Title: An Educational Gradient in Health among Chinese, Koreans and Japanese in the US

ABSTRACT

Objective: Previous studies reported a weaker education-health gradient in racial minorities and foreign-born populations compared to non-Hispanic whites and U.S.-born populations. However, few studies have examined the relationship between education and health among East Asian subpopulations in comparison with US-born counterparts.

Methods: Using two data sources from the East Asian Social Survey 2008 and 2010 and the March Current Population Survey 2008-2015, we investigate the relationship between education and self-reported health among Chinese, Koreans and Japanese who migrated to the U.S., those who were born in the U.S. and those living in their country of origin. We estimated ordered logistic regression models to assess education-health gradients among the nine East Asian subpopulations and U.S.-born non-Hispanic whites are used as a reference in models.

Results: Education is weakly associated with the health outcome among East Asian adults living in their home country compared with those who migrated to the U.S and who were born in the U.S. Among all groups, non-Hispanic whites have the strongest education gradient. Among Koreans and Japanese, those who were born in the U.S. have a similar gradient to non-Hispanic whites.

Conclusions: We confirmed the weak education gradient in health among three Asian subpopulations compared to non-Hispanic whites. We found that there is a substantial variation in the gradient by nativity and immigration status. The results suggest that there is a selection of immigrants in the U.S. in terms of education and the gradient is affected by social environments of the host country after arrival, the health returns to education among Asian immigrants become more similar to those of the native-born.

INTRODUCTION

A positive association between education and health is longstanding (Ross & Wu, 1995). A body of literature has shown that the more educated are likely to be in better health than their less-educated counterparts as people with high education tend to obtain better material, psychological, network and community-based recourses and conduct healthy lifestyle (Adler & Newman 2002). On the other hand, emerging evidence demonstrates that such education-health "gradient" is not constant between foreign- and U.S.-born populations; specifically, the health benefits from each incremental in education level is weaker for the foreign-born than the U.S.-born, indicating returns to education in terms of health is associated with immigration status (Kimbro et al. 2008; Stoddard Adler 2011). This pattern is observed with a wide range of health outcomes including health behaviors and physical health conditions with a variety of populations.

One limitation of the prior literature is that the literature focused mostly on Hispanic origins in comparison to non-Hispanic groups, mostly whites, and little studies systematically examined the health-education relationship in Asian subpopulations, whose educational attainment appears to be the highest in the US than other racial groups. Although a handful of studies included Asian ethnicity in their analysis (Stoddard Adler 2011; Kimbro et al 2008), these studies do not differentiate Asian subpopulations, failing to account for substantial heterogeneity within Asian national origins (Pew Research Center 2015). In addition, researchers have paid little attention to the meaning of achieving high education among Asian population based on their contextual background in the country of origin as well as the host country and how these implements into the education-health gradient. To answer the gap, one needs to understand the gradients in both the destination country and origin country and how immigration and acculturation process affects the gradients in this population.

Our aim is to compare the health gradient in education among the three most educated Asian subpopulations, Chinese Koreans and Japanese. Especially, we investigate the Asian populations in their

country of origin, those who migrated to the U.S. and those who were born in the U.S. Then we compare the relationship between education and health within these groups and to U.S.-born non-Hispanic whites. By doing this, we will advance our understanding of the impact of nativity and immigration status on the health-education gradient among certain Asian subgroups which allows us to avoid a bias derived from substantial heterogeneity within diverse Asian ethnic populations.

LITERATURE REVIEW

Education and Health: Asian immigrant

As a fundamental measure of social stratification and socioeconomic components, education has been shown to be positively associated with better health outcomes (Cutler and Lleras-Muney 2010; Winkleby et al. 1992; Zajacova and Hummer 2009). Research on the education-health association has also demonstrated that the association is weaker in the foreign-born populations when compared to non-Hispanic whites or U.S.-born natives in the same racial/ethnic category (Goldman et al. 2006; Kimbro et al. 2008; Turra and Goldman 2007). For instance, the relationship of education with health is more modest for Hispanics compared to non-Hispanic whites, and the same phenomenon is also observed among foreign-born Mexicans compared to U.S.-born Mexicans. In particular, the disadvantage in the gradients is more pronounced in highly educated immigrants, indicating that these immigrants have fewer health benefits in the U.S. than U.S.-born natives with the same educational attainment (Turra and Goldman 2007). Several other studies have also revealed flatter gradients among racial minorities compared to non-Hispanic whites. For instance, Goldman et al (2006) investigated the gradients between whites and Mexican origins with regard to six unfavorable health outcomes and found a significant and negative impact of years of schooling for whites, while Mexican origins' schooling impact is much smaller.

While previous evidence consistently shows a weaker educational gradient in health among foreign-born and racial minority membership, only a handful of studies examined Asian population in the U.S. Even in the literature that included Asian Americans, the literature treats Asians as an undifferentiated group, by collapsing all Asian subpopulations into one group in its statistical model. As noted, this approach ignores an extensive variation within Asian subpopulations. Furthermore, most literature analyzed the US population and postulated that immigration status is somehow linked with the education-health relationship. However, how international migration affects observed educational gradient in health among Asian immigrants and whether Asian immigrants bring the education-health pattern from the country of origin can be explored by looking at the pattern in the home country.

Education-Health Gradient in China, Korea and Japan

During the last decades, Asian population has become the fastest growing ethnic group in the U.S., increasing from 6.9 million to 18.9 million between 1990 and 2011 (U.S. Census Bureau, 2011). Such rapid growth of the Asian population in recent years exceeded that of Hispanic origins, the largest minority in the U.S (Pew Research Center, 2010). In the future, Asian population is projected to be 42 million in 2025, which will account for nearly 15 percent of the total projected US population (U.S. Census Bureau, 2014). One of the important features of this population is that the majority of Asian Americans are immigrants and the rapid growth of the Asian American population in recent years has been fueled primarily by international migration, rather than natural increase (American Community Survey, 2016). Due primary to this feature, researchers have consistently found substantial heterogeneity within this population in terms of demographic composition, culture, economic and immigration status, emphasizing that the considerable variation should be considered in studying Asian Americans (Xie and Goyette 2005;Cho and Hummer 2001; Mutchler, Prakash, and Burr 2007).

Several studies have shown that Asian populations in the US tend to reveal more favorable health and health behaviors than non-Hispanic whites or natives of the same racial/ethnic group (Cunningham, Ruben, and Narayan 2008). For instance, Mutchler and colleagues (2007) reported that older U.S.-born Asians and foreign-born Asians are at lower risks for reporting limitation on physical activities and difficulty in performing self-care tasks than non-Hispanic whites, and the advantages relative to non-Hispanic whites appear to be greater for foreign-born older Asians (Mutchler et al. 2007). In this study, Korean immigrants appear to have a higher probability of reporting difficulty going outside along, but at a lower probability of reporting limitations to physical activities than U.S.-born non-Hispanic whites, controlling for basic demographic and socioeconomic characteristics (Mutchler et al. 2007). Frisibe et al (2001) also found the positive effect of nativity among Asian Pacific Islander groups using 1992-1995 National Health and Interview Survey, but this advantage significantly erodes with increasing time in the U.S. In their analysis that considers national origin of Asians and Pacific Islanders, Koreans are more likely to report poor/fair health, having no regular care and less likely to visit a physician at all when compared to Japanese, net of socioeconomic characteristics (Frisbie et al. 2001). Lauderdale and Rathousz (2000) who investigate overweight and obese among the six largest Asian American groups found a consistent evidence that U.S.-born groups have higher odds of being overweight and obese compared to foreign-born Asians (Lauderdale and Rathouz 2000). Also, Singh and Siahpush (2002) found lower mortality risks among both foreign-born and U.S.-born Asians/Pacific Islanders compared to U.S.-born non-Hispanic whites and the lower mortality risk is more evident among foreign-born group than their U.S.-born counterparts (Singh and Siahpush 2002). Although investigated only Asian immigrants in the U.S. Li and Hummer (2014) found that Korean immigrants show the lowest odds of reporting poor/fair self-reported health among six Asian national immigrant groups (Li and Hummer 2014).

There have been a few studies on the relationship between education and health outcomes in China, Korea and Japan. In the literature on China, most of them have been concerned with establishing causal relationships between improved educational attainment and the consequent health benefits,

following a tradition of quasi-experimental studies of compulsory schooling laws, the results do not tell us whether and to what extent people with higher education experience health benefits compared to their counterparts with less education at a population level (Huang 2015; Xie and Mo 2014). Even among studies on population-level average effects, different health measures lead to different conclusions. For instance, education does not affect the probability of having poor physical functioning status, whereas more education reduces the probability of reporting poor health status (Zhong 2016). The relationship has also changed over time. In the 1990s, individuals with a college degree reported worse health status than those who just completed junior or senior high schools, which is the opposite of the current trend (Zhong 2015).

Several studies in Korea reported similar evidence on educational gradients in a wide array of health measures including adult mortality and morbidity in men and women (Khang, Lynch, and Kaplan 2004; Khang et al. 2004). However, when it comes to the association between having a college degree and reporting better health, results are rather mixed. Although a positive education-health relationship is observed in Korea in general, having a college degree is significantly associated with reporting a better health only when compared to those who did not completed high school, suggesting that the difference between college graduates and high school graduates is not significant, or the magnitude is small even when it is significant (Lee 2005; Park 2005). It also has not been confirmed whether this education-health association is fully explained by other socio-economic measures such as income or occupation (Hanibuchi et al. 2010; Kim et al. 2013; Park 2005).

Unlike the results of studies on China and Korea, it has been found that the association between education and health is not significant or weakly expressed among the Japanese (Hanibuchi et al. 2010; see Kagamimori et al. 2009, for a review). It has been suggested that at least a part of the weaker association may be accounted for by the fact that overall health status and degree of equality is relatively high compared to other countries (Kagamimori et al. 2009). Therefore, the size of the association is expected to increase as the social inequality has started to grow. However, it is also possible that this

weaker association is due to a response preference that is specific to Japanese who prefer to give a midpoint answer rather than definite ones (Hanibuchi et al. 2010). If this is the case, the association between education and self-reported health may be constant over time.

In sum, higher educational achievement among Asians in the U.S. is expected to play a role in their more favorable health outcomes than other racial groups or the U.S.-born. However, existing evidence shows that Asians have a weaker education-health association than non-Hispanic whites and their U.S.-born counterparts. These findings have led to questions about which factor -nativity status, race/ethnicity, acculturation- generates the observed disadvantage in the education-health gradient for Asian groups. To answer the question, we compare the education-health association among ten groups, namely, Chinese in China, Koreans in Korea, Japanese in Japan, Chinese, Korean, and Japanese immigrants in the U.S., U.S.-born Chinese, Koreans, and Japanese and U.S.-born non-Hispanic whites.

METHODS

To achieve our goal, we used data from two sources: the East Asian Social Survey (EASS) and the March Current Population Survey (March CPS). The EASS is a cross-national survey that was conducted in China, Japan, South Korea, and Taiwan and includes a representative sample of adults in each society. The March CPS includes a large national representative non-institutionalized US population and their demographic and socioeconomic information. This study obtained the data set through the Integrated Public Use Microdata Series (King et al. 2010). The sample for this study is limited to US-born non-Hispanic (NH) white, Chinese, Korean and Japanese adults ages 30-64. Three Asian subgroups are categorized by nativity and residence as follows: those who were born in the US, those who were born in the country of origin and migrated to the US and those who are living in the country of origin.

Measurements

Our outcome is self-reported health (SRH). Many scholars have reported that the SRH is a valid and strong measure in assessing individual's overall health, mortality, mortality and health behaviors (Koivumaa-Honkanen et al. 2000; Martin et al. 2000; McGee et al. 1999). On the other hand, using SRH in research in which multiethnic populations are compared may be problematic because cultural background and language characteristics can affect how people respond to the question of overall health. For instance, Shetterly et al. (1996) found that Hispanics are much more likely to assess their health as fair or poor than non-Hispanic whites, but highly acculturated Hispanics in terms of language and cultural values are similar to non-Hispanic whites in reporting their SRH. Furthermore, the data sources that employed in this study use similar survey question asking respondents assess their health using a five-point scale, but scales are slightly different which can affect results (survey questions are presented in Appendix A1). However, the purpose of this study is to compare estimates of education impact on health in different groups, not to compare the health differentials across the groups. Also, to avoid potential bias due to different coding schemes of the question in two data sets, we used ordered logistic regression models to estimate the impact of a college degree or higher education on reporting better health status. Then following a method used in previous studies (Kimbro et al 2008; Goldman et al 2006), we focus on differences in gradients by looking at the predicted probability of reporting good health a between high school or less education vs. some college or higher education across the groups.

RESULTS

Table 1 presents demographic characteristics of the sample. Of all covariates, there is a substantial difference in the proportion of college or higher education by nativity status within each ethnic group. For instance, only 5.6% of Chinese living in China obtained a college or higher education, whereas corresponding values are 57% and 78% among Chinese who migrated to the US and were born in the US, respectively. This pattern is also observed among Koreans and Japanese, but the gap in the proportion by

nativity is smaller than Chinese. The result implies that there is a strong selection process in international migration to the US among these three Asian subgroups in terms of education. In addition, consistent with previous evidence, all three Asian groups appear to have higher educational attainment compared to US-born non-Hispanic whites. It is also observed that US-born Asian groups are less likely to be married compared to people in the same ethnic category who stayed in the home country and those who migrated to the US.

Table 2 shows unadjusted mean self-reported health by education and difference in the mean across the groups. Compared with non-Hispanic whites, all Asian subgroups show a smaller gap in the mean by the college education. Within Asian subpopulation, those who were born in the US tend to show a greater difference in self-reported health by their college education. Koreans in Korea reveals the smallest gap (0.13) in the mean health by the college education.

Table 3 presents the results of the ordered logistic regression models estimating the association between college education and self-reported health, net of age at baseline, sex, marital status and employment. The results show that the impact of college or higher education is the greatest in US-born NH-whites (HR:2.19, $p<0.01$). Looking at three East Asian subpopulations, in general, education gradient in self-reported health appears to be steeper in people living in the US than those who are living in the country of origin. For instance, a hazard ratio of college or higher education for Koreans is 1.30 among people living in Korea, but 1.62 and 1.78 for those who migrated to the US and who were born in the US, respectively. This pattern is also observed in Japanese. However, US-born Chinese (HR:1.60, $p<.01$) show greater hazard ratio than Chinese migrants (HR:1.60, $p<.05$). For Chinese in China, there is no significant effect of education on health.

DISCUSSION

We investigated the association between education and health among three most highly educated Asian subpopulations in the U.S. Especially, we focused on the education-health gradient in Asian groups' country of origin to examine the Asians bring the pattern from the home country. The results show that in general Chinese, Koreans and Japanese in their country of origin have a weaker gradient and those in the U.S. tend to have a steeper gradient, while US-born NH-whites have the strongest predicted power. Among the sample living in the US, US-born Koreans and Japanese show stronger impact of education on health. This finding suggests that Asian immigrants may import the pattern of education and health from their country of origin and also the pattern tends to become similar to that of the majority population in the host country (Buttenheim et al 2010). The results provide an important qualification to the prior studies on Asian populations. Consistent with prior studies (Kimbro et al 2008), we observed a weaker gradient among Asian groups compared to NH-whites, but we found that there is a substantial difference across the Asian groups in terms of educational attainment and the impact of education on health. The finding suggests that estimates from all Asian groups combined may present the characteristics of few major largest countries in the sample.

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TABLES

Table 1. Descriptive information of the Sample. Adults Aged 30 – 64.

	NH-Whites	Chinese			Koreans			Japanese		
	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]
Sample size	457,502	6,238	4,819	1,064	2,519	3,625	578	1,704	1,661	858
4 yrs college +	47.5	5.6	57.0	78.0	26.9	65.1	72.6	31.0	54.9	50.7
Age, in years (SD)	47.7(9.6)	46.3(9.5)	45.7(9.1)	45.1(10.0)	47.2(10.4)	46.1(9.5)	38.2(7.8)	44.8(9.0)	46.9(10.0)	45.2(10.4)
Female	50.6	49.3	55.0	47.6	48.9	58.6	50.9	51.2	58.5	51.2
Marital Status										
Never married	13.5	1.4	8.8	28.5	13.7	12.7	32.9	11.3	11.6	18.0
Married	67.7	93.6	84.0	59.5	78.5	77.4	55.5	79.0	73.9	66.6
Other[c]	18.8	5.1	7.2	12.0	7.8	9.9	11.6	9.8	14.5	15.4
Employed	74.3	55.7	75.5	83.1	75.8	68.0	80.6	71.2	72.5	76.9

NH: Non-Hispanic

[a]Data are from the East Asian Social Survey 2010 - 2012.

[b]Data are from the March Current Population Survey 2008-2018

[c]Other category includes divorced, widowed and separated.

Table 2. Unadjusted Mean Self-Reported Health by Education. Adults Aged 30 – 64.

	NH-Whites	Chinese			Koreans			Japanese		
	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]
Education										
< 4 yrs college	3.53	3.58	3.60	3.75	3.25	3.55	3.70	3.45	3.80	3.69
	(3.5-3.5)	(3.5-3.6)	(3.6-3.6)	(3.6-3.9)	(3.2-3.3)	(3.5-3.6)	(3.5-3.9)	(3.3-3.4)	(3.7-3.9)	(3.6-3.8)
4 yrs college +	4.01	3.95	3.94	4.01	3.38	3.94	4.14	3.67	4.06	4.18
	(4.1-4.1)	(3.8-4.0)	(3.9-4.0)	(3.9-4.1)	(3.3-3.5)	(3.9-3.9)	(4.0-4.2)	(3.6-3.7)	(3.9-4.1)	(4.1-4.3)
Difference	0.54	0.37	0.35	0.44	0.13	0.38	0.49	0.31	0.26	0.49
	(0.5-0.6)	(0.3-0.5)	(0.3-0.4)	(0.2-0.7)	(0.1-0.2)	(0.3-0.5)	(0.3-0.6)	(0.2-0.4)	(0.1-0.4)	(0.3-0.6)

Higher value indicates better self-reported health.
NH: Non-Hispanic
[a]Data are from East Asian Social Survey 2010 and 2012.
[b]Data are from March Current Population Survey 2008-2018
Data in parentheses are 95% CIs.

Table 3. Results from Ordered Logistic Regression of Reporting Better Self-Reported Health. Adults Aged 30 – 64.

	Whites	Chinese			Koreans			Japanese		
	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]	Living in Origin Country[a]	Migrants in the US[b]	US-born[b]
Education										
< 4 yrs college (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
4 yrs college +	2.19**	1.15	1.60**	1.36*	1.30**	1.62**	1.78**	1.35**	1.40**	2.46**
Age	0.97**	0.95**	0.97**	0.97**	0.98**	0.95**	0.94**	0.97**	0.96**	0.96**
Gender										
Male	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Female	1.07**	0.67**	1.074	1.17	1.06	1.127	1.1	0.89	1.34*	1.49*
Marital Status										
Never married (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Married	1.50**	1.44	1.03	1.99**	1.49**	1.11	1.97**	1.24	1.48*	1.39
Other[c]	0.94**	1.06	0.79	1.34	1.42+	0.71+	0.64	0.84	0.87	0.70
Employment										
Unemployed (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Employed	3.11**	1.46**	1.59**	2.40**	1.24*	1.35**	3.14**	1.78**	1.72**	1.56*

ref: Refence group

*p<.05 ** p<.01

[c]Other category includes divorced, widowed and separated.

Appendix

Table A-1. Survey questions of Self-reported health and Educational Attainment

Data	East Asian Social Survey 2010	March Current Population Survey 2008-2015
Self-reported health	How would you describe your overall health status? 1. Very good 2. Good 3. Fair 4. Bad 5. Very bad	Would you say …'s health in general is: 1. Excellent 2. Very good 3. Good 4. Fair 5. Poor
Education	What is the highest level of education you have attained? 1. No formal qualification 2. Elementary school 3. Junior high 4. High school 5. Junior college 6. University 7. Graduate school	What is the highest level of school (name/you) (have/has) completed or the highest degree (name/you) (have/has) received? 31. Less than 1st grade 32. 1st, 2nd, 3rd or 4th grade 33. 5th or 6th grade 34. 7th or 8th grade 35. 9th grade 36. 10th grade 37. 11th grade 38. 12th grade NO DIPLOMA 39. HIGH SCHOOL GRADUATE-high school DIPLOMA or the equivalent (For example: GED) 40. Some college but no degree 41. Associate degree in college- Occupational/vocation program 42. Associate degree in college – Academic program 43. Bachelor's degree (For example: BA, AB, BS) 44. Master's degree (For example: MA< MS, Meng, Med, MSW, MBA) 45. Professional School Degree (For example: MD, DDS, DVM, LLB, JD) 46. Doctorate degree (For example: PhD, EdD)