Social Networks and the Probability of Having a Regular Family Doctor

by Jamie Rudolph-Zbarsky

(6129307)

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Supervisor: Rose Anne Devlin

ECO 6999

Abstract

This paper contributes to the literature on the determinants of healthcare utilization by examining how social networks affect whether or not the individual has a regular doctor. This question is particularly important in situations where the supply of family physicians is clearly a constraint – as is the case for most jurisdictions in Canada. Having a regular doctor has been shown to have an impact on the health of an individual (McIsaac et al. 2001; Sanmartin et al., 2004; Sanmartin & Ross, 2006). This study uses the Canadian Community Health Surveys from 2000 to 2010 to examine the relationship between having a regular doctor and social networks. Three measures of social networks are used which include: sense of belonging to the local community, how often an individual has someone to confide in, and number of close friends and relatives. A probit model is employed to estimate the impact of a variety of demographic and socio-economic variables, as well as social networks, on the probability of having a regular doctor. Some evidence is found that there is a relationship between social networks and having a regular doctor.

1.0 Introduction

Inequality in healthcare utilization exists today in spite of the fact that universal healthcare has been around in one form or another across Canadian jurisdictions for over 40 years.[1] A number of factors appear to influence health-care access and utilization, chief among which are income and other socio-economic characteristics. For instance, income has been shown to increase the probability of visiting a general practitioner (GP) at least once a year (Allin, 2008). However, lower income groups tend to use more medical services relative to others (Dunlop et al., 2000; van Doorslaer et al., 2004). Furthermore, Dunlop et al. (2000) found that lower income households are more likely to make six or more visits to a GP compared to those of high income households; and individuals in higher socio-economic groups are more likely to receive referrals to specialists for both the probability of a visit and also the total number of visits (Dunlop et al., 2000). Although they have been found to use more healthcare services, individuals living in the poorest 20% of neighborhoods are more likely than the more prosperous to die of cancers, heart disease, diabetes, and respiratory diseases (Raphael, 2000).

Immigration status and length of time an immigrant has been in Canada has been shown to effect healthcare utilization. Recent immigrants were found to be approximately two and a half times more likely than individuals who are Canadian born to report having difficulties getting access to immediate care (Sanmartin & Ross, 2006).

The effect of employment status on health services utilization is indirect, because employment status affects income. The literature suggests that working is associated with better

[1] Health Canada. *Canada's Health Care System.* Retrieved on 2 November 2012, from http://www.hc-sc.gc.ca/hcs-sss/pubs/system-regime/2011-hcs-sss/index-eng.php#a3

health and that the unemployed are more likely to use healthcare services (Laroche, 2000; Newbold & Danforth, 2003)[2].

In addition to socio-economic factors, 'social capital' is thought to be linked to healthcare utilization. Social capital is a broad concept which has been defined and interpreted in numerous ways. The theory of social capital suggests that relationships lead to mutually beneficially behaviours (Brown et al., 2006). While a general definition for social capital does not exist, there are some generally agreed upon characteristics such as community involvement and networks. Putnam (1995) defines social capital as the networks, norms, and social trust that are created by membership in organizations that create coordination and cooperation for mutual benefit.

Several researchers have linked different aspects of social capital to healthcare utilization. Laporte et al. (2008) found that community social capital (CSC), measured using the Petris Social Capital Index(PSCI), resulted in increased utilization of physician services utilization for younger individuals, but decreased utilization for seniors (Laporte et al., 2008).The PSCI is based on employment levels in community and religious-based organizations. At the community level, social capital is thought to enhance healthcare services access and accessibility within the community (Scheffler & Brown, 2008). In addition to effecting the utilization of healthcare services, social capital has also been shown to have a positive effect on both physical and mental health (Kawachi et al., 1997). Mortality rates have also been shown to be affected by social capital (Hyyppä & Mäki, 2003).

A small number of papers have recognized the potential link between networks, one component of social capital, and healthcare utilization. For instance, Miltiades and Wu (2008) find that for Chinese immigrants their social networks are a primary predictor of GP visits. Deri

[2] Individuals may be unemployed because they are sick.

(2005) also finds evidence that networks affect healthcare utilization in groups where traditional medicine and in groups where alternative medicine is the cultural norm. However, while networks effect utilization they do not necessarily improve outcomes (Deri, 2005). Cultural norms refer to what are socially acceptable or encouraged behaviours.

This paper contributes to the literature on the determinants of healthcare utilization by examining how social networks affect whether or not the individual has a regular doctor. This question is particularly important in situations where the supply of family physicians is clearly a constraint – as is the case for most jurisdictions in Canada. Canada's supply of physicians per capita is significantly below the average for the Organization for Economic Co-operation and Development (OECD) countries. Canada ranks below the European Union nations and the United States and has the seventh lowest supply of physicians per capita among OECD nations (Haggie, 2012). The Canadian Collaborative Centre for Physician Resources (2009) estimates that Canada has a shortage of at least 3,244 family physicians.[3] This shortage is likely responsible for 24% of Canadians reporting difficulty getting an appointment with a general or family doctors and 25% of Canadians reported having to wait six or more days for a medical appointment as opposed to 19% of Americans and 13% of British (Sanmartin & Ross, 2006).

Having a regular doctor has been shown to have an impact on the health of an individual. For instance, McIsaac et al. (2001) found a relationship between regular visits to a family doctor and receiving preventive services. Individuals without a family doctor were also more likely to experience difficulties getting routine care than those with a regular family doctor (Sanmartin et al., 2004). Sanmartin and Ross (2006) found that having a regular family doctor reduced the

[3] The Canadian Collaborative Centre for Physician Resources. Family Physician Shortage Estimates. Retrieved on 24 June 2012, from http://www.cma.ca/multimedia/CMA/Content_Images/Policy_Advocacy/Policy_Research/10-FP_Shortage-E.pdf

probability of reporting problems accessing routine care. These studies show that having a regular source of care improves access to healthcare services (Dunlop et al., 2000; Sanmartin et al., 2004; McIssac et al., 2001). Moreover, having a regular doctor is needed facilitate referrals to specialists, which must come from a family physician.

In this study, I use the Canadian Community Health Survey data from 2000 to 2010 to examine the relationship between having a regular doctor and social networks. Three measures of social networks are used which include: sense of belonging to the local community, how often an individual has someone to confide in, and number of close friends and relatives. A probit model is employed to predict the probability of having a regular doctor. Some evidence is found that there is a relationship between social networks and having a regular doctor.

2.0 Literature Review

A small body of literature recognizes that aspects of social capital may be important in influencing individual's healthcare decisions particularly when it comes to using healthcare services. First, the literature on healthcare utilization is examined. Then, the literature on social capital and health services utilization is summarized.

2.1 Healthcare Utilization

Understanding the factors that affect the utilization of healthcare services is necessary to help ensure their efficient use. Interestingly, while the price of primary healthcare services in Canada may not be a factor given that they are essentially 'free', differences exist between how groups with low and high socio-economic status use these medical services. Lower income households are found to be more likely to make six or more visits to a general practitioner (GP), per year, compared to those in high income households (Dunlop et al., 2000). However,

individuals in higher socio-economic groups are more likely to receive referrals to specialists. Gender has also been shown to effect demand for healthcare services. Women have been found to use outpatient medical services more frequently than men (Bertakis et al., 2000; Nathanson, 1975). Immigration status has been found to affect an individual's ability to access care. Recent immigrants, who are defined as living in Canada for less than five years, have reported difficulty getting access to immediate healthcare (Sanmartin & Ross, 2006). Marital status and whether an individual has children also influence healthcare use. Household composition affects demand for healthcare, with some suggesting that there is an obligation to one's spouse and/or children to remain healthy and to decrease the tendency to engage in risky behaviour (Folland, 2006).

Appropriate medical care includes preventive care which not only improves health, but also can reduce overall healthcare expenditures. Preventive care is typically provided through a regular family doctor, and is often underused; consequently, some people require expensive medical treatments, have their lives shortened, and are less productive (National Commission on Prevention Priorities, 2007). The lack of a regular medical doctor is associated with a lower rate of utilization of both primary and specialist services even after making adjustments for socio-economic factors (Dunlop et al., 2000). A relationship was found between regular visits to a family doctor and receiving preventive services. Those without regular doctors were less likely to have ever had their blood pressure taken than individuals without regular doctors (McIssac et al., 2001). Individuals without a family doctor were also more likely to experience difficulties getting access to routine care than those with a regular family doctor (Sanmartin et al., 2004). These studies show that having a regular source of care makes accessing healthcare services easier (Dunlop et al., 2000; Sanmartin et al., 2004; McIssac et al., 2001). One potential influence

on having a regular source of care may be the networks created by individuals, which are often considered to be an important component of social capital.

The notion of social capital has been applied to a broad array of phenomena. Here, we consider it as a resource created by interactions between individuals that can be used to achieve common goals (Kawachi et al., 1999). Work on social capital while controversial among some economists due to the difficulty in agreeing upon a common definition and identifying its effects, has been increasingly accepted in economics journals (Macinko & Starfield, 2001). The literature has discussed whether social capital is developed at a community level, as an individual resource, or both. However, there is no widely agreed upon way to measure social capital.

Ahern and Hendryx (2005) view social capital as an inherently community level resource. Community social capital looks at the amount of cooperation, trust, and networks in a community. An individual's connections with others can have benefits[4] and this is thought to be due to reciprocity. Reciprocity is the theory that when one individual is friendly or does a favor an individual feels the need to repay this favor. While there is no agreed upon method for measuring community social capital (CSC) it is commonly measured using the Putnan index and the Petris social capital index (PSCI) (Laporte et al., 2008; Brown et al., 2006; Apinunmahakul & Devlin, 2008). The PSCI is based on employment levels in religious and community-based organizations. Areas with large number of people employed in religious and community-based organizations have a higher supply of CSC. The Putnam index focuses more on the demand side and looks at membership in various local organizations, community service, voter turnout, and so on. Putnam's indicators of social capital include: measures of community or organizational life,

[4] It is also possible that an individual's connections can cause harm and have negative externalities.

measures of engagement in public affairs, measures of informal sociability, measures of community volunteerism, and measures of trust (Putnam, 2000). Researchers have also suggested that income inequality is a proxy for CSC (Kawachi et al., 1997). An increase in income inequality has led to decrease in the level of social cohesion and trust, and hence a decrease in community social capital.

Other authors believe that social capital is an individual-level resource which is accrued through the interaction, cooperation, and networking with other individuals in the community (Laporte et al., 2008). Individual social capital (ISC) refers to networks which influence social support systems, social engagement and attachment (personal relationships such as family and friends), and access to scarce resources (Portes, 1998). Individual social capital is believed to have a positive link with several important behaviours, including healthcare utilization. The exact manner in which ISC effects healthcare utilization is a topic of debate. Anderson (1995) believes it may serve an enabling role by improving access to healthcare resources. In theory ISC can increase utilization of health services by information and transportation (rides from family members or friends) which can help improving access to the healthcare system (Laporte et al., 2008). Measures which are indicators for individual social capital (ISC) include an individual's feelings of belonging, sense of trust within the community, feeling of control over one's life, measures of social support, number or presence of friends (Rose, 2000) and the extent of social networks (Deri, 2005).

2.2 Social Capital and Healthcare

The literature on social capital and health has measured social capital at both the individual level, state level, and regional level. Most of the empirical studies initially focus on

community social capital; however some of the more recent work has included both individual and community components (Laporte et al., 2008).

A study by Kawachi et al. (1997) looks at the effects of community social capital on mortality rates. Community social capital was measured using some common indicators associated with Putnam (1995). First civic engagement was measured by using per capita density of membership in voluntary organizations at the state level. Then the level of social trust was measured by using data from the American General Social Survey[5]. Multiple questions were used to measure residents thought that people could be trusted. The study found that income inequality was strongly negatively correlated with membership in voluntary organizations and social trust. Both memberships in voluntary organizations and social trust were negatively associated with total mortality. Kawachi et al. (1997) concluded that income inequality leads to a decreased in investment in social capital which leads to an increase in mortality. A similar conclusion was also found in a paper by Lochner et al. (2003) which looked at neighborhoods in Chicago and social capitals effects on mortality rates. Neighborhood social capital included measures of reciprocity, trust, and civic engagement. Higher levels of neighborhood social capital were associated with lower mortality rate for neighborhoods. Another study by Kawachi et al. (1999) looked at trust and self-rated health. Social capital indicators were aggregated to the state level and created by using questions from the General Social Survey. These questions included: "Generally speaking, would you say most people can be trusted? (Kawachi et al., 1999, p. 1118)", "Would you say that most of the time people try to be helpful, or are they mostly looking out for themselves? (Kawachi et al., 1999, p. 1118)", and

[5] General Social Survey conducts research on the demographic characteristics and attitudes of residents of the United States with a data collection program that has existed since 1972.

question on membership in voluntary organizations was asked. A negative correlation between social trust and the percentage of individuals in fair or poor health was found.

Numerous studies measure social capital at the individual level (Rose, 2000; D'Hombres et al., 2010; Macinko & Starfield, 2001; Apinunmahakul & Devlin, 2008). One study of particular interest is Rose (2000) who besides using standard measures also adds measures to capture the different types of networks (formal and informal, market and anti-modern) to his regressions on social capital and individual health. Examples of a formal network would involve buying a house from an estate agent, of an informal network would be relying on friends to do repair work, and of anti-modern networks would include paying bribes and nepotism. Rose (2000) uses questions from the New Russia Barometer survey to measure networks. The survey is designed to measure social capital. Some of the questions ask if people have friends who will help them if they are sick, if they exercise or smoke, and whether they would pay a bribe to a doctor. Rose's (2000) definition of networks is unique in the sense that he does not use language or ethnic groups to form network variables (Deri, 2005; Aizer & Currie, 2004; Bertrand et al., 2000). Rose preforms three regressions to test three hypotheses: human capital is the main determinant of health; social capital is the main determinant of health; and human capital and social capital are both important determinants of health. Human capital is measured using questions on educational attainment, gender, age, total household income, and subjective socio-economic status[6]. Rose finds that if both human capital and social capital are included in a regression on individual health each has a significant effect on health. Including both forms of capital allows him to argue that social capital makes an independent contribution to health. Rose

[6] Measured using a ten point scale

(2000) also finds that social capital improves both physical and emotional health more than human capital.

Laporte et al. (2008) found community social capital resulted in the increased utilization of physician services by younger individuals, but decreased utilization for seniors. The authors suggested that CSC may make some services unnecessary such as counseling or caring services for seniors. CSC may also help keep seniors healthy, limiting the need for formal health services. Community programs such as "Meals on Wheels" have been especially beneficial to seniors and have allowed them more independence. In theory ISC can increase the utilization of health services by providing information on the availability of medical services which can help improve access to them. ISC can also lead to increased doctor visits up to a certain number of visits, however it can actually lead to a decrease in the number of doctor visits for individuals that are heavy users of healthcare services, by acting as a substitute for formal healthcare (Laporte et al., 2008). Hyyppä and Mäki (2001) also use individual social capital to explain the differences in health between Swedish and Finnish speaking communities in the Ostrobothnia region of Finland. Social capital and health status was measured by creating a survey. Questions about a person's number of friends and the availability friends to provide help measured social ties. Trust was measured by using two questions: Can people be trusted? And, do you think most people would try and take advantage of you if given the opportunity? Civic engagement was based on individual's participation in cultural clubs, attendance at events (cultural, religious, political, sports, work-related and community events, festivals, and art shows), and membership in voluntary organizations. Swedish communities have a higher level of social capital and have a higher level of health than the Finnish speaking communities.

Networks have been shown to affect the utilization of healthcare services. Deri (2005) suggests that having friends or acquaintances can help reduce search costs by providing information on available medical services. The opinions of your friends, family, and acquaintances may and change the demand for services by affecting the perceptions of the services. For instance, Deri (2005) looked at networks based on a common language other than French and English. Regions with high and low densities of language groups were compared and it was found that among certain high utilizing language groups there was an increase in use of healthcare services associated with networks. The opposite was true for low utilizing groups. Deri (2005) finds that networks affect behaviour possibly due to norms or by spreading information. When healthcare use is the norm for a certain group then its use is encouraged by the network. Networks can also affect the perceived usefulness and benefits of certain services by, for instance, providing information on various services (Deri, 2005). For groups whose first language is not English or French using ones friends or relatives to help find and understand what services are available is quite common. If these friends or relatives prefer alternative forms of medicine they will promote these services as opposed to traditional healthcare services.

Most research on networks involves either looking at immigrants or ethnic groups (Deri, 2005). For these groups it was found that networks replace formal support such as government agencies and religious institutions. However, when networks are overburdened, more formal resources will be employed. Aizer and Currie (2004) look at the effect of social networks on the utilization of publicly-funded prenatal care. They find evidence that utilization is highly correlated with the network variable. However, they believe that information sharing among individuals in the network is not responsible for this increase in utilization because the estimated

''network'' effect occurs even in the women who have some knowledge of the services because they have previously used them.

There are several limitations when examining the current research on social capital and networks and health services utilization. One of the main issues is that there is no standard way of measuring social capital or networks. These terms are ambiguous and broad. There is also no consensus on the exact definition of social capital. This makes comparing the various papers that study social capital difficult. Researchers use different measures and it is difficult to know if the proper measures are being used or are even available. Not all authors give explanations for why one measure of social capital was chosen over another (Macinko & Starfield, 2001). Another issue is creating indicators for measuring an individual's feelings such as their sense of belonging and trust. For social capital to be accurately and consistently measured a common set of measures must be developed (Macinko & Starfield, 2001).

An issue which makes discerning the relationship between social capital and health difficult is that most papers rely on cross-sectional data which does not allow us to observe the effects of social capital has over time. An individual with poor health and high level of social capital health may see larger and faster improvement in health than a person with low level of social capital. Another issue from an empirical perspective is omitted variable bias. There are significant limitations and problems associated with unobservable environmental variables. It is difficult to control for all factors which effect healthcare utilization such as labor market opportunities, school quality, and crime rates. This lack of information can make it difficult to make conclusions about the role of social capital (Deri, 2005; Moffitt, 2000).

3.0 Data and Methodology

The main sources of data for this study are six Canadian Community Health Surveys (CCHS): 2001(cycle 1.1), 2003(cycle 2.2), 2005(cycle 3.1), 2007-2008, 2009, and 2010. The CCHS surveys household population aged 12 or older in all provinces and territories. Individuals living on crown lands and on Indian Reserves, institutional residents, full time members of the Canadian Armed Forces, and residents of certain remote areas are not included in the survey (Statistics Canada, 2010).

The sample size of CCHS was 131,535 in cycle 1.1, 135,573 in cycle 2.1, 132,947 in cycle 3.1, 131,959 for 2007-2008, 61,679 for 2009, and for the 2010 survey the sample size was 63,191. However, after eliminating the observations with missing variables and observations not relevant for this study, the sample size decreased significantly. Table 1 defines all of these variables. The majority of the dropped variables are due to the fact that the social support component which contains the social network information is optional and each time the survey is produced the provinces decide whether or not to ask these optional questions. A significant number of people also refuse to divulge their income. People were also reluctant to answer whether the feel a sense of belonging to the community. After dropping those observations for which information was missing the sample size was reduced to 41,471 in cycle 1.1, 2,290 in cycles 2.1 (cycle 2.1 has the smallest sample size because only Newfoundland and PEI asked the questions from the optional social support component), 29,174 in cycle 3.1, 27,655 in 2007, 14,205 in 2009, and 14,331 in 2010 survey.

The confidential master files of the surveys were accessed through the COOL Research Data Centre and were used because they provided additional and more precise data than is available in the public use files. The master files provided information on the population density

of where an individual lives which is relevant because access to healthcare services may differ by the population of a community. Another benefit of having the master files is that you get exact responses on age and income.

There are many characteristics of the CCHS data set which makes it particularly well suited for this type of research. In addition to collecting demographic, socioeconomic and health information, these surveys also collect information on an individual's sense of belonging to the community and an individual's support network (number of friends, someone available to drive you to a doctor appointment, etcetera).

One issue with the CCHS is that the social support component which contains the social network information is optional, which means that each province or territory has the choice of asking the respondents these questions. The data from cycle 1.1 is most extensive. Manitoba was the only province that did not use this optional component at all in 2001. However, only 2% of respondents from Ontario and 75% of respondents from Saskatchewan were asked these questions. Ontario[7] and Saskatchewan[8] only asked individuals from certain regions questions from the optional component[9]. All other provinces asked all respondents these questions.[10] The data for cycle 2.1 was the least extensive wherein only respondents from Newfoundland and Prince Edward Island were asked these questions.[11] In cycle 3.1 only Quebec, Alberta, British

[7] Brant was the only region in Ontario where the social component questions were asked in 2001.
[8] Swift Current (C) Service Area, Regina (D) Service Area, Yorkton (E) Service Area, Saskatoon (F) Service Area, Rosetown (G) Service Area, Melfort (H) Service Area, North Battleford (J) Service Area, and Northern Health Services Branch (K) Service Area were the only regions in Saskatchewan where the social component questions were asked in 2001.
[9] Cycle 1.1 -- Health Region Sample Sizes and Optional Content Selections- http://www.statcan.gc.ca/concepts/health-sante/pdf/results-resultats-eng.pdf
[10] Cycle 1.1 -- Health Region Sample Sizes and Optional Content Selections- http://www.statcan.gc.ca/concepts/health-sante/cycle1_2/pdf/cchs-escc-selection1_2_1-eng.pdf
[11] CCHS Cycle 2.1 - Summary of Optional Content by Health Region http://www.statcan.gc.ca/concepts/health-sante/cycle2_1/pdf/cchs-escc-selection2_1_2-eng.pdf

Columbia, and the Northwest Territory used this optional component.[12] In 2007, Nova Scotia, Quebec, Yukon, and Nunavut used this optional component.[13] In 2009 and 2009-2010 surveys, New Brunswick, Quebec, Saskatchewan, British Columbia, and the Northwest Territories used this optional component. [14]

3.1 Dependent Variable

The point of this paper is to look at how networks may influence the probability that an individual has a regular family doctor. Thus, the dependent variable for the regression analysis is created from the answer to one question posed in all five surveys, namely: "do you/name have a regular medical doctor (Statistics Canada, 2010, p. 98)". The vast majority of respondents answered this question and less than one fifth of one percent either refused or did not know[15]. Having a regular doctor is important not only for preventive medicine but also to facilitate referrals to specialists – which must come from a family physician.

3.2 Social Network Variables

To test for the presence of network effects in the likelihood that someone has a regular family doctor, I use two different measures of networks. First, I use a number of different indicators of social networks reflecting the literature on this subject and the availability of data (e.g., Rose, 2000; D'Hombres et al., 2010; Hyyppä & Mäki, 2003; Macinko & Starfield, 2001; Laporte et al., 2008) and available data, I chose to use three variables: sense of belonging, number friends and relatives, and how often do you have "someone to confide in". The sense of

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[12] Canadian Community Health Survey (CCHS) Cycle 3.1 Optional Module Selection Consultation http://www.statcan.gc.ca/concepts/health-sante/cycle3_1/results.xls

[13] 2007 CCHS Microdata File User Guide http://www23.statcan.gc.ca/imdb-bmdi/pub/document/3226_D7_T9_V4-eng.pdf

[14] User guide 2009 Microdata files http://www23.statcan.gc.ca:81/imdb-bmdi/document/3226_D56_T9_V1-eng.htm#a14

[15] Respondents dropped for not answering whether they had a regular doctor ranged from 89 (0.00068%) to 198(0.00151) per year

belonging to the local community variable captures the aspect of the dealing with norms of reciprocity and generalized trust within a community. An individual with a strong social network is more likely to have a strong sense of belonging, as opposed to someone who is more isolated and does not feel like he belongs. The question "How would you describe your sense of belonging to your local community? Would you say it is: (Statistics Canada, 2010, p. 7)" was used to measure sense of belonging to the community. This variable has four responses: very strong, somewhat strong, somewhat weak, and very weak. Four Dummy variables are created using these responses to this one question. Dummy variables are also used to reflect the responses to the question: "How often is each of the following kinds of support available to you if you need it (Statistics Canada, 2010, p. 113)" "someone to confide in or talk to about yourself or your problems? (Statistics Canada, 2010, p. 113)" Five dummy variables are created by using the five possible responses: all of the time, most of the time, some of the time, a little of the time, or none of the time. Number of close friends and relatives variable comes from the response to the question "about how many close friends and close relatives do you have, that is, people you feel at ease with and can talk to about what is on your mind (Statistics Canada, 2010, p. 111)." The response to this question is a positive integer ranging from 0 to 99.

Rather than using a series of variables reflecting the components of social networks, the second approach used in this paper amalgamates the responses to all three network questions and creates an index which is included as an independent variable in the regression analysis. To create the network index, the numeric responses to each of the three questions were normalized for every respondent. Every response was assigned a number: for example for the question: How often do you have someone in whom you can confide? the value of 1 was given to the response "none of the time", the value of 2 to the response "a little of the time", 3 was assigned to "some

of the time", 4 to "most of the time", and 5 to "all of the time". The answer to the number of friends question was already a number, which made this step redundant. The mean and the standard deviation were calculated for all three questions. The responses for all three questions were normalized by subtracting from each individual's response the sample mean for that response and then dividing the resulting number by the standard deviation for that question. The normalized responses for the three questions from each individual were then summed and this number became their social network index. (Notice that we are thus assigning the same weight to each of the three questions in the index). The responses are normalized in a manner which makes the mean of the entire population equal to zero, as described in Apinunmahakul and Devlin, (2008)[16] rendering it easy to interpret the results (Appendix 1 contains a detailed explanation of how the index was created).

Separate regressions are run using either the individual components of social networks or the index of social networks. The social network variable attempts to see the affect that social contacts has on healthcare utilization

3.3 Control Variables

In addition to social capital, other explanatory variables were included in the analysis that potentially affect health and health services utilization (see, for instance, Rose, 2000; D'Hombres et al., 2010; Hyyppä & Mäki, 2000; Laporte et al., 2008; Dunlop et al.,2000). Sex has been shown to effect demand for healthcare services. Age was used because individuals tend to use more healthcare services with increasing age. Age squared was included because the relationship

[16] Social Netwok Index $= \frac{(X_1-\overline{X_1})}{\sigma_1} + \frac{(X_2-\overline{X_2})}{\sigma_2} + \frac{(X_3-\overline{X_3})}{\sigma_3}$
Where xi = question i, $\overline{x}i$ mean of question i, and σ_i standard deviation of question i

between age and healthcare utilization may not be linear. Income[17] was defined as total household income from all sources before taxes and deduction in the past year. Income squared was included for the same reason age squared was included; the relationship between income and healthcare utilization may not be linear. Marital status (married, common law marriage, separated, divorced, or single never married) and household size may influence an individual's decision making process. There may be obligations to one's spouse and/or children to remain healthy, use preventive medical services, and reduce risky behaviour (Folland, 2006). Education (less than secondary school graduation, secondary school graduation, some post-secondary, or post-secondary) was also included, because of its documented effect on healthcare utilization. Self-perceived health (excellent, very good, good, fair, or poor) and number of chronic conditions were also included.

Whether or not an individual is an immigrant may well influence the probability that they have a regular physician for several reasons. Language may be a barrier, and as pointed out by Deri (1995), individuals may seek more medical services when they are able to find physicians who speak their native language. Moreover, it may simply be a case of an individual immigrant not residing long enough in Canada to have information regarding which doctors are taking on new patients. As a result, we want to control for both the fact that the individual is an immigrant and the length of time that he or she has been in Canada. We know both of these pieces of information from the CCHS data set. Two variable are created to measure effect being immigrant has on whether you have a regular doctor. A dummy variable is created for being an

[17] Income is adjusted for inflation using the consumer price index. 2002 was selected as the bas year, which means that incomes are adjusted to be expressed in 2002 dollars. 2002 was selected by Statistics Canada as the base year for the table. Retrieved on 4 November 2012, from http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/econ46a-eng.htm

immigrant. A second variable (YSM) measures how long an immigrant has resided in Canada since immigrating to Canada. Thus, an individual born in Canada has value of 0 for the YSM variable.

Geographic variables include a dummy variable for the provinces and territories as well as dummy variables for population density (urban and rural). Individuals in rural areas may not be able to access healthcare services in the same way as those in more densely populated areas. In addition, since health is primarily the responsibility of provincial governments, each province has some differences when it comes to the implementation of health policies.

Table 2A shows the sample means[18] of all independent variables used in this analysis. Total household income is the only variable with a significant amount of variation between surveys. Income varies from approximately $5900 to a high of $67000. The variation can be explained by looking at which provinces were dropped from the sample because they did not ask the optional social support component. The 2003 CCHS had the smallest sample size which explains why that survey had the most variables with noticeable variation from other surveys. Gender, income, household size, and level of education show no significant amount of variation across the samples. Marital status has some minor variation, however if the 2003 CCHS survey is excluded the variation is no longer obvious. The sample means of the remaining variables are fairly consistent across surveys.

The sample means for self-received health represent the percentage of those surveyed who report excellent, very good, good, or poor health. The largest percent of respondents reported very good health 37% to 48% followed by good health 21% to 30%, excellent health 22% to 26%, fair health 6% to 8%, and poor health 1% to 2%. The number of individuals

[18] Sample means are weighted using population weights provided by the CCHS.

reporting poor health seemed low when taking in consideration that approximately 5.5% of the sample had diabetes and about 5% had heart disease. It seems likely that individuals tend to overestimate their health status.

The means for the social capital variables are fairly consistent across sample years; however there is some variation between the sample means from 2003 survey and the other years surveyed. While the number of respondents reporting having someone to confide in all the time range from 62% to 71% the values for sense of belonging to community are skewed more towards the middle with the large percentage (38% to 48%) of respondents reporting feeling a somewhat strong of a sense of belonging followed by a somewhat weak sense of belonging to the community (19% to 31%).

Table 2B shows the sample means for the dependent variables of select groups used in this analysis. Approximately 78% of the population has a regular doctor. A larger percentage of females, 85%, had a regular doctor than men (72%). Immigrants were slightly less likely to have a regular doctor than the mean for total sample. Higher income, married, and individuals with lower levels of education individuals were more likely to have a regular doctor.

3.4 Methodology

The dependent variable is a binary variable: one either has a regular family doctor or not, rendering the probit procedure the appropriate one to use. We focus only on the probability model as we are interested in how social networks influence the likelihood that someone has a regular family doctor. Since marginal benefit calculations are not observable, the probit model is based on an index function model, as described in Greene (2011, p.686). As Greene explains, the difference between the benefit and cost of engaging in a particular activity (in our case, taking on a regular doctor) can be denoted as an unobserved variable y^* such that

$$y^* = X'\beta + \varepsilon, \quad \text{where } \varepsilon \sim N(0, 1)$$

Since we do not observe the net benefit, only whether individual has decided to engage in the activity or not, then an index function can be created as follows:

$y = 1$ if $y^* > 0$,

$y = 0$ if $y^* \leq 0$

The index function allows us to link the regression model to the theoretical model of costs and benefits. The probability of observing y = 1 has the structure:

$$\Pr\{y = 1\} = F(\beta'X)$$

A probit model is one method that can be used to estimate this function (Greene, 2011) which assumes that the error structure follows a normal distribution. This approach is well known in the literature, for instance, see Laporte et al., 2008 and D'Hombres et al., 2010 for examples pertaining to healthcare utilization. One of main concerns is that correlation as opposed to causation is found. However, reverse causality is unlikely due to nature of dependent variable. Still, it is possible that omitted variable bias may exist. One of the benefits of using CCHS data is that it provides information on a variety of factors that affect whether an individual has a regular doctor. Using a rich array of variables reduced the omitted variable problem.

The probability of having a regular doctor was estimated as a function of social network variables plus the control variables described previously. The CCHS provides weights that render the sample representative of the Canadian population: population weights were used in the regressions and for the summary statistics. Fourteen separate regressions in total were run. Two regressions for each of the six surveys were run, one using the constructed index for the social network variable and a second regression using multiple individual variables to capture the effects of social network. In addition, two more regressions were run by pooling the 2007, 2009,

and 2010 surveys. For this regression a dummy variable denoting the year of the survey year was added to see if year had an effect on whether an individual had a regular doctor; the estimated coefficient on the year dummy was not significant. Those respondents who did not provide information or refused to answer certain questions were dropped from the analysis. Marginal effects were calculated to measure the change in the probability of having a regular doctor that is produced by a one-unit change in the various variables.

4.0 Results

Tables 3A and 3B report the marginal effects when individual social network components are included separately and when an index combining all of these components is used, respectively. The predicted probability that the reference individual would have a regular family doctor, i.e., a female, age 43 to 46[19], age squared 2095 to 2419, household income $53902 to $66172, household income squared $4000000 to $6800000, single, household sized 2.6 to 2.9, has a university degree, 1.4 chronic conditions[20], has chronic condition 0.67 to 0.69, has ever had cancer 0.040 to 0.045, heart disease 0.046 to 0.051, diabetes 0.054 to0.057, never smokes, in past week had approximately 4 to 5 drinks, immigrant 0.02 to 0.17, length time in Canada since immigration 0.6 to 3.9 years, has poor health, very weak sense of belonging to the community, number of close friends and relatives 6.5 to 8.8, and has no one to confide in, Rural, province British Columbia (except 2003 is Prince Edward Island) is provided at the bottom of each table.

[19] The reference group for age, age squared, household income, household income squared, number of chronic conditions, has a chronic condition, cancer, heart disease, diabetes, Immigrant variable, and friends is sample mean which varies across survey's.

[20] The Number of chronic conditions was only available in 2001 CCHS. Chronic Condition variable was only available in 2003 and 2005 CCHS.

An individual's sense of belonging to the community is one of the variables used to measure the strength of an individual's social network. The respondent had four choices for sense of belonging: very strong, somewhat strong, somewhat weak, and very week (reference group). The joint F Test found the variable was significant for six of the seven regressions; it was not significant for 2003 regression. Except for in 2003 and 2010, individuals reporting a higher sense of belonging were more likely to have a regular doctor, with not much difference between those who reported very strong and somewhat strong. The marginal effects for very strong ranged between 0.049 to 0.082, somewhat strong ranges from 0.042 to 0.076, and somewhat weak ranged from a low of 0.031 to 0.052. In other words, individuals with a strong sense of belonging to the local community are about 5-8% more likely to have a regular family doctor, relative to others.

Generally speaking, the number of close friends and relatives that an individual had did not play much of a role when it comes to explaining the presence of a regular family doctor. All the regressions found the number of close friends and relatives to not be statistically significant. Once explanation is that the other variables – sense of belonging and people in whom to confide – are so highly correlated with the number of friends that the effect from these variables is overwhelming number of friends, per se. However, when I looked at correlation between the number of close friends and relatives and the other social network variables they were not strongly correlated.

Having someone to confide in seems to matter sometimes. Five binary variables were constructed: confide all of time, most of the time, some of the time, a little of the time, and none of the time (reference group). The joint F Test found the variable was significant for all seven of the regressions. Confide all of the time had the largest positive effect and was significant in

2001, 2003, 2005, 2007, and 2007-2010 regressions. Confide in most of the time was significant and positive in 2001 and 2003. Confide in some of the time was significant and positive in 2001, 2003, and 2009. Confide in a little of the time was significant and positive in 2001 and 2003. Individuals who had no one to confide in were the least likely to have a regular doctor, consistent with the idea that social networks may play a role in facilitating having a regular family doctor (in an environment where physicians are in short supply). The marginal effects for confide in all of time ranged from 0.049 to 0.161, most of the time 0.065-0.081, some of the time 0.037 to 0.075, and a little time 0.044 to 0.108.

The social network index was constructed using the variables for sense of belonging, having someone confide in, and number of close friends and relatives. The index was significant for five out of the six regressions. The regression preformed on the 2003 data set which had the smallest sample size was not significant. The marginal effect for the significant CCHS years ranged from 0.006 to 0.015 and Z scores ranged from a low of 1.88 to a high of 8.83. The social network index was one of the more consistently significant variables. The marginal effect of the social network variable while more consistently significant than the other individual measures of social networks the marginal effects were not as large as sense of belonging to the community and having someone to confide in variables.

Gender was one of the variables which had the most consistent relationship with having a regular doctor. Males were significantly less likely to have a regular doctor than females in all regressions; and in 12 of the 14 regressions the difference was about 10% whereas in the two regressions using the 2003 sample, the effect was 4-5%. The link between age and dependent variable is positive, but not particularly strong. For the 2001, 2005, 20010, and 2007-2010 samples, this relationship is positive, whereas it is not significant for the other regressions. The

results for age squared variable are similar. Age squared has a positive impact on having a regular family physician, although the marginal value of this effect is even smaller. The elderly are more likely than young adults to have regular doctors.

Household income exerts a positive and statistically significant effect on having a regular family doctor in all 14 regressions. Importantly, even when the estimated coefficient on income is statistically strong, its economic effect is quite small. In all years, income would have to increase by some $100,000 before it would make a noticeable impact on the predicted probability of having a regular doctor. For instance, in table 3A, in 2007 if household income where to increase by $100,000 – representing an increase of 161% for the average household – it would bump up the probability of having a regular doctor by .07, or 7% for the reference household. However, this also means that members of very wealthy households will have a clearly higher likelihood of having a regular family physician relative to those of more modest means. In other words, there will only be a noticeable difference between the very high income groups and lower income groups. Household income squared is significant and has a negative marginal effect, which means the relationship between income and dependent variable is not linear. However, marginal effect of income squared is very small and close to zero.

Marital Status is defined as being either single (reference group), married, or in a common law relationship. Marriage is positively associated with having a regular doctor except for 2003 which is not statistically significant, the year in which the sub-sample for our analysis was particularly small. Common law arrangements are only statistically significant influences in the 2000 and 2005, and in this case they are negatively associated with having a regular physician, relative to being single. This is most likely due to the fact that a much smaller portion of the sample is in a common law relationship relative to other two classifications. The single

group represent close to 35% and married groups represents close to 50% of those surveyed and less than 20% for common law. Education is based on highest level attained with four possible choices: post-secondary (reference group), some post-secondary, secondary, and less than secondary. Only two variables are significant: secondary in 2001 is slightly positive and less than secondary is weakly negative in 2003. Education is not statistically significant.

Individual's health is highly related to whether a person has a regular doctor. Individuals with chronic conditions are more likely to have a regular doctor and the number of such conditions also increases this likelihood. The average number of chronic conditions is provided in the 2000-2001 CCHS and is 1.4. The results from tables 3A and 3B suggest that one more chronic condition would increase the predicted probability of having a regular family doctor by 0.03. The surveys in 2007, 2009 and 2010 ask about specific conditions, and we can see that the presence of diabetes adds about 0.11 to 0.12 to the predicted probability of having a family doctor, whereas, the presence of cancer has a smaller and statistically weaker effect. Heart disease adds about 0.07 onto the likelihood of a regular doctor in two of the three samples, whereas the statistical effect in 2009 is week. Having a chronic condition was a dummy variable in 2003 and 2005 survey. Having a chronic condition increases by approximately 0.02 to 0.10 the probability of having a regular doctor. Chronic condition include: allergies, asthma, cancer, diabetes, high blood pressure, chronic bronchitis, migraine headaches, emphysema, epilepsy, back problems, heart disease, and number of other conditions (Appendix 2 contains a complete list).

The smoking and alcohol consumption behaviour of the individual was included in the analysis to try to get at behavioral risk factors. Three binary variables were included for smoking: never smoked (reference group), occasionally smoked, and smoked daily. Individuals

who smoked daily were significantly less likely to have a regular doctor than those who never smoked. The Z scores were consistently low and not significant for the variable denoting if the individual smoked occasionally likely due to the fact that the sample means for smoked occasionally were small (approximately 0.05). The marginal effect for the smoke daily variable varied from -0.043 to -0.083 and was significant for all the regressions except 2003. The alcohol variable denotes the number of drinks in the previous week that was consumed and was added to 2001, 2003, 2005 regressions. After 2005, the number of alcoholic drinks consumed in past week question became an optional question, which was only asked of respondents from some of the provinces. The 2001 and 2005 results show that having a drink would reduce the predicted probability of having a regular doctor by about 0.001 to 0.002. The results from the 2003 survey were not found to be statistically significant. It may be that individuals who engage in risky behaviour from the point of view of health eschew regular medical visits; alternatively, perhaps those who see a family doctor regularly are counseled to engage in less-risky activities which affect their behaviour.

Self-reported health status is composed of four binary variables which represent four possible choices: excellent health, very good health, good health, and poor health (reference group). Relative to those in poor health, individuals who reported their health as excellent were the least likely to have a regular doctor followed by those reporting very good health and good health. Marginal effects for self-perceived health were also fairly large for excellent health a range of -0.069 to -0.192, very good -0.064 to -0.153, good health-0.063 to -0.157, and for fair -0.014 to 0.082.

Whether or not an individual is an immigrant and for how long they have lived in Canada is captured by two variables, as previously discussed. The results from tables 3A and 3B show

that immigrants are less likely than the Canadian born to have a regular doctor, in all of the CCHS surveys. However, the more time an immigrant has spent in Canada the more likely they are to have a regular doctor. The immigrant variable is significant for all regressions and the YSM is significant in all years except 2003. Immigrants are approximately10%-20% less likely to have a regular doctor than Canadian born Individuals. However, each year an immigrant resides in Canada their chance of having a regular doctor increase by about 0.002 to 0.005.

Adding geographical identifiers such as urban / rural and province and territory of the respondent had mixed effects. Rural and Urban were two binary variables with Rural being the reference group. In 2003, Urban was positively related to having a regular doctor and in 2005, 2007, 2009, 2010, and 2007-2010 it was negatively related. The province and territory of the respondent had stronger relationship with having a regular doctor than the Rural / Urban variables. Living in one of the three territories had a very strong negative effect on predicted probability of having a regular doctor. Living in Quebec also had a fairly strong negative marginal effect of between 0.086 and 0.150. Saskatchewan and Alberta also had negative relationship with having a regular doctor. The province or territory where an individual's lives in has the largest effect on predicted probability of all the variables used in the regressions.

5.0 Discussion and Conclusion

The findings from this paper provide some evidence that social networks increase the probability of having a regular doctor. In particular, a sense of belonging to the community is the strongest indicator among the social network variables employed in this paper. This result is makes sense insofar as one would expect a sense of belonging to develop with the time spent in a community which is likely to influence the likelihood that someone becomes aware of family

doctors accepting new patients and accessing them. The number of close friends and relatives did not have a statistically significant effect.

As good as the CCHS data are, however, a number of problems exist. Community belonging, having someone to confide in, and number of friends and relatives are all components of social networks, but they do not measure all aspects of social networks. Emotional support and intra-family relationships which can measure the quality of individual's relationship with parents, siblings, spouse, children, and other immediate family play an important role in an individual's social network. An individual whose home environment is positive may have a significant advantage over an individual with a negative home environment. Another issue is that asking individuals about their social networks is subject to their personal interpretation. For example a respondent's answer to the question on "sense of belonging to the local community" depends on his interpretation of the definition of "sense of belonging" and "community." In addition the number of close friends and relatives question depends on a person's definition of "close" and "friend." Nevertheless, it is interesting to see the extent to which the responses to these questions seem to matter.

The effects of most of the control variables on whether an individual had a regular doctor were not unexpected. Gender, age, and marital status all affected the predicted probability of having a regular doctor. Level of educational attainment was not significant possibly because it is highly correlated with some of the other control variables such as income. The behavioral risk factors variables which included type of smoker (daily, occasional, and never) and number of drinks in past week had strong relationship with the dependent variable. Individuals with perceived their health to be poor and had chronic medical conditions all had stronger likelihood of having a regular doctor. This is not unexpected as those with poor health need a regular

doctor and individuals who are healthy are most likely to feel like they do not need one. A respondent's province of residence had a strong effect on the predicated probability of having regular doctor, likely reflecting differing market conditions for family doctors and different health policies. A future research project would be to look further into this issue.

The fact that individuals with stronger social networks, and particularly stronger bonds to communities, are more likely to have a regular doctor suggests some direction for government policy. Investments such as the building of community centres and libraries as well as the financing of community groups may have broader implications than were previously considered. To the extent that these can help to foster community strength, they may help people to feel connected to their community and thus reduce isolation which is known to negatively impact health (Berkman, 1995).

Canadian born individuals were more likely to have a regular doctor, compared to immigrants. The longer an immigrant has resided in Canada the more likely they are to have a regular doctor. The immigrant variable and the length of time since immigration variable had a strong had strong relationship with the dependent variable. This was not unexpected result as individuals who are new to Canada may face certain barriers which restrict access to care such as language barriers and lack information on available medical services.

As previously mentioned there are limitations with trying to capture and measure social capital. A clear definition of social capital and standardized set of measures would be useful. There are areas of social networks which need further study which include looking at work relationships and relationships inside households. New longitudinal surveys which contain mandatory questions on individual's social networks as well as more research on valid measures

of social capital would be useful to help us gain a better understanding of how social networks can affect healthcare utilization.

Despite the mixed results and the limitations to the analysis, social networks are an important area of study and have the potential to influence healthcare access and utilization. This paper helps us understand better this influence by highlighting the connection between social networks and having a regular doctor. Given the many barriers individuals face in accessing the health care system more research into how these barriers may be eliminated is definitely called for. As regular doctors act as gatekeepers to many specialized healthcare services the first logical step in advancing access is to make sure that all Canadians have a regular family doctor.

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Table 1
Variable Definitions

Dependent Variable	
Regdoc	1=has regular medical doctor 0=otherwise
Independent Variable	
Female Male	1=female, 0=otherwise **reference group** 1=male, 0=otherwise
Age	age 0-99
AgeSQ	age squared
HHIncome	total household income from all sources $0-$500000
HHincomeSQ	total household income from all sources squared[21]
Married Common Single	1=married, 0=otherwise 1=common law, 0=otherwise 1=single, 0=otherwise **reference group**
HHSize	household size 1-17
Imm	1=individual is an immigrant, 0=otherwise
YSM	length of time an Immigrant has lived in Canada since immigrating, Canadian born =0
Less than Sec. Sec. Some Post Sec. Post Sec.	1=less than secondary school graduation, 0=otherwise 1=secondary school graduation, 0= otherwise 1=some post-secondary school education, 0= otherwise 1= post-secondary graduation, 0= otherwise **reference group**
Num Cond	number of chronic health conditions 0-17
Cond	1=has a chronic health condition, 0=otherwise
Cancer	1=has cancer, 0=otherwise
Heart	1=has heart disease, 0=otherwise
Diabetes	1=has diabetes, 0=otherwise
SmkDaily SmkOcca SmkNever	1=smokes daily, 0=otherwise 1=smokes occasionally, 0=otherwise 1=never smokes, 0=otherwise **reference group**
Drinks/Week	number of drinks an individual had in the past week
HExcellent HVGood HGood HFair Hpoor	1=self-perceived health excellent, 0=otherwise 1=self-perceived health very good, 0=otherwise 1=self-perceived health good, 0=otherwise 1=self-perceived health fair, 0=otherwise 1=self-perceived health poor, 0=otherwise **reference group**
BelongVS	1=sense of belonging to the community very strong, 0=otherwise

[21] HHincomeSQ is divided by 1000, this is necessary because STATA is not able to calculate the derivative because the marginal effect of an extra dollar of income is too close to zero.

BelongSS BelongSW BelongVW	1=sense of belonging to the community somewhat strong, 0=otherwise 1=sense of belonging to the local community somewhat weak, 0=otherwise 1=sense of belonging to the community very weak, 0=otherwise **reference group**
Friends	number of close friends and relatives 0-99
SocIndex	social network index variable (see appendix 1)
ConfideNone ConfideLittle ConfidwSome ConfideMost ConfideAll	1=has someone to confide in none of the time, 0=otherwise 1=has someone to confide in a little of the time, 0=otherwise 1=has someone to confide in some of the time, 0=otherwise 1=has someone to confide in most of the time, 0=otherwise 1=has someone to confide in all of the time, 0=otherwise **reference group**
Urban Rural	1=Urban, 0=otherwise 1=Rural, 0=otherwise
ON NFLD PEI NS NB QC MB SK AB BC YT NT NU	1=Ontario, 0=otherwise 1=Newfoundland , 0=otherwise 1=PEI, 0=otherwise 1=Nova Scotia, 0=otherwise 1= New Brunswick, 0=otherwise 1=Quebec, 0=otherwise 1=Manitoba, 0=otherwise 1=Saskatchewan, 0=otherwise 1=Alberta, 0=otherwise 1=British Columbia, 0=otherwise 1=Yukon, 0=Otherwise 1=Northwest Territory, 0=otherwise 1=Nunavut, 0=otherwise

Table 2A
Means of Independent Variables

	2001	2003	2005	2007	2009	2010	2007-2010
Variable	n=41,471	n=2,290	n= 29,174	n=27,655	n=14,205	n=14,331	n=56,191
Male	0.507	0.521	0.528	0.510	0.515	0.520	0.515
Female	0.493	0.479	0.472	0.490	0.485	0.480	0.485
Age	43.84	43.50	44.34	45.86	46.45	46.52	46.28
AgeSQ	2161.14	2095.66	2196.56	2353.56	2409.90	2419.76	2395.01
HHIncome	58970	53092	66712	61945	64783	63261	63347
HHIncomeSQ	5.5E+06	4.0E+06	6.8E+06	6.0E+06	6.7E+06	6.5E+06	6.4E+06
Married	0.523	0.670	0.502	0.459	0.477	0.472	0.469
Common	0.139	0.092	0.183	0.192	0.192	0.187	0.190
Single	0.338	0.238	0.315	0.349	0.331	0.340	0.340
HHSize	2.770	2.887	2.729	2.604	2.567	2.571	2.580
Less than Sec.	0.194	0.022	0.122	0.145	0.140	0.129	0.138
Sec.	0.181	0.595	0.142	0.133	0.142	0.138	0.138
Some Post Sec.	0.088	0.185	0.086	0.083	0.071	0.076	0.077
Post Sec.	0.538	0.197	0.649	0.639	0.646	0.657	0.648
Num Cond	1.414						
Cond		0.665	0.689				
Cancer				0.044	0.040	0.045	0.043
Heart				0.047	0.046	0.051	0.048
Diabetes				0.057	0.056	0.054	0.055
SmkDaily	0.252	0.218	0.191	0.197	0.170	0.182	0.183
SmkOcca	0.047	0.047	0.060	0.050	0.048	0.055	0.051
SmkNever	0.701	0.735	0.749	0.753	0.781	0.763	0.763
Drinks/Week	4.167	4.360	4.829				
Hexcellent	0.263	0.220	0.241	0.237	0.239	0.240	0.239
HVGood	0.373	0.479	0.398	0.365	0.378	0.369	0.370
Hgood	0.268	0.214	0.280	0.301	0.292	0.297	0.297
Hfair	0.077	0.063	0.068	0.077	0.073	0.074	0.075
Hpoor	0.019	0.023	0.014	0.020	0.018	0.020	0.019
Imm	0.127	0.022	0.151	0.172	0.169	0.170	0.170

YSM	3.148	0.595	3.703	3.820	3.862	3.684	3.788
BelongVS	0.156	0.281	0.135	0.147	0.142	0.154	0.148
BelongSS	0.381	0.477	0.447	0.450	0.462	0.459	0.457
BelongSW	0.313	0.190	0.311	0.303	0.307	0.291	0.300
BelongVW	0.150	0.052	0.107	0.101	0.090	0.095	0.095
Friends	6.531	8.804	8.173	7.875	7.973	8.125	7.993
ConfideAll	0.622	0.713	0.642	0.679	0.666	0.664	0.669
ConfideMost	0.256	0.201	0.233	0.206	0.218	0.221	0.215
ConfideSome	0.078	0.060	0.083	0.073	0.075	0.072	0.073
ConfideLittle	0.027	0.015	0.027	0.026	0.025	0.024	0.025
ConfideNone	0.016	0.011	0.015	0.016	0.016	0.019	0.017
SocIndex	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Urban	0.809	0.592	0.833	0.807	0.807	0.810	0.808
Rural	0.159	0.408	0.167	0.193	0.193	0.190	0.192
AB	0.159		0.200				
BC	0.207		0.267	0.323	0.306	0.305	0.311
NFLD	0.029	0.816					
NB	0.036				0.055	0.050	0.035
NS	0.054			0.071			0.023
ON	0.007						
PEI	0.006	0.184					
SK	0.040				0.065	0.065	0.044
QC	0.458		0.530	0.601	0.572	0.577	0.583
YT	0.002			0.002			0.001
NT	0.002		0.002		0.003	0.003	0.002
NU	0.001			0.001			0.000
2007							0.324
2009							0.336
2010							0.340

Table 2B
Means of Dependent Variable (Having a Regular Doctor) on Select Groups

	2001	2003	2005	2007	2009	2010	2007-2010
Variable	n=41,471	n=2,290	n= 29,174	n=27,655	n=14,205	n=14,331	n=56,191
All	0.779	0.860	0.790	0.787	0.781	0.791	0.786
Male	0.713	0.830	0.733	0.721	0.727	0.734	0.727
Femle	0.848	0.892	0.853	0.855	0.839	0.853	0.849
HHIncome 80K+	0.789	0.909	0.802	0.817	0.781	0.829	0.809
HHIncome 60K-80K	0.783	0.870	0.800	0.786	0.797	0.805	0.797
HHIncome 40K-60K	0.776	0.886	0.784	0.777	0.767	0.809	0.784
HHIncome 20K-40K	0.776	0.823	0.788	0.788	0.783	0.770	0.833
HHIncome 0K-20K	0.766	0.819	0.754	0.739	0.775	0.705	0.739
Married	0.840	0.870	0.861	0.861	0.854	0.864	0.860
Common	0.672	0.813	0.704	0.708	0.687	0.729	0.708
Single	0.729	0.849	0.727	0.733	0.730	0.723	0.729
Less than Sec.	0.800	0.793	0.821	0.827	0.814	0.836	0.825
Sec.	0.798	0.853	0.811	0.801	0.799	0.835	0.812
Some Post Sec.	0.769	0.842	0.770	0.760	0.751	0.756	0.756
Post Sec.	0.767	0.885	0.782	0.778	0.773	0.777	0.776
Immigrant	0.778	0.822	0.808	0.765	0.753	0.728	0.749

Table 3A

Marginal effects from a probit model of the influences of having a regular doctor. (CCHS data set various years) with social network components

	2000-2001		2003		2005		2007		2009		2010		2007-2010	
	n=41,471		n=2,290		n= 29,174		n=27,655		n=14,205		n=14,331		n=56,191	
Variable	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z
Male	-0.114	-18.510	-0.045	-2.470	-0.111	-16.180	-0.130	-16.130	-0.107	-8.730	-0.112	-9.830	-0.116	-18.340
Age	0.005	4.520	0.002	0.720	0.003	2.180	0.001	0.580	0.001	0.480	0.006	2.770	0.003	2.370
AgeSQ	-7.5E-06	-0.580	4.17E-06	0.120	3.12E-05	2.200	4.96E-05	2.970	4.41E-05	1.850	-2.09E-06	-0.090	2.91E-05	2.290
HHIncome	4.80E-07	3.210	2.22E-06	2.720	2.31E-07	1.430	7.53E-07	3.810	2.59E-07	0.850	1.26E-06	4.370	8.02E-07	5.000
HHIncomeSQ	-1.33E-09	-2.800	-1.15E-08	-2.340	-2.71E-10	-0.580	-1.69E-09	-2.920	-7.61E-10	-0.820	-3.20E-09	-3.850	-2.03E-09	-4.210
Married	0.024	2.950	-1.50E-02	-0.660	0.041	4.320	0.043	3.960	0.061	3.430	0.044	2.910	0.049	5.550
Common	-0.021	-2.200	-0.018	-0.510	-0.008	-3.070	-0.006	-0.560	-0.004	-0.200	0.003	0.180	-0.002	-0.240
HHSize	0.014	4.960	0.002	0.024	0.018	5.110	0.013	3.240	0.006	1.020	0.013	2.410	0.011	3.410
Less than Sec.	0.007	0.770	-0.055	-1.780	0.001	0.070	-0.006	-0.480	-0.014	-0.680	0.005	0.260	-0.005	-0.470
Sec.	0.020	2.560	0.006	0.290	0.014	1.450	-0.001	-0.120	-0.002	-0.100	0.020	1.130	0.006	0.690
Some Post Sec.	0.013	1.280	-0.034	-0.870	0.002	0.190	-0.012	-0.840	-0.009	-0.410	-0.002	-0.110	-0.007	-0.640
Num Cond	0.033	13.050												
Cond			0.051	2.460	0.095	11.700								
Cancer							0.052	2.880	0.047	1.560	0.002	0.080	0.031	1.920
Heart							0.075	4.110	0.047	1.620	0.073	2.870	0.065	4.400
Diabetes							0.115	9.330	0.119	7.710	0.106	6.780	0.113	13.180
SmkDaily	-0.047	-6.340	-0.037	-1.480	-0.050	-5.320	-0.043	-3.990	-0.079	-4.600	-0.071	-4.290	-0.065	-7.310
SmkOcca	-0.020	-1.410	0.032	0.830	-0.019	-1.350	-0.005	-0.310	-0.060	-2.140	-0.038	-1.420	-0.034	-2.310
Drinks/Week	-0.002	-4.350	-0.002	-1.480	-0.001	-3.420								
Hexcellent	-0.106	-2.830	-0.040	-0.700	-0.170	-4.340	-0.069	-2.150	-0.151	-3.070	-0.132	-1.670	-0.116	-3.380
HVGood	-0.092	-2.650	-0.011	-0.220	-0.138	-4.090	-0.064	-1.980	-0.124	-2.400	-0.138	-1.660	-0.107	-2.990
Hgood	-0.069	-1.930	-0.024	-0.440	-0.157	-4.220	0.000	0.010	-0.084	-1.350	-0.026	-0.340	-0.034	-0.940
Hfair	-0.049	-1.280	-0.010	-0.160	-0.141	-3.180	0.052	3.740	0.082	4.260	0.012	0.490	0.049	4.320
Imm	-0.100	-4.650	-0.373	-1.760	-0.059	-3.070	-0.127	-5.080	-0.185	-4.970	-0.159	-4.600	-0.154	-8.030
YSM	0.003	3.700	0.007	1.750	0.002	2.450	0.004	4.270	0.005	4.560	0.003	2.940	0.004	6.360
BelongVS	0.071	7.820	-0.049	-0.990	0.076	7.010	0.052	3.740	0.082	4.260	0.012	0.490	0.049	4.320
BelongSS	0.067	7.680	-0.011	-0.250	0.076	7.250	0.048	3.630	0.074	3.440	0.042	2.150	0.054	4.980
BelongSW	0.031	3.460	-0.037	-0.710	0.037	3.590	0.015	1.150	0.052	2.460	0.018	0.930	0.028	2.530
Friends	1.51E-04	0.350	-2.92E-04	-0.330	6.76E-04	1.590	-2.41E-04	-0.460	-6.65E-04	-0.840	1.83E-04	0.230	-1.95E-04	-0.450

ConfideAll	0.080	3.600	0.161	1.750	0.049	1.750	0.052	2.140	0.067	1.570	0.015	0.390	0.041	1.860
ConfideMost	0.065	3.500	0.081	1.720	0.019	0.740	0.026	1.170	0.051	1.440	-0.027	-0.650	0.014	0.680
ConfideSome	0.037	1.860	0.069	1.660	0.036	1.440	0.021	0.850	0.075	2.420	-0.016	-0.370	0.025	1.210
ConfideLittle	0.044	2.020	0.108	6.200	-0.008	-0.240	0.026	0.940	-0.047	-0.810	-0.009	-0.170	-0.015	-0.550
Urban	-0.006	-0.910	0.096	4.970	-0.017	-2.010	-0.040	-4.380	-0.021	-1.630	-0.022	-1.700	-0.028	-4.030
AB	-0.099	-9.070			-0.066	-13.290								
BC	Reference Group				Reference Group		Reference Group		Reference Group		Reference Group		Reference Group	
NFLD	0.050	3.270	-0.052	-3.710										
NB	0.073	7.030							0.042	2.160	0.066	3.680	0.051	3.980
NS	0.059	5.260					0.087	8.290					0.093	9.980
ON	0.100	5.530												
PEI	0.038	2.430	Reference Group											
SK	-0.051	-3.770							-0.043	-1.770	-0.019	-0.860	-0.032	-2.020
QC	-0.148	-17.010			-0.112	-13.290	-0.107	-12.100	-0.111	-7.950	-0.086	-6.490	-0.100	-13.930
YT	-0.011	-0.470					-0.102	-4.050					-0.086	-3.590
NT	-0.481	-17.020			-0.386	-12.040			-0.473	-10.140	-0.465	-10.250	-0.478	-15.140
NU	-0.636	-18.100					-0.733	-38.360					-0.719	-37.590
2007													-0.003	-0.440
2009													-0.014	-1.630
Pred. Probability	0.822		0.884		0.828		0.837		0.828		0.836		0.832	

Table 3B

Marginal effects from a probit model of the influences of having a regular doctor. (CCHS data set various years) with social network index

	2000-2001		2003		2005		2007		2009		2010		2007-2010	
	n=41,471		n=2,290		n= 29,174		n=27,655		n=14,205		n=14,331		n=56,191	
Variable	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z	M. Effect	z
Male	-0.113	-18.460	-0.050	-2.730	-0.111	-16.240	-0.131	-16.220	-0.109	-8.860	-0.113	-9.800	-0.118	-18.540
Age	0.006	4.790	1.90E-03	0.580	0.003	2.530	0.001	0.640	0.001	0.610	0.006	2.620	0.003	2.420
AgeSQ	-9.41E-06	-0.730	6.30E-06	0.180	2.78E-05	1.970	4.95E-05	2.960	4.16E-05	1.740	5.29E-08	0.000	2.88E-05	2.26
HHIncome	4.61E-07	3.100	2.37E-06	2.850	2.08E-07	1.280	7.28E-07	3.680	2.77E-07	0.890	1.27E-06	4.370	7.89E-06	4.91
HHincomeSQ	-1.31E-09	-2.780	-1.23E-08	-2.430	-2.47E-10	-0.530	-1.62E-09	-2.780	-8.35E-10	-0.890	-3.25E-09	-3.870	-2.00E-09	-4.13
Married	0.024	3.020	-0.011	-0.045	0.019	5.360	0.044	4.110	0.061	3.420	0.046	3.100	0.050	5.730
Common	-0.023	-2.330	-0.014	-0.040	-0.058	-2.970	-0.006	-0.490	-0.005	-0.260	0.006	0.370	-0.001	-0.140
HHSize	0.015	5.350	0.004	0.380	0.019	5.360	0.014	3.420	0.007	1.090	0.013	2.390	0.011	3.620
Less than Sec.	0.006	0.690	-0.054	-1.710	0.002	0.200	-0.005	-0.370	-0.015	-0.720	0.005	0.260	-0.005	-0.470
Sec.	0.020	2.510	0.006	0.240	0.014	1.440	-0.001	-0.090	0.000	0.010	0.020	1.150	0.007	0.800
Some Post Sec.	0.012	1.200	-0.032	-0.830	0.003	0.230	-0.013	-0.860	-0.010	-0.450	-1.93E-04	-0.010	-0.007	-0.620
Num Cond	0.033	13.060												
Cond			0.021	2.420	0.096	11.750								
Cancer							0.052	2.870	0.045	1.490	0.004	0.150	0.032	1.990
Heart							0.074	4.070	0.043	1.400	0.072	2.790	0.064	4.210
Diabetes							0.114	9.220	0.117	7.420	0.107	6.780	0.113	13.160
SmkDaily	-0.048	-6.550	-0.035	-1.390	-0.051	-5.460	-0.044	-4.010	-0.083	-4.770	-0.069	-4.190	-0.066	-7.420
SmkOcca	-0.021	-1.470	0.033	0.850	-0.020	-1.380	-0.006	-0.340	-0.063	-2.160	-0.040	-1.460	-0.035	-2.370
Drinks/Week	-0.002	-4.520	-0.002	1.210	-0.001	-3.510								
Hexcellent	-0.101	-2.720	-0.042	-0.720	-0.168	-4.280	-0.110	-3.010	-0.192	-3.100	-0.161	-1.680	-0.151	-3.720
HVGood	-0.086	-2.500	-0.015	-0.310	-0.135	-4.010	-0.066	-2.100	-0.153	-2.900	-0.126	-1.510	-0.113	-3.210
Hgood	-0.063	-1.790	-0.026	-0.480	-0.155	-4.170	-0.063	-1.950	-0.127	-2.300	-0.132	-1.500	-0.103	-2.850
Hfair	-0.044	-1.150	-0.014	-0.210	-0.141	-3.160	0.001	0.020	-0.093	-1.380	-0.018	-0.220	-0.032	-0.870
Imm	-0.096	-4.490	-0.379	-1.840	-0.058	-2.970	-0.126	-5.020	-0.179	-4.810	-0.162	-4.640	-0.154	-7.990
YSM	0.003	3.600	0.007	1.850	0.002	2.460	0.004	4.280	0.005	4.520	0.003	2.880	0.004	6.310
SocIndex	0.014	8.830	0.003	0.580	0.015	8.100	0.010	4.300	0.010	2.950	0.006	1.880	0.009	4.800
Urban	-0.007	-1.030	0.102	5.220	-0.018	-2.030	-0.040	-4.370	-0.022	-1.710	-0.022	-1.730	-0.028	-4.110
AB	-0.102	-9.280			-0.067	-5.750								
BC	Reference Group				Reference Group		Reference Group		Reference Group		Reference Group		Reference Group	

NFLD	0.045	2.970	-0.054	-3.330								
NB	0.074	7.100							0.039	1.960	0.066	3.670	0.050	3.890
NS	0.060	5.320					0.088	8.410					0.093	10.070
ON	0.099	5.410												
PEI	0.040	2.600	Reference Group											
SK	-0.052	-3.810							-0.043	-1.780	-0.018	-0.800	-0.031	-1.980
QC	-0.150	-17.270			-0.116	-13.700	-0.107	-12.090	-0.113	-8.100	-0.084	-6.370	-0.101	-14.070
YT	-0.006	-0.240					-0.098	-3.930					-0.085	-3.570
NT	-0.477	-16.830			-0.381	-11.830			-0.461	-9.860	-0.466	-10.270	-0.473	-14.890
NU	-0.627	-17.380					-0.731	-38.260					-0.719	-37.820
2007													-0.003	-0.420
2009													-0.014	-1.600
Pred. Probability	0.821		0.882		0.828		0.837		0.826		0.836		0.832	

Appendix 1 Social Network Index

The Social Network Index is comprised of three variables which were based on the responses to three questions.

1. How often do you have someone in whom you can confide? The five possible responses were assigned a numerical value.

None of the time = 1
A little of the time = 2
Some of the time = 3
Most of the time = 4
All of the time = 5

2. How would you describe your sense of belonging to the local community? The four possible responses were assigned a numerical value.

Very weak =1
Somewhat weak =2
Somewhat strong = 3
Very strong =4

3. How many close friends and close relatives do you have?
Unlike the previous two questions the response to this question is a number (0to 99).

Each respondent answers to the questions are then normalized by subtracting from each individual's response the sample mean for that response and then dividing the resulting number by the standard deviation for that question.

Example:
Individual answers
How often do you have someone in whom you can confide?
All of the Time = 5

How would you describe your sense of belonging to the local community?
Very strong =4

How many close friends and close relatives do you have?
9 friends and relatives = 9

An example of an individual's Social Network Index Value

Index = (5-Mean of Confide In)/Standard Deviation of Confide In + (4- Mean of Sense of Belonging)/ Standard Deviation of Sense of Belonging + (9-Mean of Number of friends and relatives)/ Standard Deviation of Number of friends and relatives

Social Network Index values were then created for all of the individual's surveyed who answered the three social network questions.

Appendix 2 List of Chronic Conditions[22]

Alzheimer's disease and other dementia
Anxiety disorder such as a phobia, obsessive compulsive disorder, panic disorder
Arthritis/Rheumatism
Asthma
Autism and other developmental disorder
Back problems
Bowel disorder
Cancer
Cataracts
Chronic bronchitis
Chronic fatigue syndrome
Chronic obstructive pulmonary disease
Diabetes
Eating disorder such as anorexia or bulimia
Effects of stroke
Emphysema
Epilepsy
Fibromyalgia
Food allergies
Other allergies
Glaucoma
Heart disease
High blood pressure
Intestinal/Stomach ulcers
Learning disability
Migraine headaches
Mood disorder including depression, bipolar disorder, mania, dysthymia
Multiple chemical sensitivities
Other long-term physical or mental health condition diagnosed by health professional
Schizophrenia
Thyroid condition
Urinary incontinence

[22] Statistics Canada. Table B Chronic conditions listed in 2005 Canadian Community Health Survey Retrieved on 2 October 2012, from http://www.statcan.gc.ca/pub/82-003-x/2011001/article/11403/tbl/tblb-eng.htm