

The Healthy Immigrant Effect: Differentials between Canadian Immigrants and Native-born Population in the Education Health Gradient

by

Haorui Wang

B.Sc., University of Prince Edward Island, Canada, 2013

A Report Submitted in Partial Fulfillment
of the Requirements for the Degree of

Master of Arts

in the Graduate Academic Unit of Economics

Supervisor: Ted McDonald, PhD, Economics

Examining Board: Yuri V. Yevdokimov, PhD, Economics, Chair
Michael G. Farnworth, PhD, Economics
Paul Peters, PhD, Economics

This report is accepted by the
Dean of Graduate Studies

THE UNIVERSITY OF NEW BRUNSWICK

January 2016
© Haorui Wang, 2016

ABSTRACT

The relationship between education and health has been examined in many studies. This paper focuses on the relationship between health and education and explores the differentials of education health gradients between the immigrants and native-born population in Canada by analyzing cross-sectional datasets from the Canadian Community Health Survey collected by Statistic Canada. In particular the objective is to identify possible reasons for observed differences in gradients between these groups. After estimating a Logit model, this paper estimates the education health gradients on two health outcomes and three health behaviors. In most cases, the education health gradients of immigrants are flatter than that of native-born Canadians, indicating that less educated immigrants are in relatively better health (compared to non-immigrants with the same characteristics) than are more highly educated immigrants. Various possible explanations for this observed relationship are suggested.

DEDICATION

I dedicate my work to my family, professors and friends who have been there for me throughout the entire study. A special gratitude to my parents who provide me the selfless financial supports so that I have a chance to be an international student at University of New Brunswick.

ACKNOWLEDGEMENTS

I would like to express my very great appreciation Professor Ted McDonald, my supervisor, for his encouragement, patient guidance and useful critiques of this study. As a beginner in the field of economic analysis, I have met lots of challenges during this study and Professor Ted McDonald has always guided me patiently. Moreover, his deep knowledge and practical advice have inspired me throughout my study. I am also grateful for assistance given by Xiaochen Zhou, a graduate student in economics at UNB, for her help in collecting data and estimating my model. I also send very warm regards to Dr. Nan Zhou in Data Research Center, New Brunswick, Professor Michael Farnworth, Professor Paul Peters and other professors in the Department of Economics at UNB who were teaching me and are reading this report.

Table of Contents

ABSTRACT.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
Table of Contents.....	v
I. Introduction and Literature Review	1
II. Data and Methodology.....	6
III. Results.....	11
A. Summary of Immigrants Composition	12
B. Health Outcomes and Health Behaviors.....	13
Health Outcomes	13
Health Behaviors.....	13
C. Education	15
D. Years since Migration and Cohort Effect.....	17
Years since Migration.....	17
Cohort Effect	19
IV. Regression Results.....	20
A. Health Outcomes	21
B. Health Behaviors.....	21
C. Health Gaps and Education Health Gradients	22
V. Discussion	27
A. Over-educated	27
B. More Educated Immigrants Are Easier to Adapt to New Environment.....	28
VI. Limitation and Future Work.....	28
References.....	31
Appendix.....	35
Curriculum Vitae	

I. Introduction and Literature Review

It is well known that Canada is a nation of immigrants. Every year Canada accepts about 200,000 new immigrants, a number which represents 0.7 percent of its total population, from more than 200 countries in the world (Facts and Figures, CIC, 2006). Immigrants have formed a significant and growing proportion of the Canadian population. According to Statistics Canada data, the number of immigrants in Canada has risen from 5,448,480 in 2001 (Statistics Canada, 2002) to 6,186,950 in 2006 (Statistics Canada, 2008). If this trend continues immigration will soon be the main driving force for population growth in Canada. With such a large and growing share of the population, issues that are related to Canada's immigrant population become a prime concern to scholars and policymakers.

When it comes to immigration, the health status of immigrants becomes an important topic for research and policy. There are many reasons to explain the importance of the health status of a country's immigrants to the recipient country, and immigration and public health interact in many aspects. The health of a country's immigrants will be affected by the public funding of the country's health system. An immigrant's health will also substantially affect the process through which he or she adapts to the new cultural and environment. Further, the changing of an immigrant's health status after migration will provide insights into how the health system, social welfare system, and the labour market of the recipient country could be improved by comparing outcomes between immigrants and non-immigrants in these dimensions.

When comparing health status between immigrants and non-immigrants, scholars find that recent immigrants from developing countries enjoy significant health advantages relative to the comparable native-born population in the developed destination countries. (See Dunn and Dyck, 2000; Newbold and Danforth, 2003; McDonald, 2006; Hyman, 2007; Karmakar and Breslin, 2008; Chen, Smith, and Mustard, 2009) The relatively good health of immigrants is known as the “healthy immigrant effect (HIE)”. A significant amount of research shows the existence of the HIE. For example, Newbold (2004) and Roterman (2011) find that recent immigrants enjoy better health behaviors than native-born Canadians, and are less likely to have chronic conditions. According to previous research, HIE is ostensibly attributed to a number of possible explanations, including the mandatory medical examination for permanent residents, relatively healthier behaviors of recent immigrants before immigration, and immigrant self-selection effects whereby younger, healthier people are more likely to undertake the process necessary to migrate to another country such as Canada. (See Deri, 2004; McDonald and Kennedy, 2004). However, with the increasing duration of residency in Canada, the health status of immigrants declines and can converge toward that of native-born Canadians. (See Deri, 2004; McDonald, 2006). Various studies have also proposed several hypotheses to explain this erosion of the health advantage - the healthy immigrant effect - after migration. One hypothesis is that immigrants may start adopting native behaviors in terms of diet related, smoking, drinking, and exercise- a process referred as to acculturation (See Varghese and Moore, 2002; Perez 2002; Bethel and Schenker, 2005). A second hypothesis suggests that immigrants face barriers in access to the health care services because of language or cultural differences. (See Stephenson, 1995; Dunn and

Dyck 2000). However, in some studies, scholars pointed out that immigrants and native-born Canadians exhibit similar rates of utilization of health services. (See Laroche, 2000; McDonald and Kennedy 2004). These studies in turn provide another a reason why health status of immigrants may decline after arrival. With the improved access and use of health services over time, some existing but undiagnosed conditions might be recognized and consequently narrow the gap in health status between immigrants and native-born Canadians. Some other reasons that may contribute to the declines in immigrant health status can be summarized as loss of socio-economic status and social networks, poor working conditions, and language barriers (Elliott and Gillie, 1998; Dunn and Dyck, 2000; Wozniak, 2001). However, another hypothesis which is referred to as “salmon bias hypothesis (SBH)” posits that the continued relatively good health among immigrants is due to a possible tendency for sick immigrants to return to their home countries before death. (Palloni and Arias, 2004; Diaz, Koning, and Donate, 2014) This is usually cited as a reason for the improving health status of immigrants with the increasing time in Canada. However, due the restricted data access, the direct evidence of SBH is limited. Lu and Qin (2014) compare the self-reported health of immigrants who stay in destinations and who return or move to home countries using data from a national longitudinal survey. They find some evidence to support SBH that immigrants with poorer health are more likely to return or move closer to their home countries. However, Turra and Elo (2008) find that the magnitude of SBH is too small to be a prime explanation for the relatively good health of immigrants.

It is commonly accepted that a person’s health status is closely related to his/her

socioeconomic status. In recent years, researchers have started to investigate the social and economic determinants of health outcomes, health behaviors and health service use of Canada's immigrants. For example, Dunn and Dyck (2000) find some evidence that the most important antecedents of human health status are not medical care inputs and health behaviors, but rather social and economic characteristics of individuals and populations. When working on the social and economic determinants of immigrants' health status, many scholars focus on exploring the relationship between income and health status of immigrants. A great deal of research has been done on differences in earnings of immigrant sub-groups and the effect of income on health status of immigrants in Canada. However, education, as an important factor that could have a significant impact on health was usually viewed as an exogenous factor in the past few decades (Grossman, 2000). In recent years, scholars have started to explore the relationship between education attainment and health for immigrants. Previous literature finds that education is more powerful determinant of health behaviors and outcomes for immigrants than it is for others. The health return to education attainment for immigrants is typically more modest than those for comparable native-born population in the United States. (See Kimbro, Bzostek, Goldman, and Rodriguez, 2008). However, Seo and Senauer (2009) find some evidence against this hypothesis. They believe education is associated with a greater beneficial effect on every health outcome for immigrants compared to those born in the United States. For Canada, Kennedy, McDonald, and Biddle (2006) find that the recent immigrants are more educated than their corresponding native-born Canadians and the education health gradients (the health "return" to having a university degree relative to not having a degree) are smaller for immigrants than for the native-born Canadians,

which implies that less educated immigrants are relatively healthier than less educated native-born Canadians than are more educated immigrants to more educated native-born Canadians. Also, Newbold (2004) finds a similar result that less-educated immigrants are less likely to report fair or poor health than all other educational immigrants groups.

Since the existence of HIE is commonly accepted and it is also well known that health is positively related with education, we have enough motivation to doubt the conclusion that education health gradients are smaller for immigrants than for the native-born Canadians. Furthermore, differentials between Canadian immigrants and native-born population in the education health gradient were not deeply and systematically investigated in the previous literature. There are few scholars in Canada examining the education health gradient as an independent topic and exploring the reason behind it with updated data and a wide range of health measures. These provide us the motivation for this paper.

In this paper, we will focus on the relationship between health and education and explore the differentials of education health gradients between immigrants and native-born population in Canada. The objective is to examine differentials of education health gradients between immigrants and native-born population in Canada, and attempt to identify reasons for any differences in gradients between these groups. Specifically, we will see how education-health gradients differ after controlling for differences across immigrant groups in country of birth and an increasing duration of residency in Canada.

The outline of the rest of the paper is as follows. Section II provides a sketch of the data source for this study, the Canadian Community Health Survey (CCHS), which provides information on health status, education level, and a wide range of other socioeconomic and demographic information including immigrant characteristics. An outline of the methodology is also presented in this section. Section III provides an overview of the descriptive analysis results while Section IV summarizes regression analysis results. In the last section, a conclusion and a discussion about the topics of future research are presented.

II. Data and Methodology

The Canadian Community Health Survey (CCHS) is a cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population. It relies upon a large sample of respondents and is designed to provide reliable estimates at the health region level (Statistic Canada, 2007). The analysis below is based on the CCHS data for the years 2003, 2008, and 2013. These three datasets are combined resulting in a total sample size of 162,590 (23.61 percent immigrants and 76.39 percent native-born population). While CCHS data covers the entire population, the dataset for this work is restricted to the native-born population aged 21 to 70 and immigrants aged 21 to 70 who arrived in Canada between 1949 and 2013. We categorize immigrants into three subgroups based on the length of time since they migrated to Canada: the main focus is on relatively recent immigrants (have lived in Canada within 10 years) but I also identify immigrants who have been in Canada more than 10 years and less than 20 years, and immigrants who have resided in Canada for

more than 20 years.

This dataset contains information on demographic and socioeconomic factors (marital status, age, gender, education level, country of born, province of residence, place of residence, and occupation classification), health outcomes (chronic conditions), health behaviors (fruit and vegetable consumption per day, type of smoker within the previous 12 months, type of drinker with the previous 12 months) for every respondent, and country of origin, years since migration, year of arrival in Canada, and age at migration for immigrants.

To examine the health status of both the immigrants and native-born population, we use self-reported chronic conditions and self-perceived health status. Although self-reported data have limitations that will be discussed in more detail later, previous research has shown that self-reported health status is a relatively accurate predictor of mortality and functional ability, even after controlling for other objective health measurements.

In the CCHS datasets, general self-perceived health condition is measured in a five point scale: excellent, very good, good, fair, poor. For simplicity, we define a binary indicator variable as “better” health which groups together respondents who report excellent and very good health status, and groups together “worse” health status for others.

For the presence of a chronic condition, we select seven diseases among the common chronic diseases in Canada based on our data access: arthritis, diabetes, high blood

pressure, heart disease, asthma, cancer, and ulcer. For each of the chronic conditions, we define a dummy variable which takes on the value one if the respondent reports that he or she has been diagnosed with that condition by a healthcare professional. Also, we use three measures to represent health behaviors of immigrants and native-born population: total fruit and vegetables consumptions per day, type of smokers and drinkers during the last 12 months. For ease of comparison, we define one dummy variable for each of these three measurements respectively. For total fruit and vegetables consumptions per day, we set 'fruit_veg' equals to one if the respondent eats fruit and vegetables less than five times per day. For type of smoker during the last 12 months, we divide all respondents into two categories by using one dummy variable: 'daysmoker', which takes a value 1 if the person reported being a daily smoker and 0 otherwise. In a similar way, we define 'regdrinker' (people who drink alcohol greater than or equal to one time per week during the last 12 months) a dummy variable to aggregate "type of drinkers" into two categories.

For demographic and socioeconomic factors, we use marital status, age, gender, education level, country of birth, province of residence, place of residence, and occupation classification.

Since health status would remain stable (unless an unexpected situation take place) within a short period of time and we do not focus on investigating the relationship between age and health, age is aggregated into five ten-year subgroups for ease of comparison. Also since people's health behaviors are affected by the place where they live (the distance to the nearest trails, availability of alcohol and tobacco store, price of vegetable and fruit in

the local community, demographic and population structures, and so on), we define indicator variables (province of residence and place of residence: urban and nonurban areas) to control the presence of region-specific factors. For the ease of comparison, we divide occupation classification into three subgroups based on the National Occupation Classification in Canada: white-collar worker¹, blue-collar worker², and other.

Based on previous research, health returns on a university degree is more remarkable than that on other education levels (Lundborg, 2008) and it is logical to regard university degree as a benchmark of a person's education attainment. Also, the observations of immigrants with higher than university degree are relatively small. Therefore, we define a dummy variable "lessuniv" by whether or not the respondent has a university degree. By doing this, we estimate the education health gradient as the health "return" to having a degree relative to not having a degree.

Based on country of birth, all respondents are divided into two groups. First of all, people who were born in Canada are referred to as a Canadian group and other respondents are classified as the immigrant group. In order to examine differences associated with language and region of origin, immigrants are also divided into several subgroups. Immigrants who are from English speaking developed countries (EngSpekDev) including United States, UK and Ireland, New Zealand, Australia, and South Africa are aggregated

¹ White-collar worker include people who have: management occupations, business, finance and administration occupations, natural and applied science and related occupations, health occupations, or occupations in social science/education/government/religion.

² Blue-collar worker include people who have occupations in culture, recreation and sport, sales and service occupations, trades/transportation/equipment operator/related occupations, occupations unique to primary industry, or occupations unique to production/manufacture/utilities.

into one subgroup. Immigrants from rest of the European countries (RestEur) are aggregated into another subgroup. Similarly we define other subgroups based on geographically contiguous countries: Middle East and Western Asia (MidEandWAsia), South Asia, South East and East Asia (SEandEAsia), Developed Asia (South Korea, Japan, Hong Kong, Taiwan and Macau), South and Latin America, and other countries.

With regard to immigrant characteristics, we examine region of origin, years since migration, years of arrival in Canada, age at migration. Because of co-linearity and the data restriction, we define a dummy variable “age at migration” which has value one if an immigrant arrived in Canada as an adult, zero otherwise. To observe arrival period cohort effects, we also include “years since arrival in Canada” as one of our independent variables. Cohort effect is known as the effect of a person’s year and place of birth on his/her socioeconomic status. Here, we try to identify the time of arrival cohort effect on immigrants’ health status at different education levels. For the ease of comparison, we use dummy variables to aggregate “years of arrival in Canada” into four categories: immigrants who arrived in Canada between 1949 and 1979 (Years of Arrival_1), immigrants who arrived in Canada between 1980 and 1989 (Years of Arrival_2), immigrants who arrived in Canada between 1990 and 1999 (Years of Arrival_3), and immigrants who arrived in Canada between 2000 and 2013 (Years of Arrival_4).

Since the working dataset combines multiple waves of the CCHS, it is important to ensure as much consistency as possible in terms of variable definitions. As a result, certain health conditions and health behaviors not available in all waves of the CCHS

have been omitted from further consideration.

In this paper, we utilize the statistical methodology employed by Kimbro, Bzostek, et al. (2008) and Kennedy, McDonald, and Biddle (2006) to investigate differentials of education health gradients between immigrant and native-born in Canada. The regression analysis involves a series of Logit models, adjusting for the clustered sampling design by weighting the dataset appropriately. Separate models are estimated for each health outcome and health behavior, with each model including the variables discussed above. Because of the complexity of the models and the large number of groups considered, we estimate marginal effects for each set of regression results to calculate the health gap and health-education gradient between native-born population and immigrants. We control years since migration (YSM), years of arrival, and education level to observe the change of the health gap and education health gradient with the increasing duration of residency in Canada across different groups.

III. Results

The section that follows has several parts. In the first part, we present summary statistics of the main variables in our analysis for both immigrants and native-born Canadians (See Table 1). In the second part, we present descriptive statistics on the health outcomes of immigrants and native-born population by country of origin. Then we focus on health behaviors of immigrants and the native-born population. The health outcomes and behaviors of immigrants are compared to not only native-born population, but also to

immigrants from other countries of origin. By doing this, we can examine the existence and magnitude of any immigrant health gap. We begin the third part by presenting descriptive statistics on the educational attainment of the native-born population and immigrants by country of origin. We compare the educational attainments of immigrants with that of native-born population and among different immigrant groups. In the last part of this section, we explore differences in health status by education level for subgroups of immigrants based on their years since migration and the period in which they entered Canada. These results will help to lay the foundation for the econometric analysis to follow.

A. Summary of Immigrants Composition

As we can see from Table 1, by the year 2013 immigrants represent about 23.61 percent of the Canadian population. Most of the immigrants come from non-English Speaking European countries and South East and East Asia, representing 23.13 percent and 17.79 percent of the total immigrants respectively. Also, we divide the whole immigrant group into three categories by years since migration. As we can see in Table 1, 30.19 percent of immigrants have migrated to Canada less than 10 years ago, and we define this group as “recent immigrants”. The proportion of immigrants who have been in Canada for 10 years or above but less than 19 years is 24.59 percent, and the rest of the immigrants are people who have been in Canada for more than 19 years. Also in Table 1 we present summary statistics on years of arrival in Canada. As can be seen, the largest immigration wave take place between 1949 and 1979 and more and more people tend to migrate to Canada in recent years. Also, as an alternative of immigration relevant factor, we include

“age at migration” in our analysis. In Table 1, there are 71.56 percent of immigrants arrived at Canada as an adult.

B. Health Outcomes and Health Behaviors

Health Outcomes

Table 2 lists the results of immigrants and native-born population for two measurements of health: presence of a chronic condition and the proportion of people who are in “better” health. As we can see, the proportion of immigrants who have a chronic condition is less than that of native-born population. This is not only true for all immigrants as a group, but also for each country of origin, except immigrants who come from “EngSpekDev” which include the following English Speaking European countries: UK, US, Australia, New Zealand, Ireland, and South Africa. Another notable point is that immigrants from developed Asian countries are less likely to report chronic conditions than any other population groups, confirming what has been reported in earlier literature (Rotermann, 2011). For the proportion of people who are in “better” health, there are more variations than for the measure of chronic condition. The native-born population is more likely to have “better” health than immigrants except immigrants who come from “EngSpekDev”. McDonald and Kennedy (2004) found similar results. Immigrants who come from developed Asian countries are less likely to have self-reported very good health than other immigrants groups.

Health Behaviors

In Table 3, we present summary statistics on the incidence of various health behaviors for

both the native-born population and immigrants by country of origin. As we can see from Table 3, it is clear that the native-born residents are much more likely to be daily smokers than immigrants. Immigrants who come from Asian countries have the lowest incidence of being a daily smoker compared to all other immigrant groups. In contrast, immigrants who come from “RestEur” have the highest proportion of being a daily smoker among immigrants by regions of birth. Very similar patterns can be seen for consumption of alcohol. Immigrants as a group are less likely to be a regular drinker than the native-born population. However, immigrants that come from “EngSpekDev” have a higher possibility of being regular drinkers than native Canadians. Among immigrant groups, immigrants from Asian countries have a lower rate of being a regular drinker compared with other groups. Also in Table 3, we present fruit and vegetable consumption statistics per day for immigrants and the native-born population. As we can see, there is less variation for dietary habits than for smoking and alcohol consumption. Immigrants and native-born Canadians tend to have very similar eating patterns. As can be seen, 58.62 percent of immigrants would eat fruit and vegetables less than five times per day while the rate for native-born population is 59.01 percent. Immigrants who come from developed Asian countries are less likely to eat fruit and vegetables than other immigrants.

The results we present above for health behaviors are consistent with the results for health outcomes. In summary, the descriptive statistics for the measurements of health examine the existence and magnitude of immigrant health gap and provide some evidence for the HIE. Overall, immigrants regardless of country of origin are in better

health than native-born Canadians for most measures of health.

C. Education

Table 4 presents a summary of educational attainment for both immigrants and native-born population. We divide immigrants by country of origin and education attainment in terms of whether or not the respondent has a university degree. In Table 4 we can see that immigrants as a group are more likely to have university or above degree than the native-born population. Immigrants who come from “OtherCount” have the largest proportion of people who have less than a university degree. Also notable is that immigrants from South Asia are more likely to have university degree or above than any other immigrants groups. One possible explanation is that immigrants who come from Asian countries are more likely to be recent immigrants and they are much more likely to be selected based on education level (See Frenette and Morissette 2003; McDonald 2006; Statistics Canada 2008). In summary, immigrants are more educated than native-born population, and education attainments for immigrants across all the source countries are relatively smaller.

In Table 5, we examine the effect of education on immigrants’ health outcomes. We summarize the comparable statistics on self-reported health status of immigrants and native-born population at different education levels. In Table 5, there are 53.44 percent of immigrants and 59.36 percent of native-born people with less than university degrees who believe that they have “better” health. For people who have at least a university degree, 63.79 percent of immigrants and 76.63 percent of native-born people believe they are in “better” health. The results in Table 5 are consistent with what we get in Table 2.

There are more tendencies for native-born population to report “better” health than immigrants. Also in Table 5, we compare statistics on chronic conditions of immigrants and native-born at different education levels. As can be seen, people who have lower education levels are more likely to report having chronic condition. For people who have less than a university degree, 34.02 percent of immigrants and 36.32 percent of native-born population report having a chronic condition. However, for people who have a university degree or above, the proportion declines to 25.25 percent and 26.90 percent respectively. The results suggest that the health gap between immigrants and native-born population is similar by education level.

We obtain some comparable statistics on health behaviors for both immigrants and native-born at different education levels in Table 6. As we can see, for people who have less than a university degree, 13.68 percent of immigrants and 24.38 percent of native-born are daily smokers. However, only 7.01 per cent of immigrants and 6.77 per cent of native-born have at least a university degree who are daily smokers. Therefore, we have evidence that people with higher education have a lower probability of being a daily smoker but that the gap by education is much smaller for immigrants than non-immigrants.

According to Table 6, for people who have less than a university degree, 49.83 percent of immigrants and 69.68 percent of native-born population are regular drinkers. In comparison, 55.08 percent of immigrants and 80.43 percent of native-born population with a university degree or above are regular drinkers. In other words when comparing

immigrants to native-born Canadians, the difference of being a regular drinker for people with lower than university degree is 19.85 percent while that for people with at least university degrees is 25.35 percent. Therefore, we have evidence to say that people with higher education level have relatively larger probability of being a regular drinker. In addition, compared with immigrants, the native-born population has a larger tendency to be a regular drinker. Thus as with other measures of health the health gap is narrower for more highly educated individuals than for less well educated individuals.

Also in Table 6, we summarize the statistics on dietary habits of immigrants and native-born population. As we can see, for both immigrants and native-born respondents, people with higher education level have healthier diet habits than people with lower education. 59.95 percent of immigrants and 61.81 percent of native-born who have less than a university degree eat fruits or vegetables less than 5 times per day while the percentage for immigrants and native-born population with a higher education level is 56.19 percent and 49.30 percent respectively. Thus there is a much narrower difference in consumption by education level for immigrants than non-immigrants.

D. Years since Migration and Cohort Effect

Years since Migration

Based on previous research, with increasing duration of residency in Canada the health status of immigrants declines over time relatively more quickly and can converge to that of native-born Canadians (See Deri, 2004; McDonald and Kennedy, 2004). In this section, we present some comparable statistics on health status and years since migration at

different education levels. We try to identify the changes in health gap between immigrants and the native-born population with increasing duration of residency in Canada. As can be seen from Table 7, the proportion of people having a chronic condition for immigrants who do not have university degree increases from 16.17 percent to 47.46 percent when the duration of residency in Canada increases from zero years to more than 19 years. For immigrants with at least a university degree the result is similar. The probability of have a chronic condition converges to that of native-born population with additional years in Canada. In the case of self-reported health status, the health gap between native-born and immigrants who have at least a university degree shows little change with YSM. However, for immigrants with less than a university degree, the proportion who report being in “better” health declines from 58.97 percent to 49.99 percent.

In Table 8, we present some statistics on health behaviors for immigrants at different education levels with increasing YSM. As can be seen, the rate of being a daily smoker for immigrants with less than a university degree increases 4.18 percent with YSM increasing from 0 year to more than 19 years while the proportion of daily smoker for immigrants with at least a university degree decreases from 8.51 percent to 6 percent. Also we can see that the probability of being a regular drinker for immigrants at lower education level increases from 38.7 percent to 57.47 percent with the change of YSM. Similar results can be found for immigrants with at least a university degree as well. For fruit and vegetable consumption, there is little variation but it remains the case that the health gap narrows based on the statistics in Table 8. Immigrants, regardless of education

level, tend to eat more fruit and vegetables over the YSM.

In summary, the results show that the health gap between immigrants and native-born population narrows and the health status of immigrants converge towards that of native-born population with increasing duration of residency in Canada.

Cohort Effects

In the next section, we present some statistics on arrival period cohort effects and health status of immigrants in Canada. Here, we try to identify possible time of arrival cohort effects on immigrants' health status at different education levels. As can be seen in Table 9, regardless of education attainment, immigrants who arrived in Canada recently (between 2000 and 2013) are more likely to report having a chronic condition than earlier arrival cohorts. Also in Table 9, we find that recent immigrants at both lower and higher education level are more likely to have "better" health than immigrants who arrived in Canada in earlier time period. However, there are larger variations among immigrants without university degree. In the case of health behaviors (See Table 10), immigrants who arrived in Canada between 2000 and 2013 are healthier than other arrival cohorts in most of the health behaviors. They are less likely to be a daily smoker and a regular drinker than other immigrants regardless of education level. The exception is that recently arrived immigrants with a university degree are more likely to be a daily smoker than immigrants who arrived in Canada before 1990. Also immigrants who recently arrived regardless of their education levels are less likely to eat fruit and vegetables than their earlier arrival cohorts.

IV. Regression Results

In this section, we examine the extent to which observable factors such as demographic, socioeconomic, and geographic factors can explain the observed health differences between immigrants and native-born population in health outcomes and behaviors. Then we explore the differentials in education health gradients between immigrants and the native-born population in Canada, and attempt to identify reasons for any differences in gradients between these groups.

Our main regression approach involves estimating reduced form equations for native-born population and immigrants by country of origin and educational attainment. Health status is expressed as a function of demographic and socioeconomic factors (including marital status, age, gender³, education level, country of birth, province of residence, and occupation classification) as well as years since migration, years since arrival in Canada, and age at migration for immigrants. We estimate Logit models with the statistical program called Stata for each measure of health outcome and behavior and estimate marginal effects for each set of regression results to calculate the health gap and health-education gradient between native-born population and immigrants. We also capture the changes of health gap and education health gradient with the increasing duration of

³ Since it is commonly accepted that the health patterns between male and female are quite different, we estimate separate models by gender as one of our sensitivity checks although these models are not reported in our paper. Compared to men, immigrant women are less likely to be a daily smoker and a regular drinker, and tend to eat more fruit and vegetables. But overall, both immigrant men and women are healthier than comparable native-born Canadians. Regarding the health gap and education health gradient, immigrant men show significant increases with YSM in the incidence of being a daily smoker and a regular drinker. However, for immigrant women, the main results is quite different from the case for men in that there is no evidence of convergence to native-born health levels with increasing YSM for most of the health measures.

residency in Canada and the arrival period cohort effect on the health gap and education health gradient.

A. Health Outcomes

For chronic conditions, as can be seen in Table 11, immigrants as one group are 11.32 percent less likely to have a chronic condition than otherwise comparable non-immigrants, and this estimate is significant at the 5 percent level of significance. Since demographic and socioeconomic factors are controlled and the regression results are consistent with the descriptive analysis, we have evidence to say that health gap between immigrants and native-born population cannot be fully explained by those demographic and socioeconomic factors. Also notable is that there are significant differences among immigrant groups, with immigrants who come from “DevelpAsia” having a statistically significant lower incidence of chronic condition than any other immigrant groups. For self-reported health status, the pattern of results is similar to that for descriptive statistics. Native-born Canadians are more likely report “better” health than immigrants after controlling demographic, socioeconomic, and other factors.

B. Health Behaviors

In the case of health behaviors, regression analysis presents some different results compared with the results we get in the descriptive analysis. For example, after controlling for education, age, and other observable factors, the differences in tobacco consumption between immigrants and native-born population tend to be smaller than for chronic conditions. That is, if those immigrants have the same demographic and

socioeconomic background as native-born population, they may have a similar incidence of being a daily smoker to native-born people. As we can see in Table 12, the incidence of being a daily smoker for immigrants is only 1 percent lower than that of native-born population while in the descriptive statistics, the percentage is 9.13. Also notable is that after controlling for other factors those immigrants who come from “RestEur” are significantly more likely to be a daily smoker than any other immigrants. However, for the incidence of being a regular drinker, the difference between immigrants and native-born population tends to be larger after controlling for demographic and socioeconomic factors. In other words, lower incidence of being a regular drinker cannot be fully explained by education attainment, age, and other controlled factors. Similar results can be obtained in terms of dietary habits. Also notable is that after controlling for demographic and socioeconomic factors, immigrants have more tendencies to eat less fruit and vegetables than native-born Canadians which is contrary to what we get in the descriptive statistics. Namely, we have some evidence to say that dietary habits of immigrants are related with the demographic and socioeconomic factors we include in our regression analysis.

C. Health Gaps and Education Health Gradients

So far, we have focused on health outcomes and behavior between immigrants and native-born population. We have found some evidence to support the existence of the Healthy Immigrant Effect. In this section, we examine the distribution of health outcomes and behaviors by education attainments and explore how it varies across different immigrant groups and native-born population. We divide education attainment into two

categories by whether or not a respondent has a university degree. Then using the results we obtained for immigrants and native-born population, we calculate the education health gradient by estimating the health return to a university degree relative to not having a university degree. Similarly, comparing the difference in health between immigrants and non-immigrants yields the health gap. Our main issue of interest is whether there is a statistically significant difference in education-health gradients, or in other words whether the health gap varies by education level.

Table 13 and Table 14 present the health gaps and education health gradients of health outcomes and behaviors for recent immigrants. Overall, the education health gradients for recent immigrants are flatter than for native-born people and the health gaps are larger for people who have lower than university degree than those who have university degree or above. This is consistent with the idea that the health return to a university degree is less for immigrants than it is for non-immigrants. In another words, while immigrants overall are healthier than non-immigrants, less educated immigrants are in proportionately better relative to non-immigrants than are more educated immigrants. Also, statistically significant differences in education health gradients provide some evidence that education attainment and other observable factors we include in our regression are not sufficient to explain the health gap between immigrants and native-born population. There are some unobservable characteristics for example self-selection and mental health conditions affecting health status.

We include YSM variables in our regression to reflect the extent to which the health

status of immigrants at different education levels changes with the change of YSMs. Table 15 presents some summary regression statistics of health gaps and education health gradients on health outcomes for both immigrants and native-born Canadians. As can be seen, for chronic conditions, the health gap between recent immigrants with lower than university degrees and comparable native-born Canadians is 15.21 percent. This decreases to 13.63 percent when we compare immigrants who have resided in Canada more than 10 years but less than 20 years with native-born population. Eventually, the health gap between immigrants who lived in Canada for more than 20 years and native-born Canadians becomes to 11.7 percent. Similar results can be found among people who have at least a university degree. The health gap decreases from 10.28 percent to 6.77 percent with the increasing duration of residency in Canada. As an alternative of health gap, education health gradient also show some evidence that with the increasing time of staying in Canada, health status of immigrants would converge to that of native-born Canadians. As we can see, the education health gradients of immigrants are approaching the native-born population gradually over YSM. However, for the self-reported health status of people who have lower than university degrees, the health gaps between immigrants narrow at first and then increase. The fluctuated health gaps might attribute to the limitation of self-reported data. Self-reported data may be subjected to the cultural background and the perception of the respondents. For example, if the respondent happened to sick at the moment they took the survey, it is reasonable to believe that he/she would not report “better” health even though they are very healthy. For people who have at least a university degree, the health gap shows little changes over the YSM. The health gap between recent immigrants and native-born Canadians is 8.49 percent

while that between immigrants who have been in Canada for more than 20 years and native-born population is 10.72 percent.

In conclusion, for the health outcomes of immigrants at different education levels, after controlling for demographic, socioeconomic, and geographic factors, there are still clear instances of convergence over YSM to the native-born Canadian level. In another words, there are unobservable factors that could lead to the convergence.

For the measures of health behaviors, in Table 16, we provide statistics on health gap and education health gradient for both immigrants and native-born Canadians at different education levels. For the change of health gaps and education gradients among daily smokers, after controlling for demographic, socioeconomic, and geographic factors, for both education levels, the health gaps between immigrants and native-born Canadians do have little variation but we can still observe downward and narrowing trend with the increasing duration in Canada. Similar patterns can be found in the education health gradients, with the increasing years in Canada, the education health gradients of immigrants for being a daily smoker converge to that to native-born level gradually although very slowly. For health gaps and education gradients among daily drinkers and fruit/vegetable consumption, we get similar results. The only exemption is that education health gradients of immigrants do not converge towards the native-born level after years of staying in Canada.

We also find differences in the size of gradients across different health behaviors. Fruit

and vegetable consumption has relatively flatter gradients across all YSM groups, which suggests that the impact of education varies across health behaviors.

To observe the cohort effect on changes of health gaps and education health gradients, we include years of arrival variables in our regression. As we can see in Table 17, for chronic conditions, the health gaps between immigrants and native-born Canadians at different education levels decrease with the years of arrival in Canada going back from 2013 to 1949. For self-reported health status, the health gaps between earlier arrival immigrants and native-born Canadians are relatively large, and the education health gradients are closer to native-born level than those of recent arrival cohorts. In Table 18, we observe changes of health gaps and education health gradients for health behaviors with the change of years of arrivals. In the case of “regular drinker” and “fruit/vegetable consumption”, we find that health gaps between earlier arrival immigrants and native-born population at different education levels are much narrower than that between recent arrivals and native-born Canadians. However, we do not obtain health gaps narrowing down and convergence of education health gradients in terms of “daily smoker”.

To sum up, the results we obtain above provide some evidence consistent with the existence of an arrival period cohort effect for immigrants and these findings are consistent with earlier regression. To some extent, we could say the earlier an immigrant arrives in Canada, the more likely his/her health status and behaviors converge to that of a native-born Canadian.

V. Discussion

This paper provides clear evidence of the healthy immigrant effect across almost all immigrants groups. Our findings that immigrants in Canada enjoy better health status than comparable native-born Canadians confirm the results from previous literature across a wide range of health outcomes. Also, we find significant evidence that the health gap between immigrants and the native-born population narrows with increasing duration of residency in Canada and that the education health gradient for immigrants is relatively flatter than that for native-born population. This suggests that less educated immigrants are relatively healthier than less educated non-immigrants. We propose several explanations for findings on the health gap and the education health gradient as follows:

A. Over-Educated

According to Chiswick and Miller (2010), there is a “usual” education level for each occupation. Some workers will have this level of education, and therefore, they will be regarded as being matched to the typical educational requirements of their job. In contrast, some people will have a higher level of education than that which is usual in their jobs. These people with surplus years of schooling are viewed as being over-educated. Previous literature has explored the incidence of being over-educated among immigrants and finds that the incidence of being over-educated for immigrants is higher than that for native-born population. Also, some scholars explore the prevalence of being over-educated and its association with health status for immigrants. Chen, Smith, and Mustard (2010) find that immigrants who are over-educated for their attained occupation have

poorer mental health status than other immigrants. Based on what we find in this paper, immigrants are more educated than native-born Canadians and it is logical to believe that mental health is closely related with general health status. So, over-educated might be a possible reason to explain the narrower health gap at high education level and the smaller education health gradient for immigrants. That is, while immigrant status confers health benefits relative to non-immigrants, this advantage is reduced for highly educated immigrants owing to their greater likelihood of being in lower skilled occupations.

B. More Educated Immigrants Find it Easier to Adapt to New Environment

It is logical to suggest that immigrants with relatively higher education levels have better learning skills than those with lower education. Also, the problem of language barriers may be less of an obstacle in adapting to the new environment for more educated immigrants than less educated immigrants. So, immigrants with relatively high education level would adapt to the new cultural and environment easier and more quickly than less educated immigrants, meaning both the adoption of unhealthy behaviors and also greater use of health services leading to increased diagnosis of chronic conditions. So, better learning skills, less language barriers, and easier process of acculturation provide another explanation regarding why less educated immigrants are relatively healthy.

VI. Limitation and Future Work

There are three important limitations of this analysis. First of all, we focus mainly on education as our measure of socio-economic status but other important factors such as

income, occupation, and wealth may capture other dimensions relevant to health. Future work could examine the occupation health gradient for immigrants who are perfectly matched to the requirement of their jobs and see if the health status of those immigrants still converges to that of native-born population. Secondly, for the ease of comparison and the limited data size, we aggregate education attainment for all respondents into two categories by whether or not a respondent has a university degree. However, by doing this, we can only observe the health return on education specifically on university degree. Thus future work should consider more complex measures of education. Another limitation is that we focus on comparing health status of immigrants with native-born Canadians while it is also very important to compare the health status of immigrants with their counterparts in the source countries. Also, we could use race or ethnicity as an alternative of country of birth to compare the health status of immigrants from a particular region with that of Canadian born residents whose parents are from that particular region in our future work. Furthermore, since those chronic conditions we choose may be quite uncommon among people aged 40 or less, in future work we may put more restrictions on age variables and observe how education health gradients change. Last but not the least, as the health status of immigrants differs by country of birth, we may include another interaction term by multiplying YSM variables and country of birth variables to allow health gaps and education health gradients specifically to differ by country of birth with the increasing duration of staying in Canada.

Understanding and addressing socio-economic disparities in health is a topic of great concern to health researchers and policymakers. It is critical for these and other interested

groups to understand the complex interactions between health and education and how these relationships vary between immigrants and non-immigrants as well as among different immigrant groups. Interventions targeted at particular groups may be more effective than those aimed at broader populations.

Reference

1. Chen Cynthia, Peter Smith, and Cameron Mustard. "The Prevalence of Over-qualification and Its Association with Health Status among Occupationally Active New Immigrants to Canada." *Ethnicity & Health* Vol. 15.No. 6 (2010): 601-19. Web. 1 Feb. 2015.
2. Christina Diaz, Stephanie Koning, and Anna Martinez Donate. "Moving Beyond Salmon-Bias: Mexican Return Migration and Health Status." (2014). Web. 1 Feb. 2015.
3. Chiswick Barry R. and Paul W. Miller. "Educational Mismatch: Are High-Skilled Immigrants Really Working at High-Skilled Jobs and the Price They Pay If They Aren't?" *The Stockholm University Linnaeus Center for Integration Studies* 1654-1189 (2010). Web. 1 Feb. 2015.
4. Conti Gabriella, and Christopher Hansman. "Personality and the Education–health Gradient: A Note on “Understanding Differences in Health Behaviors by Education”." *Journal of Health Economics* 32 (2013) 480– 485 (2012). ELSEVIER. Web. 1 Feb. 2015.
5. Conti Gabriella, James Heckman, and Sergio Urzua. "The Education-Health Gradient." *American Economic Review* (2010): 234–238. Web. 1 Feb. 2015.
6. Dunn James R., and Isabel Dyck. "Social Determinants of Health in Canada's Immigrant Population: Results from the National Population Health." *Social Science & Medicine* 51 (2000) 1573-1593 (2000). ELSEVIER. Web. 1 Feb. 2015.
7. Edward Ng, LHAD research team. "Insights into the Healthy Immigrant Effect:

- Mortality by Period of Immigration and Birthplace." 1915-5190 (2011). Statistics Canada. Web. 1 Feb. 2015.
8. Frenette Marc and René Morissette. "Will They Ever Converge? Earnings of Immigrant and Canadian-born Will They Ever Converge? Earnings of Immigrant and Canadian-born." 1205-9153 (2003). Business and Labour Market Analysis Division. Web. 1 Feb. 2015.
 9. Galarneau Diane and René Morissette. "Immigrants' Education and Required Job Skills." (2008). Statistics Canada. Web. 1 Feb. 2015.
 10. Hyman Ilene. "IMMIGRATION AND HEALTH: REVIEWING EVIDENCE OF THE HEALTHY IMMIGRANT EFFECT IN CANADA." (2007): 1-42. Web. 1 Feb. 2015.
 11. Karmakar Sunita D. and F. Curtis Breslin. "The Role of Educational Level and Job Characteristics on the Health of Young Adults." *Social Science & Medicine* 66 (2008) 2011-2022 (2008). ELSEVIER. Web. 1 Feb. 2015.
 12. Kennedy Steven, Ted McDonald, and Nicholas Biddle. "The Healthy Immigrant Effect and Immigrant Selection: Evidence from Four Countries." (2006). *SOCIAL AND ECONOMIC DIMENSIONS OF AN AGING POPULATION*. Web. 1 Feb. 2015.
 13. Kimbro Rachel Tolbert, Sharon Bzostek, Noreen Goldman, and Germán Rodríguez. "Race, Ethnicity, And The Education Gradient In Health." *Health Affairs* 361-372 (2008). Project HOPE. Web. 1 Feb. 2015.
 14. Lundborg Petter. "The Health Returns to Education: What Can We Learn from Twins?" (2008). *Forschungsinstitut Zur Zukunft Der Arbeit Institute for the Study of*

Labor. Web. 1 Feb. 2015.

15. Lu Yao and LiJian Qin. "Healthy Migrant and Salmon Bias Hypotheses: A Study of Health and Internal Migration in China." *Social Science & Medicine* 102 (2014): 41-48. Web. 1 Feb. 2015.
16. McDonald Ted, and Steven Kennedy. "Insights into the 'healthy Immigrant Effect': Health Status and Health Service Use of Immigrants to Canada." *Social Science & Medicine* 59 (2004) 1613–1627 (2004). ELSEVIER. Web. 1 Feb. 2015.
17. McDonald Ted. "The Health Behaviours of Immigrants and Native-Born People in Canada." (206). Atlantic Metropolis Centre. Web. 1 Feb. 2015.
18. Newbold K. Bruce, and Jeff Danforth. "Health Status and Canada's Immigrant Population." *Social Science & Medicine* 57 (2003) 1981–1995 (2003). ELSEVIER. Web. 1 Feb. 2015.
19. Newbold K. Bruce. "HEALTH CARE USE AND THE CANADIAN IMMIGRANT POPULATION." *International Journal of Health Services* 39.3 (2009): 545–565. Web. 1 Feb. 2015.
20. Newbold K. Bruce. "Self-rated Health within the Canadian Immigrant Population: Risk and the Healthy Immigrant Effect." *Social Science & Medicine* 1359–1370 (2004). ELSEVIER. Web. 1 Feb. 2015.
21. Palloni Alberto and Elizabeth Arias. "Paradox Lost: Explaining the Hispanic Adult Mortality Advantage." *Demography* (2004): 385-415. Web. 1 Feb. 2015.
22. Picot Garnett, Feng Hou, and Simon Coulombe. "Chronic Low Income and Low-income Dynamics Among Recent Immigrants." 1205-9153 (2007). Web. 1 Feb. 2015.
23. Rotermann Michelle. "The Impact of considering Birthplace in Analyses of

Immigrant Health." (2011). Print.

24. Turra Cassio M. and Irma T. Elo. "The Impact of Salmon Bias on the Hispanic Mortality Advantage." *Popul Res Policy Rev* 10.1007/s11113-008-9087-4 (2008): 515-30. Web. 1 Feb. 2015.
25. Wang Lu and Wei Hu. "Immigrant Health, Place Effect and Regional Disparities in Canada." *Social Science & Medicine* 98 (2013) 8-17 (2003). ELSEVIER. Web. 1 Feb. 2015.

Appendix

Table 1: Summary Statistics

		Native-born Population	Immigrants	Total Observations
Age	Age_1	22.04%	16.18%	20.66%
	Age_2	20.29%	23.01%	20.93%
	Age_3	22.91%	24.81%	23.36%
	Age_4	21.10%	20.95%	21.06%
	Age_5	13.66%	15.05%	13.99%
Gender	Male	49.68%	48.36%	49.37%
Marital Status	Now Married	50.96%	68.23%	55.03%
Education	Lower than University Degree	77.65%	64.61%	74.57%
Province of Residence	NL	2.07%	0.12%	1.61%
	PEI	0.55%	0.10%	0.44%
	NS	3.59%	0.68%	2.91%
	NB	2.95%	0.34%	2.33%
	QC	26.95%	13.77%	23.84%
	ON	34.52%	54.77%	39.30%
	MB	3.40%	2.16%	3.11%
	SK	3.15%	0.97%	2.63%
	AB	10.82%	9.92%	10.60%
	BC	11.81%	17.04%	13.05%
	YU	0.10%	0.06%	0.09%
	NW	0.09%	0.05%	0.08%
	NU	0.02%	0.01%	0.02%
Place of Residence	Urban	78.31%	94.45%	82.12%
Occupation	Blue-collar Worker	37.24%	34.49%	36.59%
	White-collar Worker	41.15%	38.81%	40.60%
	Other	21.61%	26.70%	22.81%
Self-Reported Health Status	"Better" Health	63.22%	57.10%	61.78%
Chronic Conditions	Chronic Conditions	34.21%	30.92%	33.44%
Type of Smoker	Daily Smoker	20.45%	11.32%	18.29%
Type of	Regular Drinker	72.08%	51.69%	67.27%

Drinker				
Dietary Habits	Eat Fruit/Vegetables Less than 5 times/day	59.01%	58.62%	58.92%
Country of Birth	EngSpekDev	NA	13.26%	3.13%
	RestEur	NA	23.13%	5.46%
	MidEandWAsia	NA	6.35%	1.50%
	SAsia	NA	12.79%	3.02%
	SEandEAsia	NA	17.79%	4.20%
	DevlpAsia	NA	6.00%	1.42%
	SandLatinAme	NA	13.89%	3.28%
	OtherCount	NA	6.78%	1.60%
	Native-Born Ca	100%	0%	76.39%
Years Since Migration	YSM_1	NA	30.19%	7.13%
	YSM_2	NA	24.59%	5.81%
	YSM_3	NA	45.22%	10.67%
Years of Arrival	Years of Arrival_1	NA	28.75%	6.79%
	Years of Arrival_2	NA	24.77%	5.85%
	Years of Arrival_3	NA	16.92%	3.99%
	Years of Arrival_4	NA	29.56%	6.98%
Age at Migration	Arrive as an Adult	NA	71.56%	16.90%
	Other	NA	28.44%	6.71%
Year Dummies	2003	32.74%	28.25%	31.68%
	2008	33.25%	33.88%	33.40%
	2013	34.01%	37.87%	34.92%

Table 2: Proportion of People Who have Chronic Conditions or in "Better" Health

	Chronic Conditions	"Better" Health
EngSpekDev	38.94%	66.88%
RestEur	36.04%	54.69%
MidEandWAsia	22.63%	59.92%
SAsia	27.15%	54.25%
SEandEAsia	27.15%	55.63%
DevlpAsia	21.71%	48.00%
SandLatinAme	27.51%	57.16%
OtherCount	32.50%	58.94%
Immigrants	30.92%	57.10%
NativeCa	34.21%	63.22%

Table 3: Proportion of People for Being a Daily Smoker, a Regular Drinker or Eat Fruit/Veg Less than 5 Times/Day

	Daily Smoker	Regular Drinker	Eat Fruit/Veg Less than 5 Times/Day
EngSpekDev	14.69%	73.66%	59.08%
RestEur	17.66%	71.62%	53.21%
MidEandWAsia	14.16%	44.45%	58.81%
SAsia	5.39%	29.38%	55.09%
SEandEAsia	7.99%	35.63%	65.77%
DevlpAsia	9.66%	42.49%	68.43%
SandLatinAme	8.48%	35.14%	58.71%
OtherCount	8.08%	54.06%	56.91%
Immigrants	11.32%	51.69%	58.62%
NativeCa	20.45%	72.08%	59.01%

Table 4: Education Attainment of Immigrants by Country of Birth

	Lower than University Degree
EngSpekDev	66.46%
RestEur	69.47%
MidEandWAsia	59.63%
SAsia	53.30%
SEandEAsia	61.13%
DevlpAsia	58.73%
SandLatinAme	61.80%
OtherCount	75.87%
Immigrants	64.61%
NativeCa	77.65%

Table 5: Proportion of People Who have Chronic Conditions or in "Better" Health at Different Education Levels

	Chronic Condition	"Better" Health
Imm_LowUniver	34.02%	53.44%
Nb_LowUniver	36.32%	59.36%
Imm_UniverAbove	25.25%	63.79%
Nb_UniverAbove	26.90%	76.63%

Table 6: Proportion of People for Being a Daily Smoker, Regular Drinker and Eat Fruit/Veg Less than 5 Times/Day at Different Education Levels

	Daily Smoker	Regular Drinker	Eat Fruit/Veg Less than 5 Times/Day
Imm_LowUniver	13.68%	49.83%	59.95%
Nb_LowUniver	24.38%	69.68%	61.81%
Imm_UniverAbove	7.01%	55.08%	56.19%
Nb_UniverAbove	6.77%	80.43%	49.30%

Table 7: Proportion of People Who have Chronic Conditions or in "Better" Health at Different Education Levels with the Change of YSM

	Chronic Conditions	In "Better" Health
YSM_1_LowUniver	16.17%	58.97%
YSM_2_LowUniver	23.85%	55.10%
YSM_3_LowUniver	47.46%	49.99%
YSM_1_UniverAbove	17.47%	64.33%
YSM_2_UniverAbove	20.98%	63.48%
YSM_3_UniverAbove	37.46%	63.39%

Table 8: Proportion of People for Being a Daily Smoker, Regular Drinker, or Eat Fruit/Veg Less than 5 Times/Day at Different Education Levels with the Change of YSM

	Daily Smokers	Regular Drinkers	Eat Fruit/Veg Less than 5 Times/Day
YSM_1_LowUniver	10.96%	38.70%	61.76%
YSM_2_LowUniver	13.36%	45.05%	59.52%
YSM_3_LowUniver	15.14%	57.47%	59.30%
YSM_1_UniverAbove	8.51%	47.45%	59.33%
YSM_2_UniverAbove	5.94%	52.86%	56.65%
YSM_3_UniverAbove	6.00%	65.66%	52.17%

Table 9: Self-Reported Health Outcomes of Immigrants and Years of Arrival

	Chronic Conditions	"Better" Health
Yrs of Arri_1_LowUniver	15.56%	59.82%
Yrs of Arri_2_LowUniver	22.88%	54.42%
Yrs of Arri_3_LowUniver	35.01%	52.92%
Yrs of Arri_4_LowUniver	53.76%	48.82%
Yrs of Arri_1_UniverAbove	17.81%	65.34%
Yrs of Arri_2_UniverAbove	21.33%	61.47%
Yrs of Arri_3_UniverAbove	30.97%	61.93%
Yrs of Arri_4_UniverAbove	40.09%	64.71%

Table 10: Health Behaviors of Immigrants and Years of Arrival

	Daily Smokers	Regular Drinkers	Eat Fruit/Veg Less than 5 Times/Day
Yrs of Arri_1_LowUniver	10.50%	37.07%	61.05%
Yrs of Arri_2_LowUniver	13.28%	44.04%	61.77%
Yrs of Arri_3_LowUniver	13.83%	52.87%	59.42%
Yrs of Arri_4_LowUniver	15.98%	60.81%	58.18%
Yrs of Arri_1_UniverAbove	7.41%	48.30%	57.84%
Yrs of Arri_2_UniverAbove	8.18%	51.00%	59.22%
Yrs of Arri_3_UniverAbove	4.88%	57.37%	52.48%
Yrs of Arri_4_UniverAbove	6.35%	71.06%	52.12%

Table 11: Self-Reported Health Outcomes of Immigrants by Countries of Birth

	Chronic Conditions (Pseudo R ² : 0.0248)	"Better" Health (Pseudo R ² : 0.0484)
EngSpekDev	-2.15%	13.75%
RestEur	-3.62%	2.80%
MidEandWAsia	-3.26% ⁴	3.87%
SAsia	1.80%	-3.11%
DevlpAsia	-9.77%	-5.71%
SandLatinAme	1.35%	5.59%
OtherCount	1.40%	1.57%
SEandEAsia ⁵	0.00%	0.00%
Immigrants ⁶	-11.32%	-6.48%
NativeCa ⁷	0.00%	0.00%

Table 12: Health Behaviors of Immigrants by Countries of Birth

	Daily Smokers (Pseudo R ² : 0.0365)	Regular Drinkers (Pseudo R ² : 0.0781)	Eat Fruit/Veg Less than 5 Times/Day (Pseudo R ² : 0.0942)
EngSpekDev	11.46%	23.13%	-7.15%
RestEur	14.77%	22.53%	-13.85%
MidEandWAsia	8.99%	4.38%	-8.55%
SAsia	-3.61%	-8.87%	-12.05%
DevlpAsia	3.55%	5.19%	3.18%
SandLatinAme	-2.51%	12.42%	-10.07%
OtherCount	0.07%	-5.00%	-6.78%
SEandEAsia ⁵	0.00%	0.00%	0.00%
Immigrants ⁶	-1.00%	30.19%	12.44%
NativeCa ⁷	0.00%	0.00%	0.00%

⁴ Coefficients in bold are not significant at the 5% level, significant otherwise.

⁵ Immigrants come from "SEandEAsia" are our base group, we compare base group with other immigrant subgroups.

⁶ We put immigrants as one group in our regression without other immigrant subgroups by country of birth and compare immigrants with native-born Canadians, though not reported in Appendix.

⁷ Native-born Canadians is our base group here compared with immigrants.

Table 13: Health Outcomes with Health Gaps and Education Health Gradients at Different Education Levels

		Chronic Conditions	“Better” Health
Health Gaps¹	Lower than University	-0.1521	0.0046
	University or above	-0.1028	-0.0849
Education Health Gradients²	Immigrants	0.0239	-0.0643
	Native-born Canadians	0.0732	-0.1538

¹ We test the significance of the health gaps' difference at two education levels. The difference of underline coefficients is significant at 5% level.

² We test the significance of education health gradients' difference between immigrants and native-born Canadians. The difference of underline coefficients is significant at 5% level.

Table 14: Health Behaviors with Health Gaps and Education Health Gradients at Different Education Levels

		Daily Smokers	Regular Drinkers	Eat Fruit/Veg Less than 5 Times/Day
Health Gaps¹	Lower than University	-0.0899	-0.3613	0.122
	University or above	-0.0099	-0.4006	0.1916
Education Health Gradients²	Immigrants	0.0607	-0.0651	0.0507
	Native-born Canadians	0.1407	-0.1044	0.1203

¹ We test the significance of the health gaps' difference at two education levels. The difference of underline coefficients is significant at 5% level.

² We test the significance of education health gradients' difference between immigrants and native-born Canadians. The difference of underline coefficients is significant at 5% level.

Table 15: Health Outcomes with Health Gaps and Education Health Gradients at Different Education Levels (YSM)

			Chronic Conditions	“Better” Health
Health Gaps¹	Lower than University	YMS1	-0.1521	0.0046
		YMS2	-0.1363	0
		YMS3	-0.117	-0.0177
	University or above	YMS1	-0.1028	-0.0849
		YMS2	-0.087	-0.0895
		YMS3	-0.0677	-0.1072
Education Health Gradients²	Immigrants	YMS1	0.0239	-0.0643
		YMS2	0.0397	-0.0689
		YMS3	0.059	-0.0866
	Native-born Canadians	YMS1	0.0732	-0.1538
		YMS2	0.0732	-0.1538
		YMS3	0.0732	-0.1538

¹ We test the significance of the health gaps' difference at two education levels. The differences of underline coefficients are significant at 5% level.

² We test the significance of education health gradients' difference between immigrants and native-born Canadians. The differences of underline coefficients are significant at 5% level.

Table 16: Health Behaviors with Health Gaps and Education Health Gradients at Different Education Levels (YSM)

			Daily Smokers	Regular Drinkers	Eat Fruit/Veg Less than 5 Times/Day
Health Gaps¹	Lower than University	YSM1	-0.0899	-0.3613	0.122
		YMS2	-0.0999	-0.3458	0.0736
		YSM3	-0.0847	-0.3554	0.0948
	University or above	YSM1	-0.0099	-0.4006	0.1916
		YMS2	-0.0199	-0.3851	0.1432
		YSM3	-0.0047	-0.3947	0.1644
Education Health Gradients²	Immigrants	YSM1	0.0607	-0.0651	0.0507
		YMS2	0.0507	-0.0496	0.0023
		YSM3	0.0659	-0.0592	0.0235
	Native-born Canadians	YSM1	0.1407	-0.1044	0.1203
		YMS2	0.1407	-0.1044	0.1203
		YSM3	0.1407	-0.1044	0.1203

¹ We test the significance of the health gaps' difference at two education levels. The differences of underline coefficients are significant at 5% level.

² We test the significance of education health gradients' difference between immigrants and native-born Canadians. The differences of underline coefficients are significant at 5% level.

Table 17: Health Outcomes with Health Gaps and Education Health Gradients at Different Education Levels (Years of Arrivals)

			Chronic Conditions	“Better” Health
Health Gaps¹	Lower than University	Yrs of Arri_1	-0.1521	0.0046
		Yrs of Arri_2	-0.1215	-0.0345
		Yrs of Arri_3	-0.0420	-0.0441
		Yrs of Arri_4	-0.0107	-0.0480
	University or above	Yrs of Arri_1	-0.1028	-0.0849
		Yrs of Arri_2	-0.0722	-0.1240
		Yrs of Arri_3	0.0073	-0.1336
		Yrs of Arri_4	0.0386	-0.1375
Education Health Gradients²	Immigrants	Yrs of Arri_1	0.0239	-0.0643
		Yrs of Arri_2	0.0545	-0.1034
		Yrs of Arri_3	0.1340	-0.1130
		Yrs of Arri_4	0.1653	-0.1169
	Native-born Canadians	Yrs of Arri_1	0.0732	-0.1538
		Yrs of Arri_2	0.0732	-0.1538
		Yrs of Arri_3	0.0732	-0.1538
		Yrs of Arri_4	0.0732	-0.1538

¹ We test the significance of the health gaps' difference at two education levels. The differences of underline coefficients are significant at 5% level.

² We test the significance of education health gradients' difference between immigrants and native-born Canadians. The differences of underline coefficients are significant at 5% level.

Table 18: Health Behaviors with Health Gaps and Education Health Gradients at Different Education Levels (Years of Arrivals)

			Daily Smokers	Regular Drinkers	Eat Fruit/Veg Less than 5 Times/Day
Health Gaps¹	Lower than University	Yrs of Arri_1	-0.0899	-0.3613	0.122
		Yrs of Arri_2	-0.0837	-0.3578	0.1371
		Yrs of Arri_3	-0.1058	-0.3095	0.0889
		Yrs of Arri_4	-0.1094	-0.2871	0.0861
	University or above	Yrs of Arri_1	-0.0099	-0.4006	0.1916
		Yrs of Arri_2	-0.0037	-0.3971	0.2067
		Yrs of Arri_3	-0.0258	-0.3488	0.1585
		Yrs of Arri_4	-0.0294	-0.3264	0.1557
Education Health Gradients²	Immigrants	Yrs of Arri_1	0.0607	-0.0651	0.0507
		Yrs of Arri_2	0.0669	-0.0616	0.0658
		Yrs of Arri_3	0.0448	-0.0133	0.0176
		Yrs of Arri_4	0.0412	0.0091	0.0148
	Native-born Canadians	Yrs of Arri_1	0.1407	-0.1044	0.1203
		Yrs of Arri_2	0.1407	-0.1044	0.1203
		Yrs of Arri_3	0.1407	-0.1044	0.1203
		Yrs of Arri_4	0.1407	-0.1044	0.1203

¹ We test the significance of the health gaps' difference at two education levels. The differences of underline coefficients are significant at 5% level.

² We test the significance of education health gradients' difference between immigrants and native-born Canadians. The differences of underline coefficients are significant at 5% level.

Regress Statistics: Marginal Effect

	Chronic Conditions	"Better" Health	Daily Smoker	Regular Drinker	Eat Fruit/Veg Less than 5 Times/Day
Age_1	-0.0689	0.0307	-0.0437	0.0609	-0.0301
Age_3	0.1293	0.0644	0.0221	0.0036	0.0332
Age_4	0.3081	-0.1196	0.0044	-0.0224	0.0153
Age_5	0.4394	-0.1114	-0.0612	-0.0232	-0.0047
Male	-0.0186	-0.0058	0.0323	0.1774	0.1534
Lower Than University Degree	0.0732	-0.1538	0.1407	-0.1044	0.1203
Immigrants	-0.1028	-0.0849	-0.0099	-0.4006	0.1916
EngSpekDev	-0.0215	0.1375	0.1146	0.2313	-0.0715
RestEur	-0.0362	0.0280	0.1477	0.2253	-0.1385
MidEandWAsia	-0.0326⁸	0.0387	0.0899	0.0438	-0.0855
Sasia	0.0182	-0.0311	-0.0361	-0.0887	-0.1205
DevlpAisa	-0.0977	-0.0571	0.0355	0.0519	0.0318
SandLatinAme	0.0135	0.0559	-0.0251	0.1242	-0.1007
OtherCount	0.0140	0.0157	-0.0007	-0.0500	-0.0678
Now Married	-0.0226	0.0566	-0.1018	0.0069	-0.0479
NL	0.0107	0.0621	-0.0074	-0.0625	0.1189
PEI	0.0185	0.0203	0.0012	-0.0831	0.0737
NS	0.0421	-0.0291	0.0061	-0.0697	0.0663
NB	0.0223	-0.0531	0.0096	-0.0915	0.0367
QC	-0.0631	0.0118	-0.0077	0.0762	-0.0941
MB	0.0112	0.0037	0.0005	-0.0228	0.0602
SK	-0.0149	0.0050	-0.0024	-0.0224	0.0112
AB	-0.0145	0.0284	0.0013	-0.0114	-0.0367
BC	-0.0558	0.0087	-0.0314	0.0202	-0.0301
YU	-0.0295	-0.0038	-0.0034	0.0254	0.0012
NW	-0.0412	-0.0324	0.0183	-0.0159	0.0302
NU	0.0348	-0.0975	0.0760	-0.0835	0.0271
YSM_2	0.0158	-0.0046	-0.0100	0.0155	-0.0484
YSM_3	0.0351	-0.0223	0.0052	0.0059	-0.0272
Years of Arrival_2	0.0306	-0.0526	-0.0195	0.0742	-0.0359
Years of Arrival_3	0.1101	-0.0487	-0.0159	0.0518	-0.0331
Years of Arrival_4	0.1414	-0.0391	0.0062	0.0035	0.0151
Urban	0.0086	-0.0166	0.0051	0.0175	0.0205
Blue-collar Worker	0.0036	-0.0377	0.0516	-0.0371	0.0122
Other	0.0985	-0.1582	0.0648	-0.1450	0.0144

⁸ Bold indicates that these coefficients are not significant at the 5% level, significant otherwise.

Age at Migration	0.0257	-0.0646	-0.0199	-0.0404	-0.0494
Imm_LowUniver	-0.0493	0.0895	-0.0800	0.0393	-0.0696
Data2008	0.0077	0.0089	0.0272	0.0042	-0.0263
Data2003	0.0159	0.0186	0.0356	-0.0203	0.0015

Regress Statistics: P-Values

	Chronic Conditions	"Better" Health	Daily Smoker	Regular Drinker	Eat Fruit/Veg Less than 5 Times/Day
Age_1	0	0	0	0	0
Age_3	0	0	0	0	0
Age_4	0	0	0	0.002	0.044
Age_5	0	0	0	0.003	0.055
Male	0	0.025	0	0	0
Lower Than University Degree	0	0	0	0	0
Immigrants	0	0.002	0.004	0	0
EngSpekDev	0.037	0	0	0	0.002
RestEur	0.039	0.048	0	0	0
MidEandWAsia	0.053	0.014	0.01	0.108	0.015
Sasia	0.045	0.042	0.013	0.001	0
DevlpAisa	0	0.017	0.032	0.045	0.035
SandLatinAme	0.036	0.015	0.017	0	0
OtherCount	0.039	0.061	0.007	0.035	0.029
Now Married	0	0	0	0	0
NL	0.336	0	0.316	0	0
PEI	0.202	0.162	0.097	0	0
NS	0	0.008	0.04	0	0
NB	0.025	0	0.016	0	0
QC	0	0.024	0.07	0	0
MB	0.034	0.047	0.094	0.038	0
SK	0.012	0.014	0.072	0.022	0.027
AB	0.007	0.002	0.027	0.019	0
BC	0	0.018	0	0.006	0
YU	0.112	0.061	0.081	0.17	0.095
NW	0.045	0.049	0.024	0.047	0.016
NU	0.386	0.014	0.018	0.036	0.047
YSM_2	0.035	0.049	0.045	0.454	0.046
YSM_3	0.034	0.004	0.048	0.844	0.042
Years of Arrival_2	0.03	0.019	0.046	0.008	0.033
Years of Arrival_3	0.006	0.041	0.049	0.044	0.013
Years of Arrival_4	0.001	0.018	0.041	0.019	0.007
Urban	0.048	0.002	0.137	0.001	0
Blue-collar Worker	0	0	0	0	0.044
Other	0	0	0	0	0.04
Age at Migration	0.038	0	0.052	0.005	0.001
Imm_LowUniver	0.001	0	0	0.005	0

Data2008	0.245	0	0	0.521	0
Data2003	0.007	0	0	0	0.792

Curriculum Vitae

Candidate's full name: Haorui Wang

Universities attended:

University of Prince Edward Island, Charlottetown, PE, Canada, 2011-2013, B.A. in Business Administration

YanBian University, YanJi, JiLin, China, 2008-2010, B.A. in Political Science