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Understanding the 'Health Immigrant Effect' in Canada

by
Catherine Deri

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uOttawa

Faculté des sciences sociales
Faculty of Social Sciences

CP 450 SUCC. A
OTTAWA (ONTARIO)
CANADA K1N 6N5

P.O. BOX 450 STN. A
OTTAWA, ONTARIO
CANADA K1N 6N5

Understanding the 'Healthy Immigrant Effect' in Canada

Catherine Deri[1]

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Abstract:

The 'Healthy Immigrant Effect' (HIE), as it is dubbed in the social science literature, is the finding that recent immigrants are healthier than the average locally born resident but that over time this health advantage declines. In the existing literature, this phenomenon is documented using only cross section data. The limiting problem with drawing conclusions about immigrant health dynamics from a cross section alone is that a researcher cannot separately identify changes in health with each year that an immigrant spends in a host country from fixed differences between entry cohorts. In this paper, I exploit the panel nature of the Canadian National Population Health Survey to document the HIE using four measures of health including both subjective and objective measures. I find evidence of the HIE, for all measures of health I consider. Further, interesting patterns emerge for different cuts of the data. Age at immigration and sex matter. The HIE is a phenomenon affecting only those that immigrate at older ages. As well, I find that the HIE affects both men and women, but the effects are found in different measures of health.

JEL Code: I12
Key Words: Immigration, Health

Résumé:

Tel que nommée dans la littérature des sciences sociales «l'effet de l'immigrant en bonne santé» (EIBS), est la découverte que les immigrants récents sont en meilleure santé comparés aux résidents nés localement, mais au fils du temps cet avantage de santé diminue. Dans la littérature courante, ce phénomène est documenté en utilisant des enquêtes ponctuelles. Le problème limitant de prendre des conclusions sur la dynamique de la santé des immigrants d'une enquête ponctuelle est que le chercheur ne peut identifier séparément les changements de santé avec chaque année que l'immigrant passe dans son pays d'hôte des différences fixes entre les cohortes d'entrées. Dans cet article, j'exploite la nature panel de l'Enquête nationale sur la santé de la population Canadienne pour documenter l'EIBS en utilisant quatre mesures de santé, incluant des mesures subjectives et objectives. Je trouve de l'évidence de l'EIBS pour toutes les mesures de santé que je considère. De plus, des tendances intéressantes émergent pour différents sous-groupes de la population. L'age d'immigration et le sexe ont de l'importance. L'EIBS est un phénomène qui affecte seulement ceux qui immigrent à un age plus élevées. Aussi, je trouve que l'EIBS affecte les hommes et les femmes, mais les effets sont trouvées dans différentes mesures de santé.

Code JEL: I12
Mots clés: Immigration, Santé

[1] Catherine Deri, Department of Economics, 200 Wilbrod Street, University of Ottawa, Ottawa, Ontario, K1N 6N5, Canada. Telephone (613)562-5800 x 1690. Fax (613)562-5999. Email cderi@uottawa.ca. I am grateful to my PhD thesis supervisors Michael Baker, Mark Stabile and Aloysius Siow for their guidance and advice. I would also like to thank Dwayne Benjamin, Ig Horstmann and Mara Lederman for many helpful comments. I gratefully acknowledge financial support from an Ontario Graduate Scholarship, CIHR grant MOP53133 and the Institute for Policy Analysis at the University of Toronto. All remaining errors in this paper are my own.

I. Introduction

One of the most striking findings in the literature on immigrant health is the 'Healthy Immigrant Effect', the finding that recent immigrants are healthier than the average locally born resident, but that over time this health advantage shrinks or even disappears. Evidence of this phenomenon comes from Canada and elsewhere and spans a variety of health outcomes including self-reported health, the incidence of various chronic conditions (such as heart disease, diabetes and cancer), mental health and perinatal health.

A careful understanding of this effect and its magnitude is important for several reasons. It can promote understanding of any social burden immigrants' pose on the Canadian population[2]. Further, as immigrants represent over one sixth of the population, measures of the average health of Canadians – often cited and important statistics in international comparisons – will be affected[3]. Finally, since employability is one of the main characteristics by which immigrants gain admittance to Canada and since health is essential for productivity in the workforce, a decline in the health of immigrants with tenure may undermine one of the main goals of Canadian immigration policy[4].

There is however, a serious limitation in most of the existing studies. Conclusions are drawn from a single cross section – thus potentially confounding cohort and assimilation effects. There are a few relevant exceptions where pooled cross section analysis has been done. Laroche (2000) pools the 1985 and 1991 General Social Surveys. Instead of looking at the effect of tenure in Canada, however, she examines the effect of age at immigration. Recall, age = age at immigration + time since immigration, so it is not possible to account for all three at the same time, owing to collinearity. Antecol and Bedard (2003) use the 1989 to 1996 U.S. National Health Interview Surveys to examine whether the body weight

[2] The concern is the potential for the average cost of immigrants' use of publicly provided health services to exceed the average contribution immigrants make through taxes for these services.
[3] In 1996, one sixth of the population was foreign born. One in five children was an immigrant or a child of an immigrant (Kinnon 1999).
[4] Canadian immigration policy requires that the economic class of immigrant applicants be screened through a 'points system' that puts heavy emphasis on the migrant's intended employment. In 2001, 61 percent of all immigrant applicants belonged to this class. In 1992, 43 of the 70 points required for immigration could be obtained from the migrant's intended occupation. (See Grant 1999b, and references therein).

of immigrants to the US converge to American weights. Finally, McDonald (2003) uses three Canadian Surveys to examine the HIE for a subset of the measures of health used here.

The problem with drawing conclusions about immigrant health dynamics from a cross section alone, is that a researcher cannot separately identify changes in health with each year that an immigrant spends in Canada from fixed differences between entry cohorts. That is, a researcher cannot disentangle the story of declining health following immigration from either of the following: a story of increasing 'health quality' of immigrants that have immigrated to Canada over time, or a story of selective emigration such that the healthier immigrants emigrate again *from* Canada resulting in a declining average health of the immigrants that remain.

A similar problem was found in the literature on immigrant earnings assimilation. Observed in a cross section researchers consistently found that 1) immigrant earnings at the time of immigration were significantly lower than those of comparable locally born residents but that 2) immigrant earnings grew more rapidly than those of comparable locally born residents.[5] Borjas (1985) challenged the earlier work, arguing that the steepness of the earnings profile of immigrants observed in cross section was the result of declining "quality" of subsequent immigrant cohorts. His work using two US censuses allowed him to conclude, "cross-section studies of immigrant earnings provide useless and misleading insights into the process of immigrant assimilation into the labour market" (p485).

The goal of this paper is to address this problem in the context of the HIE. I employ data from three cycles of the Canadian National Population Health Survey (NPHS), a nationally representative survey containing information on respondent's health, health service utilization, and various socio-demographic characteristics. I exploit the panel nature of the data to determine whether the documented decline in immigrant health with duration in Canada can be explained by an increasing health quality of immigrants over time, such that newer immigrant cohorts are simply healthier than their predecessors.

[5] See Bloom and Gunderson (1991) and references therein.

I have several interesting results. The main finding is that the HIE is robust to the inclusion of cohort and year effects for all four measures of health included in the study. In all cases the magnitude of the HIE is found to be strongest in the first years in Canada and is significant in size. For example, the first 10 years in Canada is found to increase the likelihood of reporting an activity limitation by 9.2 percentage points (184 percent) relative to an observationally identical newly arrived immigrant[6]. That the effect is only present in the first number of years in Canada sheds some light on the driving cause(s) of the HIE. It suggests that the decline in health is caused by something (or things) that develop quickly—thus ruling out such behaviours as smoking that in general take much longer than ten years for the ill effects to show. Further, interesting patterns emerge for different cuts of the data. Age at immigration matters. The HIE is a phenomenon affecting those that immigrate at older ages. As well, I find that the HIE affects both men and women, but the effects are found in different measures of health.

The remainder of the paper proceeds as follows. I begin by summarizing the existing literature on immigrant health and the HIE. I then summarize the data used in this study as well as the measures of health I examine. Next, I present the empirical strategy for identifying the 'decline in immigrant health'. I follow this with the results and a series of specification checks. I conclude with a brief discussion.

II. Literature Review

There are two parts to the HIE. The first part addresses the idea that there is some underlying selection taking place such that all else equal, it is the healthier immigrant that will immigrate. The corresponding empirical prediction is that newly arrived immigrants should be healthier than natives of the host country.

A recent paper by Jasso et al. (2003) focuses primarily on this issue of selectivity. The authors propose a simple model in which migration is chosen if the gains from migration outweigh the costs. Factoring into the decision are the expected income in both countries (including country specific price of skills), costs of moving, both monetary costs associated with mobility and non-pecuniary costs such as

[6] Having an 'activity limitation' means being restricted in ability to prepare meals, shop for groceries and other necessities, do housework, do heavy household chores, take personal care or move about the house.

cultural differences between the two countries, availability of health care and the distance to friends and family. Health enters the model in many ways but primarily through its effects on earnings; better levels of health are associated with increased human capital (Grossman 1972). The model predicts that healthier people have higher gains from migration and thus migrants will be positively selected based on health. Using data from the US New Immigrant Pilot Survey (NIS-P) they find robust evidence of these predictions.

This finding of selectivity has been documented and discussed in many other studies. Hyman (2001) summarizes evidence from Canada. Donovan et al. (1992) document the same finding for Australia, as do Stephen et al. (1994) using data from the United States.

These studies suggest many possible reasons for this finding. The most commonly cited reason is that those in the worse states of health are less likely to migrate – both because of the stresses and difficulties involved with relocating to a new country and because Canada's 'point system' based immigration policy puts heavy emphasis on the migrant's employability, which itself requires a given level of health[7,8]. Another aspect of immigration policy is also thought to be part of the explanation. "As a rule, immigrant applications will be made inadmissible under the excessive demands clause if their expected usage of health services exceeds that of the average Canadian (evaluated at $2,500/year); if their admission may displace a Canadian resident from obtaining services; or if the required services are not available or accessible" (Laroche 2000 p53). However, in 1996, less than two percent of immigrants were refused admission on the basis of their medical exams of which 86 percent could be considered for future admission (Laroche 2000).

The second part of the HIE – that there appears to be a narrowing of the immigrant health advantage, or that the health of immigrants appears to be declining after immigration – is arguably the more interesting. Hyman (2001) provides a good review of the evidence both in the Canadian context and abroad. Two more recent works are worth noting. Ali (2002) uses the 2000/2001 Canadian Community

[7] See for example Chen, Wilkins and Ng (1996) and references therein.
[8] Recall it is only the economic class of immigrant applicants that is screened through the 'point system'. In 2001, 61 percent of immigrant applicants belonged to this class.

Health Survey (CCHS) and finds that immigrants have lower rates of depression and alcohol dependence than Canadian Born residents – and that among immigrants, more recent immigrants have the lowest rates of depression and alcohol dependence and those with the longest tenure in Canada have the highest. This difference remains even after controlling for standard observables such as age, sex, marital status, income and education. Perez (2002) also uses the CCHS but considers how the reporting of physical conditions changes with time since immigration. He finds that immigrants have superior health in term of chronic conditions, even after controlling for observables, and that the odds of reporting any chronic condition rises with time in Canada[9,10].

Again the literature suggests many possible explanations for this narrowing of the immigrant health advantage. Changing health behaviours such as smoking, alcohol consumption or the adoption of a North American diet is one possibility. Another explanation could be access barriers to health services – either due to a general lack of information and inexperience with the Canadian health care system, or language barriers. Indeed there is concern about access barriers to health service utilization in Canada. The interim report on the future of health care in Canada by the Romanow Commission (2002) classifies immigrants as a marginalized group with potential cultural, linguistic and class barriers to health services. A third explanation could be the impacts of stresses associated with the transitions into a new country. Using longitudinal data on Australian immigrants, Kennedy (2002) finds that such stresses combined with the additional stress due to unemployment affects the mental health of immigrants.

There is one paper that finds that immigrant health *improves* with tenure. Jasso et al. (2003) use of the US New Immigrant Pilot Survey (NIS-P), a telephone survey that followed a nationally representative sample of new legal immigrants to the United States up to three times in the first year after immigration. These results reflect the experience of immigrants that arrived during July and August of 1996.

[9] He also examines health behaviours such as smoking and alcohol consumption. He finds that there are differences in these behaviours that vary by immigrant status and length of time in Canada.
[10] See also Chen, Wilkins and Ng (1996) and Stephen et al. (1994) for evidence on the 'health decline of immigrants' using Canadian data.

III. Data

The main sources of data are the health files of the first three cycles, 1994-95, 1996-97 and 1998-99 of the National Population Health Survey (NPHS). As there is a longitudinal component the survey: a subset of respondents from the first cycle was re-interviewed in the second and third cycles, I have repeated observations for 24 percent of the sample. I restrict my sample to include only individuals aged 12-65. This is done to make the results comparable to other studies and to focus attention on the working age population. As well, selectivity issues may be different for older immigrants. The group of older immigrants, those that I exclude from my sample, includes both of the following: those that immigrated at young age and thus were positively selected on their health, and those that immigrated at older ages, whose selectivity may be in fact in the reverse direction. This reverse direction selectivity suggests that less healthy individuals will want to immigrate to Canada for increased access to health care and services (Jasso et al. 2003).

The first panel of Table 1 reports, for each of the three survey cycles, means for the key variables used in this study for each of the following groups: 1) Canadian born residents, 2) recent immigrants (having arrived in Canada within 10 years of the survey) and 3) earlier immigrants (having arrived in Canada more than 10 years prior to the survey).

The first thing to note is that the sample size of cycle 2 is more than four times that of the other two cycles. In that cycle three provinces, Alberta, Ontario and Manitoba, provided extra funds to increase the number of households surveyed.

Immigrants in this data are on average older than the Canadian-born population – the average age of the recent immigrant subgroup is 32.5 years and is statistically significantly lower than both the Canadian born subgroup (37.0 years) and the earlier immigrant subgroup (45.6 years)[11]. Recent immigrants in this sample are more likely to be 'married' than the Canadian born (57 percent relative to

[11] The average age for all immigrants is 41.46 years.

54 percent) and less likely to be married than the earlier immigrants (68 percent) (both differences are statistically significant). Finally, the average household size for recent immigrants (3.26 family members), is statistically significantly larger than both Canadian born (2.90 family members) and earlier immigrants (2.84 family members).

A striking difference between the two immigrant subgroups is the proportion of the sample for which English or French is the respondent's mother tongue: 28 percent for recent immigrants but 51 percent for earlier immigrants[12]. This is consistent with the trend in Canadian immigration; the proportion of immigrants from Asia more than tripled (from 19 percent to 62 percent) between 1971 and 2001. During the same period, immigration from Europe fell from 43 percent to 17 percent[13]. This is very similar to the patterns in this data – 43 percent of recent immigrants in the sample are from Asia whereas only 15 percent of the earlier immigrants are from Asia. Twenty nine percent of the recent immigrants in the sample came from Europe while 63 percent of the earlier immigrants are from Europe.

On average immigrants are more educated than the Canadian born. Twenty seven percent of the Canadian born sample has not completed high school where as only 22 percent of the recent immigrant subgroup and 18 percent of the earlier immigrant subgroup have not. These differences are statistically significant.

The measure of income I use in this study is a derived variable called Income Adequacy. This variable takes into account both household income and household size[14]. There are five categories where 1 represents the lowest income adequacy quintile and 5 represents the highest. Nearly 16 percent of the respondents did not provide information on their income. As such they are not included in the analysis[15,16]. The variable 'low income' that I report in the table refers to being in the lowest two income

[12] This difference is statistically significant.
[13] These figures have been calculated from CANSIM II series V16, V17 and V27.
[14] There is another measure of income in the NPHS: a categorical measure of total household income from all sources. These are reported in 11 categories where the increments range from $5,000 to $10,000. The main findings of this chapter are consistent across both measures of income.
[15] A comparison of means of age, sex, educational attainment, household size and immigrant status between those that did and did not report their household income revealed no patterns. In Deri (2004) I report OLS regressions

adequacy quintiles. Fifteen percent of the Canadian born subsample belong to low-income families, whereas 28 percent of recent immigrants are low income and only 13 percent of earlier immigrants are low income. Again, these differences are statistically significant.

That there are such differences in observables across these broadly defined immigrant subgroups (early and recent) has important implications for this study. It highlights the potential dangers of examining the HIE in cross section – as it highlights the need to carefully control for differences in observables between cohorts.

I focus on four measures of health. *Poor health* (PHEALTH) is based on a measure of global health. Respondents were asked to rate their health on a scale of 1-5: (1) excellent, (2) very good, (3) good, (4) fair or (5) poor. This measure of health has been found to capture information on individual's health and well being and is strongly correlated with mortality and the onset of many serious health conditions, even after controlling for socio-economic status and medical doctor's objective health assessment as well[17]. PHEALTH takes on the value 1 if the respondent reported him/herself to be in 'fair' or 'poor' self reported health.

Activity Limitations (ACTLIM) takes on the value 1 if the respondent reports being restricted in ability to prepare meals, shop for groceries or other necessities, do housework, do heavy household chores, take personal care or move about the house.

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including these observations by creating an additional category in income adequacy for them. This strategy is employed for example in Currie and Gruber (1996) footnote 19. This analysis shows comparable results to those presented here, suggesting no significant harm in omitting them from the main results. As I could not instrument for the missing income category, these observations are dropped from the main results of the paper for which IV techniques are used.

[16] There is some debate as to what is the relevant measure of wealth that affects health. Absolute wealth is believed to affect health through the increased access to health promoting goods and services. Relative wealth has also been shown to affect health through the increased levels of stress associated with being relatively worse off. While on average an immigrant's economic situation increases on arrival and the economic gains persist with tenure in Canada, there is large heterogeneity in the economic success of immigrants (Jasso et al 2003). As such, while I expect income to be protective of health, I cannot control for how the relative wealth of a family changed upon immigration. While a family may look like they are doing well in Canada and thus *ceteris peribus* should be in good health, it may be that the family is relatively doing worse than before they arrived impacting negatively on their health. Conversely, it may be that while by Canadian standards the family is doing poorly, it may be a large improvement from their situation prior to arrival in Canada, thus positively impacting on their health.

[17] See Meer, Miller and Rosen (2003) and Ettner (1996) and references therein.

Body Mass Index (BMI) is an indicator of total body fat or obesity. It is calculated as (weight in kilograms)/(height in meters)^2. Obesity has been shown to exacerbate many chronic conditions, have negative effects on patient's health related quality of life, to be associated with deteriorating functional status and increasing levels of distress, and is a strong predictor of mortality[18, 19]. It is constructed from the respondent's self reports on their weight and height for respondents aged 20-64 and excludes pregnant women.

Presence of a chronic condition (CC) takes on the value 1 if the respondent reports having any of the following 13 chronic conditions: asthma, arthritis, back problems, hypertension, migraines, bronchitis, sinusitis, diabetes, epilepsy, heart disease, cancer, ulcers or stroke – as diagnosed by a health care professional[20].

I use both subjective and objective measures of self reported health. PHEALTH is clearly the more subjective measure. The concern with subjective measures is that respondents may interpret 'health' differently, thus making responses difficult to compare. For example, a person who has had a stroke may still report "excellent health", interpreting the question as asking about health conditional on past ailments. However, as described above, there is strong evidence that even these subjective measures have excellent explanatory power in predicting many health outcomes. Still, many researchers prefer to use the more objective measures such as CC, ACTLIM or BMI. These however come with their own problems. For example, using the NPHS linked to provincial health records, Baker, Stabile and Deri (2001) show that there are significant errors in self-reporting of chronic conditions.

The second panel of Table 1 provides the means for these measures of health for the three cycles by immigrant status. Again because of sample size, I refer to the means from the 1996 cycle. Recent

[18] See Hakim, Wolf and Garrison (2002) and Costa (1996) and references therein.
[19] The limits of the BMI are that it will overestimate body fat in athletes and those with muscular builds and underestimate body fat in older individuals and those who have lost muscle mass. See http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/risk.htm#limitations for additional details on BMI.
[20] This is not the complete set of chronic condition asked about in the survey. I exclude those that are more common in older individuals: Alzheimers, cataracts, glaucoma and urinary incontinence, the conditions not asked about in all three cycles: thyroid conditions and chrone's / colitis, as well as questions pertaining to allergies.

immigrants, as expected due to selectivity report themselves on average in better health. Fifteen percent of Canadian born respondents report having an activity limitation – whereas only 5 percent of recent immigrants do[21]. Forty two percent of Canadian born respondents report having a chronic condition whereas only 25 percent of recent immigrant respondents. Nine percent of Canadian born respondents report being in poor health whereas only 5 percent of recent immigrant respondents. And finally, the average BMI of Canadian born respondents is 25.63, higher than the 23.64 average BMI of recent immigrant respondents. All these differences are statistically significant. As the average age of the long-term immigrant respondents is much higher, it is expected that the average measures of health will be poorer.

IV. Empirical Strategy

Consider documenting the HIE using cross section data alone, say by running the following:

(1) $Health = \alpha_1 + \alpha_2 YSM + \alpha_3 YSM^2 + \alpha_4 X + \sum_j \theta_j Country_j + \varepsilon$,

where the dependent variable is one of the measures of health described above. *YSM* and YSM^2 are the number of years since immigration (equal to 0 if Canadian born) and its square, *X* is a vector of all relevant personal characteristics and *Country* are a set of dummy variables for country of birth included to account for the large heterogeneity that exists across immigrants from different parts of the world. The omitted country of birth category is Canada.

The coefficients of Years Since Migration (YSM) and its square (YSM^2), α_2 and α_3, measure the average percentage point change in health with each year that an immigrant spends in Canada, *beyond* the

[21] Notice that the mean for the Activity Limitation variable is higher for the 1994 cycle than the two subsequent cycles. As there is no codebook available from Statistics Canada for the first cycle, I contacted them to inquire about this difference. They indicated to me that the construction of this variable did differ across cycles. In the calculation of the Cycle 1 (1994) Restriction of Activity Flag, the category "2-no" included "don't know" and "refusals" but in Cycles 2 and 3 (1996 and 1998), the category "2-no" included only responses of "no". This however would have the effect of increasing the denominator for the mean of Activity Limitations Cycle 1 and thus a *lower*, not higher mean in Cycle 1. To verify that such a difference is not driving my results, I report regressions for the main specifications of this chapter in Deri (2004) excluding Cycle 1.

change that comes with age and the other observables[22]. The base or reference group in this specification is those with YSM=0, ie the Canadian born respondents[23].

The HIE story predicts that the θ_j's, the coefficients of the country of birth dummies, would be negative – a newly arrived immigrant is less likely to be in poor health than the observationally identical Canadian born, and the combined effect of α_2 and α_3 would be positive – the probability of poor health increases with tenure in Canada.

As has been pointed out by Borjas (1985), Bloom and Gunderson (1991) and others, the identification of *YSM* coefficents in (1) rests on one critical assumption – that there is no omitted variable correlated with *YSM*, excluded from the regression. Suppose that there exists an unobserved cohort specific fixed effect in the error term ε, say u that is decreasing over time; that is, $u_{\text{recent}} < u_{\text{early.}}$ Put another way, suppose there is some unobservable factor, call it 'average health quality', that is causing more recent immigrant cohorts to be permanently healthier than their earlier counterparts. Then, the estimates of α_2 and α_3 will be capturing not only the average percent point change in health with each year that an immigrant spends in Canada, but also the average difference in this unobservable factor across cohorts. If the inequality were as above, there would be a positive bias to the cross section estimates of YSM.

As an example, suppose earlier immigrants came from countries/areas with significantly poorer health conditions or inferior medical technology than the more recent immigrants – causing a permanent health difference across entry cohort. If this factor were not accounted for in the regression framework above, it may appear in the estimated coefficients of YSM that health is declining after immigration whether or not such a decline in fact exists.

[22] This is a standard assumption in the Grossman model (1972) for the demand for health. In the model, one is initially endowed with a level of health capital that depreciates over time but can be augmented with investments in health: such as seeking medical care and eating healthier food.

[23] In this paper I use native Canadians as the base/reference group. Alternative reference groups used in the literature on immigrant earnings include: a specific entry cohort, or immigrants more with 24 years in the country. (See Baker and Benjamin, 1994, and references therein). The most ideal reference group for examining changes in the health of immigrants might arguably be a set of comparable residents from the immigrants' home countries. Unfortunately such data is not available.

To be able to separate out across- cohort effects from the within cohort effects, I pool the three survey cycles together to create a quasi-panel. Recall, pooling will not create a true panel as I only have repeated observations for 24 percent of the respondents in my sample. In this manner, I have observations for a given entry cohort at three different points in time. This allows me to separately identify both cohort of entry and YSM effects in the same regression[24]. I estimate

$$(2)\quad \begin{aligned} Health = {} & \beta_0 + \beta_1 Income\ Adequacy + \beta_2 YSM + \beta_3 YSM^2 + \beta_4 X \\ & + \sum_j \phi_j Cohort_j + \sum_k \delta_k Cohort * Country_k + \sum_l \gamma_l Cycle_l + \mu \end{aligned}$$

where *Income Adequacy* is the measure of income described above. *YSM* and YSM^2 are again the number of years since immigration (equal to 0 if Canadian born) and its square, *X* is a vector of personal characteristics which include age, age^2, sex, marital status, household size, educational attainment, province of residence, work status (a set of dummies for whether the respondent is currently working – omitted category, did not work in the past 12 months or is not currently working but did work in the past 12 months), an indicator for the presence of children at home, urban residence and whether English or French is their mother tongue[25]. *Cohort* are dummy variables for the entry cohorts of the immigrants (since 1994, 1990-1994, 1986-1990, 1982-1986, 1978-1982, 1974-1978 and before 1974) and *Cycle* are a set of dummy variables for the survey cycle the observation came from. To attempt to account for the large heterogeneity that exists across immigrants from different parts of the world, dummy variables for country of birth are created. The country groups are 1) North America and Oceania, 2) South and Central America and the Caribbean, 3) Europe 4) Africa and 5) Asia. While using Canada as the omitted category would provide easily interpretable results, it is not possible to include both a set of cohort dummies and a set of country dummies if both sets of dummies are to be interpreted as deviations from Canadian born

[24] While the NPHS provides the opportunity to address the limitations of cross section data described above, it itself has a limitation. The three cross sections are relatively close together (only four years separates the first and last cross section), which potentially makes separate identification of YSM and cohort of arrival effects more difficult. As more cycles of the survey become available and we are able to observe more YSM for each cohort of arrival, better estimates of HIE will be obtainable.

[25] As pointed out in Ettner (1996), marital status and the presence of children may be endogenous to health if it the case that healthier people are more likely to be married and have children. The lack of adequate instruments prevents me from addressing this issue further.

respondents. This is because the sum of each set of dummies included in the regression would be equal, and thus collinear. Instead, I include the full set of cohort dummies and interact each with the set of country of birth dummies excluding Europeans, the largest country group. The interpretation of the cohort dummies answers: How much healthier is a European immigrant from each of the seven cohorts relative to an otherwise identical Canadian born. To explain the interpretation of the interactions terms, consider the interaction of D1990-1994*North America. The estimated coefficient tells whether there is any deviation in health between an immigrant arriving between 1990-94 from North America and a comparable immigrant from the same cohort arriving from Europe. More simply put: the estimates of the cohort dummies are for the excluded country of birth (Europe), and the interactions with the county of birth dummies reveal the heterogeneity across source countries. This specification allows me to test 1) Whether European immigrants from all cohorts are in better health than otherwise identical CB (individual and joint significance of cohort dummies), 2) Whether immigrants from one country group are in better, or worse, health than European immigrants for each cohort of immigration (individual and joint significance of interaction terms).

Income Adequacy can be viewed as a measure of socio-economic status (SES), and a positive association between health and SES is well documented in the literature. The relationship holds over time, for all ages, places and genders, for different measures of health and SES[26]. To address this issue of endogeneity of income I use an instrumental variables (IV) strategy creating instruments for Income Adequacy using data from the 1996 Canadian Census. I create three instruments: the percentage of the respondent's Consolidated Census Sub-Division (CCS) below the 1996 low income cut-off, the percent unemployed in this subdivision and the percent in this subdivision that have post secondary degrees or diplomas[27]. It is hypothesized that all three of these affect household income – for example through an

[26] See Marmot and Wilkinson (1999), Adams et al (2002) and references therein.
[27] CCS are groups of municipalities as defined by provincial legislation.

effect on wages, but do not affect an individual's health other than through income[28]. These instruments are in the same spirit as those in Ettner (1996)[29].

Importantly, from the above specification I can also obtain an estimate of the average rate of change in health that is free of any fixed cohort of entry bias (β_2, β_3). These regressions are estimated using instrumental variables and robust standard errors corrected for clustering by individuals are reported[30].

Three attributes of this specification merit attention. First, the country/cohort specific fixed effects are assumed to be time invariant. That is, the unobserved factor of a given entry cohort/country group – estimated by the cohort dummies and its interaction terms – remains the same across the three survey cycles. This assumption would be violated if for example selective emigration caused systematic changes in the averages of these unobserved factors between survey cycles. I address this potential criticism in a later section. Second, the survey cycle effects are restricted to be common across all cohorts and across Canadian born and immigrants. This is a common and necessary restriction (See Baker and Benjamin, 1994, and references therein). This assumption would be violated if there were some exceptional situation, as for example the current outbreak of Severe Acute Respiratory Syndrome (SARS) in the Toronto area. In this case, one could imagine that there might be differential effects on immigrant cohorts, with those with higher Chinese composition – the group the virus hit hardest, more adversely affected[31]. Third, as pointed out in Baker and Benjamin (1994), this strategy restricts the effect of YSM of each cohort to lie along a common quadratic profile. Thus the estimate of YSM is a measure of the average effect across cohorts. The inclusion of up to a quartic in YSM did not alter my main findings. While this specification is standard in the literature, separate YSM paths are sometimes employed by

[28] This assumption would be violated if for example doctors only located in high income areas or the quality of care provided was higher in such areas.
[29] In her paper, Ettner examines the impact of income on various measures of health. She instruments an individual's income with the state unemployment rate, work experience, parental education and spousal characteristics. She finds a significant effect of income on health even after instrumenting.
[30] Recall that there is a panel component to the survey. As such, I have repeated observations for twenty four percent of my sample.
[31] To my knowledge there were no such exceptional situations between 1994-1998.

cohort of arrival and country of origin (see for example Crossley, McDonald and Worswick, 2001). Data limitations preclude this sort of analysis in this study.

V. Results

To motivate the main results of the paper, I graphically provide a simple way to see the two aspects of the HIE: selectivity and health decline. In Figures 1a-d I have plotted the unadjusted means for the four measures of health for Canadian born residents and four different immigrant cohorts (those arriving before 1974, those that arrived between 1975 and 1982, those that arrived between 1983 and 1990 and those that arrived since 1990) from the 1994 and 1998 survey cycles.

Figure 1a provides the means for self reported poor health. Members of the most recent immigrant cohort (arriving between 1990 and 1994) were approximately 5 percent less likely to report themselves in poor health than Canadian born respondents in the 1994 survey. This difference is a measure of how much healthier are newly arrived immigrants on average as compared to the average Canadian born – i.e. it is a measure of the selectivity by health of recent immigrants[32]. A similar health differential can be seen in the other three graphs: the 1990-94 cohort was 26 percent less likely to report chronic conditions, 13 percent less likely to report an activity limitation and had a derived BMI 2.5 points lower than the Canadian born respondents.

Next, between 1994 and 1998, the average incidence of poor self-reported health fell for Canadians and two of the older immigrant cohorts (indicating that on average their health improved over this time period). The remaining immigrant cohorts, including the three most recent, reported on average worse health in the 1998 survey relative to the 1994 survey. The difference in the levels of the bars for a given immigrant cohort minus the difference in the corresponding bars for Canadian born (a 'difference in

[32] This difference could also be capturing any misreporting of health by new immigrants. If new immigrants were hesitant to report their ill health, there would be the same discrepancy between the average of their reported health and that of Canadian born respondents. A discussion of this possibility is discussed in a later section.

difference') is a graphical measure of the second feature of the HIE, the decline in health following immigration. In all cases the biggest decline in health is observed for the most recent immigrant cohort.

Healthy Immigrant Effect

Table 2 provides the main regression results for this paper: the regressions for which the three survey cycles are pooled and cohort and survey year effects are taken into account, so that the effects of YSM can separately be identified from cohort of entry effects. For all measures of health the effect YSM is significant and positive. This is the main significant finding in the paper – the HIE is robust to the inclusion of cohort and year effects. The estimated effects are calculated and reported in the tables for the effect at 2, 5, 10 and 20 years since immigration[33].

The decline in health (increased probability of poor health) from living in Canada for the first 10 years, calculated by adding the estimated values for each year's decline in health. The worsening of health in the first 10 years is Canada is estimated to be a 9.2 percentage point increase (184 percent) in the probability of reporting poor health, a 9.2 percentage point (184 percent) increase in the probability of reporting an activity limitation, an 8.1 percentage point increase in the probability of reporting a chronic condition (32 percent) and an increase in BMI of 0.88 (3.73 percent)[34]. Is this a significant decline? To answer this, I compare the estimated declines just reported with the derived decline in health associated with aging from 40-50. The increased probability of reporting poor health associated with aging from 40–50 is 1.9 percentage points (less than the 9.2 percentage points due to the HIE). The increased probability of reporting an activity limitation is 2.8 percentage points (less than the 9.2 percentage points due to the HIE). Aging from 40-50 is associated with an increased probability of a chronic condition of 8.9 percentage points (slightly more than the 8.1 percentage points due to the HIE) and an increase in BMI of 0.60 (less than the 0.88 due to the HIE). According to this metric, the HIE is of significant magnitude.

[33] The effect at YSM=2,5,10 and 20 is the estimated percentage point increase in poor health associated with being in Canada 2, 5, 10 and 20 years relative to an observationally identical immigrant with only 1, 4, 9, and 19 years tenure.

[34] The percentages are calculated based on the means of the health measures for recent immigrants (less than ten years in Canada) presented in Table 1 from the 1996 cross section. As these means are quite low, the percentage increases seem large.

I examine the cohort dummies and their interactions with the country of birth dummies to see whether they also tell a story of declining *health quality* of immigrants. Recall that the excluded country of birth group is Europe and so the cohort dummies give the health differential between European immigrants from each cohort and otherwise identical Canadian born residents. The individual estimates for each cohort are all negative and significant in each of the four health regressions with the exception of D1978-81 in the chronic condition regression. This indicates that European immigrants from all cohorts are significantly healthier on average than Canadian born counterparts. The F statistics for the joint test of significance for the cohort dummies are provided at the bottom of the tables and are all significant at the 1 percent level. The cohort dummies do not decline in magnitude with tenure however, as the story of falling 'health quality' would predict. In fact, the dummies do not reveal any distinct pattern. So it is not possible to conclude that the unobservable 'health quality' of European immigrants is increasing or decreasing over time.

Differences in health between recent *non*-European immigrants and Canadian born, while not directly estimated in these specifications, can be retrieved by adding to the estimate of the 1994 cohort dummy the effects of the interaction between the D1994 and each other country group. These effects are presented in the fourth panel of Table 2. While not all estimates are individually significant, the F statistics for the joint test of significance for all D1994 cohorts (including Europe) are all significant at the one percent level. Thus, I again find evidence of selectivity by health in these specifications.

The remaining interactions terms are summarized in the F tests at the bottom of the Tables. I test whether there is joint significance of the interaction of the country of birth dummies for each cohort separately. This tests whether there is significant heterogeneity in health between European and non-European immigrants from a given cohort. For example, in the poor health regression, only the interactions with the D1990-94 cohort dummy are significant at the five percent level. This indicates that

there are significant differences in health between European and non-European immigrants from this cohort[35].

The justification for the instrumenting *income adequacy* is provided in the last panel of the table. The F-statistic for the test of joint significance of the instruments in the first stage regression is 49.64 (p-value=000). Further, in all four regressions the augmented Durbin Wu Hausman (DWH) test statistic is significant indicating that OLS is not consistent

I now turn to some of the specification checks and tests of some alternate explanations for the 'decline in health following immigration'.

Selective Emigration

One potential explanation discussed above for the decline in health of immigrants observed in cross section is selective emigration. If it is that selectively healthier immigrants are re-emigrating out of Canada, then the average health of the remaining immigrants will fall with YSM.

To determine the extent to which selective emigration is influencing my results is difficult. Ideally, this would require a very long panel of data that would follow a full set of newly arrived immigrants for a long period of time. This would allow the researcher to observe the dynamics of the health of immigrants that stayed, thus allowing an accurate estimate of the HIE, and to observe the health differential of those that left to quantify the bias selective emigration causes on the estimate of the HIE. As this is not possible with the current data, I am limited to examining whether patterns in the observables and unobservables in my data suggest that selective emigration could be driving my results.

Recall the discussion of the means of key variables from Table 1. There I compare two very broadly defined cohorts, recent immigrants (in Canada less than 10 years) and earlier immigrants (in Canada more than 10 years). I report that recent immigrants are on average more likely to be classified as 'low income', less likely to have completed high school but are in superior health. If the differences

[35] A full set of regression results with estimates for the individual interactions in available in the appendices in Deri (2004). In general an examination of the interaction terms and the joint test statistics from all four regressions revealed no discernable patterns.

across cohorts reflect nothing more than the changing trends in the composition of immigrants to Canada, then the inclusion of controls for cohort and survey cycle in the pooled cross section regressions is all that is required for the identification of the HIE. The relevant question is whether these differences reflect changes in the composition of existing cohorts due to emigration from Canada and in which direction this biases my estimates of the HIE. Suppose for the moment that all immigrant cohorts are all the same with respect to observables (say income, education and health) upon arrival and that average socioeconomic circumstances do not change with tenure. Then if selective emigration is at the root of the observed health decline it must be that the people leaving are the very healthy poor people. Even if we instead assume that socioeconomic circumstances improve with tenure, then to the extent that higher income is associated with better health outcomes it would seem that average health should be improving – not declining with YSM. Existing evidence on emigration patterns do not corroborate this story. Dryburgh and Kelly (2003) examine the emigration patterns of immigrants who obtained landed immigrant status in Canada in the 1980s. They find that those who are more highly skilled and their dependents are the most likely to migrate. Their results are consistent with existing evidence on US and Canadian out migration indicating that it is more prevalent among the relatively more successful[36].

To make this argument more formally, I examine measures of predicted health. I pool the three cross sections. Using the same specification as in (1) for the four measures of health, I obtain values for predicted health ($X\beta$) and compare the predicted means for each cohort in the different cycles[37]. For example: I compare the predicted health for the D1990-1994 cohort from the 1994 cycle with the predicted health for the same cohort but the 1996 and 1998 samples.

The results are presented in the columns 2-4 in Table 3. For almost all cohorts for each of the dependent variables, the predicted health increases, not decreases from the earliest survey 1994 to the most recent 1998. This is not entirely surprising – as the SES variables for immigrants, which are very

[36] See Jasso and Rosensweig (1987, 1990) and Lam (1987).
[37] I pool the data and compare predicted values, and later residuals, instead of making comparisons between different cross sections so as to make sure that the differences that I observe are not coming from differences in the estimated betas.

large determinants of health, improve with tenure. However, the same pattern appears for the Canadian born respondents – and there is no reason to expect this result. Still, based on observables, it does not seem that selective emigration is driving the HIE results of this paper. Even if selectively higher skilled, and healthier, individuals are leaving the country, the fact that the SES of those that remain is still increasing with tenure suggests that health should be improving as well.

As another exercise, I examine the residuals from this regression. The motivation for this comes from the literature on out-migration. There are two sets of models in this literature. According to imperfect information models, out-migration is an unplanned event, resulting from unrealized labour market expectations (Yezer and Thurston (1976), Allen (1979), Blejer and Goldberg (1980) and Lam (1986)). In these models, out-migration is more likely among those at the lower tail of the earnings distribution. Conversely, according to intertemporal substitution models, out-migration is a planned event among those that take advantage of temporarily favorable earning opportunities (Stark and Bloom (1986) and Fox (1987)). Under these models, out-migration should be more likely among those at the upper tail of the earnings distribution, those that are more active and successful in the labour market.

Because of the positive association between health and socio-economic status discussed above the models of out-migration have very different predictions on the relationship between out-migration and health. The imperfect information models predict that out-migration is more likely for those in the lower tail for the health distribution and the intertemporal substitution models predict that out-migration is more likely for those in the upper tail of the health distribution.

Bloom and Gunderson (1991) note that while the imperfect information model and intertemporal substitution model are very different in spirit, they share an empirical implication – namely, that the variance of the residuals in a migrant earning (and thus health) regression should be declining with YSM[38]. I examine patterns in the variance of residuals from the regressions above to see if the pattern is

[38] On the other hand, job-matching or asymmetric information models imply that the residual variance in earnings (and thus health) regressions should be increasing with YSM as employers become better able to determine the true productivity of workers.

suggestive of selective migration; that is whether measures of immigrant health tend to become less dispersed[39].

The results of this exercise are presented in the last three columns of Table 3. There is no discernable pattern for the standard deviations of any cohort of entry, in any of the four measures of health, looking across survey cycles. In summary, the exercises in this section do not indicate that selective migration is driving the HIE. Further, if cohort effects and cohort/country effects are similar, the assumption in the analysis above that cohort/country specific fixed effects are taken to be time invariant, does not seem to be very restrictive. There is no evidence that these change systematically across survey cycles.

Age at Immigration

A recent paper by Schaafsma and Sweetman (2001) examining immigrant earnings in Canada highlights the importance of age at immigration. They note in particular that one of the main variables for which points are awarded in the 'points system' that Canada has used since 1967 to assess the eligibility of the economic class of immigrant applicants, is age – making the age at immigration an important variable to understand.

There are many reasons to expect age at immigration to matter for an immigrant's health profile. On the one hand, being educated in Canada has been shown to translate into better success in the labour market and thus better health outcomes[40]. Thus perhaps immigration at an early age is protective of one's health. On the other hand, as it is believed that the young acculturate more easily, it may be that those that arrive at an early age are exposed to the bad health related activities of Canadian born residents and are then more likely to face worse health outcomes. That is, immigrants that arrive at young ages become more like natives in many ways, including health, and at a faster rate. Thus perhaps immigration at an early age is harmful for one's health. To assess the importance of age at immigration I follow the example

[39] A decrease in variance in the residuals may imply a decrease in heterogeneity in reporting of health conditions rather than a decrease in the heterogeneity in health.
[40] See Schaafsma and Sweetman (2001) and references therein for evidence that being educated in the host country yields better success in the labour market.

of Baker and Benjamin (1994), Borjas (1995) and Grant (1999a). I re-estimate the models separately for adult immigrants (immigrating after age 16) and child immigrants.

The results of this exercise are presented in Table 4. Again I focus the discussion only on the coefficient of YSM. Looking across the regressions for the immigrated-under-age-16 group, the coefficient of YSM is never significant. On the other hand YSM is significant with the predicted sign for all the measures of health for the over-16 group. Comparing the coefficients from Table 2, the effects of YSM are considerable larger. Now, using the same calculation as above, the first 10 years in Canada result in a 15 percentage point increase in the probability of reporting poor health, 13 percentage point increase in reporting an activity limitation, a 13 percentage point increase in reporting a chronic condition and an increase in BMI of 1.26. The HIE is thus a phenomenon affecting those that immigrate at older ages[41]. Note that it is not that people that immigrate at ages less than 16 are already as unhealthy as Canadian born – the joint test statistics for the significance of the D1994 effects for all countries indicate that they are in better health – but that there is no subsequent decline in health. BMI is the one exception where the joint test statistic is not significant[42].

By Sex

One could imagine many reasons why immigration could have different effects on the health of males and females. Men and women are known to have very different labour market experiences, differ with respect to their responsibilities at home, and perhaps more importantly, deal with stress differently. A review of the literature on how men and women deal with stress reveals some striking findings. First, hostility and marital strife have been found to have a much tougher negative impact on women than men. An experiment at the University of Ohio found that when exposed to such hostility, women's stress hormones

[41] Note that because BMI is only defined for respondents over 20, I lose almost all observations from the 1994 cohort for the Under 16 regression. I exclude both that cohort and the D1990-94 as there were too few observations to identify all the cohort/country cells.

[42] To better understand why those that immigrate at younger ages do not experience the decline in health associated with the HIE, I examine a related question: What difference does it make to health, that immigrants who arrive at different ages receive different proportions of their schooling in Canada? In Deri (2004) I test the hypothesis that Canadian education yields higher returns to health than foreign education. I cannot reject that domestic and foreign education have the same return to health based on the test statistic for the equality $\text{Education}_{\text{Canada}}=\text{Education}_{\text{Foreign}}$

(epinephrine, norepinephrine and ACTH) both rose faster than men's and stayed elevated longer (Kiecolt-Glaser 2003). In addition, women showed a decline in certain aspects of immune function. Second, women are found to deal with more stress. Alice Domar, a psychologist at the Beth Israel Deaconess Medical Center in Boston is cited saying that "Men worry about three things: their immediate family, their job and money." Further, "Women worry on a daily basis about up to 12 things – their immediate family, their job, money, their extended family, their friends, their kid's friends, the way the house looks, their weight, the dog etc." [43] Third, women may be better equipped to deal with stress. Studies from the Medicine Research Center at Duke University found that women have hormonal advantages for dealing with stress due to their higher estrogen levels in their bodies. Estrogen boosts the effectiveness of oxytocin, a stress-fighting hormone. Oxytocin has been found to decrease the stress hormone cortisol, which, in cases of long-term exposure to stress, has been shown to be associated with weight gain[44]. Thus if women experience more stress, they may self report themselves in worse health based on more subjective measures. Further, because stress raises blood pressure and cholesterol levels and suppresses the immune system, women may report themselves in worse health based on objective measures of health as well.

To test whether the effects are the same, I run the preferred regressions – IV including both cohort and year effects, for the two sexes separately. The results for this exercise are presented in Table 5. Here, again interesting patterns appear. The decline in health, represented by significant estimates of YSM appears for women only for two measures of health: poor health and activity limitations; and only for men only in the case of BMI. The coefficients for YSM in the case of chronic conditions are not significant, individually or jointly, for either sex. Thus, while the HIE affects both men and women, the effects are reflected in different measures of health. Now, using the same calculation as above, the first ten years in Canada result in a 12 percentage point increase in the probability of reporting poor health, a 13 percentage point increase in reporting an activity limitation, and an increase in BMI of 1.44 for men.

[43] See http://www.myhealthsense.com/F020813_womenStress.html for a more detailed discussion of the gender differences in stress levels and how they are dealt with.
[44] See http://my.webmd.com/content/article/14/1689_51226.

Certainly there are many stresses involved with immigration and assimilation processes. The evidence discussed above that the sexes experience different levels of stress and deal with stress differently may help explain why the HIE affects men and women differently.

The HIE: a limited time phenomenon?

Returning for a moment to Figure 1, the largest difference in health is observed between Canadian born and the more recent immigrant cohorts. This result is paralleled in the regression analysis. In the specifications above where I find evidence of the HIE, the decline in health appears to be limited to the first 10 years in Canada. To see whether recent immigrant cohorts are driving my results, I rerun the main specifications excluding the two most recent entry cohorts. The results of this exercise are reported in Table 6. For all four measures of health, the coefficients of YSM are no longer significant. This provides some insight into the determinants of the HIE. The cause(s) of the deterioration in health must therefore be something that develops fairly quickly. It rules out such explanations as immigrants developing poor health related activities like smoking that in general take much longer than ten years for the ill effects to appear.

Changes in Reporting Over Time

Another possible explanation merits attention. If new immigrants were reluctant to reveal their poor health when they first arrive, but over time begin to reveal their problems, the same pattern of YSM on measures of health would be found[45]. This mechanism is highly unlikely to affect BMI as this measure is derived from self-reports of the respondent's weight and height. It would require very forward thinking respondents to worry about how their reports of height and weight may be translated into some measure of poor health. However, other measures of health may be subject to this criticism. Plans for a future Statistics Canada survey include the collection of blood samples from the respondents. These samples could potentially be used to measure such components as cholesterol, adiposity, blood pressure, cardio-

[45] There is some evidence for example that there are some cultural differences in the interpretation of mental health questions and in the willingness to report symptoms of depression of alcohol dependence (Noh, Speechley, Kaspar et al., 1992)

respiratory fitness and pulmonary functioning. An analysis of these truly objective measures will be able to evaluate this story.

VI. Conclusion

Recent work and the media have drawn attention to the Healthy Immigrant Effect: the finding that recent immigrants are healthier than the average locally born resident but that over time this health advantage declines. One serious limiting factor of the existing work is that conclusions are drawn for a single cross-section, thus potentially confounding cohort and assimilation effects. In this paper, I exploit the quasi-panel nature of the National Population Health Survey to document this relationship using four measures of health including both subjective and objective measures.

I have several interesting results. The main finding is that the HIE is robust to the inclusion of cohort and year effects for all four measures of health included in the study. In all cases the magnitude of the HIE is found to be strongest in the first years in Canada and is significant in size. For example, the first 10 years in Canada is found to increase the likelihood of reporting an activity limitation by 8.6 percentage points relative to an observationally identical newly arrived immigrant. Interesting patterns are revealed by different cuts of the data. Age at immigration matters. The HIE is a phenomenon affecting those that immigrate at older ages – and this difference cannot be explained by differing returns between domestic and foreign education. Further, I find that the HIE affects both men and women, but the effects are reflected in different measures of health.

These findings can help direct policy. Evidence of the HIE suggests the need to target funding towards immigrant health, in both the areas of health maintenance and health promotion. The findings suggest that programs targeted at both men and woman, and in particular those who emigrated after their schooling years, might be more successful in addressing the narrowing of the immigrant health advantage.

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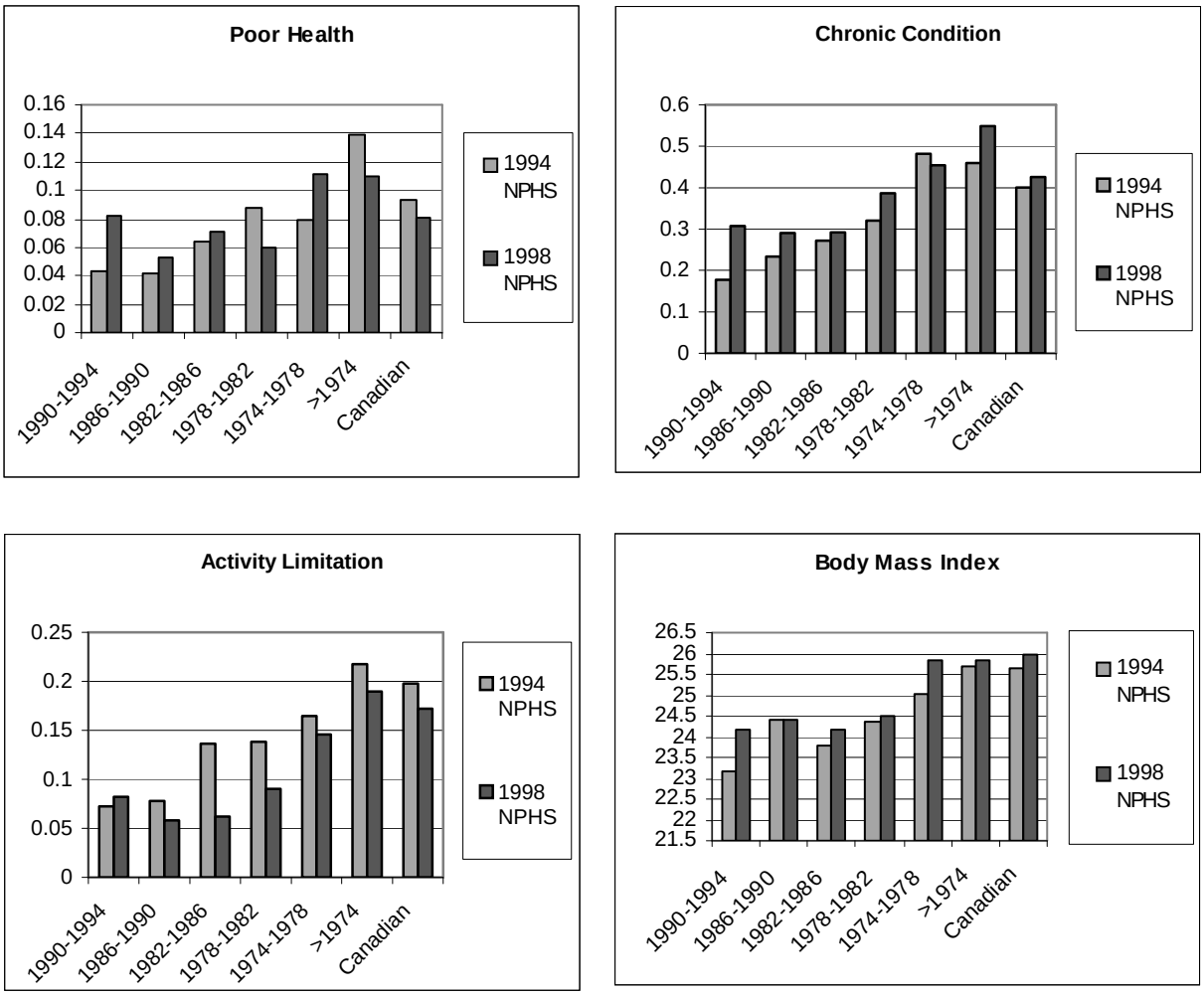
Figure 1: Healthy Immigrant Effect



Notes: Data are from Health Files of the 1994 and 1998 National Population Health Surveys. Sample includes respondents between 12 and 65 years of age. Reported are the unadjusted means for the five measures of health by tenure in Canada.

Table 1: Means of Key Variables

	Canadian Born			Immigrants<=10 years			Immigrants >10years		
	1994	**1996**	**1998**	**1994**	**1996**	**1998**	**1994**	**1996**	**1998**
Male	0.47	0.48	0.48	0.45	0.47	0.44	0.48	0.48	0.49
Age	36.58	37.00	37.49	31.81	32.47	33.11	44.59	45.55	45.74
Household Size	2.88	2.90	2.91	3.30	3.26	3.41	2.80	2.84	2.96
No High School	0.32	0.27	0.27	0.26	0.22	0.22	0.20	0.18	0.17
Low Income	0.20	0.15	0.14	0.31	0.28	0.26	0.18	0.13	0.13
Eng/Fr Mother Tongue	0.96	0.95	0.96	0.26	0.28	0.23	0.52	0.51	0.50
Married	0.55	0.54	0.55	0.57	0.57	0.58	0.65	0.68	0.67
Country of Birth									
Other North America and Oceania				8.09	7.29	7.21	11.05	9.56	10.74
South, Central America & Caribbean				16.39	13.79	10.96	9.40	9.73	11.07
Europe				24.07	28.71	22.97	61.36	62.99	54.43
Africa				6.64	7.37	8.86	3.61	2.96	4.10
Asia				44.81	42.83	50.00	14.58	14.74	19.67
Measures of Health									
Poor Health	0.09	0.09	0.08	0.04	0.05	0.05	0.12	0.11	0.10
Activity Limitation	0.20	0.15	0.17	0.08	0.05	0.05	0.20	0.14	0.15
Chronic Condition	0.40	0.42	0.42	0.20	0.25	0.27	0.44	0.45	0.48
BMI	25.64	25.63	25.97	23.56	23.64	23.90	25.40	25.28	25.46
N	11430	50413	10690	500	2431	666	1301	6638	1221

Table 2: Pooled Cross Section Health Regressions

	Poor Health	Chronic Condition	Activity Limitation	BMI
YSM	0.011**	0.0095*	0.011**	0.100*
	(0.0029)	(0.0049)	(0.0034)	(0.054)
YSM^2	-0.00016**	-0.00013*	-0.00013**	-0.0011
	(0.00004)	(0.00007)	(0.00005)	(0.00074)
Estimated Effect at:				
YSM=2	0.0103**	0.0090*	0.0100**	0.0953*
	(0.0028)	(0.0048)	(0.0033)	(0.0528)
YSM=5	0.0094**	0.0082*	0.0093**	0.0890*
	(0.0027)	(0.0046)	(0.0032)	(0.0510)
YSM=10	0.0078**	0.0070	0.0080**	0.0784
	(0.0026)	(0.0044)	(0.0031)	(0.0487)
YSM=20	0.0046*	0.0045	0.0055*	0.0573
	(0.0025)	(0.0043)	(0.0030)	(0.0474)
Income Adequacy	-0.130**	-0.114**	-0.137**	-2.94**
	(0.025)	(0.042)	(0.031)	(0.502)
Age	0.0098**	0.0064**	0.012**	0.288**
	(0.00086)	(0.0014)	(0.0011)	(0.020)
Age^2	-0.00009**	0.00003*	-0.00011**	-0.0026**
	(0.00001)	(0.00002)	(0.00001)	(0.00023)
Male	0.011**	-0.068**	0.017**	1.66**
	(0.0030)	(0.0053)	(0.0040)	(0.060)
D1994-	-0.145**	-0.228**	-0.216**	-3.69**
	(0.023)	(0.045)	(0.029)	(0.496)
D1990-93	-0.108**	-0.179**	-0.158**	-2.83**
	(0.023)	(0.039)	(0.029)	(0.400)
D1986-1989	-0.154**	-0.193**	-0.178**	-2.08**
	(0.026)	(0.048)	(0.032)	(0.572)
D1982-1985	-0.111**	-0.127**	-0.142**	-1.51**
	(0.035)	(0.062)	(0.042)	(0.651)
D1978-1981	-0.111**	-0.099	-0.141**	-1.53**
	(0.039)	(0.070)	(0.046)	(0.764)
D1974-1977	-0.162**	-0.174**	-0.200**	-2.62**
	(0.047)	(0.078)	(0.056)	(0.877)
D-1974	-0.181**	-0.184**	-0.233**	-2.47**
	(0.052)	(0.089)	(0.062)	(0.997)
Cycle 2	0.0023	0.025**	-0.034**	0.056
	(0.0033)	(0.0054)	(0.0043)	(0.056)
Cycle 3	0.019**	0.056**	0.0054	0.884**
	(0.0064)	(0.011)	(0.0082)	(0.112)
N	68050	67876	68034	59988

D1994				
North America	-0.117**	-0.126*	-0.069	-1.08
	(0.030)	(0.065)	(0.056)	(0.807)
South America	-0.032	-0.123*	-0.182**	-0.853
	(0.062)	(0.072)	(0.038)	(1.11)
Africa	-0.189**	-0.163*	-0.280**	-3.74**
	(0.033)	(0.084)	(0.037)	(0.980)
Asia	-0.163**	-0.338**	-0.278**	-5.32**
	(0.027)	(0.042)	(0.030)	(0.519)
Joint F- test D1994 Estimates	12.42	13.55	21.42	22.56
Prob > F	0.0000	0.0000	0.0000	0.0000
Joint F-Test Country of Birth Dummies				
Prob > F				
F test D94 D90 D86 D82 D78 D74 D74B	9.72	6.55	10.47	12.55
Prob > F	0.0000	0.0000	0.0000	0.0000
F-test Interactions terms with D1994	1.82	4.76	4.64	8.87
Prob > F	0.1221	0.0008	0.0010	0.0000
F-test Interactions terms with D1990	3.92	3.79	5.00	16.31
Prob > F	0.0035	0.0044	0.0005	0.0000
F-test Interactions terms with D1986	0.74	0.18	2.38	9.03
Prob > F	0.5624	0.9498	0.0497	0.0000
F-test Interactions terms with D1982	0.74	1.47	2.68	7.17
Prob > F	0.5642	0.2090	0.0300	0.0000
F-test Interactions terms with D1978	2.03	3.43	3.37	8.93
Prob > F	0.0879	0.0082	0.0092	0.0000
F-test Interactions terms with D1974	1.56	0.83	1.23	3.09
Prob > F	0.1829	0.5079	0.2967	0.0149
F-test Interactions terms with D1974B	1.21	1.70	1.94	9.04
Prob > F	0.3039	0.1476	0.1014	0.0000
Joint F test Instruments – First Stage	49.64	49.64	49.64	49.64
Prob > F	0.0000	0.0000	0.0000	0.0000
DWH				
Prob > F	0.000	0.048	0.001	0.000

Notes: Data are from the 1994, 1996 and 1998 Health Files of the National Population Health Survey. Robust standard errors are in parenthesis and corrected for clustering by individuals. * denotes significance at the 10% level. ** denotes significance at the 5% level. Sample includes respondents between 12 and 65 years of age. The dependent variables are an indicator for poor health and an indicator for the presence of a chronic condition. Also included in the regressions are household size, marital status, the presence of children at home, indicators for urban residence, English or French mother tongue, dummy variables for province of residence, work status, educational attainment. The regressions in columns 2 and 4 also contain country of birth dummies. The regressions in columns 3 and 5 also contain interactions between cohort and country of birth dummies. European country of birth is the excluded category. Estimation is by instrumental variables. The instruments are the percent of the respondent's CCS below the 1996 low income cut-off, the percent unemployed and the percent who have post secondary degrees of diplomas.

Table 3: Investigating Selective Emigration
Means of Predicted Health and Standard Deviations of the Residuals

	Mean of Predicted Health			Standard Deviation of Residuals		
	1994	1996	1998	1994	1996	1998
Poor Health						
1994-		.1475956	.1125858		.2737946	.255756
1990-1993	.1308359	.1045295	.0634302	.2451708	.2556867	.2906779
1986-1989	.083279	.0860086	.0653099	.2559642	.2395416	.2234183
1982-1985	.0794744	.0640639	.0379452	.2807328	.2874798	.2649117
1978-1981	.073375	.054078	.0277225	.3046515	.2917489	.2512276
1974-1977	.0797746	.0716357	.0514402	.2929266	.2960152	.2947887
-1974	.1118763	.1050663	.0886591	.3411272	.3143565	.3063281
Canadian Born	.1031827	.091733	.0704325	.2956657	.285581	.2746794
Chronic Conditions						
1994-		.360291	.3304002		.4062082	.4585998
1990-1993	.3471083	.3393014	.3108686	.4086768	.4463443	.4526507
1986-1989	.3133768	.3318585	.3122269	.4727063	.4586181	.4640354
1982-1985	.3245251	.3266842	.2988447	.4588481	.4734568	.4610665
1978-1981	.3342146	.3360733	.3196122	.4758786	.4686856	.4887355
1974-1977	.3725358	.3829146	.3721178	.4670262	.4855866	.4828185
-1974	.4843327	.4836866	.4779794	.4805764	.4838943	.4915985
Canadian Born	.4351382	.4372619	.4145662	.4761621	.4796181	.4770609
Activity Limitations						
1994-		.1592279	.1279381		.2368856	.2675619
1990-1993	.1407565	.1159379	.0785827	.2854434	.2723636	.3072612
1986-1989	.0927641	.0966626	.0823351	.3150778	.2711997	.2663583
1982-1985	.0974453	.0853352	.0612187	.3549891	.310236	.2818966
1978-1981	.1032589	.0873822	.0697394	.3831558	.3056605	.2817066
1974-1977	.1195032	.1124238	.1004534	.366795	.3517391	.379769
-1974	.173739	.1631513	.1558031	.3964635	.3590709	.3937634
Canadian Born	.1840947	.1731927	.1599197	.391208	.3586508	.3719023
BMI						
1994-		24.74395	23.89768		4.472582	4.637838
1990-1993	24.26951	24.09643	23.47074	4.373068	3.97642	4.612113
1986-1989	23.9206	24.24912	23.72429	4.503077	4.593062	4.624292
1982-1985	24.06344	23.99192	23.32795	4.663345	4.389856	3.795393
1978-1981	24.18861	24.01703	23.62876	5.39305	4.51626	4.699669
1974-1977	24.35129	24.58707	24.2503	5.26466	4.417978	4.710316
-1974	25.4869	25.43161	25.17691	4.769344	4.613317	5.08469
Canadian Born	25.52715	25.44885	25.13175	4.995267	4.904598	4.97949

Notes: Data are from the 1994, 1996 and 1998 Health Files of the NPHS. Sample includes respondents aged 12-65.

Table 4: Age at Immigration Matters
Separating the Sample by Age at Immigration

	Poor Health		Chronic Condition	
	Under 16	Over 16	Under 16	Over 16
YSM	0.0061	0.019**	0.0086	0.015**
	(0.0045)	(0.0038)	(0.0082)	(0.0066)
YSM^2	-0.00009	-0.00032**	-0.00010	-0.00026**
	(0.00006)	(0.00006)	(0.00011)	(0.00010)
Estimated Effect at:				
YSM=2	0.0057	0.0177**	0.0082	0.0140**
	(0.0044)	(0.0037)	(0.0080)	(0.0064)
YSM=5	0.0052	0.0158**	0.0076	0.0124**
	(0.0043)	(0.0035)	(0.0077)	(0.0062)
YSM=10	0.0043	0.0126**	0.0066	0.0099*
	(0.0041)	(0.0034)	(0.0073)	(0.0059)
YSM=20	0.0025	0.0062*	0.0046	0.0048
	(0.0040)	(0.0034)	(0.0071)	(0.0059)
Joint F- test D1994 Estimates	8.16	11.19	23.42	11.65
Prob > F	0.0000	0.0000	0.0000	0.0000
N	61924	64517	61766	64355

	Activity Limitation		BMI	
	Under 16	Over 16	Under 16***	Over 16
YSM	0.0085	0.016**	-0.0082	0.147**
	(0.0055)	(0.0047)	(0.101)	(0.071)
YSM^2	-0.00010	-0.00025**	0.00023	-0.0019*
	(0.00007)	(0.00008)	(0.0013)	(0.0011)
Estimated Effect at:				
YSM=2	0.0081	0.0152**	-0.0073	0.1398**
	(0.0054)	(0.0045)	(0.0983)	(0.0694)
YSM=5	0.0076	0.0137**	-0.0059	0.1283*
	(0.0052)	(0.0044)	(0.0950)	(0.0668)
YSM=10	0.0066	0.0112**	-0.0036	0.1092*
	(0.0050)	(0.0042)	(0.0907)	(0.0639)
YSM=20	0.0047	0.0061	0.0009	0.0710
	(0.0048)	(0.0042)	(0.0877)	(0.0639)
Joint F- test D1994 Estimates	15.10	18.86	1.57	19.77
Prob > F	0.0000	0.0000	0.1655	0.0000
N	61914	64502	54207	56871

Notes: Data are from the 1994, 1996 and 1998 Health Files of the National Population Health Survey. Robust standard errors are in parenthesis and corrected for clustering by individuals. * denotes significance at the 10% level. ** denotes significance at the 5% level. Sample includes respondents between 12 and 65 years of age. The dependent variables are an indicator for poor health, an indicator for the presence of a chronic condition, an indicator for activity limitations and body mass index. Also included in the regressions are age, age^2, household size, marital status, the presence of children at home, indicators for sex, urban residence, English or French mother tongue, dummy variables for province of residence, work status, educational attainment, t, cohort of arrival, survey cycle and interactions between cohort and country of birth dummies. European country of birth is the excluded category. Estimation is by instrumental variables. The instruments are the percent of the respondent's CCS below the 1996 low income cut-off, the percent unemployed and the percent who have post secondary degrees of diplomas.

Table 5: Separating the Sample by Sex

	Poor Health		Chronic Condition	
	Female	Male	Female	Male
YSM	0.015**	0.0049	0.0091	0.0083
	(0.0041)	(0.0039)	(0.0068)	(0.0068)
YSM^2	-0.00021**	-0.00008	-0.00012	-0.00012
	(0.00006)	(0.00005)	(0.00009)	(0.00009)
Estimated Effect at:				
YSM=2	0.0139**	0.0046	0.0086	0.0078
	(0.0040)	(0.0038)	(0.0066)	(0.0066)
YSM=5	0.0126**	0.0041	0.0079	0.0071
	(0.0038)	(0.0036)	(0.0064)	(0.0064)
YSM=10	0.0106**	0.0033	0.0067	0.0059
	(0.0037)	(0.0035)	(0.0061)	(0.0061)
YSM=20	0.0065*	0.0016	0.0043	0.0036
	(0.0036)	(0.0034)	(0.0059)	(0.0060)
Joint F- test				
D1994 Estimates	10.28	4.01	9.10	3.97
Prob > F	0.0000	0.0012	0.0000	0.0013
N	35592	32458	35510	32366

	Activity Limitation		BMI	
	Female	Male	Female	Male
YSM	0.015**	0.0041	0.031	0.164**
	(0.0047)	(0.0046)	(0.081)	(0.072)
YSM^2	-0.00018**	-0.00005	-0.00035	-0.0017*
	(0.00007)	(0.00006)	(0.0011)	(0.00097)
Estimated Effect at:				
YSM=2	0.0140**	0.0039	0.0296	0.1566**
	(0.0046)	(0.0045)	(0.0790)	(0.0699)
YSM=5	0.0129**	0.0036	0.0275	0.1462**
	(0.0045)	(0.0044)	(0.0763)	(0.0675)
YSM=10	0.0111**	0.0032	0.0241	0.1289**
	(0.0043)	(0.0042)	(0.0729)	(0.0645)
YSM=20	0.0075*	0.0022	0.0171	0.0942
	(0.0042)	(0.0041)	(0.0711)	(0.0627)
Joint F- test				
D1994 Estimates	14.30	6.38	12.09	13.75
Prob > F	0.0000	0.0000	0.0000	0.0000
N	35589	32445	30634	29354

Notes: Data are from the 1994, 1996 and 1998 Health Files of the National Population Health Survey. Robust standard errors are in parenthesis and corrected for clustering by individuals. * denotes significance at the 10% level. ** denotes significance at the 5% level. Sample includes respondents between 12 and 65 years of age. The dependent variables are an indicator for poor health, an indicator for the presence of a chronic condition, an indicator for activity limitations and body mass index. Also included in the regressions are age, age^2, household size, marital status, the presence of children at home, indicators for urban residence, English or French mother tongue, dummy variables for province of residence, work status, educational attainment, cohort of arrival and survey cycle, and interactions between cohort and country of birth dummies. European country of birth is the excluded category. Estimation is by instrumental variables. The instruments are the percent of the respondent's CCS below the 1996 low income cut-off, the percent unemployed and the percent who have post secondary degrees of diplomas.

Table 6: Main Specifications Excluding the Two Most Recent Cohorts

	Poor Health	Chronic Conditions	Activity Limitations	BMI
YSM	0.0044	0.0012	0.0028	-0.0071
	(0.0035)	(0.0060)	(0.0042)	(0.066)
YSM^2	-0.00007	-0.00001	-0.00002	0.00038
	(0.00005)	(0.00008)	(0.00006)	(0.00090)
Income Adequacy	-0.129**	-0.115**	-0.140**	-2.97**
	(0.024)	(0.041)	(0.031)	(0.489)
Age	0.010**	0.0066**	0.013**	0.296**
	(0.00085)	(0.0013)	(0.0011)	(0.021)
Age^2	-0.00009**	0.00002	-0.00011**	-0.0027**
	(0.00001)	(0.00002)	(0.00001)	(0.00024)
Male	0.012**	-0.068**	0.019**	1.68**
	(0.0031)	(0.0055)	(0.0042)	(0.062)
Joint F- test				
D1986 Estimates	3.49	1.63	5.28	10.40
Prob > F	0.0037	0.1484	0.0001	0.0000
N	66370	66198	66356	58510

Notes: Data are from the 1994, 1996 and 1998 Health Files of the National Population Health Survey. Robust standard errors are in parenthesis and corrected for clustering by individuals. * denotes significance at the 10% level. ** denotes significance at the 5% level. Sample includes respondents between 12 and 65 years of age. The dependent variables are 1) an indicator for poor health, 2) an indicator for the presence of a chronic condition, 3) an indicator for an activity limitation, and, 4) body mass index. Also included in the regressions are household size, marital status, the presence of children at home, indicators for urban residence, English or French mother tongue, dummy variables for province of residence, work status, educational attainment, cohort of arrival, survey cycle and interactions between cohort and country of birth dummies. European country of birth is the excluded category. Estimation is by instrumental variables. The instruments are the percent of the respondent's CCS below the 1996 low income cut-off, the percent unemployed and the percent who have post secondary degrees of diplomas.