition Survey, I found that Asian immigrants do have a weaker education gradient in health than U.S.-born whites. This weaker gradient is mostly due to the fact that Asian immigrants with high education have worse health than their U.S.-

born white counterparts, while Asian immigrants with low education are healthier than their U.S.-born white counterparts. Lower economic returns to education and a positive association between education and health behaviors can account for some health disadvantages for highly educated Asian immigrants. Also, some of the health advantage of less-educated Asian immigrants may be attributed to positive health selection among Asian immigrants. This dissertation provides a much-needed understanding of Asian immigrants' health and has implications for immigration policies and public health programs.

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Chapter 1: Introduction

A vast body of literature has documented the positive association between education and health outcomes among different populations in the United States (e.g., Feinstein 1993; Hummer, Benjamins, and Rogers 2004; Hummer and Lariscy 2011; Mirowsky and Ross 2003; Williams and Collins 1995; Williams et al. 2010). People who have more education enjoy lower mortality risk, fewer functional limitations, better physical health, and more favorable mental health in comparison with their low educated counterparts. However, recent studies have found that the education gradient in health is modest for U.S. immigrants (Acevedo-Garcia et al. 2010; Acevedo-Garcia, Soobader, and Berkman 2005; Goldman et al. 2006; Kimbro et al. 2008; McKinnon and Hummer 2007; Sánchez-Vaznaugh et al. 2009; Walsemann, Gee, and Ro 2013). For instance, Kimbro et al. (2008) found that education gradients in several health outcomes and health behaviors for black, white, Hispanic, and Asian immigrants are smaller than those of their U.S.-born counterparts. The modest education gradients in immigrants' health raise questions about why and how the association between education and health is different for immigrants than for non-immigrants in the United States.

Despite documentation of the weaker education gradient in health among immigrants, few empirical studies have examined explanations for this weaker gradient. This is an important omission in current social-demographic literature on health disparities for two main reasons. First, a weak or even flat relationship between education

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and health for immigrants challenges the robustness of the well-documented education–health relationship in the general population. Does the weak education gradient in health exist because all immigrants are healthy, regardless of education level? If this is the case, then why are less-educated immigrants as healthy as their highly educated counterparts? Understanding why a weaker gradient exists for Asian immigrants would strengthen and contextualize the existing literature on education and health and perhaps help lead to the reduction of health inequalities in the United States.

In this dissertation, I examine the education gradient in health with a particular focus on Asian immigrants. I chose Asian immigrants for two important reasons. First, Asians, as the second-largest immigrant population in the United States, receive growing but still limited attention in the literature. Most studies on immigrants' health focus on Hispanics because they are the largest immigrant population in the United States. However, Asian immigrants constituted 28% of the total U.S. foreign-born population in 2010 (Grieco et al. 2012), and they have surpassed Hispanics as the largest new immigrant group in the United States since 2009; Asians constituted about 36% of the total U.S. new immigrant population in 2010, while Hispanics constituted only 31% (Taylor et al. 2013). The rapid growth of the Asian immigrant population will exert a significant influence on the overall U.S. health profile in coming decades. Yet, they remain an understudied group. Second, on average, Asian-origin adults have the highest educational attainment in the United States compared to other racial and ethnic groups. According to Census 2010, 52.4% of Asian-origin adults have at least a college degree, while only 32.2% of non-Hispanic white, 19.9% of black, and 13.9% of Hispanic-origin adults have at least a college

degree. The high education attainment among Asian adults in the United States in some ways may foreshadow the future educational composition of the United States and thus can help the research and policy communities better understand how education at high levels is related to adults' health, both now and into the future.

Given the above gaps in the literature, the overall aims of this dissertation are to: 1) document the relationship between education and adult health for Asian immigrants and examine whether the education gradient in health for Asian immigrants is weaker than that for U.S.-born Asians and U.S.-born whites, and if so, to what extent; 2) identify the underlying reasons for a weaker education gradient in health, if it does exist, for Asian immigrants. By addressing these aims, this dissertation will help us to understand the origins of health disparities and the essence of the relationship between education and health, as well as to make the education-health paradigm more flexible and more sensitive to the context of diversity in American society.

SIGNIFICANCE

A weak education gradient in health would be socially desirable if all educational groups enjoy good health. However, a weak or flat education gradient in health would be problematic if all educational groups had poor health. It would also be problematic if the health returns to high education were limited for certain groups or if immigrants adopted unhealthy behaviors due to acculturation. Therefore, examining the nature of the education gradient in health can help us to understand the essence of U.S. health inequality and potentially eliminate disparities, and thus the issue should draw great

attention from other health researchers and policy makers. It is crucial to recognize that education may have stronger impacts on health for some racial and ethnic groups than it does for others. Because the education-health paradigm (i.e., the idea that poor health outcomes exhibit a strong reverse gradient with educational attainment) may not fit all groups, policies or interventions targeting particular groups may be more effective than targeting the general population. If we want to achieve the intended results of great health for all subgroups of Americans, then understanding the education-health relationship for all groups is paramount to this effort.

RESEARCH AIMS

This dissertation addresses key gaps in the literature on the education gradient in health among Asian immigrants through a set of three empirical chapters. Although each chapter addresses unique research questions and tests different hypotheses, they all answer the overarching research question regarding why Asian immigrants have a modest education gradient in health.

The first empirical chapter, Chapter 2, compares the education gradients in health among Asian immigrants, U.S.-born Asians, and U.S.-born whites and examines whether socioeconomic returns to education (e.g., income) is related to variation in the education gradient in health across groups. Studies have suggested that immigrants might have weaker returns to education than do non-Hispanic whites. For example, Asian Americans who obtain the majority of their education outside the United States have weaker returns to education in terms of income (Zeng and Xie 2004) and self-rated health (Walton et al.

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2009). If Asian immigrants do not receive the same payoffs for high educational attainment with regard to earnings and other work-related rewards that may lead to good health outcomes, their education gradients in health may be weaker. I use 13 waves of data from the National Health Interview Survey (NHIS), those conducted from 2000–2012, in this chapter. The health outcome under study is self-rated health, and the variables measuring socioeconomic resources include poverty status and employment status.

The second empirical chapter, Chapter 3, examines whether there is an educational difference in health selection among Asian immigrants. *Health selection* refers to health differences between U.S. immigrants and nonmigrants in their countries of origin, and *positive health selection* refers to the former being healthier than the latter. Some studies have suggested that positive health selection is most pronounced for less-educated immigrants (Buttenheim et al. 2010a; Goldman et al. 2006; Kimbro et al. 2008), while the better health for high-socioeconomic-status immigrants can be mostly explained by their socioeconomic status (Akresh and Frank 2008). If this pattern existed among Asian immigrants in the United States, it could make the difference in health between more-educated individuals and less-educated individuals less apparent, leading to a modest education gradient in health. This chapter uses data from the 2003 New Immigrant Survey (NIS), a nationally representative longitudinal study of new legal immigrants to the United States. In the 2003 NIS, Asian immigrants were asked to compare their health to that of people in their home countries, and their responses, along with responses to

other questions, are used to create a health selection measure. I use that measure to assess education differences in health selection among Asian immigrants.

The third empirical chapter, Chapter 4, uses one U.S. dataset and one Chinese dataset to examine whether Chinese immigrants have similar education gradients in health to Chinese adults in China. Researchers have proposed that the education gradient in health in countries of origin from which U.S. immigrants are drawn is possibly weaker than in the United States (Goldman et al. 2006; Kimbro et al. 2008; Turra and Goldman 2007). Immigrants may import their education gradients to the United States, and, if so, we observe a modest education gradient in health among immigrants in the United States. I use both the NHIS 2006–2011 and the 2006 China Health and Nutrition Survey in this chapter. These two datasets provide a unique opportunity to test the "importation" hypothesis for Chinese immigrants in the United States. The health outcomes are self-rated health, chronic conditions, smoking status, and body mass index (BMI).

In the last chapter, Chapter 5, I reiterate the dissertation goals and summarize the findings presented in the empirical chapters. I further discuss implications of the findings, limitations of the dissertation, and a future research agenda that builds on the findings from this dissertation.

OVERVIEW OF DATASETS

The National Health Interview Survey (2000–2012)

The NHIS is a nationally representative, annual cross-sectional survey of the civilian, noninstitutionalized U.S. population, and it contains rich information on health

outcomes, health behaviors, and socio-demographic characteristics. The NHIS data consists of a basic core (including family, sample adult, and sample child surveys) and variable supplements. The family core file collects information on everyone in the family. From each family in the NHIS, one sample adult and one sample child are randomly selected, and detailed information on each is collected with the sample adult questionnaire and the sample child questionnaire.

The NHIS contains valuable information on health-related measurements and socio-demographic characteristics. Thus, it is one of the most comprehensive datasets for studying the health of various racial/ethnic groups in the United States. In addition, the NHIS implemented a new sample design that oversampled Asian Americans starting in 2006, which thus provides an increased sample of Asian immigrants in the United States. I use the NHIS to study the education gradients for Asian immigrants, U.S.-born Asians, and U.S.-born whites in Chapter 2 and Chinese immigrants, U.S.-born Chinese, and U.S.-born whites in Chapter 4.

The New Immigrant Survey (2003)

The NIS is a nationally representative longitudinal study of new legal immigrants to the United States. The sampling frame of the 2003 NIS included all immigrants who were granted legal permanent residence (LPR) between May and November of 2003 (Jasso et al. 2005). Since all people admitted by LPR were included in the sampling frame, the data consists of individuals who migrated to the United States from many countries around the world. Defined by immigration category and age, there are two samples in the

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2003 NIS: the Adult Sample and the Children Sample. My analysis draws from the Adult Sample, which covers all immigrants who were 18 years or older at the time of admission. For the Adult Sample, the response rate was 68.6%, and 8,573 interviews were completed (Jasso et al. 2005).

The NIS collects information on a wide range of migration-related topics as well as health-related topics among new immigrants in the United States. Most importantly, it asks immigrants to rate their health status in comparison to that of non-migrants in the countries of origin. This question and other health-related questions are used to measure health selection among Asian immigrants in the United States in Chapter 3.

The China Health and Nutrition Survey (2006)

The CHNS is a collaborative project by the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. The CHNS was conducted in nine provinces of China (Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, and Shandong) and contains detailed information on health, nutrition, and demographic characteristics of all members in the sampled households (Popkin et al. 2010). The CHNS is a longitudinal study that follows the same sampled households if possible and also adds new households to replace households that end their participation in the survey. There are a total of 8 waves of the CHNS (1989, 1991, 1993, 1997, 2000, 2004, 2006, and 2009). There are 4,467 households and 18,764 individuals in the 2006 sample (Popkin et al. 2010). Although the CHNS is not a nationally

representative dataset, the selected provinces are diverse in their geography, economic development, and health indicators, so they may be considered to be generally representative of all provinces in China (Popkin, Paeratakul, and Zhai 1995).

The CHNS contains information on education and health that is comparable to that in the NHIS. Most key variables of interest in the NHIS can also be found in the CHNS, such as self-rated health, some chronic conditions and health behaviors, and education in years. Thus, I use the CHNS in Chapter 4 to compare the education gradient in health for native Chinese adults to the education gradient in health for foreign-born Chinese adults in the United States in the NHIS. I use only one wave of the CHNS because its large sample size is sufficient. The sample size of adults in the 2006 CHNS (7,705) is larger than the sample size of foreign-born Chinese adults in the NHIS 2006–2010 (3,107).

All analytic samples in my dissertation are restricted to working-age adults (25 to 64 years old) for two reasons. First of all, since education is the major independent variable of my study and schooling is more likely to be completed by age 25 than earlier, I restrict the samples to ages 25 and above. Second, I do not include respondents aged 65 or older to minimize the recall and survivor biases among older respondents. In addition, for all datasets, missing cases on health outcomes and education are dropped from the analyses. Appropriate sample weights for the NHIS and the NIS are used; there is no sample weight for the CHNS (Popkin et al. 2010). Detailed sample sizes are documented in each empirical chapter.

Chapter 2: Returns to Education and the Education Gradient in Health for Asian Immigrants in the United States

INTRODUCTION

The aim of this chapter is to test the returns-to-education hypothesis for the modest education gradient in health for Asian immigrants in the United States. I first determine whether Asian immigrants in the United States have a weaker education gradient in health compared to U.S.-born whites and U.S.-born Asians. If so, I further examine whether there are differences in the economic returns to education among race/ethnicity-nativity groups, which could contribute to the differences in their education gradients in health.

The positive association between education and health is well documented in the United States. People with more education are more likely to enjoy better health than people with less education. Education is related to multiple health outcomes through multiple mechanisms, and thus education is even conceptualized as a fundamental cause of health inequality (Link and Phelan 1995; Mirowsky and Ross 2003). However, recent studies have documented that the association between education and health is much weaker for Mexican immigrants and Asian immigrants in the United States compared to U.S.-born whites (Goldman et al. 2006; Kimbro et al. 2008; McKinnon and Hummer 2007). Despite the documentation, there is little published research that examines *why* immigrants have this weaker education gradient in health. Some researchers have examined why it exists for Mexican immigrants (Buttenheim et al. 2010a), but to my knowledge, there are no similar studies on Asian immigrants. This is a significant

omission in the literature because Asian immigrants have surpassed Hispanic immigrants as the largest new immigrant group in the United States since 2009 (Taylor et al. 2013), and their health patterns have increasing implications for the country's overall population health.

The main working hypothesis for this chapter is that economic returns to education are lower for Asian immigrants compared to those of U.S.-born whites, which in turn makes the health returns to education smaller. Education, as a fundamental cause of disease, embodies an array of material and nonmaterial resources that influence health outcomes (Link and Phelan 1995; Mirowsky and Ross 2003). If Asian immigrants have fewer payoffs for the same educational attainment on earnings or other work-related aspects which lead to good health, their education gradient in health will be weaker. Using the National Health Interview Survey (NHIS) 2000-2012, I examine whether the associations between education and two economic resource measurements, poverty status and employment status, are weaker for foreign-born Asians in comparison to U.S.-born Asians and U.S.-born whites.

BACKGROUND

Education and Health in the United States

Many studies have documented the positive association between education and health outcomes in the United States (e.g., Elo and Preston 1996; Feinstein 1993; Hummer and Lariscy 2011; Kitagawa and Hauser 1968; Meara, Richards, and Cutler 2008; Mirowsky and Ross 2003; Ross and Wu 1995; Williams and Collins 1995; Williams et al. 2010). People who have more education enjoy not only better health (e.g.,

Mirowsky and Ross 2003; Ross and Wu 1995) but also a lower mortality risk (e.g., Elo and Preston 1996; Hummer and Lariscy 2011; Kitagawa and Hauser 1968; Meara et al. 2008). Evidence even suggests that education strongly predicts health in a graded fashion (Mirowsky and Ross 2003). For example, in the NHIS 2010, U.S. adults who had a college degree or higher were the most likely to report excellent health (39%), followed by people who had some college (26%) and people who had a high school degree (22%). People who do not have a high school degree are least likely to report excellent health (16%) (Sondik, Madans, and Gentleman 2011). Moreover, the positive effect of education on various health outcomes is found across all major U.S. racial and ethnic groups: non-Hispanic whites (e.g., Goldman et al. 2006; Liu and Hummer 2008; Montez et al. 2011), non-Hispanic blacks (e.g., Liu and Hummer 2008; Montez et al. 2011), the Hispanic-origin population (e.g., Goldman et al. 2006; McKinnon and Hummer 2007; Turra and Goldman 2007), and Asian Americans (Walton et al. 2009; Zhang 2013).

Education and Health among Immigrants in the United States

Recent studies have found that immigrants in the United States tend to exhibit weaker education gradients in health outcomes relative to their U.S.-born counterparts. (Acevedo-Garcia et al. 2010; Acevedo-Garcia et al. 2005; Goldman et al. 2006; Kimbro et al. 2008; McKinnon and Hummer 2007; Sánchez-Vaznaugh et al. 2009; Walsemann et al. 2013). This is the case for self-rated health for black, Hispanic, non-Hispanic white, and Asian adults (Acevedo-Garcia et al. 2010; Kimbro et al. 2008); for health behaviors among Mexican-origin American adults (Buttenheim et al. 2010a; Goldman et al. 2006);

and for mortality risk among Hispanic-origin American adults (McKinnon and Hummer 2007; Turra and Goldman 2007). Moreover, using the 2000–2006 NHIS data, Kimbro et al. (2008) found that U.S.-born Asians have similar education gradients in health to U.S.-born whites. Foreign-born Asians, however, were found to have weaker education gradients in several health outcomes relative to U.S.-born whites. For instance, the difference in the predicted probability of work limitations between college graduates and high school graduates was .07 for U.S.-born white men and only .03 for foreign-born Asian men. Similarly, the difference in the predicted probability of obesity between college graduates and high school graduates was .114 for U.S.-born white women but only .004 for foreign-born Asian women (online Appendix of Kimbro et al. 2008).

Lower Returns to Education

The weaker relationship between education and health among Asian immigrants might be partially attributed to the lower returns to education for Asian immigrants in the United States. Prior studies have shown that education influences health outcomes indirectly through work and economic conditions (Mirowsky and Ross 2003; Ross and Wu 1995). People who have more education have advantages in a number of work dimensions and thus financial advantages. They are more likely to be employed, especially in full-time positions, and they have less economic hardship than less-educated people. Compared to the less educated, they also often have more fulfilling work. These better work and economic conditions have a known positive association with well-being and health (Mirowsky and Ross 2003; Ross and Wu 1995).

However, not all people have the same economic returns to education. Studies have found that Asian immigrants, especially those who have foreign degrees, have lower economic returns to education than U.S.-born whites and U.S.-born Asians (Kim and Sakamoto 2010; Painter 2013; Xie and Gough 2011; Zeng and Xie 2004). For instance, Zeng and Xie (2004) used the 1990 Census data to analyze the annual individual income among full-time male workers aged 25 to 44, and they found that only foreign-educated Asian immigrant men face a significant earnings disadvantage. U.S.-born white men, U.S-born Asian men, and U.S.-educated Asian immigrant men have similar earnings when controlling for other covariates. Kim and Sakamoto (2010) analyzed adult male workers with at least a college degree and further found that not all U.S.-educated Asian immigrant men have similar earnings to U.S.-born white men. U.S.-educated Asian immigrant men who received their highest degrees in the U.S. but their high school degrees overseas still have earnings disadvantages. A foreign degree may create a disadvantage for earnings because the training and knowledge obtained overseas may not easily transfer to the U.S. job market (Zeng and Xie 2004). It could also be because U.S. employers are not familiar with foreign education systems (Zeng and Xie 2004).

Most Asian immigrants receive at least some of their education outside the United States, and thus it is possible that Asian immigrants as a whole do not get the same payoffs for educational attainment on earnings or other work-related aspects, which would lead to good health outcomes, as those native to the United States. In this case, the lower economic returns to education can lead to lower health returns to education as well. Based on this perspective, I hypothesize that Asian immigrants have a weaker education

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gradient in health partly because they have lower returns to education. To support this hypothesis, the economic returns to education on health for foreign-born Asian immigrants should be smaller than those for U.S.-born Asians and U.S.-born whites. Moreover, the lower economic returns for Asian immigrants should help explain the weak association between education and health for Asian immigrants compared with U.S.-born whites.

DATA AND METHODS

Data

This chapter uses data from the NHIS 2000–2012. The NHIS is an annual cross-sectional survey of the civilian, non-institutionalized U.S. population, and it contains rich information on health outcomes, health behaviors, and socio-demographic characteristics. The NHIS data consists of a basic core (including family, sample adult, and sample child surveys) and various supplements. The family core file collects information on everyone in the family. From each family in the NHIS, one sample adult and one sample child are randomly selected, and information on each is collected with the sample adult questionnaire and the sample child questionnaire. The NHIS implemented a new sample design that oversampled Asian Americans starting in 2006, and the sampling frame in the following years did not change. To obtain sufficient sample sizes, I pooled data from the 2000–2012 surveys.

To address the research aim of this chapter, my analytic sample included foreign-born Asians (i.e., Asian immigrants), U.S.-born Asians, and U.S.-born non-Hispanic

whites (henceforth "U.S.-born whites"), and the full sample was stratified by gender. I restricted my sample to working-age adults (25 to 64 years old) for two reasons. First of all, since education is the major independent variable of interest and schooling is more likely to be completed by age 25 than earlier, I limited the samples to people who are age 25 and above. Second, I did not include respondents age 65 or older to minimize the recall and survivor biases among the older respondents. I excluded individuals with missing values on any of the outcomes or covariates. The final analytic sample included 21,720 foreign-born Asians, 4,291 U.S.-born Asians, and 269,718 U.S.-born whites.

Measures

Education was measured as a categorical variable: more than college (the reference), college degree, some college education, high school degree or equivalent, or less than high school. This measure indicated the highest degree the respondent completed. Unfortunately, NHIS does not collect information on where the respondents received their degrees. Thus, I could not examine the role of place of education. I used s*elf-rated health* to measure individuals' health status. Survey respondents were asked to rate their own health, and the possible responses were "excellent," "very good," "good," "fair," and "poor." I recoded self-rated health into a dichotomous variable, "bad health" and "good health" (1 = poor or fair health, and 0 = excellent, very good, or good health), as have many previous studies of self-rated health.

I used *poverty status* and e*mployment status* to capture individuals' economic conditions. *Poverty status* is a dichotomous variable (1 = in poverty, and 0 = not in poverty) indicating whether a respondent's family income was below or above the U.S.

Census Bureau's poverty line. If the respondent's family income was below the poverty line, the respondent was "in poverty." Poverty status takes into account the self-reported family income and family size and composition (ages and numbers of children) and therefore may capture the individual's economic hardship better than individual's annual income or family income would. *Employment status* is a dichotomous variable indicating whether the person is currently employed (1 = unemployed or not in the labor force, and 0 = currently employed). For convenience, I referred to people who are not currently employed (employment status = 1), including people who are unemployed and not in the force, as "unemployed" when discussing methods and results. Control variables included age and marital status. *Age* is a continuous variable, ranging from 25 to 64. *Marital status* is a dichotomous variable (1 = not married, and 0 = married).

Methods

First, I examined the association between education and health to determine whether the association varies across the three race/ethnicity-nativity groups of interest (foreign-born Asians, U.S.-born Asians, and U.S.-born whites) and is mediated by poverty status and employment status. Model 1 in Table 2-2 estimated whether the education gradient in self-rated health varies by race/ethnicity-nativity. It regressed poor or fair self-rated health on education attainment, the three race/ethnicity-nativity groups, a series of interaction terms for the three groups by education attainment, age, and marital status. Model 2 in Table 2-2 adds poverty status and employment status to Model 1 to examine whether these two economic-condition indicators mediate some of the

association between education and self-rated health. Tables 2-3 and 2-4 provide estimated odds ratios from Table 2-2 for easier interpretation of the interaction terms.

I further examined the associations between education and poverty and between education and employment status to determine whether the returns to education vary by race/ethnicity and nativity. Table 2-5 includes regression models that predict poverty and unemployment. I regressed poverty status and employment status on education attainment, race/ethnicity and nativity, a series of interaction terms between the three race/ethnicity-nativity groups by education attainment, age, and marital status. Tables 2-6, 2-7, and 2-8 provide estimated odds ratios from Table 2-5 for easier interpretation of the interaction terms. All analyses were stratified by gender, and the appropriate sample weight for the NHIS was applied.

RESULTS

Descriptive Statistics

Table 2-1 displays the weighted descriptive statistics of the sample adults by education, race/ethnicity, nativity, and gender from the NHIS 2000–2012. The descriptive results show significant differences by race/ethnicity and nativity in health and also in the educational distribution of self-rated health, poverty status, and employment status. Among men, foreign-born Asians have a health status similar to that of U.S.-born Asians but are healthier than U.S.-born whites. The same pattern applies to women. Foreign-born Asian men also have a higher prevalence of being in poverty, but a lower prevalence of being unemployed than the other two groups. Foreign-born Asian women have both a

higher prevalence of being in poverty and being unemployed than the other two groups. The education distributions for health, poverty, and employment status are consistent across all three racial/ethnic-nativity groups, across both genders. For poor self-rated health, poverty, and being unemployed, all groups display a negative education gradient: the prevalence of the outcomes decreases as education attainment increases. Yet, consistent with expectations, the gradient is much steeper for U.S.-born whites and U.S.-born Asians relative to foreign-born Asians.

Does the association between education and health vary by race/ethnicity-nativity?

Table 2-2 shows the results of the regression analysis predicting fair or poor self-rated health by gender. Table 2-3 displays the adjusted odds ratio of poor or fair self-rated health for each level of education attainment by race/ethnicity-nativity group to better illustrate the interaction terms from Model 1 in Table 2-2. The interaction terms from Model 1 in Table 2-2 suggest that foreign-born Asians have a weaker education gradient in self-rated health than U.S.-born whites. For instance, U.S.-born white men without a high school degree are 15.7 times more likely to report being in poor or fair self-rated health compared to their counterparts with more than a college degree. Yet, in a similar comparison, foreign-born Asian men without a high school degree are only 3.6 times more likely to report poor or fair self-rated health compared to their counterparts with more than a college degree (see Table 2-3). However, the gradient difference between foreign-born Asians and U.S.-born whites is more prominent among men than among women; most interaction terms related to U.S.-born white women are not significant.

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U.S.-born Asian men's education gradient in health is not much different from that of foreign-born Asian men. The only significant interaction term in Model 1 is for U.S.-born Asian men without a high school degree. U.S.-born Asian women seem to have a steeper education gradient in self-rated health in comparison to foreign-born Asian women, but the difference is not significant, as shown in Table 2-3.

Table 2-4 displays the adjusted odds ratio of poor or fair self-rated health for race/ethnicity-nativity groups by education attainment from Model 1 in Table 2-2. Table 2-4 reveals some intriguing patterns to help us understand the weaker association between education and self-rated health for foreign-born Asians relative to U.S.-born whites. Less-educated foreign-born Asians are relatively healthy compared to U.S.-born whites with the same level of education. On the contrary, among those with more education, foreign-born Asians' health is similar to or even worse than that of U.S.-born whites. This result is surprising as foreign-born Asians, on average, have better health than U.S.-born whites, as shown in the descriptive results in Table 2-1. The relative disadvantage of foreign-born Asians with more education and relative advantage of foreign-born Asians with less education contributes to the modest association between education and health for foreign-born Asians. The relative disadvantage of foreign-born Asians with high education leads to the question of whether or not highly educated foreign-born Asians receive the same returns to their education compared to U.S.-born whites. I answer this question in the next section.

Is the association between education and health mediated by poverty status and unemployment status?

To answer the above question, I added poverty status and employment status in Model 2 in Table 2-2, and the answer is yes. Being in poverty and not being employed are each associated with higher odds of poor self-rated health for both men and women, as shown in the results of Model 2 in Table 2-2. It is also the case that poverty and (un)employment mediate some of the association between education and health: the odds ratios for education attainment and the interaction terms between education and race/ethnicity and nativity decreased in Model 2.

Does the association between education and poverty and the association between education and unemployment status vary by race/ethnicity-nativity groups?

Poverty

I further examined the association between education and poverty and the association between education and unemployment for both men and women. Table 2-5 shows the results of the regression analysis predicting the odds of being in poverty and being unemployed by gender. Table 2-6 shows the adjusted odds ratios of being in poverty for different levels of education attainment by race/ethnicity-nativity groups from the regression results of Table 2-5. The patterns for men and for women are similar, and thus I focus the following discussion on men's results. The answer to the above question is yes. The association between education and poverty is weaker for foreign-born Asian men than for U.S.-born white men. There is no significant difference between the pattern for foreign-born Asian men and the pattern for U.S.-born Asian men. For instance, based on Table 2-6, U.S.-born white men without a high school degree are 16.6 times more

likely to be in poverty compared to their counterparts with more than a college degree. Yet foreign-born Asian men without a high school degree are 8.6 times more likely to be in poverty compared to their counterparts with more than a college degree.

Table 2-8 shows the adjusted odds ratios of being in poverty for each race/ethnicity-nativity group by level of education attainment from the results of Table 2-5. Table 2-8 displays patterns to help us understand the weaker association between education and poverty status for foreign-born Asian men in comparison to U.S.-born white men. Foreign-born Asian men are more likely to be in poverty than U.S.-born white men across all education levels. Moreover, the difference in the odds of being in poverty between foreign-born Asian men and U.S.-born Asian men is the largest among the highest educated group (people who have a college degree or more). The relative disadvantage of foreign-born Asian men with more education contributes to the modest association between education and poverty for foreign-born Asian men.

Employment Status

The association between education and employment status is weaker for foreign-born Asian men than for U.S.-born white men and U.S.-born Asian men. Table 2-7 shows the adjusted odds ratios of being unemployed for different levels of education attainment by race/ethnicity-nativity group from the results of Table 2-5. U.S.-born white men without a high school degree are 6.2 times more likely to be unemployed compared to their counterparts with more than a college degree. U.S.-born Asian men without a high school degree are 9.8 times more likely to be unemployed compared to their counterparts with more than a college degree. However, foreign-born Asian men without a high school

degree are only 2.5 times more likely to be unemployed compared to their counterparts with more than a college degree.

Table 2-9 shows the adjusted odds ratios of being unemployed for each race/ethnicity-nativity group by level of education attainment from the regression results of Table 2-5. Table 2-9 reveals some interesting patterns to help us understand the weaker association between education and employment status for foreign-born Asian men in comparison to U.S.-born white men and U.S-born Asian men. Foreign-born Asian men with little education (i.e., less than high school) are less likely to be unemployed than U.S.-born white men and U.S.-born Asian men with the same level of education. However, among those with more education, foreign-born Asian men are more likely to be unemployed. The differences in the odds of being unemployed between foreign-born Asian men and the other two groups are the largest among the highest educated group. The relative disadvantage of foreign-born Asian men with more education and relative advantage of foreign-born Asian men with less education contribute to the modest association between education and employment status for foreign-born Asian men.

The patterns shown in Table 2-8 and Table 2-9 suggest that foreign-born Asians do have lower returns to their education, especially for those with a college degree or a postgraduate degree, in comparison to U.S.-born whites and in some cases in comparison to U.S.-born Asians (in the case of employment status but not poverty status).

DISCUSSION AND CONCLUSION

A rich body of literature has shown a positive relationship between education and health in the United States (e.g., Feinstein 1993; Hummer et al. 2004; Hummer and Lariscy 2011; Mirowsky and Ross 2003; Williams and Collins 1995; Williams et al. 2010). Education has been conceptualized as a fundamental cause of disease because it embodies an array of material and nonmaterial resources that benefit individual's health (Link and Phelan 1995; Mirowsky and Ross 2003). However, studies have found that the education gradient in health for Asian immigrants in the United States is flatter than those of U.S.-born whites and U.S.-born Asians. This raises a question about Asian immigrants' economic returns to education. It is possible that Asian immigrants have less of a payoff for high educational attainment on earnings or other work-related aspects, which would lead to good health, and the result is that their education gradient in health is weaker. In this chapter, I used the NHIS 2000–2012 to first examine the relationships between education and self-rated health among Asian immigrants, U.S.-born Asians, and U.S.-born whites. I further examined whether Asian immigrants have lower economic returns to education, measured by poverty status and employment status. If they do, it could help explain their weaker education gradient in health.

The results support my hypothesis that economic returns to education are lower for Asian immigrants compared to U.S.-born whites, which in turn makes the health returns to education smaller. First, consistent with Kimbro et al. (2008), the results show that foreign-born Asians have a weaker education gradient in self-rated health than U.S.-born whites. Yet the education gradient in health for foreign-born Asians is not

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significantly different from the gradient for U.S.-born Asians, which is inconsistent with the literature. This inconsistency may be due to the small sample size of U.S.-born Asians in this chapter. Also, poverty status and employment status mediate some of the association between education and self-rated health.

Smaller education gradients in health may be desirable if everyone enjoys good health. However, the weaker education gradients for foreign-born Asians than for U.S.-born whites may be because foreign-born Asians with high education levels are relatively unhealthy and their counterparts with low education are relatively healthy. Among people with low education levels, foreign-born Asians are healthier than U.S.-born whites, but among those with high education levels, foreign-born Asians have similar or even worse health than U.S.-born whites. This pattern leads to the question of whether foreign-born Asians have the same economic returns to education as U.S.-born whites since foreign-born Asians with a high level of education do not have the same health payoffs.

Indeed, the results suggest that Asian immigrants have lower economic returns to education. The association between education and employment status is weaker for foreign-born Asians than for U.S.-born whites and U.S.-born Asians. The association between education and poverty is also weaker for foreign-born Asians than for U.S.-born whites. These patterns exist partly because of the relative disadvantage of highly educated foreign-born Asians. In terms of employment status, among people with low levels of education, foreign-born Asians are less likely to be unemployed than U.S.-born whites and U.S.-born Asians. But among those with high levels of education, foreign-born Asians are more likely to be unemployed than the other two groups. In terms of

poverty, foreign-born Asians are more likely to be in poverty than U.S.-born whites regardless of education level. Yet the difference in the odds of being in poverty between foreign-born Asians and U.S.-born whites is largest among the highest education group.

The relative health disadvantage of highly educated Asian immigrants in comparison to U.S.-born whites may be partly due to their relative disadvantage in poverty and employment status. One explanation for their relative disadvantage is that many highly educated Asian immigrants received their degrees in their home countries. A foreign degree has less of a payoff than a U.S. degree (Kim and Sakamoto 2010; Painter 2013; Xie and Gough 2011; Zeng and Xie 2004). Unfortunately, the NHIS data does not have information about place of education for verification. Another possible explanation is the reverse association between education and health behaviors among immigrants. In the United States, people with more education are less likely to smoke or be obese. However, in developing countries, people with more education may be more likely to smoke and be obese because cigarettes and high-fat foods are considered luxury items that poor people cannot afford. Immigrants from those countries may still demonstrate the reverse association between education and health behaviors, which makes highly educated immigrants less healthy (Goldman et al. 2006; Kimbro et al. 2008; Turra and Goldman 2007). In Chapter 4, I examine whether Chinese immigrants have similar education gradients in health to Chinese adults in China.

On the other hand, the relative health advantage of Asian immigrants with a low level of education may be less related to their returns to education than to migration selection. Indeed, it is possible that they are relatively healthy upon immigration; that is,

immigrants are a selective group. Studies have found that U.S. immigrants are healthier relative to non-migrants in their home countries (Akresh and Frank 2008; Barquera et al. 2008; Crimmins et al. 2005; Jasso et al. 2004; Landale, Oropesa, and Gorman 2000; Riosmena, Wong, and Palloni 2013). Some researchers have speculated that health selection is most pronounced for less-educated immigrants (Buttenheim et al. 2010a; Goldman et al. 2006; Kimbro et al. 2008). This pattern would make the difference in health between highly educated immigrants and less-educated immigrants less apparent, resulting in small education differences in health among immigrants. In Chapter 3, I examine whether Asian immigrants in the United States, especially those who have less education, are selected according to positive health compared to non-migrants in their countries of origin.

Although there is little gender difference in the pattern of education gradients in health across groups, the results suggest that the difference between Asian immigrants' education gradients in health and U.S.-born whites' is larger among men than among women. This is mostly because Asian immigrant men's education gradient in health is flatter than Asian immigrant women's, while U.S.-born white men and women have similar education gradients in health. The gender differences in the education gradients in health among Asian immigrants might be because the reverse association between education and health behavior mentioned above is more pronounced among men than women. It is possible that highly educated Asian immigrant men are more likely to smoke than their counterparts with little education, while most Asian immigrant women do not smoke regardless of their education level. This speculation will be examined

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among Chinese immigrants in Chapter 4.

The results of this chapter should be interpreted with certain limitations in mind. First, as mentioned earlier, the NHIS does not have information regarding where immigrants received their education. It would be preferable to test whether place of education mediates the association between education and economic resources. Nevertheless, the results for all foreign-born Asians in this chapter have demonstrated different returns to education compared to U.S.-born whites. With information on place of education, the difference in the returns to education would still exist and might be larger for foreign-educated Asian immigrants. Second, it would be ideal to examine whether recent and long-term Asian immigrants have the same patterns. However, the sample size would be insufficient if I further stratified the foreign-born Asians by their duration in the United States because some education levels would have insufficient cell sizes. Third, I recognize that Asian immigrants are a diverse group made up of immigrants with different ethnicities and backgrounds. Similar to the previous limitation, insufficient sample sizes precluded the ability to specify this level of detail.

Despite these limitations, the findings are significant for the education-health literature. This chapter is one of very few attempts to determine why Asian immigrants in the United States have a weak or flat education gradient in health. The findings suggest that Asian immigrants have lower economic returns to education compared to U.S.-born whites (and U.S.-born Asians in the case of employment status). This chapter provides a much-needed understanding of Asian immigrants' health and returns to education as their population is growing and has even surpassed Hispanics as the largest new immigrant

group to the United States in recent years.

Table 2-1: Weighted Descriptive Statistics of Adults in the United States Aged 25-64 by Education, Race/Ethnicity, Nativity, and Gender, the NHIS 2000-2012

	More than College	College	Some College	High School	Less than High School	Total
Foreign-born Asian						
Men						
Fair or Poor Self-Rated Health (%)	3.20	4.51 *	8.53 *	8.60 *	13.84 *	6.16
In Poverty (%)	4.91	6.93 *	7.73 *	14.16 *	29.79 *	9.25
Not Employed (%)	8.60	12.05 *	15.58 *	16.55 *	26.63 *	13.24
Age (mean)	40.70	41.23	42.09 *	44.37 *	45.79 *	42.06
Not Married (%)	16.52	21.55 *	27.31 *	21.02 *	18.43	20.87
Unweighted N	2,567	3,058	1,828	1,731	749	9,933
Women						
Fair or Poor Self-Rated Health (%)	1.96	4.47 *	7.01 *	9.99 *	18.42 *	6.86
In Poverty (%)	4.63	5.85	7.75 *	12.14 *	27.00 *	9.19
Not Employed (%)	29.50	31.82	30.82	37.00 *	46.03 *	33.55
Age (mean)	38.71	40.81 *	42.07 *	45.12 *	46.87 *	42.07
Not Married (%)	18.60	20.49	23.97 *	18.99	25.57 *	20.94
Unweighted N	2,104	3,884	2,213	2,393	1,193	11,787
U.S.-born Asian						
Men						
Fair or Poor Self-Rated Health (%)	3.81	3.08	7.30 *	12.66 *	32.71 *	6.59
In Poverty (%)	2.58	3.39	6.53 *	7.13 *	28.67 *	5.17 [a]
Not Employed (%)	7.15	11.80 *	18.95 *	25.76 *	40.42 *	15.64 [a]
Age (mean)	40.89	39.54	40.60	42.95	41.32	40.67 [a]
Not Married (%)	35.17	47.06 *	51.45 *	48.03 *	46.22	45.77 [a]
Unweighted N	415	757	591	348	45	2,156
Women						
Fair or Poor Self-Rated Health (%)	1.04	3.23 *	9.50 *	10.16 *	17.90 *	5.50
In Poverty (%)	5.00	3.41	4.96	11.62 *	43.59 *	6.07 [a]
Not Employed (%)	14.36	18.97	24.04 *	33.88 *	58.28 *	22.11 [a]
Age (mean)	38.05	38.55	40.91 *	43.97 *	42.00	39.82 [a]
Not Married (%)	41.60	42.87	44.41	40.17	58.94 *	42.93 [a]
Unweighted N	398	861	523	309	44	2,135
U.S.-born white						
Men						
Fair or Poor Self-Rated Health (%)	2.80	3.73 *	8.67 *	11.87 *	29.54 *	9.28 [a]
In Poverty (%)	1.39	2.20 *	4.75 *	7.39 *	21.98 *	5.76 [a]
Not Employed (%)	9.40	9.68	15.29 *	18.76 *	37.97 *	15.95 [a]
Age (mean)	46.98	43.10 *	43.78 *	44.21 *	45.19 *	44.24 [a]
Not Married (%)	21.15	28.98 *	32.93 *	34.85 *	41.66 *	31.84 [a]
Unweighted N	15,659	28,568	38,583	40,039	8,957	131,806
Women						
Fair or Poor Self-Rated Health (%)	3.10	3.74 *	9.56 *	13.79 *	34.71 *	9.00 [a]
In Poverty (%)	1.70	2.29 *	6.61 *	9.73 *	29.12 *	7.16 [a]
Not Employed (%)	17.05	21.44 *	26.92 *	32.96 *	57.27 *	27.87 [a]
Age (mean)	44.95	42.10 *	43.88 *	46.00 *	45.88 *	44.31 [a]
Not Married (%)	29.36	29.36	33.25 *	31.70 *	42.33 *	31.98 [a]
Unweighted N	15,883	30,390	44,978	38,887	7,774	137,912

* Difference between more than college and the specific educational level is significant at $p<.05$.

a. Difference between foreign-born Asian and the specific group is significant at $p<.05$.

Table 2-2: Weighted Odds Ratios from Logistic Regression Models Predicting Fair or Poor Self-Rated Health by Gender, the NHIS 2000-2012

	Men (N=143,895)		Women (N=151,834)	
	Model 1	Model 2	Model 1	Model 2
Education (ref.= More than college)				
College	1.35	1.23	2.13***	2.07***
	[.97,1.86]	[.88,1.72]	[1.49,3.03]	[1.44,2.97]
Some college	2.46***	2.21***	3.19***	3.06***
	[1.76,3.44]	[1.56,3.13]	[2.23,4.56]	[2.10,4.45]
High school	2.29***	1.83***	4.32***	3.61***
	[1.67,3.13]	[1.31,2.55]	[3.08,6.05]	[2.54,5.11]
Less than high school	3.63***	2.29***	7.95***	5.21***
	[2.56,5.13]	[1.58,3.34]	[5.59,11.3]	[3.65,7.44]
Education x Race/Ethnicity and Nativity				
College x U.S.-born white	1.19	1.24	.65*	.61*
	[.84,1.67]	[.87,1.77]	[.44,.94]	[.41,.89]
Some college x U.S.-born white	1.52*	1.43	1.07	.91
	[1.07,2.15]	[1.00,2.05]	[.74,1.55]	[.62,1.34]
High school x U.S.-born white	2.29***	2.24***	1.13	.99
	[1.66,3.16]	[1.60,3.15]	[.80,1.61]	[.69,1.42]
Less than high school x U.S.-born white	4.32***	3.80***	2.02***	1.50*
	[3.03,6.16]	[2.59,5.57]	[1.40,2.91]	[1.03,2.16]
College x U.S.-born Asian	.58	.54	1.44	1.39
	[.21,1.60]	[.18,1.56]	[.46,4.56]	[.44,4.41]
Some college x U.S.-born Asian	.70	.57	2.72	2.55
	[.29,1.69]	[.22,1.45]	[.89,8.31]	[.82,7.98]
High school x U.S.-born Asian	1.28	1.03	2.00	1.69
	[.52,3.19]	[.39,2.75]	[.65,6.11]	[.54,5.31]
Less than high school x U.S.-born Asian	3.52*	2.59	1.90	1.15
	[1.03,12.0]	[.74,9.08]	[.50,7.19]	[.30,4.51]
Race/Ethnicity (ref.= Foreign-born Asian)				
U.S.-born white	.57***	.63**	1.14	1.45*
	[.43,.75]	[.47,.84]	[.84,1.55]	[1.06,1.98]
U.S.-born Asian	1.09	1.26	.48	.60
	[.51,2.32]	[.57,2.81]	[.17,1.32]	[.22,1.68]
In poverty (ref.= Above poverty line)		2.10***		2.49***
		[1.95,2.26]		[2.35,2.64]
Not employed (ref.= Employed)		5.56***		3.79***
		[5.31,5.83]		[3.63,3.95]
Demographics				
Age	1.06***	1.04***	1.04***	1.04***
	[1.06,1.06]	[1.04,1.04]	[1.04,1.04]	[1.04,1.04]
Not married (ref.= Married)	1.85***	1.31***	1.89***	1.77***
	[1.77,1.94]	[1.25,1.38]	[1.81,1.97]	[1.69,1.85]

Note: 95% confidence intervals in brackets. * p<.05, ** p<.01, *** p<.001

Table 2-3: Adjusted Odds Ratios of Reporting Poor or Fair Health by Education, Race/Ethnicity, Nativity, and Gender

	Foreign-born Asian		U.S.-born Asian		U.S.-born white	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Men						
Education (ref.= More than college)						
College	1.35	[.97,1.86]	.78	[.30,2.05]	1.60 ***	[1.42,1.80]
Some college	2.46 ***	[1.76,3.44]	1.72	[.79,3.75]	3.74 ***a	[3.35,4.19]
High school	2.29 ***	[1.67,3.13]	2.93 *	[1.26,6.79]	5.23 ***a	[4.69,5.82]
Less than high school	3.63 ***	[2.56,5.13]	12.8 ***a	[3.92,41.59]	15.67 ***a	[13.87,17.71]
Women						
Education (ref.= More than college)						
College	2.13 ***	[1.49,3.03]	3.07 *	[1.07,8.81]	1.37 ***a	[1.22,1.54]
Some college	3.19 ***	[2.23,4.56]	8.69 ***	[3.22,23.48]	3.43 ***	[3.10,3.80]
High school	4.32 ***	[3.08,6.05]	8.62 ***	[3.11,23.91]	4.90 ***	[4.43,5.41]
Less than high school	7.95 ***	[5.59,11.3]	15.1 ***	[4.33,52.74]	16.02 ***a	[14.34,17.89]

Note: Adjusted odds ratios are calculated on the basis of results from Model 1 in Table 2-2, with demographic covariates controlled.

a. Difference between foreign-born Asians and the specific group is significant at $p < .05$.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2-4: Adjusted Odds Ratios of Reporting Poor or Fair Health by Race/Ethnicity, Nativity, Education, and Gender

	More than College		College		Some College		High School		Less than High School	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Men										
Race/ethnicity (ref.=Foreign-born Asian)										
U.S.-born Asian	1.09	[.51,2.32]	.63	[.30,1.32]	.76	[.51,1.12]	1.39	[.87,2.23]	3.83 **[a]	[1.46,10.01]
U.S.-born white	.57 ***	[.43,.75]	.67 ***	[.55,.82]	.86 [a]	[.70,1.07]	1.30 **[a]	[1.07,1.57]	2.46 ***[a]	[1.93,3.12]
Women										
Race/ethnicity (ref.=Foreign-born Asian)										
U.S.-born Asian	.48	[.17,1.32]	.69	[.43,1.09]	1.30	[.85,1.99]	.95	[.60,1.51]	.91	[.39,2.15]
U.S.-born white	1.14	[.84,1.55]	.73 **[a]	[.60,.90]	1.22 *	[1.02,1.47]	1.29	[1.10,1.52]	2.29 ***[a]	[1.91,2.76]

Note: Adjusted odds ratios are calculated on the basis of results from Model 1 in Table 2-2, with demographic covariates controlled.

a. Difference between more than college and the specific educational level is significant at p<.05.

* *p*<.05, ** *p*<.01, *** *p*<.001

Table 2-5: Weighted Odds Ratios from Logistic Regression Models Predicting Being in Poverty and Not Employed by Gender, the NHIS 2000-2012

	Men (N=143,895)		Women (N=151,834)	
	In Poverty	Not Employed	In Poverty	Not Employed
Education (ref.= More than college)				
College	1.36*	1.36**	1.28	1.07
	[1.01,1.84]	[1.09,1.71]	[0.92,1.77]	[0.92,1.24]
Some college	1.43*	1.67***	1.68**	1.00
	[1.07,1.93]	[1.36,2.05]	[1.19,2.35]	[0.85,1.19]
High school	3.11***	1.67***	3.33***	1.23*
	[2.34,4.14]	[1.36,2.05]	[2.42,4.58]	[1.04,1.45]
Less than high school	8.57***	2.45***	8.88***	1.76***
	[6.27,11.7]	[1.88,3.21]	[6.33,12.4]	[1.46,2.12]
Education x Race/Ethnicity and Nativity				
College x U.S.-born white	1.06	.89	1.00	1.32***
	[0.75,1.50]	[0.70,1.14]	[0.69,1.47]	[1.13,1.55]
Some college x U.S.-born white	2.15***	1.16	2.32***	1.86***
	[1.54,2.99]	[0.94,1.44]	[1.58,3.42]	[1.55,2.23]
High school x U.S.-born white	1.57**	1.46***	1.92***	1.94***
	[1.13,2.17]	[1.18,1.80]	[1.33,2.78]	[1.62,2.32]
Less than high school x U.S.-born white	1.94***	2.54***	2.62***	3.89***
	[1.36,2.77]	[1.92,3.35]	[1.77,3.86]	[3.18,4.77]
College x U.S.-born Asian	1.01	1.28	.52	1.32
	[0.41,2.50]	[0.76,2.13]	[0.15,1.71]	[0.81,2.15]
Some college x U.S.-born Asian	1.96	1.65	.66	1.84**
	[0.81,4.71]	[0.97,2.79]	[0.19,2.21]	[1.18,2.87]
High school x U.S.-born Asian	1.05	2.29**	.97	2.12**
	[0.46,2.40]	[1.37,3.82]	[0.28,3.37]	[1.31,3.45]
Less than high school x U.S.-born Asian	2.20	3.98**	1.82	4.66***
	[0.62,7.83]	[1.63,9.74]	[0.44,7.58]	[2.06,10.5]
Race/Ethnicity (ref.= Foreign-born Asian)				
U.S.-born white	.26***	.69***	.32***	.44***
	[0.20,0.34]	[0.59,0.81]	[0.23,0.45]	[0.38,0.50]
U.S.-born Asian	.33**	.67	.67	.41***
	[0.16,0.69]	[0.44,1.01]	[0.22,2.10]	[0.28,0.61]
Demographics				
Age	1.00	1.06***	0.98***	1.02***
	[1.00,1.00]	[1.06,1.06]	[0.98,0.98]	[1.02,1.02]
Not married (ref.= Married)	2.73***	2.46***	4.13***	0.75***
	[2.58,2.88]	[2.37,2.56]	[3.93,4.34]	[0.73,0.77]

Note: 95% confidence intervals in brackets. * $p<.05$, ** $p<.01$, *** $p<.001$

Table 2-6: Adjusted Odds Ratios of Being in Poverty by Education, Race/Ethnicity, Nativity, and Gender

	Foreign-born Asian		U.S.-born Asian		U.S.-born white	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Men						
Education (ref.= More than college)						
College	1.36 *	[1.01,1.84]	1.38	[.59,3.23]	1.44 ***	[1.21,1.72]
Some college	1.43 *	[1.07,1.93]	2.81 *	[1.25,6.32]	3.08 ***a	[2.60,3.64]
High school	3.11 ***	[2.34,4.14]	3.26 **	[1.49,7.13]	4.87 ***a	[4.13,5.73]
Less than high school	8.57 ***	[6.27,11.7]	18.81 ***	[5.44,65.03]	16.64 ***a	[14.07,19.69]
Women						
Education (ref.= More than college)						
College	1.28	[0.92,1.77]	.66	[.23,1.91]	1.28 **	[1.09,1.51]
Some college	1.68 **	[1.19,2.35]	1.10	[.36,3.32]	3.90 ***a	[3.34,4.54]
High school	3.33 ***	[2.42,4.58]	3.22 *	[1.04,9.96]	6.41 ***a	[5.49,7.47]
Less than high school	8.88 ***	[6.33,12.4]	16.16 ***	[4.33,60.34]	23.22 ***a	[19.73,27.32]

Note: Adjusted odds ratios are calculated on the basis of results from logistic regression models predicting being in poverty in Table 2-6, with demographic covariates controlled.

a. Difference between foreign-born Asians and the specific group is significant at $p < .05$.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2-7: Adjusted Odds Ratios of Being Not Employed by Education, Race/Ethnicity, Nativity, and Gender

	Foreign-born Asian		U.S.-born Asian		U.S.-born white	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Men						
Education (ref.= More than college)						
College	1.36 **	[1.09,1.71]	1.74 *	[1.08,2.81]	1.21 ***	[1.12,1.32]
Some college	1.67 ***	[1.36,2.05]	2.75 ***	[1.67,4.53]	1.94 ***	[1.80,2.08]
High school	1.67 ***	[1.36,2.05]	3.82 ***[a]	[2.33,6.25]	2.43 ***[a]	[2.27,2.60]
Less than high school	2.45 ***	[1.88,3.21]	9.77 ***[a]	[4.06,23.48]	6.22 ***[a]	[5.71,6.78]
Women						
Education (ref.= More than college)						
College	1.07	[0.92,1.24]	1.41	[.92,2.18]	1.42 ***[a]	[1.34,1.50]
Some college	1.00	[0.85,1.19]	1.85 **[a]	[1.24,2.74]	1.87 ***[a]	[1.77,1.97]
High school	1.23 *	[1.04,1.45]	2.60 ***[a]	[1.66,4.10]	2.38 ***[a]	[2.25,2.51]
Less than high school	1.76 ***	[1.46,2.12]	8.18 ***[a]	[3.68,18.18]	6.84 ***[a]	[6.36,7.35]

Note: Adjusted odds ratios are calculated on the basis of results from logistic regression models predicting being not employed in Table 2-6, with demographic covariates controlled.

a. Difference between foreign-born Asians and the specific group is significant at $p < .05$.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2-8: Adjusted Odds Ratios of Being in Poverty by Race/Ethnicity, Nativity, Education, and Gender

	More than College		College		Some College		High School		Less than High School	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
A. Men										
Race/ethnicity (ref.=Foreign-born Asian)										
U.S.-born Asian	.41 **	[.21,.80]	.35 **	[.22,.56]	.64 **	[.42,.99]	.34 ***	[.22,.51]	.69	[.28,1.70]
U.S.-born white	.26 ***	[.20,.34]	.27 ***	[.22,.35]	.56 ***a	[.45,.68]	.41 ***a	[.33,.50]	.50 ***a	[.40,.63]
B. Women										
Race/ethnicity (ref.=Foreign-born Asian)										
U.S.-born Asian	.71	[.24,2.11]	.36 ***	[.24,.55]	.43 **	[.27,.70]	.64	[.39,1.04]	1.24	[.53,2.89]
U.S.-born white	.32 ***	[.23,.45]	.32 ***	[.27,.39]	.74 **a	[.61,.90]	.62 ***a	[.52,.72]	.84	[.69,1.02]

Note: Adjusted odds ratios are calculated on the basis of results from logistic regression models predicting being in poverty in Table 2-6, with demographic covariates controlled.

a. Difference between more than college and the specific educational level is significant at p<.05.

* *p*<.05, ** *p*<.01, *** *p*<.001

Table 2-9: Adjusted Odds Ratios of Being Not Employed by Race/Ethnicity, Nativity, Education, and Gender

	More than College		College		Some College		High School		Less than High School	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
A. Men										
Race/ethnicity (ref.=Foreign-born Asian)										
U.S.-born Asian	.66 *	[.44,1.00]	.84	[.63,1.13]	1.10	[.82,1.47]	1.49 *[a]	[1.10,2.02]	2.41 *[a]	[.53,2.89]
U.S.-born white	.69 ***	[.59,.81]	.62 ***	[.52,.73]	.80 **	[.69,.94]	1.00	[.86,1.18]	1.75 ***[a]	[1.11,5.23]
B. Women										
Race/ethnicity (ref.=Foreign-born Asian)										
U.S.-born Asian	.43 ***	[.29,.63]	.55 ***	[.44,.70]	.76 *[a]	[.59,1.00]	.95 [a]	[.71,1.25]	2.03 [a]	[.98,4.18]
U.S.-born white	.44 ***	[.38,.50]	.58 ***[a]	[.52,.64]	.81 ***[a]	[.73,.90]	.85 **[a]	[.76,.94]	1.70 ***[a]	[1.47,1.97]

Note: Adjusted odds ratios are calculated on the basis of results from logistic regression models predicting being not employed in Table 2-6, with demographic covariates controlled.

a. Difference between more than college and the specific educational level is significant at p<.05.

* *p*<.05, ** *p*<.01, *** *p*<.001

Chapter 3: Does Positive Health Selection Vary by Education Level for Asian Immigrants in the United States?

INTRODUCTION

The aim of this chapter is to examine whether the weak gradient in health among Asian immigrants is partly due to education differences in positive health selection in the group. *Health selection* refers to health differences between U.S. immigrants and nonmigrants in their countries of origin, and *positive health selection* refers to the former being healthier than the latter. If less-educated immigrants are more likely to be selected on good health, it may help to explain the modest education gradient in health for Asian immigrants in the United States.

Immigrants are selected on good health; researchers have found that U.S. immigrants are healthier than nonmigrants in their home countries (Akresh and Frank 2008; Barquera et al. 2008; Crimmins et al. 2005; Jasso et al. 2004; Landale et al. 2000; Riosmena et al. 2013). To my knowledge, there is no study examine whether there are education differences in this positive health selection. We tend to assume all immigrants are healthier than their nonmigrant counterparts. However, it is possible that less-educated immigrants may be even more selected on good health to compensate for their limited resources, compared to their highly educated counterparts. If this pattern exists, it would make the difference in health between more-educated immigrants and less-educated immigrants less apparent, resulting in small education differences in health among immigrants.

I address the following question in this chapter: "Does positive health selection

among Asian immigrants in the United States differ by education level?" Using the New Immigrant Survey (NIS), I examine whether Asian immigrants in the United States, especially those who have less education, are more likely to be selected for positive health compared to nonmigrants in their countries of origin.

BACKGROUND

Immigration is a time- and resource-consuming process that requires a certain level of good health to undertake. Indeed, most studies have found evidence of positive health selection among U.S. immigrants (Akresh and Frank 2008; Barquera et al. 2008; Crimmins et al. 2005; Jasso et al. 2004; Landale et al. 2000; Riosmena et al. 2013). For example, Akresh and Frank (2008) found that 71.8% of recent adult immigrants to the United States are positively selected on self-evaluated health compared to citizens in their countries of origin. Moreover, Landale, Oropesa, and Gorman (2000) found that the infant mortality rate for Puerto Rican women who recently migrated to the United States is significantly lower than the infant mortality rate for nonmigrant women in Puerto Rico. Moreover, studies found that older Mexican immigrants in the United States are taller than nonmigrants in Mexico (Crimmins et al. 2005; Riosmena et al. 2013). Yet, the results for self-rated health among older Mexican immigrants are mixed. Riosmena et al. (2013) found support for positive health selection in terms of self-rated health among older Mexican immigrants in the United States, but Bostean (2013) and Rubalcava et al. (2008) did not. The proximity of Mexico to the United States and the well-established migration networks may contribute to a lower degree of positive health selection among

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Mexican immigrants (Akresh and Frank 2008).

Some researchers suspect that positive health selection might be most pronounced for low-socioeconomic-status immigrants (Buttenheim et al. 2010a; Goldman et al. 2006; Kimbro et al. 2008). Compared to highly educated immigrants, less-educated immigrants have fewer resources to manage the migration process. Thus, less-educated immigrants may need to have much better health conditions to migrate. Researchers have found some indirect support for this proposition. For instance, in terms of low birthweight, foreign-born status is more protective for Hispanic immigrant mothers with low levels of education than those with higher education (Acevedo-Garcia et al. 2005; Acevedo-Garcia, Soobader, and Berkman 2007). Moreover, Turra and Goldman (2007) found that the Hispanic mortality advantage is most pronounced among people with lower socioeconomic status. They found that at middle and older ages, Hispanics who have little schooling or low incomes have lower mortality risk than their white counterparts, while Hispanics who are in the highest education and income categories have mortality risks that are similar to or higher than those of their white counterparts (Turra and Goldman 2007).

If all Asian immigrants were selected on good health, we could expect educational differences in their health status to be small; that is, the association between education and health might be weak. Furthermore, if less-educated Asian immigrants were more likely to be selected for good health than more-educated Asian immigrants, the pattern would make the difference in health between more-educated Asian immigrants and less-

educated Asian immigrants less apparent, and thus the education gradient in health for Asian immigrants would be modest.

Akresh and Frank (2008), however, found that higher socioeconomic status might be related to higher levels of positive health selection. They found that health selection among immigrants differs by their region of origin, and the differences are largely explained by the socioeconomic status differences among immigrants. For instance, they found that Mexican immigrants in the United States are less likely to experience positive health selection partly because they have a lower socioeconomic profile than immigrants from other regions. Their analysis focused on differences in health selection *across* U.S. immigrants from different regions of origin. We do not know whether the same pattern exists *among* Asian immigrants, who are a heterogeneous population from different countries with varying education levels and migration contexts. For instance, Asians from Southeastern Asia (e.g., Filipinos and Vietnamese), on average, have lower education attainment than those from South Central Asia (e.g., Indians) and Eastern Asia (e.g., Chinese) (Gryn and Gambino 2012).

Taken together, my general hypothesis is that the extent of positive health selection varies by education level. If the positive health selection is more pronounced for less-educated Asian immigrants, then this can help to explain the modest education gradient in health for Asian immigrants.

DATA AND METHODS

Data

I use the first wave of the 2003 cohort New Immigrant Survey (NIS) to test the hypothesis. The NIS is a nationally representative longitudinal panel study of new legal immigrants to the United States. The sampling frame of the NIS included all immigrants who were granted legal permanent residence (LPR) between May and November of 2003 (Jasso et al. 2005). The NIS has two waves so far. The first wave was conducted from 2003 to 2004, and the second wave was conducted from 2007 to 2009. I only use the first wave because the study design is cross-sectional. Since all people admitted by LPR are included in the sampling frame, many countries of origin are represented. Defined by immigration category and age, there are two samples in the NIS: the Adult Sample and the Child Sample. My analysis draws from the Adult Sample, which covers all immigrants who were 18 years or older at the time of admission. My analytic sample includes only immigrants from Asian countries, such as China, India, the Philippines, and Vietnam.

I further restricted my analytic sample to working-age adults (25 to 64 years old) for two reasons. First, since education is the major independent variable of interest and schooling is more likely to be completed by age 25 than earlier, I restricted the samples to people who are age 25 and above. Second, I did not include respondents age 65 or older to minimize recall and survivor biases among older respondents. Listwise deletion was conducted for missing information. The final sample size is 2,127.

Measures

Positive health selection is a dichotomous variable (1 = positive selection, and 0 = neutral or negative selection). Positive health selection is constructed by multiple questions designed by Akresh and Frank (2008: 2059). Table 3-1 shows the coding procedures of the positive health selection measurement. Most of the respondents' (79%, *n* = 1,630) measurement coding is decided by the question, "If you compared your current health to people in your home country, how would you rate it—excellent, very good, good, fair, or poor?" Responses of "excellent" and "very good" were coded as positive health selection, and those of "good," "fair," and "poor" were coded as neutral/negative selection. For the remaining 21% of respondents, the measurement's coding was decided by self-rated health status when filing for a visa or consistency of health status from childhood to postimmigration. Akresh and Frank (2008) tested the validity of this measurement by using census data from the Philippines and the Mexican National Health Survey. This measurement captures immigrants' health status right before their immigration or at the time they applied for an immigration visa, a time when they had not been in the United States at all or for long. Thus, this measurement also teases out the possible effect of duration of residency in the United States on immigrants' health (see Table 3-1 for detailed questions).

Education level is a categorical variable determined by years of education that respondents reported: low education (fewer than 12 years), middle education (12 to 15 years), and high education (16 years or more). Two confounders are country of origin and admission category. *Country of origin* is also a categorical variable with five categories:

China, India, the Philippines, Vietnam, and other Asian countries (including Korea, East/South Asia, and the Pacific Islands). *Admission category* is a categorical variable with four categories: family preference, employment preference, refugee, and diversity visa or other. *Age* (in continuous years) and *gender* (1 = female, 0 = male) are two demographic variables in the analysis.

Methods

I use weighted logistic regression models to analyze whether Asian immigrants with fewer years of education are more likely to experience positive health selection. Model 1 regresses positive health selection on education level, controlling for age and gender. This model establishes whether differences in the odds of positive health selection exist by education level net of age and gender. Model 2 adjusts for country of origin and admission category. Furthermore, I apply Model 1 to immigrants from different countries of origin separately to see if the association between positive health selection and education is consistent across Asian subgroups. I do not control for admission category when analyzing by subgroups because there is not much variation in admission category within each Asian subgroup. I exclude immigrants from "other" Asian countries in this step because there is very little information about the composition of the "other" category. Appropriate sampling weights are applied.

RESULTS

Table 3-2 begins the analysis by showing the weighted means and proportions for the analytic sample. I include tests of significance between Asian immigrants with high

education and those with less education. The table reveals some descriptive differences in health selection among Asian immigrants with different education levels. About 70% of all Asian immigrants exhibited positive health selection, but the proportion increases with education level. About 75% of Asian immigrants with high education exhibited positive health selection, compared with 70% of those with middle education and 62% of those with a low education level.

Table 3-2 also shows significant education differences in admission category, country of origin, age, and gender. Compared to Asian immigrants with high education, those with less education are significantly less likely to be on an employment visa and more likely to be on a family visa. Forty-three percent of Asian immigrants with high education are employment immigrants, compared with only 16% of those with middle education and 5% of those with low education. In terms of countries of origin, Asian immigrants with less education are more likely to be from China and Vietnam and less likely to be from the Philippines and India compared to those with the high education. In addition, Asian immigrants with high education are also younger and have a smaller proportion of women than those with less education.

The descriptive results in Table 3-2 provide initial evidence that highly educated Asian immigrants are more likely to be selected on positive health compared to less-educated Asian immigrants, which supports the general hypothesis but cannot explain the weak education gradient in health for Asian immigrants. Yet this finding cannot be confirmed without controlling for other factors: immigrants' admission category, country of origin, age, and gender. These factors are likely to be related to Asian immigrants'

health selection experience, and the differences in these factors across education level groups may contribute to the association between education level and positive health selection.

To examine whether the association between education and health selection in Table 3-2 is affected by confounders, I turn to the logistic regression analysis. Table 3-3 presents the results from logistic regression models predicting the odds of positive health selection for all Asians (Model 1 and Model 2) and by country of origin (Model 1). The results for all Asians support the general hypothesis that the extent of positive health selection varied by education level. Consistent with the descriptive results, regression results for all Asians show that higher education is associated with higher odds of positive health selection. Immigrants with low education and with middle education are 39% and 21% less likely, respectively, to experience positive health selection than those with high education, as shown in Model 1. The association between education level and positive health selection weakens a little but remains significant even when adjusting for country of origin and admission category in Model 2. Immigrants' countries of origins are related to their odds of positive health selection. Country of origin, not admission category, seems to account for some differences in the odds of positive health selection between immigrants with high education and those with low education (odds ratio increases from .61 to .69). In addition, results from Model 2 also show that Asian immigrants are very heterogeneous in terms of positive health selection. For example, Vietnamese immigrants are much less likely (OR = .42) and Filipino immigrants are much more likely (OR = 1.96) to have positive health selection than Indian immigrants.

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The association between education level and positive health selection for all Asian immigrants, however, is not present in every Asian subgroup. To simplify the interpretation, Figure 3-1 shows the predicted probability of positive health selection by country of origin from the results in Table 3-3. Similar to the pattern for all Asians, Indians with high education have an advantage in positive health selection over Indians with low or middle education, as shown in Figure 3-1. On the other hand, education level has no significant association with positive health selection for Filipinos or Vietnamese, a pattern that goes against the general hypothesis. The pattern for Chinese immigrants is different from the patterns for other Asian subgroups. Chinese immigrants with middle education are slightly less likely to have positive health selection than those with high education. Yet, Chinese with low education have similar odds of positive health selection as Chinese with high education. However, further analysis (not shown) suggests that Chinese with low education do not have higher odds of positive health selection than Chinese with middle education, either. The pattern for Chinese immigrants provides mixed support for the hypothesis.

In addition, gender and admission category do not associate with the odds of positive health selection for Asian immigrants, which is inconsistent with the results for all immigrants (Asians and non-Asians) from Akresh and Frank (2008). Akresh and Frank (2008) found in the NIS that for all immigrants in the United States, women have lower odds of positive health selection than men, and family-preference immigrants and refugees have lower odds of positive health selection than employment immigrants when adjusting for immigrants' regions of origin. Furthermore, they also found that the positive

association between education level and odds of positive health selection is stronger for women than for men (Akresh and Frank 2008), which is not found in the present study.

DISCUSSION AND CONCLUSION

Previous literature has documented that Asian immigrants have a weaker education gradient in health compared to non-Hispanic whites. This challenges the well-documented positive association between education and health outcomes among the general population. Despite some studies that have documented the weaker education gradient in health among minority groups and provided some possible explanations, very few studies have used empirical data to examine those explanations. One explanation is educational differences in health selection; the education gradient in health for Asian immigrants would be weak or even flat if less-educated Asian immigrants were more likely to be selected on good health and thus healthier. Using the 2003 NIS, the present study is among the first to examine the explanation involving educational differences in health selection among Asian immigrants.

Does health selection among Asian immigrants in the United States differ by education level? The short answer is yes. About 70% of Asian immigrants experienced positive health selection, and those with low and middle education are less likely to experience positive health selection than those with high education (in Model 1). The findings are consistent with Akresh and Frank (2008); they found that higher education is related to positive health selection for all U.S. immigrants when adjusting for immigrants' *region* of origin (e.g., Asia, Mexico, etc.). My findings further add to the

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literature, showing that higher education level is also related to positive health selection when considering Asian immigrants' *countries* of origin (in Model 2). Moreover, the association between education and positive health selection varies by Asian immigrants' country of origin. For instance, education has no significant relationship with positive health selection for Filipino and Vietnamese immigrants.

Can educational variation in positive health selection be a possible explanation for the weak education gradient in health for Asian immigrants in the United States? The answer is no. Based on previous studies on immigrants' education and health (Acevedo-Garcia et al. 2005; Acevedo-Garcia et al. 2007; Turra and Goldman 2007) and researchers' speculations (Goldman et al. 2006; Kimbro et al. 2008), the association between education and health for immigrants is attenuated because most immigrants exhibit positive health selection, especially those with less education or low socioeconomic status. The results of this chapter, however, contradict the speculation, showing that Asian immigrants with high education, instead of those with lower education, are more likely to be selected on positive health. Even when looking into each Asian immigrant subgroup separately, none of the subgroups show the pattern that previous researchers speculated would be found. For Indians, those with high education levels have significantly higher odds of positive health selection than those with less education. For Filipinos and Vietnamese, education does not seem to be related to the odds of positive health selection. For Chinese, the only significant difference in the odds of positive health selection is among those with high education and those with middle education.

What can explain the observed association between high education level and positive health selection for all Asian immigrants even when adjusting for their countries of origin? It is probably related to respondents' choice of the reference group when they answered the main question regarding the positive health selection measurement. Respondents were asked, "If you compared your current health to people in your home country, how would you rate it—excellent, very good, good, fair, or poor?" It is possible that respondents choose "average people" in their home countries as the reference group instead of people with education levels similar to their own. Thus, because education level is positively related to good health status (e.g. Hummer and Lariscy 2011; Mirowsky and Ross 2003; Ross and Wu 1995) and health selection is highly associated with health status (Akresh and Frank 2008), highly educated immigrants are more likely to report not only positive health status but also positive health selection. Previous studies on self-rated health status have found that people may use a certain age group as a reference group when they evaluate their health status, depending on the wording of the question and the respondents' age (see more at Jylhä 2009; Kaplan and Baron-Epel 2003). This possibility exists especially for Indians and Chinese because, for them, education level is positively related to the odds of positive health selection. However, without further qualitative studies, it is difficult to know how people choose their reference groups.

This chapter has important implications for the theoretical understanding of the weak education gradient in health for immigrants. First, as the results suggest, educational differences in health selection cannot explain the weaker education gradient

in health for Asian immigrants; highly educated Asian immigrants are more likely to experience positive health selection than those with less education, and thus we would expect significant education gradients in health for Asian immigrants. Second, the results imply that educational differences in acculturation among immigrants proposed by previous literature might not explain the weaker gradient either. Researchers of previous studies suspected that, compared to immigrants with less education, highly educated immigrants might have stayed longer in the United States and become more acculturated to the American lifestyle, which may worsen the more-educated Asian immigrants' health. However, the results suggest that highly educated Asian immigrants are likely to be quite healthy because they experience positive health selection, which is related to current self-rated health (Akresh and Frank 2008). Nevertheless, this chapter is not designed to test the proposed "acculturation" hypothesis, and empirical studies are needed to specifically test this hypothesis.

This chapter also improves our understanding of health selection and Asian immigrants in the United States. First, the results suggest that most Asian immigrants are healthier compared to their nonmigrant counterparts in their countries of origin, which is consistent with previous literature on health selection. Yet not all immigrants enjoy positive health selection; the odds of positive health selection varies by the immigrants' education levels. Overall, highly educated Asian immigrants (16 or more years of education) are about 30% more likely to exhibit positive health selection than immigrants with fewer than 12 years of education. Second, previous studies on health selection are mostly focused on either exclusively U.S. immigrants or older Mexican immigrants in the

United States (Akresh and Frank 2008; Barquera et al. 2008; Crimmins et al. 2005; Jasso et al. 2004; Landale et al. 2000; Riosmena et al. 2013). This chapter focuses solely on Asian immigrants in the United States, an understudied population. Third, the results also imply that Asian immigrants in the United States are a very diverse group. Asian immigrants are from many different countries and vary widely in the degree of positive health selection. For instance, Vietnamese are much less likely to experience positive health compared to Indians. Also, variation in the association between education and positive health selection across Asian immigrant subgroups reinforces the heterogeneity of Asian immigrants. Further studies on Asian immigrants' health or health selection should consider variations in their subgroups when possible.

The findings offered in this chapter should be considered in light of some limitations. The 2003 NIS is the best data available to examine health selection among immigrants from many different countries. From a series of questions, researchers create a measurement of health selection that represents how immigrants view their health compared to that of nonmigrants in their countries of origin. However, the measurement is a subjective comparison, which may not directly reflect the health selection processes (Akresh and Frank 2008). Second, the sample from the NIS is all legal immigrants who obtained legal permanent residence status between May and November of 2003. Thus, the results of this chapter may not represent illegal immigrants and immigrants from earlier migration cohorts.

Despite the limitations, the findings are significant for education-health and immigrant health literature. This chapter is one of very few attempts to determine why

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Asian immigrants in the United States have a weak or flat education gradient in health. This chapter is also the first to examine whether health selection varies by education level for Asian immigrants. The findings have implications for our theoretical understanding of the weak education gradient in health for immigrants, although educational differences in health selection are unlikely to explain the weak education gradient in health for Asian immigrants. The findings also benefit our understanding of health selection and Asian immigrants in the United States. Future research should work toward identifying other possible explanations for the weak education gradient for immigrants, such as educational differences in acculturation, lower returns on education, and different education-health relationships in the countries of origin. The dramatically growing immigrant populations are changing the composition of the U.S. population, and those immigrants' health will soon have a significant impact on the overall U.S. health profile. This is especially the case for Asian immigrants—this understudied population is about a quarter of the total U.S. immigrant population, and it has surpassed Hispanics as the largest new immigrant group to the United States in recent years. This line of research, building on the present study, will broaden our understanding of health selection among immigrants and the education gradient in health for immigrants so that we can more completely understand U.S. minority groups' health.

Table 3-1: Coding of the Positive Health Selection Measure from the 2003 Cohort New Immigrant Survey.
(From left to right, Positive Health Selection is coded by answers to the first and following questions.)

First Question			Following Questions	
Question	Answer		Question	Answer and Coding
Compared with your health right before you most recently came to the United States to live, would you say that your health is better now, about the same, or worse?	About the Same (79% respondents, $n = 1,630$)		If you compared your current health to people in your home country, how would you rate it —excellent, very good, good, fair, or poor?	Excellent/Very good = Positive Selection; Good/Fair/Poor = Neutral/Negative Selection
	Better/Worse	& have been in the U.S. ≤ 5 years when filing the visa (20% respondents, $n = 408$)	At the time of the first filing that started the process for the immigrant visa that you now have, would you say your health was excellent, very good, good, fair, or poor?	
	Better/Worse	& have been in the U.S. > 5 years when filing the visa (1% respondents, $n = 20$)[a]	Considering your health while you were growing up, from birth to age 16, would you say that your health during that time was excellent, very good, good, fair, or poor?	

Note:

a. For respondents in this category, health selection is coded by the consistency of answers to all three following questions. If their responses to the three questions were consistently "good," their health selection was coded as neutral. If their responses to the three questions were consistently "fair" or "poor," their health selection was coded as negative selection. Respondents with inconsistent responses to these three questions were excluded.

b. Coding developed by Akresh and Frank (2008). See coding details from Akresh and Frank (2008: 2059)

Table 3-2: Weighted Descriptive Statistics for Asian Immigrants in the United States Aged 25–64 by Education Level from the 2003 New Immigrant Survey

Education	Low Education[a]	Middle Education[a]	High Education[a]	Total
Health selection (%)				
Positive	62.4*	69.7*	75.2	69.9
Neutral or negative	37.5*	30.3*	24.8	30.1
Admission category (%)				
Employment preference	5.3*	15.7*	43.1	23.5
Family preference	73.6*	62.3*	44.2	58.4
Refugee	2.2*	4.5	4.5	3.9
Diversity visa or other	18.9*	17.4*	8.2	14.3
Country of origin (%)				
China	28.8*	12.8*	12.4	16.9
India	19.5*	20.6	34.6	25.7
Philippines	12.2	27.9*	14.8	18.7
Vietnam	20.3*	12.0*	5.0	11.5
Other	19.2*	26.8	33.2	27.2
Age (mean)	45.2*	40.1*	37.0	40.3
Female (%)	64.6*	68.62*	55.0	62.4
Unweighted N	471	672	982	2,125

Note:

a. Low education = fewer than 12 years of education; middle education = 12–15 years of education; high education = 16 or more years of education

*Difference between immigrants with 16 or more years of education and immigrants with other education levels is significant at $p < .05$.

Table 3-3: Weighted Odds Ratios from Logistic Regression Models Predicting Positive Health Selection for All Asians and by Country of Origin, the 2003 New Immigrant Survey

	All Asians Model 1	All Asians Model 2	Chinese Model 1	Filipinos Model 1	Indians Model 1	Vietnamese Model 1
Education (ref. = High education)						
Low education	.61***	.69*	.76	.90	.59+	.60
	(0.09)	(0.11)	(0.25)	(0.39)	(0.19)	(0.30)
Middle education	.79+	.77+	.52+	1.62	.59*	.76
	(0.11)	(0.12)	(0.20)	(0.57)	(0.16)	(0.40)
Female	.99	.96	1.01	1.17	.82	.74
	(0.11)	(0.12)	(0.27)	(0.37)	(0.18)	(0.25)
Age	.99*	.98**	.97+	.97*	.98+	.99
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Country of origin (ref. = India)						
China		1.09				
		(0.19)				
Philippines		1.96***				
		(0.37)				
Vietnam		.42***				
		(0.09)				
Other Asian countries		.72*				
		(0.12)				
Admission category (ref.= Family preference)						
Employment preference		.97				
		(0.15)				
Refugee		1.50				
		(0.40)				
Diversity visa or other		.96				
		(0.16)				
Pseudo R2	.013	.044	.023	.039	.030	.013
Unweighted N	2,125	2,125	343	406	626	186

Note:

a. The reference category for positive health selection is a combination of neutral health selection and negative health selection

b. Low education = fewer than 12 years of education; middle education = 12–15 years of education; high education = 16 or more years of education

c. Standard errors in parentheses

d. *+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001*

Figure 3-1: Predicted Probability of Positive Health Selection by Countries of Origin from Table 3-3
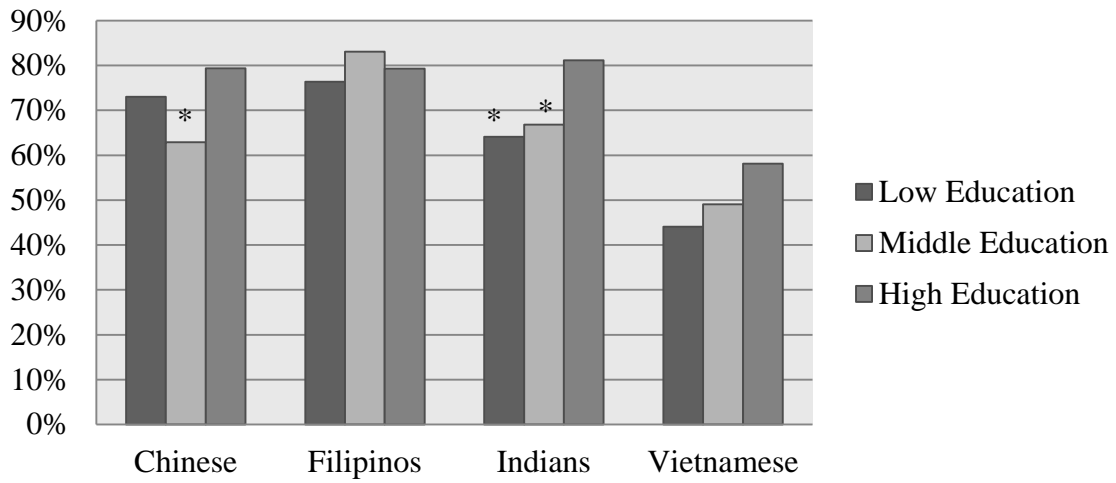
* Significant difference from the probability of immigrants of high education, *p < 0.1*

Chapter 4: The Education Gradient in Health for Chinese Immigrants in the United States: Do Chinese Immigrants "Import" Their Education Gradient in Health to the United States?

INTRODUCTION

The aim of this chapter is to examine whether Chinese immigrants in the United States have an association between education and health that is similar to that of native Chinese in China—in other words, whether Chinese immigrants "import" their education gradient in health with them to the United States. By examining Chinese immigrants' education gradient in health, we can gain insight into the modest education gradient in health for Asian immigrants in the United States.

Studies speculated that immigrants have a modest education gradient in health partly because of the "importation" of weak gradients from their home countries where education has been a less powerful determinant of health. The main rationale behind the importation hypothesis is that cigarettes and high-fat or high-calorie foods are luxury goods that poor people in China cannot afford. Thus, smoking, obesity, and some chronic diseases might be most prevalent among people of high socioeconomic status or with high education levels. Therefore, the relationship between education and health may be weaker than it is in the United States or even the positive of it, and Chinese immigrants bring those weaker gradients in health with them when they migrate to the United States.

In this chapter, I use national data sets from China and the United States to test the hypothesis that the weak gradients in health among Chinese Americans are partly due to the "importation" of education gradients in health by immigrants. I focus on four health-related measures: self-rated health, chronic conditions, smoking, and body mass index (BMI). First, I examine whether education gradients in these health-related measures for Chinese immigrants in the United States are weaker than those for U.S.-

born Chinese and U.S.-born non-Hispanic whites. Second, I test the importation hypothesis by examining whether the education gradients in these health-related measures for Chinese immigrants in the United States are similar to those for Chinese adults in China.

BACKGROUND

Researchers speculate that education differences in health and health behaviors in some countries from which immigrants come are weak or even positive (Goldman et al. 2006; Turra and Goldman 2007). McLaren (2007) reviewed the literature on the SES-obesity relationship and found that in less developed countries, more education is associated with higher BMI, especially for women. The opposite is found in more developed countries (McLaren 2007). The positive relationship between SES-obesity in some Latin American countries might be because cigarettes and high-fat foods are luxury goods that poor people cannot afford (Kain, Vio, and Albala 2003). Furthermore, Wang et al. (2007) found that, as China experienced economic development, the overweight and obesity rate in China increased from 20% to 29.9%, especially for men, urban residents, and high-income people. A similar pattern applies to smoking. Pampel's (2001) study on smoking patterns in 16 European countries supports the cigarette-diffusion hypothesis: smoking is initially prevalent in high social status groups, and then it diffuses to lower social status groups. Another recent empirical study by Buttenheim et al. (2010b) found that education gradients in smoking for men and in obesity for women are weak for Mexican adults. They further found that, for Mexican adults, the education gradient in male obesity is flat (i.e., there is no association between education and obesity) and is

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even reversed for female smoking (i.e., the higher the socioeconomic status, the more likely they are to smoke) (Buttenheim et al. 2010b).

Therefore, it is likely that immigrants from less-developed or developing countries bring these patterns with them when they move to the United States. To my knowledge, only one study so far has directly tested this hypothesis. Buttenheim et al. (2010a) used the U.S. National Health Interview Survey and the Mexican National Health Survey to determine whether Mexican immigrants import social gradients in health to the United States. They found support for the importation hypothesis related to smoking for both men and women. The gradient in smoking for recent Mexicans in the United States was not significantly different from the gradient in smoking for native Mexicans in high-migration regions in Mexico. However, they did not find support for the importation hypothesis for obesity for either men or women. Moreover, a recent study by Frank and Akresh (2012) provided some indirect evidence for the importation hypothesis; they found that immigrant women from the highly developed countries have stronger SES-BMI relationships than immigrant women from less developed countries.

Based on the importation hypothesis, I ask two questions in this chapter: 1) Is the education gradient in health for Chinese immigrants weaker than the education gradient in health for U.S.-born non-Hispanic whites and U.S.-born Chinese in the United States? 2) If so, can the importation hypothesis explain the weaker education gradient in health for Chinese immigrants in the United States? To answer these two questions, I first examine differences in education gradients in health among U.S.-born Chinese, Chinese immigrants, and U.S.-born non-Hispanic whites in the United States. I hypothesize that

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Chinese immigrants have a weaker education gradient in health compared to U.S.-born Chinese and non-Hispanic whites. Second, if there are indeed weaker education gradients in health among Chinese immigrants, I further test the importation hypothesis. The importation hypothesis is supported if the education gradient in health for Chinese immigrants in the United States is similar to the education gradient in health for adults in China.

DATA AND METHODS

Data

Data come from the U.S. National Health Interview Survey (NHIS) from 2006 to 2011 and the 2006 China Health and Nutrition Survey (CHNS). I use the NHIS to investigate the association between education and health for U.S.-born Chinese, foreign-born Chinese, and U.S.-born non-Hispanic whites (hereafter U.S.-born whites) in the United States and the CHNS to examine the education gradient in health for Chinese adults in China.

The NHIS is an annual cross-sectional survey of the civilian, non-institutionalized U.S. population. I use the Family Core and Sample Adult files of the NHIS. The Family Core file collects information on everyone in the sample family. From each family, one sample adult is randomly selected, and his/her information is collected with the Sample Adult questionnaire. I pooled six waves of the NHIS (2006–2011) to maximize the number of cases for U.S.-born Chinese and foreign-born Chinese respondents.

The CHNS is a longitudinal study conducted in nine provinces of China. It contains

detailed information on health, nutrition, and demographic characteristics of all members

in the sampled households (Popkin et al. 2010). The nine provinces are diverse in their

geography, economic development, and health indicators, and are considered

representative of all provinces in China (Popkin et al. 1995). I use the 2006 wave of the

CHNS because its sample size is sufficient.

I restricted my U.S. and China samples to adults aged 25 to 64 years old for two

reasons. First, education is the key independent variable, and schooling is more likely to

be completed by age 25 than earlier. Second, I do not include respondents age 65 or older

to minimize recall and survivor biases among older respondents. I divide the CHNS

sample based on whether the individuals live in an urban area or a rural area because

urban Chinese adults are more likely to migrate to the United States than are rural

Chinese adults. Thus, foreign-born Chinese in the United States might be more similar to

urban Chinese adults than to rural Chinese adults. Appropriate sample weights are

applied for the NHIS. There are no sample weights for the CHNS (Popkin et al. 2010).

Measures

The key independent variable is education in continuous years. The dependent

variables are self-rated health, chronic conditions, smoking status, and BMI. *Self-rated*

health is coded as a dichotomous variable (1 = fair/poor health. 0 = excellent/very

good/good health*). Chronic conditions* include high blood pressure, heart conditions, and

heart attack, collapsed into a dichotomous variable (1 = for at least one condition. 0 = no

condition). *Smoking status* is coded as a dichotomous variable (1 = ever smoked. 0 = never smoked). *BMI* is a continuous variable. I exclude underweight people (BMI < 18) because the education-BMI relationship for underweight individuals may be different from the relationship for their higher-BMI counterparts. Control variables include *age* in years and *marital status* (married versus not married).

Cases with any missing information were dropped. In the NHIS, information about self-rated health is in the Family Core file, which has a larger sample size. Information about chronic conditions, smoking status, and BMI is in the Sample Adult file, which has a smaller sample size. Cases that are not in the Sample Adult file are kept when analyzing self-rated health. Thus, the NHIS sample contains 135,320 adults to analyze self-rated health and 54,153 adults to analyze the other three health-related variables. The sample size of the CHNS data is 6,658.

Methods

First, I combine the 2006–2011 NHIS and the 2006 CHNS. Since the NHIS has a sample weight whereas the CHNS does not, I assign identical weights to the CHNS cases in the combined data set, making the CHNS weights equal to those in the NHIS in the combined dataset.

Following Buttenheim et al. (2010a), I answer the first research question in two steps. First, I use logistic regression to analyze education differences in self-rated health, chronic conditions, and smoking status and OLS regression to analyze education differences in BMI among U.S.-born whites in the United States (UBW), U.S.-born

Chinese Americans in the United States (UBC), and foreign-born Chinese in the United States (FBC). All regression models control for age and marital status and are stratified by gender. Second, I use Wald tests to test the equality of the education coefficients between two groups of interest. If the *p*-value of the Wald test is more than .05, the two coefficients are not statistically different. I conduct three comparisons: FBC versus UBW, FBC versus UBC, and UBC versus UBW. If FBC or UBC adults have weaker gradients in health than UBW, first, we should see a difference in the coefficients or the odds ratio in the regression analysis, and second, the *p*-value from the Wald test should be less than .05.

To answer the second research question, I follow the same two-step analytic strategy described above, but compare education gradients in health for foreign-born Chinese in the United States (FBC), urban Chinese in China (UC), and rural Chinese in China (RC). The importation hypothesis is supported if the education gradient in health for FBC is similar to the corresponding gradients for either UC or RC.

RESULTS

Descriptive statistics

Table 4-1 presents the descriptive statistics for adults in the United States and China. First, for both genders, UBC and RC have the highest and lowest average education levels among all groups, respectively. FBC also have, on average, four more years of education than do both RC and UC.

Compared to UBW, both UBC and FBC have better self-rated health, lower BMI, fewer chronic conditions, and a lower prevalence of smoking. These patterns are

consistent with previous literature (Frisbie, Cho, and Hummer 2001; Sondik et al. 2011; Yu, Huang, and Singh 2004) and are true for both genders. Moreover, UBC have slightly better self-rated health but a higher prevalence of chronic conditions and a higher average BMI than do FBC. The nativity difference in smoking varies by gender. About 13% of UBC women and men have ever smoked, while the prevalence of smoking is much lower among FBC women (4.7%) and much higher among FBC men (28.3%). Furthermore, compared to FBC, UC and RC have worse self-rated health but a lower prevalence of chronic conditions for both genders. The patterns of smoking status and BMI differ by gender. For women, FBC have a lower average BMI and a higher prevalence of smoking than do RC and UC. For men, the opposite pattern is observed.

Is the education gradient in health for foreign-born Chinese weaker than the gradient for U.S.-born whites and U.S.-born Chinese?

The results partially support the hypothesis that FBC have a weaker education gradient in health compared to UBC and UBW. FBC have weaker education gradients in self-rated health, smoking status, and BMI than do UBW. Table 4-2 and Table 4-3 present the odds ratios from logistic regression models predicting poor/fair self-rated health, at least one chronic condition, and having ever smoked and the coefficients from OLS regression models predicting BMI for women and men, respectively. For both genders, the relationship between education and the odds of poor/fair self-rated health is stronger (i.e. the odds ratio is smaller) for UBW than for FBC. Education is unrelated to FBC adults' smoking status and BMI, while the education-smoking and education-BMI

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relationships are very strong for UBW for both genders. Results of the Wald tests in Table 4-4 confirm that, for both genders, the education gradients in self-rated health, BMI, and smoking for FBC and for UBW are significantly different.

The relationships between education and chronic conditions differ by gender. The relationship between education and the odds of chronic conditions is very strong for UBW men but insignificant for FBC men (Table 4-3). The Wald test confirms that the education gradients in the odds of chronic conditions for UBW men and for FBC men are indeed different. Yet, for women, education has equally significant relationships with the odds of chronic conditions for both FBC and UBW (Table 4-4).

FBC men have a similar education-health relationship to UBC men. FBC women have similar education-health relationships to UBC women except for self-rated health and BMI. The education gradients in self-rated health and BMI are stronger for UBC women than for FBC women (Table 4-2 and Table 4-4). Nevertheless, UBC and UBW have similar relationships between education and all health-related measures. For both genders, the education gradients in all health-related measures for UBC look different from the gradients for UBW in the regression analysis (Table 4-2 and Table 4-3); yet the results of the Wald tests presented in Table 4-4 show that the differences are not significant. This may because of the small sample size of UBC adults.

In summary, FBC have weaker education gradients than UBW for all health-related measures except women's chronic conditions. The education gradients in health for UBC are similar to the corresponding gradients for UBW. The results are similar to previous

findings (Kimbro et al. 2008), showing that UBW have stronger education gradients in health outcomes than Asians as a whole or Chinese Americans (regardless of nativity).

Can the importation hypothesis explain the weaker education gradient in health (except women's chronic-condition status) for foreign-born Chinese in the United States?

For women, the importation hypothesis is supported for BMI and smoking patterns but not for self-rated health. First, the education gradients in smoking status and BMI for FBC women are similar to the corresponding gradients for UC and RC women, as indicated by the Wald test results (Table 4-4). The education gradient in self-rated health is stronger for FBC women than for UC and RC women (Table 4-4). Each additional year of education is associated with 12% (1-.88) lower odds of reporting poor/fair self-rated health for FBC women, but only 3% (1-.97) and 4% (1-.96) lower odds for UC and RC women, respectively (Table 4-2).

For men, the importation hypothesis is supported for all outcomes except BMI. The education gradients in self-rated health and smoking status for FBC men and for RC and UC men are not statistically different (Table 4-4). However, the results are complicated by the fact that men in China have worse self-rated health and higher prevalence of smoking than do FBC men. The education gradients in the odds of chronic conditions for FBC men and for UC or RC men are also not statistically different (Table 4-4). For RC and UC men, an "positive" education-health relationship is found for chronic conditions. For RC and UC men, each additional year of education is associated with 8% and 12%

higher odds of having at least one chronic condition, respectively (Table 4-3). Although the odds ratio for having chronic conditions associated with each additional year of education for FBC men is insignificant, it is similar to the corresponding odds ratio for RC men and UC men.

The importation hypothesis is not supported for men's BMI. For UC and RC men, a positive education-health relationship is found; each additional year of education is associated with .10 and .14 increases in BMI for UC and RC men, respectively (Table 4-3). However, for FBC men, education has no significant relationship with BMI (Table 4-3). The Wald tests also confirm that FBC men have a different education gradient in BMI than UC and RC men (Table 4-4). The positive education-BMI relationship among UC and RC men complements the findings of Wang et al. (Wang et al. 2007), which show that increases in overweight and obesity between 1989 and 1997 were most significant among men and high-income individuals in China.

DISCUSSION AND CONCLUSION

Studies have found that the education gradient in U.S. health is weaker for Asian immigrants than for non-Hispanic whites. Researchers speculated that the weak gradient is partly due to the importation of weaker education-health associations from immigrants' home countries to the United States. I used the NHIS and the CHNS to examine the education gradient in health and the importation hypothesis for Chinese Americans. The results show that, first, Chinese immigrants have weaker education gradients in all health outcomes than U.S.-born whites except women's chronic conditions. Second, most of the

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findings provide support for the importation hypothesis; that is, Chinese immigrants in the United States have similar education gradients for those outcomes to native Chinese adults in China. The hypothesis is supported for women's BMI and smoking patterns and for men's self-rated health, chronic conditions, and smoking patterns. The results for smoking are similar to the results for the Mexican-origin population reported in Buttenheim et al. (2010a). The importation hypothesis is not supported for women's self-rated health because Chinese immigrant women have a stronger education gradient in self-rated health than women in China. The hypothesis is also not supported for men's BMI patterns because Chinese immigrant men have a weaker education gradient in BMI than men in China. Furthermore, positive relationships are found between education and chronic conditions and between education and BMI for men in China.

The findings have important policy implications. Small education differences in health and health behaviors are desirable if a population has excellent health. This may be the case for Chinese immigrant women, who have excellent health and for whom the majority has never smoked. However, the weaker education gradients in health and health behaviors may be a concern if more-educated immigrants consume high-calorie and high-fat diets, and thus they may have more chronic conditions and higher BMI. This is the case for Chinese immigrant men, who have an insignificant but positive education-chronic conditions relationship. The positive relationship is possibly because more-educated immigrants have more access to health care and regular checkups than less-educated immigrants, and thus the latter are *unaware* that they have chronic conditions. However, the access-to-care speculation is possible but not likely because the same

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pattern is not found among Chinese immigrant women. Policy makers need to consider not only the typical high-risk groups but also high-socioeconomic-status immigrants from some developing countries when developing programs that target chronic diseases.

This chapter also provides clues for further theoretical development regarding the weak education gradient in health for immigrants. Although the education-health patterns for Chinese immigrant are similar to those for native Chinese in China in most cases, the descriptive results also show that Chinese immigrants and native Chinese in China are different. For both genders, Chinese immigrants are more educated and have much better self-rated health relative to rural Chinese and urban Chinese in China. The prevalence of smoking is higher among Chinese men in China than among Chinese immigrant men in the United States. The differences between immigrants and nonimmigrants are consistent with previous literature that showed that immigrants are a highly selective group (Akresh and Frank 2008; Landale et al. 2000). Therefore, it is possible that the selection of immigrants also partially accounts for the weaker education gradient in health among Chinese immigrants. If health selection is most profound among less-educated immigrants (Buttenheim et al. 2010a; Goldman et al. 2006; Kimbro et al. 2008), we might find that less-educated immigrants have better health than expected. In this case, the differences in health between more-educated and less-educated individuals are smaller, and thus we can expect the education gradient in health among immigrants to be weaker.

The results should be interpreted with some limitations. First, although they are the not key focus of this study, the sample size of U.S.-born Chinese adults is small. Second,

the sample size of Chinese immigrants is not large enough to allow for examination of whether the education gradient in health differs by duration of stay in the United States. Compared to long-term Chinese immigrants, whose education-health patterns may assimilate to the patterns of U.S.-born whites, the education-health patterns of recent Chinese immigrants should be more similar to the patterns of native Chinese in China. Last, there is no measure of international migration in the CHNS data. Immigrants' health behaviors might be more similar to the behaviors of people in high-migration areas than to those of people in low-migration areas in sending countries. To compensate for this shortcoming, I compared Chinese immigrants to both urban Chinese and rural Chinese in China.

The findings are significant for the education-health literature. This study is one of few to examine why immigrants in the United States have a weaker education gradient in health than U.S.-born whites and is the first to apply the importation hypothesis to Asian immigrants. The findings indicate that the education-health paradigm may not fit all groups. Given the dramatic growth in the Asian and Hispanic populations that the United States has experienced, incorporating migration context into this existing paradigm is crucial to understand immigrants' health and Americans' health as a whole.

Table 4-1. Descriptive Statistics of Adults Aged 25-64 in the United States and China from the NHIS 2006-2011 and the CHNS 2006.

	Adults in the U.S. (the NHIS 2006-2011)			Adults in China (the CHNS 2006)	
	U.S.-Born Whites	U.S.-Born Chinese	Foreign-Born Chinese	Urban Chinese	Rural Chinese
A. Females					
Poor/Fair Self-Rated Health (%)	10.7	4.7	5.5	44.2	35.9
At Least One Chronic Condition (%)	29.6	21.7	12.6	12.4	6.4
Ever Smoked[a] (%)	44.7	12.8	4.7	3.4	2.9
BMI[a] (mean. BMI$\geq$18) [Std. Dev.]	27.0 [5.90]	24.2 [4.41]	22.5 [2.90]	23.7 [3.18]	23.7 [3.24]
Education in Years [a] (mean) [Std. Dev.]	14.0 [2.11]	15.7 [1.39]	14.0 [3.75]	8.7 [4.55]	6.4 [4.17]
Age[a] (mean) [Std. Dev.]	45.0 [11.18]	40.4 [11.01]	43.6 [10.66]	46.2 [10.26]	45.6 [10.01]
Married [a] (%)	66.9	68.0	75.9	88.6	94.3
Unweighted *N*				1,168	2,371
Family Core File	67,242	285	1,701	-	-
Sample Adult File	27,300	109	537	-	-
B. Males					
Poor/Fair Self-Rated Health (%)	10.0	3.8	5.4	38.7	30.9
At Least One Chronic Condition (%)	33.6	26.6	15.7	10.8	8.1
Ever Smoked[a] (%)	51.3	13.0	28.3	67.8	63.2
BMI[a] (mean. BMI$\geq$18) [Std. Dev.]	28.0 [4.53]	25.9 [3.50]	24.5 [2.65]	23.8 [2.97]	23.5 [3.07]
Education in Years [a] (mean) [Std. Dev.]	13.9 [2.25]	15.7 [2.16]	14.8 [3.08]	9.9 [3.86]	8.4 [3.57]
Age [a] (mean) [Std. Dev.]	45.0 [11.20]	40.3 [9.70]	42.4 [10.07]	46.5 [10.15]	45.8 [10.23]
Married [a] (%)	64.9	57.0	74.1	92.2	92.2
Unweighted *N*				1,021	2,098
Family Core File	64,381	324	1,387	-	-
Sample Adult File	25,645	132	430	-	-

a. Descriptive statistics of the selected variables shown for the NHIS sample are from the Sample Adult file in the NHIS. Descriptive statistics of the selected variables in the Family Core file are similar to those in the Sample Adult file.

Table 4-2. Odds Ratios from Logistic Regression Models Predicting Self-Rated Health, Chronic Conditions, and Smoking Status for Females; and Coefficients from OLS Regression Models Predicting BMI for Females

Females	Adults in the U.S.[b]			Adults in China[b]	
	U.S.-Born Whites	U.S.-Born Chinese	Foreign-Born Chinese	Urban Chinese	Rural Chinese
A. Self-Rated Health[a]					
Education in Years	.75 ***	.57 **	.88 ***	.97 *	.96 ***
Age	1.03 ***	1.00	1.06 ***	1.04 ***	1.06 ***
Not Married (ref. Married)	1.96 ***	1.64	1.60 +	1.33	1.16
Unweighted *N*	67,242	285	1,701	1,168	2,371
B. Chronic Conditions[a]					
Education in Years	.89 ***	.96	.92 *	.99	1.02
Age	1.06 ***	1.13 **	1.09 ***	1.13 ***	1.12 ***
Not Married (ref. Married)	1.26 ***	.57	1.42	1.23	.66
Unweighted *N*	27,300	109	537	1,168	2,371
C. Smoking Status[a]					
Education in Years	.79 ***	1.09	.95	.98	.92 *
Age	1.00 *	1.07 +	1.03	1.08 **	1.05 **
Not Married (ref. Married)	1.68 ***	1.01	1.21	1.71	.74
Unweighted *N*	27,300	109	537	1,168	2,371
D. BMI					
Education in Years	-.44 ***	-.96 **	-.08 +	-.10 ***	-.01
Age	.05 ***	.11 *	.04 *	.06 ***	.05 ***
Not Married (ref. Married)	.48 ***	-.11	-.33	.20	-.50 +
Unweighted N	27,300	109	537	1,168	2,371

a. Reference categories for self-rated health (good, very good, excellent), for chronic conditions (none), and for smoking status (never smoked).

b. Data on adults in the United States is from the NHIS 2006-2011, and data on adults in China is from the CHNS 2006.

c. [+] *p*<.1* *p*<.05; ** *p*<.01; *** *p*<.001

Table 4-3. Odds Ratios from Logistic Regression Models Predicting Self-Rated Health, Chronic Conditions, and Smoking Status for Males; and Coefficients from OLS Regression Models Predicting BMI for Males

Males	Adults in the U.S.[b]			Adults in China[b]	
	U.S.-Born Whites	U.S.-Born Chinese	Foreign-Born Chinese	Urban Chinese	Rural Chinese
A. Self-Rated Health[a]					
Education in Years	.76 ***	.82 *	.92 *	.96 *	.95 ***
Age	1.06 ***	1.09 **	1.04 *	1.02 **	1.06 ***
Not Married (ref. Married)	1.91 ***	.87	2.14 *	.97	1.91 **
Unweighted *N*	64,381	324	1,387	1,021	2,098
B. Chronic Conditions[a]					
Education in Years	.90 ***	.93	1.11	1.08 **	1.12 ***
Age	1.07 ***	1.10 ***	1.11 ***	1.10 ***	1.11 ***
Not Married (ref. Married)	.99	3.49 *	1.28	.32	.68
Unweighted *N*	25,645	132	430	1,021	2,098
C. Smoking Status[a]					
Education in Years	.76 ***	.83	.94	.93 ***	.98
Age	1.02 ***	.96	1.03 +	.99	1.01 +
Not Married (ref. Married)	1.54 ***	.99	1.64	.77	.85
Unweighted *N*	25,645	132	430	1,021	2,098
D. BMI					
Education in Years	-.17 ***	-.14	-.05	.10 ***	.14 ***
Age	.03 ***	.04	.02	.02 *	-.01
Not Married (ref. Married)	-.84 ***	-.14	.16	-.70 *	-.88 ***
Unweighted *N*	25,645	132	430	1,021	2,098

a. Reference categories for self-rated health (good, very good, excellent), for chronic conditions (none), and for smoking status (never smoked).

b. Data on adults in the United States is from the NHIS 2006-2011, and data on adults in China is from the CHNS 2006.

c. + *p*<.1* *p*<.05; ** *p*<.01; *** *p*<.001

Table 4-4. Results (*p*-values) from Wald Tests of the Equality of Coefficients on Education from Logistic Regression Models Predicting the Log Odds of Self-Rated Health, Chronic Conditions and Smoking and OLS Models Predicting BMI.

	Self-Rated Health		Chronic Conditions		Smoking		BMI	
	Female	Male	Female	Male	Female	Male	Female	Male
A. U.S.-born whites vs. U.S.-born Chinese	.125	.430	.761	.830	.382	.523	.141	.894
B. U.S.-born whites vs. Foreign-Born Chinese	<.001	<.001	.300	.007	.017	<.001	<.001	.040
C. U.S.-born Chinese vs. Foreign-Born Chinese	.014	.256	.887	.113	.716	.450	.013	.654
D. Foreign-Born Chinese (US) vs. Urban Chinese (China)	<.001	.170	.112	.708	.736	.886	.667	.006
E. Foreign-Born Chinese (US) vs. Rural Chinese (China)	.002	.376	.016	.903	.705	.332	.165	.001

a. *p*-value of <.05 indicates that the two coefficients are not statistically different.

b. The table format borrowed from Table 2 in Buttenheim et al. (2010a)

Chapter 5: Conclusion

This dissertation examined the association between education and health among Asian immigrants in the United States. Despite being the second-largest immigrant population and the largest new immigrant group in the United States since 2009, Asian immigrants in the United States have received limited, although growing, attention in the literature on immigrants' health. Asian immigrants have a weaker education gradient in health in comparison to non-Hispanic whites, and this weak gradient raises questions on the role of education for Asian immigrants and, more broadly, on Asian immigrants' health. In this dissertation, I first documented the relationship between education and adult health for Asian immigrants and examined whether the education gradient in health for Asian immigrants' is weaker than that for U.S.-born whites. Second, I studied the underlying reasons for the modest education gradient in health for Asian immigrants. By addressing these aims, this dissertation provides a better understanding of Asian immigrants' health and makes the education-health paradigm more flexible and more sensitive to the context of diversity in American society. In this chapter, I summarize key findings, contributions, and limitations of my dissertation, and I discuss the extensions of this work for future research.

KEY FINDINGS AND CONTRIBUTIONS

Chapter 2 used the NHIS to compare the education gradients in health among Asian immigrants, U.S.-born Asians, and U.S.-born whites. I further examined whether the socioeconomic returns to education are related to the variation in education gradients

in health across groups. Two key findings emerged. First, consistent with previous literature (Acevedo-Garcia et al. 2010; Acevedo-Garcia et al. 2005; Goldman et al. 2006; Kimbro et al. 2008; McKinnon and Hummer 2007; Sánchez-Vaznaugh et al. 2009; Walsemann et al. 2013), Asian immigrants have a weaker education gradient in self-rated health than U.S.-born whites. This is mostly because Asian immigrants with high education have worse health than their U.S.-born white counterparts, while Asian immigrants with low education are healthier than their U.S.-born white counterparts. Second, Asian immigrants have lower economic returns to education in terms of poverty and employment status in comparison to U.S.-born whites, and the differences in returns are larger among those with higher education. As poverty status and employment status mediate some of the association between education and self-rated health, the lower economic returns to education for Asian immigrants can partly explain the relative health disadvantage of highly educated Asian immigrants. This work points out that health returns to education and the economic returns to education are not the same for different groups in the United States. More important, the lower returns to education for highly educated Asian immigrants highlights the importance of contextualization of the education-health paradigm (Link and Phelan 1995; Ross and Mirowsky 2003).

Chapter 3 used the NIS to examine whether there is an educational difference in health selection among Asian immigrants and whether the difference, if found, can explain the relative health advantage of Asian immigrants with low education found in Chapter 2. Findings showed that, consistent with literature (Akresh and Frank 2008; Barquera et al. 2008; Crimmins et al. 2005; Jasso et al. 2004; Landale et al. 2000;

Riosmena et al. 2013), most Asian immigrants are healthier than the nonmigrant counterparts in their home countries. However, this pattern cannot fully explain the modest association between education and health among Asian immigrants. To explain the association, Asian immigrants with low education should be more likely to be selected on positive health based on previous studies on immigrants' education and health (Acevedo-Garcia et al. 2005; Acevedo-Garcia et al. 2007; Turra and Goldman 2007) and researchers' speculations (Goldman et al. 2006; Kimbro et al. 2008). Yet the findings showed the opposite. The findings are consistent with those of Akresh and Frank (2008), who found that higher education is related to positive health selection for all U.S. immigrants.

Although this study cannot answer the overarching question about Asian immigrants' education gradient in health in this dissertation, it improved our understanding of health selection and Asian immigrants in two ways. First, this is the first study on health selection that focuses solely Asian immigrants, while most related studies discuss older Mexican immigrants. Second, not all Asian immigrants enjoy positive health selection; the odds of positive health selection varies by their education levels, and the pattern cannot be fully explained by Asian immigrants' countries of origin.

Chapter 4 used the NHIS and the CHNS to examine whether Chinese immigrants in the United States have the same shape of the education gradients in health for native Chinese in China. Three key findings emerged. First, Chinese immigrants in the United States have weaker education gradients in most outcomes than U.S.-born whites except women's chronic conditions. Second, the findings showed that higher education is

associated with higher odds of chronic conditions and higher BMI for native men in China, a pattern consistent with previous literature that found a flat or positive association between education and health or health behaviors in developing countries (Buttenheim et al. 2010b; Kain et al. 2003; McLaren 2007; Wang et al. 2007). Third, the education gradients in Chinese immigrant women's BMI and smoking and the education gradients in Chinese immigrant men's self-rated health, chronic conditions, and smoking are similar to those for their counterparts in China. There is no education gradient in BMI and smoking for Chinese immigrant men in the United States, and the association between education and chronic conditions for them is positive but insignificant. These findings suggest that the observed modest education gradient in health for Chinese immigrants in the United States probably exists because Chinese immigrants "import" those gradients with them from China. Furthermore, the lack of education gradients in BMI, smoking, and chronic conditions for Chinese immigrant men may help to explain why highly educated Asian immigrants are less healthy than U.S.-born whites with the same education and why less educated Asian immigrants are much healthier than their U.S.-born white counterparts.

Overall, findings from all three empirical chapters suggest that the weaker education gradient in health for Asian immigrants in relative to U.S.-born whites is because less educated Asian immigrants are relatively healthy and more educated Asian immigrants are not as healthy as their white counterparts. Highly educated Asian immigrants' (relative) health disadvantage is partly attributed to the lower economic returns to education and the importation of education-health patterns. Less educated

Asian immigrants' (relative) health advantage may be attributed to the positive health selection of most Asian immigrants.

POLICY IMPLICATIONS

The dissertation has important policy implications. Results from Chapter 3 showed that highly educated Asian immigrants are more likely to be selected on positive health than their less educated counterparts. However, we did not see a clear health advantage for highly educated Asian immigrants in results from Chapter 2; highly educated Asian immigrants are still healthier than less educated Asian immigrants but are less healthy than highly educated U.S.-born whites. Results from Chapters 2 and 4 suggest this is because highly educated Asian immigrants have lower returns to their education and possibly more unhealthy behaviors (at least for men).

These patterns for highly educated Asian immigrants have strong policy implications in two areas. First, the lower economic returns to highly educated Asian immigrants' education are a waste of their knowledge and skills. American society should benefit more so from these highly educated immigrants. Paperwork and high costs of visa sponsorship deter employers from hiring people who need working visas (i.e., foreign students and scholars). Current immigration policies also prevent legal residents without a green card or citizenship (e.g., a spouse of someone with a working visa or a student visa) from working; only recently (May 2015) were certain, not all, spouses of working immigrants legally allowed to work in the United States. Policy makers should

consider relaxing immigration policies on work for the benefit of not only the immigrants but also America as a whole.

Second, lack of an education gradient in health is desirable only if everyone enjoys good health. It is not desirable in the case of Chinese immigrant men, who have an insignificant but positive association between education and chronic conditions and no education gradients in BMI and smoking. Policy makers need to consider not only the typical high-risk groups but also high-socioeconomic-status immigrants from some developing countries when creating programs that target chronic diseases, obesity, and smoking.

LIMITATIONS

The limitations of the analyses were discussed in detail in each empirical chapter. Here, I discuss the two general data limitations that affected my analysis. First, Asian immigrants in the NHIS with little education may be a very selective group. The NHIS was conducted either in English or in Spanish. Asian immigrants with little education are likely to have limited English proficiency, but to be in the NHIS sample, they needed to have a certain level of English proficiency. Thus, some of the relative advantages found for Asian immigrants with little education in Chapter 2 and Chinese immigrants in Chapter 4 may be a result of this selectivity/representative issue in NHIS. Second, the small sample sizes of the U.S.-born Asians or Chinese are challenging for the analyses. Some of the results for U.S.-born Asians or Chinese are insignificant and may not be

representative of their population. I combined many years of the NHIS in this dissertation to try and overcome this limitation, but that is not an ideal solution.

FUTURE DIRECTIONS

This dissertation is one of the few to examine why immigrants in the United States have a weaker education gradient in health than U.S.-born whites and to focus exclusively on Asian immigrants. Looking ahead, work on Asian immigrants' health and immigrants' health in general cannot stop here.

First, immigrants from different migration and birth cohorts may have different education-health relationships and health behavior patterns. Immigrants who migrated two decades ago may be very different from recent immigrants in terms of their backgrounds and level of acculturation to American society. Their health behavior patterns may be more similar to those of U.S. natives as their duration in the United States increases. Similarly, age at migration may also influence how immigrants adapt to the new society. As some developing countries keep growing economically, the association between education and health behaviors in those countries may also change. Thus, immigrants may carry different education gradients with them depending on when they migrated from their home countries. Future studies should consider how the timing of migration and birth cohorts influence immigrants' health and their health behaviors.

Second, Asian immigrants are very heterogeneous, encompassing many different ethnic groups, such as Chinese, Vietnamese, Indians, Japanese, and Pacific Islanders. Chapter 3 showed that there are some subgroup differences in positive health selection

among new immigrants, and Chapter 4 showed that Chinese immigrants have similar education-health patterns as those for all Asian immigrants found in Chapter 2. We know how Asian immigrants' health differs by their countries of origin (e.g. Cho and Hummer 2001; Frisbie et al. 2001; Lauderdale and Huo 2008; Walton et al. 2009), but to date, we do not know how education gradients in health differ by subgroups. By examining how their education gradients in health differ, we can better identify the high-risk groups for poor health or negative health behaviors and develop more contextualized public health programs.

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