Health Status and Social Capital of Recent Immigrants in Canada

Evidence from the Longitudinal Survey of Immigrants to Canada

Jun Zhao, Li Xue, and Tara Gilkinson

March 2010

Research and Evaluation

Canada

Table of Contents

Abstract

Given that immigrants represent a large proportion of Canadian population growth, their health status is of particular interest to researchers, policy-makers, and program officials. Due to data limitations, there is little Canadian research on the disparities of health status among immigration categories, i.e., family class immigrants, economic class immigrants, and refugees. As well, there are few studies that examine the impact of social capital on immigrant health status at the quantitative level. This paper addresses these gaps through econometric analyses. Using data from the Longitudinal Survey of Immigrants to Canada (LSIC), we look at the dynamic changes in the health status of recent immigrants in their initial four years in Canada, focusing particularly on the effect of social capital on immigrant health. Our descriptive and regression results provide support for the "healthy immigrant effect"; however, the results show that this effect diminishes over time. Our results also suggest health status disparities between recent immigrant sub-groups. Skilled worker principal applicants are more likely to be generally healthy, while refugees are more likely to rate their health status as fair or poor. Looking at the effects of selected social capital variables, we confirm the connections between friendship networks and health status of recent immigrants. The density and ethnic diversity of friendship networks are positively associated with immigrants' self-rated overall health status. For family class immigrants, the analysis reveals a positive association between organizational networks and self-rated health status. In general, social networks are found to have stronger effects on the health status of family class immigrants than for immigrants in other categories.

Introduction

Between 2001 and 2006, roughly 1.2 million immigrants landed in Canada. Given that immigrants represent a large proportion – two-thirds – of Canada's population growth (CIC 2007), immigrant health status is of particular interest to researchers, policy-makers and program officials. Lack of data have limited Canadian research on the disparities among immigration sub-groups such as family class immigrants, economic class immigrants, and refugees (Zhao 2007a). This paper addresses this gap through econometric analyses. Its purpose is to look at the dynamic changes in the health status of recent immigrants in the initial years in Canada, focusing particularly on the effect of social capital on immigrant health.

This paper undertakes to answer the following questions:

- Does the health status of recent immigrants in Canada change over the initial four years after landing?
- Is there any disparity of health status among different immigrant sub-groups?
- Are there main social factors associated with the health status of recent immigrants?
- To what extent does social capital, embedded in social networks, affect the health status of recent immigrants?

The paper proceeds as follows. After a literature review on the concept of social capital, the data sources and indicators used in the analysis are described. The next sections present the descriptive analysis, the econometric models, and finally the regression results, followed by discussion. The conclusion summarizes the main findings and discusses some policy implications of the research.

Literature review

Defining Social Capital

The term "social capital" is a hybrid notion that "brings together the theoretical and empirical rationale for considering social ties as a potentially important ingredient of well-being and prosperity in society" (PRI 2005b, 37). It is a geographical, political, economic, and sociological concept, and although there is much debate surrounding its definition and conceptualization, it carries with it a "seductive simplicity" (Mohan and Mohan 2002, 191) in that it is "based on the premise that an interpersonal network provides value to its members by giving them access to the social resources available within the network" (Staber 2006, 190). As Putnam explains, "like tools (physical capital) and training (human capital), social networks have value" (2007, 137); "they have value for the people who are in them, and they have, at least in some instances, demonstrable externalities, so that there are both public and private faces of social capital" (2001, 41).

Table 1 identifies some of the various definitions of social capital found within the literature.

Table 1: Definitions of Social Capital

The characteristics of the social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit	Putnam 1995, 67
The sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition	Bourdieu and Wacquant 1992, 119
The ability of actors to secure benefits by virtue of membership in social networks or other social structures	Portes 1998, 6

Social capital has been linked to positive externalities such as better health, higher employment rates, and increased social interaction (Mohan and Mohan 2002, 193). However, not all the effects of social capital may be positive: "just as the sources of social capital are plural so are its consequences" (Portes 1998, 9). Portes (1998) has identified several negative externalities of social capital including "exclusion of outsiders, excess claims on group members, restrictions on individual freedom and downward levelling norms" (15). As Putnam explains, "although networks can powerfully affect our ability to get things done, nothing guarantees that what gets done through networks will be socially beneficial" (2007, 138). Therefore, "understanding social capital demands an emphasis on the *nature* of interactions, the *meaning* of linkages and their potential to *enable change*, rather than the structural casing and visible connections themselves" (MacKian 2002, 208; italics in original).

Social Capital and Immigrant Integration

The concept of social capital has been found to be particularly relevant to the study of immigrant integration. Research on social capital has emphasized the significance of social networks (both homogenous and heterogeneous) to a variety of outcomes, including employment. Results from recent analyses of the General Social Survey (GSS) and the Longitudinal Survey of Immigrants to Canada (LSIC) support the importance of social capital to the integration of immigrants to Canada (van Kemenade et al. 2006; Xue 2008). Evidence from both surveys shows that social capital is a major determinant of immigrant health (Zhao 2007a; van Kemenade et al. 2006).

Social capital has been connected to immigrant educational attainments. Ooka and Wellman (2006) found that educational attainment is positively associated with being in heterogeneous friendship networks. The authors found that first generation immigrants with post-secondary education are more likely to be in a heterogeneous network than those with less education. Educational and employment outcomes of immigrants play a role in influencing immigrant health outcomes. Dunn and Dyck (1998) analyzed results from the National Population Health Survey (NPHS 1994-1995). The authors' findings showed that

immigrants with high levels of education and high incomes were more likely to report their health status as very good or excellent.

Mechanisms Linking Social Capital and Health

Despite a recent "flourishing epidemiologic and public health interest in the investigation of the effects of social capital on physical health outcomes" (Kim et al. 2008,186), the mechanisms that link social capital to health are not yet clearly understood (Kawachi et. al 1999, 1190): "At the individual level, it is not completely established whether good health is the result of social capital or whether social capital is the result of good health and/or other unmeasured personal characteristics that determine both health status and patterns of social engagement" (Kawachi 2006, 992). Despite this major challenge, several researchers including Kawachi et al. (1999), Putnam (2000), and Berkman and Glass (2000) have attempted to identify pathways and mechanisms through which social capital impacts community and individual health outcomes.

Within the literature it is suggested that social networks may influence health outcomes –by serving as a tool that rapidly diffuses health information, therefore improving access to health resources (Kawachi et al. 1999; Berkman and Glass 2000); through the provision of tangible assistance such as "money, convalescent care, and transportation, which reduces psychic and physical stress and provides a safety net" (Putnam 2000, 327); through the reinforcement of health norms (e.g., physical activity) and social influence (networks' values and norms) (Kawachi et al. 1999; Putnam 2000; Berkman and Glass 2000); and finally, by providing emotional support (Berkman and Glass 2000), which may serve as a "psychological triggering mechanism, stimulating people's immune systems to fight disease and buffer stress" (Putnam 2000, 327).

Social Capital and Health

Putnam (2000) states that "of all the domains in which I have traced the consequences of social capital, in none is the importance of social connectedness so well established as in the case of health and well-being" (326). The relationship between social capital and health outcomes has been explored in both empirical and theoretical research. Social capital has been connected to a variety of health outcomes such as access to health care, binge drinking, leisure time, physical inactivity, food security, child behaviour problems, walking activity, violent crime and homicide, life expectancy, tuberculosis case rates, life satisfaction, and suicide rates (Kawachi et al. 2004).

Ecological studies have found that social capital is associated with lower rates of suicide and higher levels of life satisfaction (Helliwell 2003). Fisher et al. (2004) found that cohesive communities rich in trust are characterized by increased levels of physical activity, and results from Hendryx et al. (2002) suggest that community social capital is associated with better access to health care. Research in this area has also concluded that for neighbourhoods with higher social capital, members report better individual and self-rated health (Wen et al. 2003).

Self-rated health status, increasingly used as a measure of overall health, has been found within the literature to be linked to a variety of individual level measures of social capital (Kim et al. 2008). For example, research has found that self-rated health status is linked to longevity and functional ability (Idler and Kasl 1995; Idler et al. 1999) and social trust (Lavis and Stoddart 1999), as well as involvement in formal and informal networks (Rose 2000).

Immigrant Social Capital and Health

There is limited research that looks directly at the ways in which social capital affects the health outcomes of immigrant populations. However, the work of Deri (2005), Newbold (2009), van Kemenade et al. (2006) and Zhao (2007a) provides some insight into this area.

Deri (2005) used data from the Canadian National Population Health Survey (CNPHS) to examine if and how social networks impact the health care utilization patterns of immigrants whose mother tongue is neither English nor French. Following Bertrand et al. (2000), she measures social networks by the extent of linguistic

concentration in an area of Census sub-divisions. Deri's findings suggest that social networks play an important role in influencing health care utilization behaviours. She found that "for high utilizing language groups, living in areas of high concentration of the language group increases access. Conversely, for low utilizing groups, living in areas of high concentration of the language group decreases access" (Deri 2005, 1079).

Newbold (2009) used the LSIC to estimate health transitions of recent immigrants. According to Newbold, recent immigrants "who noted monthly social interactions with family or friends (relative to less than monthly social interactions), were less likely to transition to poor health. Otherwise, the degree of social interaction was unimportant" (329-30). However, the author's findings also indicate that having family or friends close in proximity and involvement in a social group do not appear to have any impact on health transitions.

Using the General Social Survey (GSS), van Kemenade et al. (2006) found that "having access to close networks of people from the same cultural origin – as well as to programs that support these networks – is associated with the social and economic integration of immigrants in the host county and with their well being" (19). Results indicate that (1) "there is a positive association between the size of networks of strong ties and reported good health among immigrants"; (2) "there is also a positive association between the number of ties with organizations and immigrants' self-reported health. Immigrants with a high number of ties to organizations perceive their health to be good"; (3) "immigrant women who say they had at least one reciprocal support relationship within their social networks were more likely to say they are in good health than their peers without such a relationship"; and (4) "immigrant men who volunteered in the year preceding the survey are more than twice as likely to say they are in good health as their peers who had not participated in volunteer activity" (19).

Zhao (2007a) conducted a duration analysis of the LSIC in an attempt to gain further insight into the health outcomes and socio-economic determinants of health among Canada's recent immigrants. According to Zhao (2007a), immigrants who had frequent interaction with friends in Canada, who spoke at least one of the official languages, who were not in low income families, and who owned a home rather than rented had a decreased risk of a decline in health status. Zhao also found that "immigrants with a social network and social support were more likely to visit doctors" (42). This reflects that immigrants with a social network and social support had fewer problems accessing health care services but possibly had more health issues. However, social capital effects were not the main interests in Zhao (2007a). The main differences between that paper and the present work are: (1) we categorize social networks into three types, i.e., kinship, friendship and organizational networks; (2) for each type of networks, we also look at its size, diversity, and density, etc; and (3) we apply a panel data model to take into account unobserved individual characteristics, such as differences in genes, lifestyle, and attitudes towards physical activities.

Data and definition

Data sources

The main data source used in this paper is the Longitudinal Survey of Immigrants to Canada (LSIC), which was designed to study how newly arrived immigrants adapt to living in Canada during their first four years after arrival. The survey's target population was immigrants who arrived in Canada between October 2000 and September 2001, were 15 years of age or over at the time of landing, and landed from abroad.[1]

The survey addresses a number of issues including demographic and household characteristics of the longitudinal respondent, health, citizenship, social interactions, groups and organizations, language skills, housing, education, employment, values and attitudes, income, and perceptions of settlement.

The LSIC is longitudinal – that is, the same respondents were interviewed at six months (wave 1), two years (wave 2), and four years (wave 3) after landing in Canada, providing a dynamic picture of the integration experiences of these recent immigrants. Approximately 12,000 immigrants participated in the wave 1 interview, representing about 164,200 of the target population. The final survey (wave 3) sample of 7,700 immigrants represents 157,600 immigrants of the target population who still resided in Canada at the time of the last interview (Statistics Canada, 2007). Our study focuses on these 7,700 immigrants who participated in all three waves. The longitudinal weights designed by Statistics Canada are used to account for sample attrition.

The second data source is the Canadian Community Health Survey (CCHS), a cross-sectional survey of the Canadian population. We use the CCHS to obtain data on the health status of the Canadian born by age group for the comparison analysis. The first year of collection for the CCHS (Cycle 1.1) was between September 2000 and November 2001, coincident with the first wave interview of the LSIC. The CCHS operates on a two-year collection cycle, and the target population for the survey represents 98 percent of the Canadian population residing in Canada's 10 provinces (Statistics Canada 2006). The first three cycles – Cycle 1.1 (2000-01), Cycle 2.1 (2002-03), and Cycle 3.1 (2004-05) – are used in this paper. The sampling weights designed by Statistics Canada are used to compute statistical estimates in order to make inference at the population level possible.

Definitions

Health status indicator

In this paper, self-rated health is used as an indicator of immigrants' health status.[2] The self-rated health indicator measures individuals' perception of their overall health. It can reflect aspects of health not captured in other measures, such as incipient disease, disease severity, aspects of positive health status, physiological and psychological reserves, and social and mental function. Epidemiologists have demonstrated that self-rated health is an accurate reflection of a person's health and a valid predictor of incident mortality and chronic morbidity (see Bond 2006; Idler and Benyamini 1997; Huisman et al. 2007).

In all three waves of the LSIC, the respondents were asked: "In general, would you say your health is excellent, very good, good, fair or poor?" Health status was then grouped into two categories according to the answer: healthy (excellent, very good, or good) and unhealthy (fair or poor). The health status variable is the dependent variable in our logit panel regression models.

Social capital indicators

To determine the extent to which social capital influences the health status of recent immigrants, we used information unique to the LSIC data on social interactions and group organization participation. We employed the social capital indicators developed by Xue (2008), which use a network-based approach to measure social capital. Unlike many social network measures in the literature that use ethnic, linguistic, or

neighbourhood characteristics as a proxy for social capital (e.g., Deri 2005; Bertrand et al. 2000; Chiswick and Miller 1996), this network based approach emphasizes both the structure and content of individuals' networks, using direct measures of social networks.

The structure of networks includes different levels of social networks. Similar to Xue (2008), in this paper social networks are categorized into three types: kinship, friendship, and organizational networks. The *kinship network* includes relationships with family members and relatives living in Canada. The *friendship network* consists of ties with friends. The *organizational network* is defined as the participation of immigrants in groups and organizations, such as community organizations, religious groups, ethnic or immigrant associations, etc.

Within each type of network, the content of networks is defined by the amount of social involvement and social support such as size, diversity, frequency of contact, and network reciprocity. Social network size is defined as the number of people or units with whom immigrants maintain different types of relationships (family, friends, organizations). While the LSIC does not provide information on the absolute numbers of people in all networks, there are some good substitutes for network size. For example, based on information available from the LSIC, we can obtain an approximation of network size for family ties by counting the number of types of relatives in Canada, such as spouse, children, parents, grandparents, brothers and sisters, uncles and aunts, and cousins. For friends network, sources where immigrants met new friends, such as ethnic association or club, religious activity, through relatives or friends, sports, hobby or other club, spouse's work, ESL or FSL classes, other classes, etc., are counted to proximate the absolute size of the network. For organizational network, LSIC provides a direct measure of absolute number of groups or organizations that immigrants participated in.

Social network diversity represents the social and ethnic heterogeneity of network members, which is measured by the relative numbers of non co-ethnic members and co-ethnic ones in a person's networks.

Social network density is defined as the frequency of contact between network members. Using the information on the frequency of contact with people in the networks and information on the relative number of co-ethnic members among friend networks and organizational networks, we create both diversity and density indexes for each type of network, which range from 0 to 1. The higher the diversity index, the more diversified the social network is. The higher the density index, the more frequently individuals contact family members, relatives, or friends, and/or the more frequently they take part in group and organizational activities.

Social network reciprocity can be measured as help received from networks as well as contribution made to networks. We create several indicators to measure the different types of help that an immigrant received from a particular type of network.[3] We also use a variable to indicate the number of organizations or groups for which an immigrant volunteered time.

The main social capital variables are shown in Table A1 in Appendix.

Income indicator

Family income is an important factor that significantly affects individuals' health status (Zhao 2007a). In this paper we group immigrants into four groups by economic family income quartiles from the lowest to the highest: 0-25 percent, 25-50 percent, 50-75 percent and 75-100 percent. "Economic family" refers to a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common law, or adoption (Statistics Canada 2007).

Employment status is also significantly related to the health status of immigrants (Zhao 2007a). The employment status of a respondent is grouped into two categories: employed, and not employed. The employment status of a respondent's spouse is grouped into three categories: no spouse, spouse currently employed, and spouse currently not employed, which also captures marital status.

Other socio-demographic variables

Other socio-demographic variables that have potential impacts on the health status of recent immigrants and are controlled for in our regression analysis include age, gender, immigrant category, source area, education level at landing, official language ability, and incidence of problems accessing Canadian health care system.

We group immigrants into five categories: (1) family class immigrants, (2) skilled workers – principal applicants, (3) skilled workers – spouses and dependants, (4) refugees, and (5) other immigrants.[4] The source countries of immigrants are grouped into five broad areas: North America, United Kingdom and Western Europe, Europe except UK and Western Europe, Asia and Pacific, Africa and Middle-East, Caribbean and Guyana, and South and Central America. Education at landing is grouped into four categories: high school or less, trade certificate or college/some university, bachelor's degree, and master's degree or above.

To investigate age-specific health status, we separate the population into five age groups: 15-19, 20-34, 35-44, 45-64, and 65+ years. Place of residence is grouped into six categories by census metropolitan areas (CMAs): living in one of the top five CMAs and living in an area other than the five major CMAs.[5] Official language ability (self-assessed)[6] is captured by two dummy variables for English and French: speaking English (or French) well (i.e., speaking fairly well, well, and very well with English or French as the native language) or not (i.e., speaking poorly or not able to speak in English or French).

Accessibility to the Canadian health care system is grouped into two categories: having and not having problems accessing health care services. Problems identified include long waiting times, discrimination, problems finding a family doctor, transportation, and/or insurance covering prescription medication, etc.[7] Health care service access is important because it influences immigrants' health status and quality of life. Health status may deteriorate as individuals become more prone to chronic conditions due to barriers to health care access (Rivers and Patino 2006).

Descriptive analysis

Evidence from the LSIC and CCHS indicates that in the initial period after arrival, the self-reported health status of immigrants is better than that of their Canadian born counterparts. This reflects the "healthy immigrant effect," which is possibly due to the health standards required by the immigrant selection program and verified by a pre-migration medical examination. According to section 38 of Canada's Immigration and Refugee Protection Act (IRPA) issued in 2002, "a foreign national is inadmissible on health grounds if their health condition (a) is likely to be a danger to public health; (b) is likely to be a danger to public safety; or (c) might reasonably be expected to cause excessive demand on health or social services." However, this "healthy immigrant effect" is found to diminish gradually with time spent in Canada.

Figure 1: Share of Immigrants and Canadian-Born Self-Reporting as Healthy
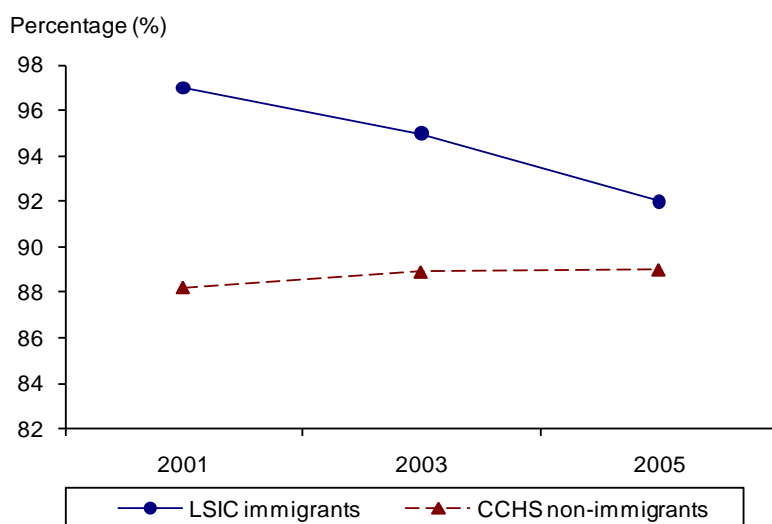
Note: The plots in Figure 1 are age standardized to represent a person of mean age in the Canadian population as measured by the CCHS
Source: LSIC (2005), CCHS (2000-2005).

The gap of incidence of a healthy population between immigrants and Canadians narrows at four years after landing, as shown in Figure 1. Our results are consistent with existing studies on health status of immigrants (e.g., McDonald and Kennedy 2004; Newbold and Danforth 2003; and Zhao 2007a).

Table 2: Immigrants' Health Status at Wave 1 Cross-Tabulated with Each of Waves 2 and 3 (Unweighted Sample Size N=7716)

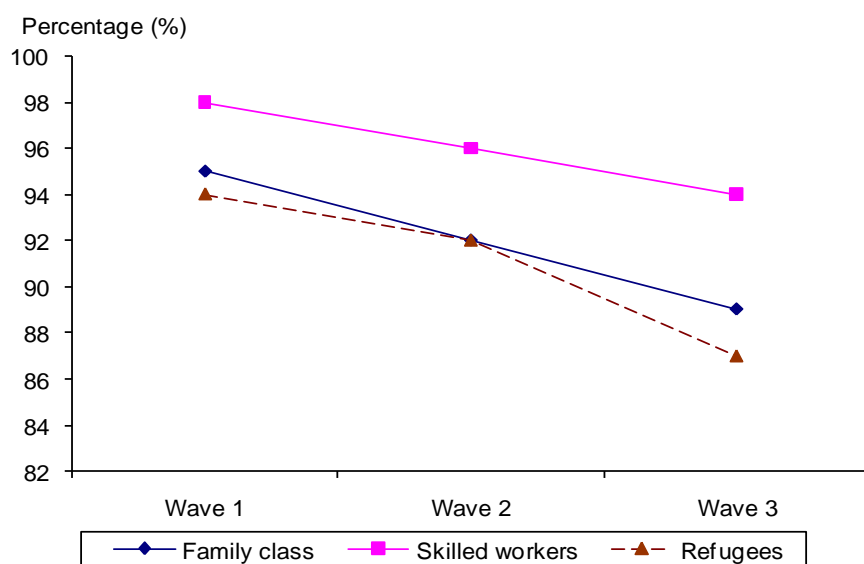| Health status, wave 1		Health status, wave 2		Health status, wave 3	
		Not healthy	Healthy	Not healthy	Healthy
Not healthy (number)	4,706	1,590	3,116	1,533	3,174
(%)	100	34	66	33	67
Healthy (number)	152,908	6,959	145,927	11,121	141,787
(%)	100	5	95	7	93
Total (number)	157,615	8,550	149,043	12,654	144,961
(%)	100	5	95	8	92

Source: LSIC (2005).

Table 3:   Immigrants' Health Status at Wave 2 Cross-Tabulated with Wave 3 (Unweighted Sample Size N=7714)

Health status, wave 2		Health status, wave 3	
		Not healthy	Healthy
Not healthy (number)	8,550	3,644	4,906
(%)	100	43	57
Healthy (number)	149,043	9,010	140,033
(%)	100	6	94
Total (number)	157,593	12,654	144,939
(%)	100	8	92

Source: LSIC (2005).

The dynamic changes in health status of immigrants over the initial period after landing can be found in Tables 2 and 3. At the wave 1 interview, 97 percent of immigrants (152,908) report their health as good, very good, or excellent. Among these healthy immigrants, 5 percent and 7 percent report their health as fair or poor at waves 2 and 3, respectively, while 93 percent remain healthy at wave 3. In contrast, among the unhealthy immigrants at wave 1, 67 percent report their health as good, very good, or excellent at four years after landing. As shown in Table 3, 95 percent of immigrants (149,043) report their health as good, very good, or excellent at wave 2, while 6 percent of these healthy immigrants report their health as fair or poor at wave 3. Among the unhealthy immigrants at wave 2, 57 percent report their health as healthy at wave 3. Given all these changes, after four years in Canada 92 percent of the LSIC immigrants deem their health status as good, very good, or excellent.

Figure 2: Share of Immigrants Self-Reporting as "Healthy" by Immigration Category

Source: LSIC (2005).

As shown in Figure 2, when looking at the health status of immigrants by immigrant category, there are obvious disparities among immigrant sub-groups. In each wave, skilled workers have the largest share of healthy immigrants, followed by family class immigrants and refugees. Refugees are more likely to report their health as fair or poor initially because they often come from areas of conflict with poor public health infrastructure and are more likely to be at risk for malnutrition and infectious diseases.

Many refugees may have suffered physical or emotional trauma and unhealthy living conditions prior to migration. After arrival in Canada, most refugees are eligible for income support and other immediate and essential services from the Resettlement Assistance Program (RAP), which are offered for up to one year. Particularly under the Interim Federal Health Program (IFHP), resettled refugees are eligible for health

benefits until their provincial health care coverage begins. Those with provincial/territorial health coverage are provided with supplemental coverage for one year. The IFHP coverage can be extended up to 24 months for recipients identified with special needs. With the income support from the RAP along with other assistance, the LSIC refugees were able by the second wave of the LSIC to narrow the gap between proportions reporting being healthy as compared to other categories. However, after this initial period, refugees may have experienced more financial and cultural barriers, which had negative effects on their health outcomes, implied by the widened gap at four years after landing.

Friendship networks of recent immigrants in Canada represent an extremely important source of support and assistance (van Kemenade et al. 2006). Figure 3 presents the health status of recent immigrants by the presence of new friends. Immigrants who have made friends after their arrival in Canada are more likely to report a better health status in all three waves. This may be largely related to the ability of friendships to promote a sense of belonging and reduce loneliness. Sense of belonging can be considered a possible emotional outcome (Ueno 2004). Friendship networks also have potential impacts on immigrants' settlement outcomes and integration to Canadian society, such as housing, employment, education, and health care services usage (Xue 2008; Zhao 2007a; van Kemenade et al. 2006), which may affect both emotional and physical health as well.

Figure 3: Share of Immigrants Self-Reporting as "Healthy" by Having Made New Friends
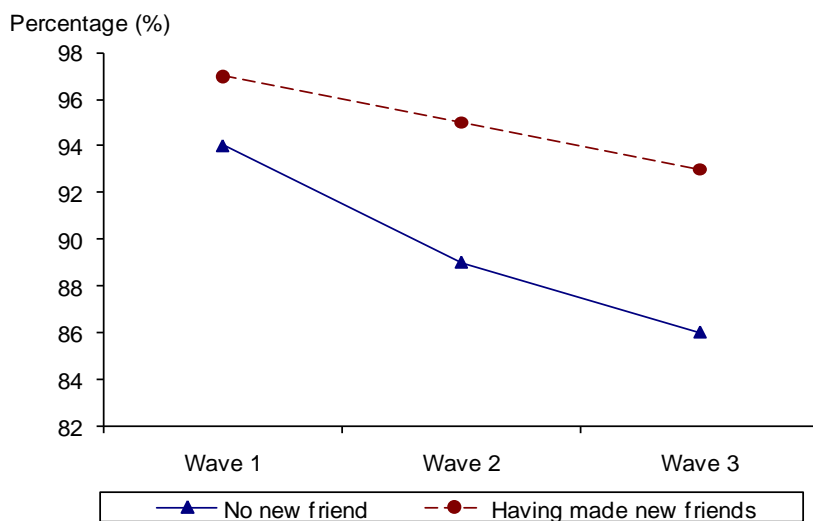
Organizational networks such as community organizations, religious groups, and ethnic and immigration associations are important sources of assistance for recent immigrants. Findings from the LSIC indicate that the percentage of immigrants involved in group or organizational activities increases with time spent in Canada (Zhao 2007a). Good social integration generally makes for good social support (Franke 2006); this social support may also be beneficial for immigrant health outcomes. As shown in Figure 4, at six months after landing, there are almost no differences in the health status between immigrants involved in organizational or group activities and immigrants who are not involved in such activities. In contrast, two years after landing, the proportion of healthy immigrants among the immigrants involved in group or organizational activities is larger than those who are not involved. At for years after landing, the gap widens to 3 percentage points.

Figure 4: Share of Immigrants Self-Reporting as "Healthy" by Participation in Organizations

Percentage (%)
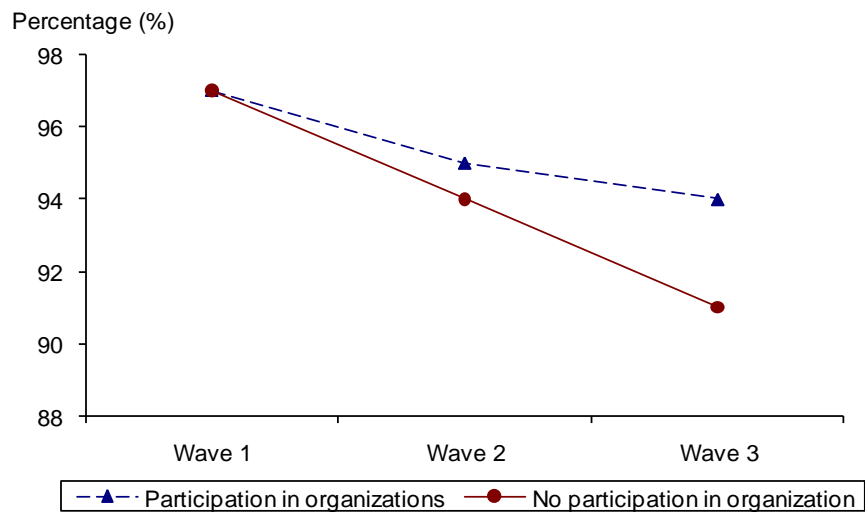
Source: LSIC (2005).

Econometric models

As mentioned above, the LSIC data is longitudinal, consisting of very large cross-sectional micro-units – which include thousands of individuals and three time periods. In order to model the probability of reporting as healthy among immigrants while taking into consideration individual heterogeneity, panel data models are applied to our regression analysis by controlling for the individual stock of social capital and other socio-demographic variables. The fundamental advantage of a panel data model is that it allows modelling differences in behaviour across individuals. Panel data modelling techniques focus on heterogeneity across units rather than time series autocorrelations.

The basic framework for the binary panel data models is a single equation model:

$$y_{it}^* = X'_{it}\,\beta + Z'_i\,\gamma + v'_i\alpha + \varepsilon_{it}, \quad i = 1,\dots, n; t = 1,\dots, T_i.$$

$$y_{it} = \begin{cases} 1 & if & y_{it}^* > 0 \\ 0 & otherwise \end{cases}$$

Where y^* is an unobserved latent variable of an immigrant's likelihood of reporting being healthy. X is a collection of k independent time varying variables denoted by the vector $\boldsymbol{x'} = (x_1, x_2, \dots, x_k)$. Z is a collection of m independent time invariant variables denoted by the vector $\boldsymbol{z'} = (z_1, z_2, \dots, z_m)$. Both X and Z are observable. The regressors also include a set of dummy variables for each wave of the panel in order to capture time effects. ε is an error term with mean zero and a standardized logistic distribution with variance $\pi^2/3$. Subscript i is an index for cross section units and t is an index for time periods ($T = 3$). The unobserved individual effect $v'_i\alpha$ capturing the heterogeneity across individuals that determine the good health probability includes a set of individual specific factors which are unobservable, such as individual difference in personality or ability, group or family specific characteristics, and health behaviours. It is assumed that v_i and ε_{it} are uncorrelated with each other.

For the estimation of panel data model, the critical issue is whether the individual effects v_i are correlated with the observed regressors X and Z (Greene 2002; Jones 2007). Compared to the random-effects model, the generalized estimating equations (GEE) approach proposed by Liang and Zeger (1986) and Zeger, Liang, and Albert (1988) can be used to estimate population-average effects. The GEE model is an extension of the generalized linear model (GLM) approach to longitudinal data analysis using quasi-likelihood estimation. The GEE model has consistent and asymptotically normal solutions, even with mis-specification of the correlation structure, because the assumption of independence of the unobserved individual effects with the explanatory variables is not required in the model (Hu et al. 1998). The GEE approach relaxes the strict independence assumption of random effects estimation and takes the dependence among units into consideration. Furthermore, time invariant variables such as immigration category, ethnic group, and region of origin can be included in the regression as part of X, which is impossible in the fixed effects model. The GEE model is appropriate when inferences about the population-average are the focus. In this paper, the average difference between groups with varied stock of social capital is of most importance, not the difference for any one immigrant. Thus we present our results from the GEE model framework in the current paper.[8]

Regression Results and Discussion

Table 4 presents the survey means and standard errors of the variables used in our empirical models for all immigrants. Time variant variables and time invariant variables are differentiated in the table. The regression results from the GEE models are reported in Table 5.

Table 4:   Survey Means of Variables in the Final Specification Estimation, All Immigrants

	N=7656 n=22320	
	Weighted mean	**Standard error**
Healthy	0.946	0.002
Time invariant variables		
Immigration category		
Family class	0.266	0.003
Skilled worker principal applicants	0.349	0.004
Skilled worker spouses and dependants	0.257	0.003
Refugees	0.063	0.001
Other immigrants	0.066	0.002
Sex		
Male	0.497	0.004
Female	0.503	0.004
World region of birth		
Asia and Pacific	0.598	0.004
North America, the United Kingdom and Western Europe	0.052	0.002
Caribbean and Guyana, South and Central America	0.059	0.002
Europe except UK and Western Europe	0.111	0.002
Africa and Middle-East	0.181	0.003
Education at landing		
High school or less	0.250	0.003
Trade certificate or college, some university	0.199	0.003
University degree	0.361	0.004
Master's degree or above	0.190	0.003
Time variant variables		
Age group		
15-19	0.051	0.002
20-34	0.431	0.004
35-44	0.315	0.003
45-64	0.169	0.003
65+	0.035	0.001
Having problems accessing health care services	0.178	0.003
CMA of residence		
Toronto	0.439	0.004
Vancouver	0.147	0.002
Montreal	0.136	0.003
Calgary	0.052	0.001
Ottawa	0.033	0.001
Other cities	0.193	0.003
Self-assessed language ability		
English	0.832	0.003
No English ability	0.168	0.003
French	0.158	0.003
No French ability	0.842	0.003
Family income		
Income quartile 0-25%	0.251	0.003
Income quartile 25%-50%	0.252	0.003
Income quartile 50%-75%	0.248	0.003
Income quartile 75%-100%	0.250	0.003
Employment		
Employed	0.580	0.004
Not employed	0.420	0.004

No spouse	0.390	0.004
Spouse employed	0.325	0.003
Spouse not employed	0.286	0.003
Social capital variables		
Having relatives in Canada upon landing	0.547	0.004
Number of relatives in Canada	0.807	0.007
Frequency of contact with family sponsors	0.278	0.003
Having friends in Canada upon landing	0.574	0.004
Having made new friends	0.891	0.002
Number of sources meeting friends	2.629	0.012
Frequency of contact with friends	0.766	0.002
Ethnic diversity of friends	0.465	0.002
Number of organizations participated in	0.339	0.005
Ethnic diversity of organizational network	0.016	0.000
Frequency of activities with organizations	0.160	0.002
Numbers of organizations for which the respondent volunteered time	0.178	0.004
Time period		
Wave 1	0.336	0.003
Wave 2	0.331	0.003
Wave 3	0.333	0.003

Source: LSIC (2005).

Let us first look at the regression results for all the LSIC immigrants (see Table 5).

Column 1 reports the regression results of the specification without social capital variables. The estimated effects of the demographic variables (e.g., age and gender) are consistent with the theoretical explanations and the findings from the existing empirical studies. Males are more likely to report good health than females. Immigrants in the older age groups are more likely to rate their health status as fair or poor. The marginal effects related to the 15-19 age group (reference group) decline as age increases. Immigrants in the oldest age group of 65 and over are less likely to rate their health status as healthy compared to those aged 15-19. However, region of birth does not have a significant effect on the health status of recent immigrants.

As discussed previously in the descriptive analysis, the health status varies across immigration categories. The regression results confirm that the health status is significantly different across immigration categories, controlled for other characteristics. Compared to family class immigrants, skilled worker principal applicants are more likely to report good health, while refugees are more likely to report poor health.

In terms of perceptions of official language ability variables, health status varies significantly across groups. Compared with no official language ability, being proficient in English is associated with a higher likelihood of reporting as healthy. However, the ability to speak French does not have a significant effect on health. The effect of level of education at landing is also not statistically significant during the initial four years after landing.

For the variables of accessibility to the Canadian health care system, immigrants who have had problems accessing health care services are more likely to rate their health as fair or poor. This may reflect the role of immigrants' ability to effectively identify and access health care services (including preventive care) in positive perceptions of health status.

Looking at family income quartiles, there are quite large differences in health status across groups. Immigrants in the lowest family income quartile are more likely to report poor health. Furthermore, the employment status of both respondents and their spouses is positively associated with immigrants' health.

When including time indicators in the regressions, we confirm the "healthy immigrant effect" – when compared with the situation in wave 1, immigrants are less likely to report being in good health in wave 2 and wave 3 (the likelihoods are 3 percent points and 4.5 percent points, respectively, lower than that in wave 1).[9]

Columns 2 to 4 of Table 5 estimate models with social capital variables. As an initial step, column 2 only adds general indicators of the existing networks including relatives and friends in Canada upon landing, and development of new networks after landing captured by whether an immigrant made new friends in Canada. The addition of these indicators does not change other effects much. Also, making new friends in Canada

shows a positive relationship with health status of immigrants. To further investigate which elements play a role among networks, column 3 includes all network content indicators in the model. The results confirm what column 2 indicates – friendship networks matter, particularly frequency of contact and ethnic diversity of the networks. Column 4 presents the final specification with social capital effects.

In terms of social capital variables, our results indicate that friendship networks have a significant effect on the respondents' self-reported status of health. Both the frequency of contact with friends and the ethnic diversity of friends have significant and positive effects on immigrants' health.

Immigrants who have more diverse friendship networks and who are in contact with their friends more frequently are more likely to report being in good health. However, it is important to note that we do not find significant effects of family and relative networks or group and organization networks on health for all immigrants.

Table 5: GEE Population-Averaged Estimations of Probability of Being Healthy for All Immigrants in the First Four Years in Canada

	1	2	3	4
	No social capital indicators	Social capital (1)	Social capital (2)	Social capital (3)
	Marginal effects (dy/dx)	Marginal effects (dy/dx)	Marginal effects (dy/dx)	Marginal effects (dy/dx)
Immigration category				
[Family class]				
Skilled worker principal applicants	0.011**	0.008*	0.008	0.009**
Skilled worker spouses and dependants	0.003	0.000	0.000	0.002
Refugees	-0.015**	-0.018***	-0.018***	-0.016***
Other immigrants	0.013***	0.011**	0.011**	0.012***
Gender				
[Female]				
Male	0.016***	0.016***	0.015***	0.015***
Age group				
[15-19]				
20-34	-0.005	-0.004	-0.004	-0.003
35-44	-0.025**	-0.024**	-0.023**	-0.021**
45-64	-0.058***	-0.053***	-0.053***	-0.05***
65+	-0.094***	-0.085***	-0.082***	-0.078***
Region of birth				
[Asia and Pacific]				
North America, the United Kingdom and Western Europe	0.017***	0.016***	0.014**	0.014**
Caribbean and Guyana, South and Central America	0.008	0.008	0.007	0.006
Europe except UK and Western Europe	0.001	0.001	-0.001	0.000
Africa and Middle-East	0.003	0.004	0.003	0.002
Problems accessing health care services				
[Not having problems accessing health care services]				
Having problems accessing health care services	-0.039***	-0.039***	-0.038***	-0.039***
Census Metropolitan Area (CMA) of residence				
[Other cities]				
Toronto	-0.005	-0.005	-0.004	-0.004
Vancouver	-0.019***	-0.019***	-0.017***	-0.017***
Montreal	-0.002	-0.002	-0.002	-0.002
Calgary	-0.012	-0.011	-0.011	-0.011
Ottawa	0.003	0.003	0.004	0.004
Official languages				
[No English speaking ability]				
English	0.028***	0.027***	0.024***	0.024***
[No French speaking ability]				
French	0.007	0.007	0.007	0.006

Economic status				
[Income quartile 0%-25%]				
Income quartile 25%-50%	0.006**	0.006**	0.006**	0.006**
Income quartile 50%-75%	0.01***	0.01***	0.01***	0.01***
Income quartile 75%-100%	0.011***	0.011***	0.011***	0.012***
Employment status				
[Not employed]				
Employed	0.012***	0.012***	0.012***	0.011***
Employment status of spouse				
[No spouse]				
Spouse employed	0.007**	0.007**	0.007**	0.007**
Spouse not employed	0.004	0.004	0.004	0.004
Education level at landing				
[High school or less]				
Trade certificate or college, some university	0.000	0.000	0.000	0.000
University degree	0.004	0.004	0.004	0.004
Master's degree or above	0.003	0.002	0.003	0.002
Social capital				
Family and relatives				
Having relatives in Canada upon landing		-0.005*		
Number of relatives			-0.001	
Frequency of contact with family sponsors			-0.002	
Friends				
Having friends in Canada upon landing		-0.003		
Having made new friends		0.014***		
Number of friends			0.000	
Frequency of contact with friends			0.015***	0.015***
Ethnic diversity of friends			0.013**	0.013***
Groups and organizational network				
Number of groups or organizations participated in			-0.003	
Frequency of activities with organizations			0.008	
Ethnic diversity of organizational networks			-0.001	
Number of organizations volunteered time for			0.002	
Time effect				
[Wave 1]				
Wave 2	-0.028***	-0.03***	-0.03***	-0.03***
Wave 3	-0.042***	-0.042***	-0.046***	-0.045***
No. of observations	22377	22375	22049	22320
No. of individuals	7656	7656	7652	7656

Notes: * p<0.1; ** p<0.05; *** p<0.01; marginal effects for dummy variables are for discrete change from 0 to 1; reference categories are in brackets.

Source: LSIC (2005).

Regression results for family class immigrants

In order to investigate the different ways in which social capital affects the health status of immigrant sub-groups, we also present the regression results of our GEE model for the reference group of family class immigrants (see Table 6).

Noteworthy regression results indicate that family and relative networks, friendship networks, and group and organization networks all have significant effects on the health status of recent family class immigrants.

Unlike the results from the model for all immigrants, for each of the three networks the effects of frequency of contact with network members or units are all statistically significant. Compared to those who do not have contact with friends or take part in organizational activities regularly, family class immigrants who interact with friends or groups on a daily basis are more likely to report that they are healthy.

However, frequency of contact with family sponsors is associated with a lower likelihood of reporting a positive health status. This may be partly due to the fact that a large proportion of family class immigrants are sponsored parent and grandparent immigrants (PGPs), who tend to be much older than the average family class immigrant.[10] The LSIC shows that the majority of PGPs lived with their family sponsors during the initial years after landing, and elderly PGPs are more likely to live with their sponsors (Zhao 2007b). In addition, a significant number of PGPs (37 percent at six months after landing, and 34 percent at two years after landing) who live with their sponsors provide unpaid labour for their sponsors, such as maintaining a house and caring for family members, which might be a factor that negatively affects their health. Another possible explanation for this finding may rest in the negative potentiality of social capital. As indicated in the literature review, social capital is not inherently positive; it may be the case that the frequency of contact with family members is connected to increased demands for time, resources, and energy by these networks. These excessive demands may adversely affect the health of recent immigrants.

The regression results also indicate that social network size and social network diversity do not have any significant effect on family class immigrants' health.

Table 6: Social Capital Effects on Probability of Being Healthy in the Initial Four Years in Canada, Family Class Immigrants

	Marginal effects (dy/dx)	Standard error
Social capital		
Frequency of contact with family sponsors	-0.018**	0.008
Frequency of contact with friends	0.027***	0.009
Frequency of activities with organizations	0.031***	0.010
Time effect		
[Wave 1]		
Wave 2	-0.044***	0.009
Wave 3	-0.068***	0.013
No. of observations	5621	
No. of individuals	1985	

Notes: * p<0.1; ** p<0.05; *** p<0.01. Reference categories are in brackets; marginal effects for dummy variables are for discrete change from 0 to 1; GEE population-averaged regression is used. The regression also includes controls for sex, age group, area of birth, incidence of problems accessing Canadian health care system, CMA of residence, ability of official languages, family income, employment status of the respondent and the spouse, and education.

Source: LSIC (2005).

Conclusion

Using all three waves of the LSIC, we investigated the changes in the health status of recent immigrants through both descriptive and regression analyses. Our descriptive analyses from the LSIC and the CCHS provides strong support for the existence of the "healthy immigrant effect," which suggests that the self-reported health status of immigrants during the initial four years after landing is better than that of the Canadian born population. However, both descriptive and regression results indicate that the proportion of immigrants reporting as healthy diminishes over time.

Our findings also suggest that there are disparities in health status among recent immigrant subgroups. Skilled workers principal applicants are more likely to be in excellent, very good, or good health, while refugees are more likely to rate their health status as fair or poor.

When looking at the effects of selected social capital variables, our study shows that friendship networks play a very important role in the health of recent immigrants. The density and ethnic diversity of friendship networks have significant and positive effects on immigrants' self-rated health status. For family class immigrants, aside from friendship networks, group and organization networks also have a significant and positive effect on health status during the initial four years after landing. Existing family ties in Canada at landing have a significantly larger positive relationship with the health status of family class immigrants' than for other immigration categories.

Policy implications

Evidence from the LSIC indicates that social capital plays an important role for immigrants in the maintenance of good health during the initial years after landing. Therefore, social capital research can be very useful in informing immigrant health policy. Government of Canada programs such as the Immigrant Settlement and Adaption Program (ISAP), the Language Instruction for Newcomers (LINC) program, and the Host program can play a significant role in increasing the social capital of immigrants and can in turn affect health outcomes. These existing programs can support and promote recent immigrants' settlement and integration into Canadian society by facilitating the building of bonding and bridging networks and community connections.

Evidence from this paper suggests that problems in accessing health care services, including language barriers, relate significantly to the health outcomes of immigrants. In order to overcome these problems and provide recent immigrants with the information they need to take charge of their health and that of their family, community based multicultural health events would be complementary to government programs. The Multicultural Health Fair (MHF), developed by the Affiliation of Multicultural Societies and Services Agencies (AMSSA) in 2005, is a free community event that brings together representatives and volunteers from ethnic communities across Vancouver to provide health care information to new immigrants (AMSSA 2008). Such events are beneficial because they provide a space where individuals can connect and share information, experience and knowledge while also building community social capital.

Governments can also encourage policies and programs that facilitate linkages between organizations and agencies involved in immigrant population health. One example of a project that attempts to achieve this is British Columbia's "Mapping Initiative." Mapping enables the identification of available services within the various communities, and also provides information for policy-makers and service providers on a wide range of health issues impacting diverse populations residing in the province. Furthermore, it encourages a community-based model for population health by connecting and linking various health organizations and community service agencies that are currently or may be potentially engaged in population health. These inter-institutional networks can "improve the effectiveness of programs and lead to the establishment of others" which can lead to an "increased circulation and sharing of tangible (money, materials, equipment) or intangible (information, expertise) resources" (PRI 2005a, 24).

Finally, further research on the effect of social capital on the health of immigrants is necessary in order to create a more robust evidence base to inform the development of policies and programs. Further analysis of datasets such as the GSS and the LSIC is an important first step. Looking forward, the development and funding of immigrant health-based datasets or the addition of a larger immigrant sample to currently existing health based datasets may also be beneficial.

References

Affliation of Multicultural Societies and Services Agencies. 2008. "Promoting Healthy Living in Multicultural Communities: The Multicultural Health Fair." Vancouver: AMSSA.

Berkman, L., and T. Glass. 2000. "Social Integration, Social Networks, Social Support and Health." In *Social Epidemiology*, edited by L. Berkman and I. Kawachi. New York: Oxford University Press.

Bertrand, M., Luttmer, E. and S. Mullainathan. 2000. "Network Effects and Welfare Cultures." *Quarterly Journal of Economics* 115: 1019-55.

Bond, J. 2006. "Self-Rated Health Status as a Predictor of Death, Functional and Cognitive Impairment: A Longitudinal Cohort Study." *European Journal of Aging* 3: 193-206.

Bourdieu, P., and L. P. D. Wacquant. 1992. *An Invitation to Reflexive Sociology*. Chicago: University of Chicago Press

Chiswick, B.R., and P.W. Miller. 1996. "Ethnic Networks and Language Proficiency among Immigrants." *Journal of Population Economics* 9 (1): 19-35.

Citizenship and Immigration Canada. 2007. *Facts and Figures*. Ottawa: CIC.

Deri, C. 2005. "Social Networks and Health Service Utilization." *Journal of Health Economic*s 24: 1076-107.

Dunn, J. and I. Dyck (1998) "Social Determinants of Health in Canada's Immigrant Population: Results from the National Population Health Survey" Research on Immigration and Integration in the Metropolis Working Paper Series No. 98-20. Burnaby, BC: Vancouver.

Fisher, K.J., F. Li, Y. Michael, and M. Cleveland. 2004. "Neighbourhood Influences on Physical Activity among Older Adults: A Multi-level Analysis", *Journal of Aging and Physical Activity* 11: 49-67

Franke, S. 2006. "What Is Social Capital and Why Is It Important to Health Research and Policy?" *Health Policy Research Bulletin* 2: 6-9.

Helliwell, J. 2003. "Well-Being and Social Capital: Does Suicide Pose a Puzzle?" NBER Working Papers from National Bureau of Economic Research Inc. http://econpapers.repec.org/paper/nbrnberwo/10896.htm (accessed 10 January 2009).

Hendryx, M., M. Ahern, N. Lovrich, and A. McCurdy. 2002. "Access to Health Care and Community Social Capital." *Health Services Research* 37 (1): 85-101.

Hu, F., J. Goldberg, D. Hedeker, B. Flay, and M.A. Pentz. 1998. "Comparison of Population-Averaged and Subject-Specific Approaches for Analyzing Repeated Binary Outcomes." *American Journal of Epidemiology* 147 (7): 694-703.

Huisman, M., F. van Lenthe, and J. Mackenbach. 2007. "The Predictive Ability of Self-Assessed Health for Mortality in Different Educational Groups." *International Journal of Epidemiology* 36 (6): 1207-13.

Idler, E.L., and S. Kasl. 1995. "Self-Ratings of Health: Do They Also Predict Change in Functional Ability?" *Journal of Gerontology* 50B (6): S344-S353.

Idler, E.L., and Y. Benyamini. 1997. "Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies." *Journal of Health and Social Behaviour* 38 (1): 21-37.

Idler, E., S. Hudson, and H. Leventhal. 1999. "The Meanings of Self-Ratings of Health: A Qualitative and Quantitative Approach." *Research on Aging* 21 (3): 458-76.

Jones, A. 2008. *Applied Econometrics for Health Economists*. Oxford: Radcliffe Publishing.

Kawachi, I. 2006. "Commentary: Social Capital and Health: Making the Connections One Step at a Time." *International Journal of Epidemiology* 35: 989-93.

Kawachi, I., B. Kennedy and R. Glass. 1999. "Social Capital and Self-Rated Health: A Contextual Analysis", *American Journal of Public Health* 89 (8): 1187-1193.

Kawachi I., D. Kim, A. Coutts and S.V. Subramanian. 2004. "Commentary: Reconciling the Three Accounts of Social Capital", *International Journal of Epidemiology* 33 (4): 682-690.

Kim, D., S.V Subramanian, and I. Kawachi. 2008. "Social Capital and Physical Health: A Systematic Review of the Literature." In *Social Capital and Health*, edited by I. Kawachi, S. Subramanian, and D. Kim. New York: Springer.

Lavis, J., and G. Stoddart. 1999. "Social Cohesion and Health." CHEPA Working Papers Series 99-09. Hamilton, ON: McMaster University.

Liang, K., and S. Zeger. 1986. "Longitudinal Data Analysis Using Generalized Linear Models." *Biometrika* 73: 13-22.

MacKian S. 2002. "Complex Cultures: Rereading the Story about Health and Social Capital." *Critical Social Policy* 22 (2): 203-25.

McDonald, J.T., and S. Kennedy. 2004. "Insights into the Health Immigrant Effect: Health Incidence and Health Service Use of Immigrants to Canada." *Social Science and Medicine* 19 (8): 1613-27.

Mohan, G., and J. Mohan. 2002. "Placing Social Capital." *Progress of Human Geography* 26 (2): 191-210.

Newbold, B. 2009. "The Short-Term Health of Canada's New Immigrant Arrivals: Evidence from the LSIC." *Ethnicity and Health* 14 (3): 315-36.

Newbold, B., and J. Danforth. 2003. "Health Status and Canada's Immigrant Population." *Social Science and Medicine* 57: 1981-995.Ooka, E., and B. Wellman. 2003. "Does Social Capital Pay Off More within or between Ethnic Groups? Analyzing Job Searches in Five Toronto Ethnic Groups." In *Inside the Mosaic*, edited by E. Fong, 199-226. Toronto: University of Toronto Press.

Ooka, E., and B. Wellman. 2006. "Does Social Capital Pay Off More within or between Ethnic Groups? Analyzing Job Searches in Five Toronto Ethnic Groups." In *Inside the Mosaic*, edited by E. Fong, 199-226. Toronto: University of Toronto Press.

Perez, C. 2002. "Health Status and Health Behaviour Among Immigrants.," *Health Reports* 13: 89-100.

Portes, A. 1998. "Social Capital: Its Origins and Applications in Modern Sociology." *Annual Review of Sociology* 24: 1-24.

PRI. 2005a. "What Impact Does Social Capital Have on the Health of Canadians?" Policy Research Initiative Project: Social Capital as a Public Policy Tool. Ottawa: Government of Canada.

– 2005b. "Measurement of Social Capital: Reference Document for Public Policy Research, Development, and Evaluation," Policy Research Initiative. Ottawa: Government of Canada.

Putnam, R. 1995. "Bowling Alone: America's Declining Social Capital." *Journal of Democracy* 6: 65-78.

– 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.

– 2001. "Social Capital: Measurement and Consequences." *Canadian Journal of Policy Research* 2 (1): 41-51.

– 2007. "E Pluribus Unum: Diversity and Community in the Twenty-First Century." *Scandinavian Political Studies* 30 (2): 137-74.

Rivers, P.A., and F.G. Patino. 2006. "Barriers to Health Care Access for Latino Immigrants in the USA." *International Journal of Social Economics* 33 (3): 207-20.

Rose, R. 2000. "How Much Does Social Capital Add to Individual Health? A Survey Study of Russians." *Social Science and Medicine* 51: 1421-35.

Staber, U. 2006. "Social Capital Processes in Cross Cultural Management." *International Journal of Cross Cultural Management* 6 (2): 189-202.

Statistics Canada. 2006. *Canadian Community Health Survey User Guide*. Ottawa: Statistics Canada.

Statistics Canada. 2007. *Longitudinal Survey of Immigrants to Canada, Wave 3 – Microdata User Guide*. Ottawa: Statistics Canada.

Subramanian, S.V., and I. Kawachi. 2004. "Income Inequality and Health: What Have We Learned So Far?" *Epidemiologic Reviews* 26: 78-91.

Ueno, K. 2004. "Emotional Consequences of Racial Concordance in Friendship Network and School Context." Paper presented at the annual meeting of the American Sociological Association, 14 August.

Van Kemenade, S., J. Roy, and L. Bouchard. 2006. "Social Networks and Vulnerable Populations: Findings from the GSS." *Health Policy Research Bulletin* 2: 16-20.

Wen, M., D. Browning, and K. Cagney. 2003. "Poverty, Affluence, and Income Inequality: Neighborhood Economic Structure and Its Implications for Health." *Social Science and Medicine* 57 (5): 843-60.

Wooldridge, J. 2005. "Simple Solutions to the Initial Conditions Problem in Dynamic, Nonlinear Panel Data Models with Unobserved Heterogeneity." *Journal of Applied Econometrics* 1: 39-54.

Xue, L. 2008. "Social Capital and Labour Market Outcomes of Recent Immigrants to Canada: Employment Entry, Wages and Duration of Access to the First Job in Intended Occupation." Ph.D. dissertation, University of Ottawa.

Zeger, S.L., K. Liang, and P.S. Albert. 1998. "Models of Longitudinal Data: A Generalized Estimating Equation Approach." *Biometrics* 44: 1049-60.

Zhao, J. 2007a. "Socio-Economic Determinants of Health and Health Care Utilization of Recent Immigrants in Canada." Prepared for Citizenship and Immigration Canada.

– 2007b. "Sponsored Parents and Grandparents: A Comprehensive Picture." Prepared for Citizenship and Immigration Canada.

Appendix

Table A1: Social capital variables

Family And Relatives	
Having relatives in Canada upon landing	1 if LR[1] had relatives in Canada upon landing, 0 otherwise.
Number of relatives in Canada	Number of types of relatives (spouse, children, parents, grandparents, brothers or sisters, etc.) in Canada, ranging from 0 to 11.
Frequency of contact with family sponsors	Frequency of contact with family sponsor (0~1) : 0--- No sponsor or having not seen or talked to sponsors since arriving; Between 0 and 1 --- Seeing or talking to sponsors in varied frequencies; the higher the index is, the more frequently LR contacts with sponsors. 1--- Seeing or talking to sponsors every day.
Friends	
Having friends in Canada upon landing	1 if LR had friends in Canada upon landing, 0 otherwise.
Having made new friends	1 if LR had made new friends, 0 otherwise.
Number of sources meeting friends	Number of sources meeting new friends other than workplace, ranging from 0 to 14.
Ethnic diversity of friends	Ethnical diversity of friend network (0~1): 0--- No friends or all friends belong to the same ethnic or cultural groups as LR; Between 0 and 1 --- Some friends belong to the same ethnic or cultural groups as LR; the higher the index is, the more ethnically diversified is the friend network. 1--- None of the friends belong to the same ethnic or cultural groups as LR.
Frequency of contact with friends	Frequency of contact with friends (0~1) : 0--- No friends or having not seen or talked to friends since arriving; Between 0 and 1 --- Seeing or talking to friends in varied frequencies; the higher the index is, the more frequently LR contacts with friends. 1--- Seeing or talking to friends every day.
Group and organizational network	
Number of organizations participated in	Number of organizations or groups LR participated in. ranging from 0 to 13.
Ethnic diversity of organizational network	Ethnical diversity of organizational network (0~1): 0--- Not participated in any organization or all the members of all organizations belong to the same ethnic or cultural groups as LR; Between 0 and 1 --- Some members of organizations belong to the same ethnic or cultural groups as LR; the higher the index is, the more ethnically diversified is the organizational network. 1--- None of the members of organizations belong to the same ethnic or cultural groups as LR.
Frequency of activities with organizations	Frequency of activities with organizations (0~1): 0--- Not participated in any organization; Between 0 and 1 --- Having taken part in organizational activities in varied frequencies; the higher the index is, the more frequently LR takes part in activities. 1--- Having taken part in activities every day.
Numbers of organizations for which LR volunteered time	Number of organizations or groups that LR volunteered time for organizations or groups, 0 otherwise.

[1] LR: Longitudinal Respondent.

Source: Xue (2008); Longitudinal Survey of Immigrants to Canada (2005).

Notes

[1] Individuals who applied and landed from within Canada are excluded from the survey. Refugees claiming asylum from within Canada are also excluded from the scope of the survey. For detailed information on sample selection of the LSIC and the survey design and frame, please consult *Longitudinal Survey of Immigrants to Canada, Wave 3 – Microdata User Guide*, Statistics Canada, 2007.

[2] Self-reported health is a commonly used measure of health but has limitations. The data from survey that are self-reported and the degree to which they may be inaccurate because of reporting error is unknown (Perez 2002). One issue in particular is that the notion of what constitutes good health may well change not only with age but also with time in the new country. One of the weaknesses of the LSIC is its limited information on health, so we have few alternatives but to use self-reported health.

[3] In the following regression analyses, not all indicators for network reciprocity are included. Because of low variability, the indicators for number of types of help received from a certain kind of network are not included.

[4] Other immigrants include mostly business immigrants and a very small number of immigrants who landed under the categories not specified in aforementioned categories.

[5] The top five CMAs are Toronto, Vancouver, Montreal, Ottawa, and Calgary.

[6] It is important to note that since we are dealing with survey data, as with most other variables in the LSIC, knowledge of official language is self-assessed.

[7] Incidence of having problems accessing Canadian health care system might be endogenously determined by social network variables, etc. To address this issue, we compare the GEE population averaged logit estimates with IV estimates, where incidence of barriers to the health care system is treated as endogenous, and education at landing is used as an instrument. We argue that education variables are correlated with incidence of reporting problems accessing health care services, but not with the health status of immigrants. The Wald test statistic of exogeneity from the IV results is not significant, suggesting that there is no sufficient information to reject the null that there is no endogeneity. With the thought that the instruments may not be adequate, we also ran a simultaneous bivariate probit regression of whether an immigrant reported as healthy and whether the immigrant reported having problems accessing health care services, based on the other covariates. The results of social capital effects on health are quite similar to what we report in Table 5. Both the IV results and the bivariate probit regression results are available on request from the authors.

[8] In this paper, we only present the results from the GEE models, while the results from random effects and fixed effects models are available upon request.

[9] To investigate the time effects, we control for two types of time variables: (1) number of weeks in Canada since landing (continuous variable), and (2) wave variables (dummy variables). Both methods provide us with similar regression results: the respondents' self-rated health status is significantly and negatively related to increased time in Canada. This is consistent with our findings in the descriptive analysis that the health of recent immigrants declines over time. In Table 5 we only report results from the models with wave indicators used.

[10] In the LSIC, PGPs account for 34 percent of family class immigrants. In 2001, the average age at landing of family class immigrants was 34 years, while the average age at landing of PGPs was 52 years – calculations based on data extracts on 31 March 2009 from CIC's Permanent Resident Data System (PRDS).