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Utilization of Healthcare by Immigrants in Canada: A Cross-Sectional Analysis of the Canadian Community Health Survey

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Abstract

Immigrants to Canada face unique barriers to health care, which leads to inequities in the utilization of health care. Lower utilization of health care by immigrants to Canada is associated with the deteriorating health of individual immigrants as well as costs to the health care system. The existing literature suggests that time since immigration is an important predictor for utilization of healthcare for Canadian immigrants. This thesis uses Andersen and Newman's Framework of Health Service Utilization and data from the 2015-2016 Canadian Community Health Survey to examine health care utilization among immigrants in Canada. The objectives were: (1) To examine the relationship between having a regular health care provider and time since immigration, and (2) To examine the relationship between number of medical consultations in the past year and time since immigration. A secondary cross-sectional data analysis was conducted using the 2015-2016 dataset for the Canadian Community Health Survey (CCHS). Eighty four percent of immigrant respondents to CCHS 2015-2016 had a regular health care provider. After controlling for other independent variables, established immigrants (10 or more years since immigration) were 1.75 times more likely to have a regular health care provider compared to recent immigrants (less than 10 years since immigration), confirming the hypothesis. The mean number of medical consultations in the past year for adult immigrant respondents to CCHS 2015-2016 was 3.37±4.53. After controlling for other independent variables, this study found that, contrary to the hypothesis, time since immigration did not have a significant effect on the number of consultations. The patterns of health care utilization for recent and for established immigrants observed in this study may be partially explained by shifting immigration policy, and the economic and social integration of immigrants over time.

Keywords

Immigrant Health, Access, Access to Health Care, Utilization, Health Care, Canada, Regular Doctor, Number of Consultations

Summary for Lay Audience

Although health care in Canada is universal, immigrants to Canada sometimes have difficulty getting the health care they need. Some previous studies have looked at the differences between use of health care by immigrants compared to the Canadian-born. However, there are few studies about the effect of time since immigration on use of health care by immigrants to Canada. The goals of this study were to investigate the effect of time since immigration on: (1) having a regular health care provider, and (2) the number of visits with a doctor in the past year.

In this study, the results of a national survey, the Canadian Community Health Survey (2015-2016), were used to answer these questions. We compared recent immigrants, who immigrated within the last 10 years, to established immigrants, who immigrated 10 or more years ago. Eighty four percent of immigrants had a regular health care provider. Established immigrants were more likely to have a regular health care provider than recent immigrants. On average, immigrants had 3.37 consultations with a doctor in the past year. However, time since immigration did not have an effect on the number of consultations with a doctor in the past year.

There may be many reasons for these findings. Over time, changes have been made to the way Canada accepts immigrants into the country. This may have resulted in differences in the types of immigrants accepted, which may affect the use of health care by recent immigrants compared to established immigrants. Over time, immigrants also become socially and economically integrated into Canada, which may explain some of the differences in use of health care by recent and established immigrants.

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Dedication

To my patients – you have shared your stories with me and inspired me with your resilience in the face of adversity. I have been privileged to be a witness to your struggles and your triumphs, and I see that it is through knowledge that we can continue to strive towards Patient-Centred Family Medicine.

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Chapter 1

1 Introduction

Despite the publicly funded provision of health care in Canada, numerous barriers exist to utilizing health care. Immigrants in particular face a unique set of barriers, both related and unrelated to their migration status [1]–[3]. Based on recent census data, immigrants represent 21.9% of the Canadian population [4]. Recent immigrants have better overall health than their Canadian-born peers, a phenomenon known as the "healthy immigrant effect". Over time, the health of immigrants appears to decline to approach that of their Canadian-born peers. In one study, the number of immigrants reporting good to excellent health decreased from 78.4% at six months after arrival, to 60.2% at four years after arrival. This decline in health is associated with several factors, including age, gender, language skills, income, region of birth, and perceived discrimination [3].

Among immigrants who experience a health decline, one in four report problems accessing health services [3]. Studies have shown that immigrants in Canada have unmet health care access needs [2] and face numerous barriers to utilizing health care [1]. Barriers to health care utilization by immigrants in Canada have previously been classified into one of five themes: cultural, communication, socio-economic status, health care system structure and knowledge [1].

1.1 Research Objectives

This thesis uses Andersen and Newman's Framework of Health Service Utilization and data from the 2015-2016 Canadian Community Health Survey to examine health care utilization among immigrants in Canada. The thesis examines two measures of health care utilization: having a regular health care provider and number of medical consultations in the past year. The research objectives are:

1. To examine the relationship between having a regular health care provider and time since immigration, and
2. To examine the relationship between number of medical consultations in the past year and time since immigration.

1.2 Rationale

Immigrants to Canada represent a vulnerable segment of the population who face unique barriers to accessing and utilizing health care. There is ample evidence that immigrants experience numerous barriers to access of health care [1]–[3] and that these barriers lead to inequities in access and utilization of health care in Canada [2]. Immigrants to Canada who face barriers to utilization of health care have worse self-reported health than immigrants who do not report barriers. Although language barriers represent an important contributor to worsening health for immigrants, the effect of poor access on health outcomes persists even after controlling for differences in knowledge of official languages [5]. These findings suggest that barriers to utilization of health care have real consequences in terms of both the health of immigrants and costs to the health care system. It is important to study utilization of health care by immigrants to Canada to help inform policy-making that may optimize access and thereby improve health outcomes for immigrants to Canada.

While several studies have examined access and utilization of health care for immigrants, there remain gaps in the literature. The majority of studies examining specific barriers to utilization have been qualitative [6]–[11], or mixed methods with a focus on the qualitative component [12], [13]. Although these qualitative studies provide valuable information about the nature and impact of barriers to utilization of health care, it is also valuable to quantify these barriers. Most existing quantitative studies on utilization of health care by immigrants have focused on whether there is a difference between immigrants and non-immigrants [14]–[21], with little emphasis on barriers to utilization of health care other than immigration status. As well, many of these studies focused on comparing health disparities between immigrants in the United States and Canada [14]–[17], [21]. While this is a relevant research question, and reflects some of the barriers that may exist in the absence or presence of a public health care system, a study focused on a Canadian immigrant population may better elucidate the barriers that immigrants face to utilizing health care in Canada.

Some previous quantitative analyses of Canadian data used a conceptual framework for studying utilization of health care [14]–[16], [18]. In these studies, the Andersen and

Newman [22] framework was used to inform the selection of independent variables that were considered to be predisposing, enabling or need factors. Other studies ([17], [19], [20], [21]) were not explicitly informed by a conceptual framework, which may have led to missing important predictor variables. The existing literature uses older data collected prior to 2012 [14]–[21], [23].

The existing literature suggests that time since immigration is an important predictor for utilization of healthcare for Canadian immigrants [15], [16], [19], [23], with established immigrants being more likely to have a regular doctor than recent immigrants. However, many previous studies of utilization of health care by immigrants in Canada did not include time since immigration in the analysis [14], [15], [18], [20], [21].

A quantitative analysis of recent Canadian data on immigrant utilization of health care that includes important predictor variables is lacking. The present study addresses this gap by using Andersen and Newman's conceptual framework for utilization of health care to identify important independent variables in an analysis of the most recent data from the Canadian Community Health Survey.

Chapter 2

2 Literature Review

The literature on utilization of health care by immigrants in Canada is mixed, with some studies indicating that immigrants have lower utilization of health care than non-immigrants, while other studies suggest immigrants have similar utilization as non-immigrants (see Table 1).

There is great variability in the literature in terms of outcome measures used to represent utilization of health care, as well as independent variables included in the analyses. Studies examined having a regular doctor [14]–[16], [19], [21], [23], ability to access a primary care provider [20], unmet medical needs [14], [15], [19], consultation with doctors and other health professionals in the last year [15], [16], number of visits in the last year [20] and uptake of preventive services such as Pap tests [15], [16], [21] and flu shots [16]. This variability in outcome measures may explain some of the mixed results in the literature.

There was also variability in the data sources and sample sizes used: some studies used secondary data from the Canadian Community Health Survey [16], [17], [23], the Joint Canada-United States Survey of Health [14], [15], [21] or the National Population Health Survey [19]; two studies used primary data collected through a mixed-methods practice-based cross-sectional study [20] and a telephone survey of elderly South Asian immigrants [18]. Differences in the sample sizes, data collection methods and independent variables included in the analysis may explain some of the remaining variability in the results of the quantitative studies comparing utilization between immigrants and non-immigrants.

The literature that identified specific barriers to health care by immigrants in Canada was primarily qualitative. Relative to the quantitative literature that focuses on comparisons between immigrants and non-immigrants, the qualitative literature can provide a more in-depth understanding of the types of barriers faced by immigrants and, in turn, help identify potential predictors for utilization of health care.

2.1 Andersen and Newman's Framework for Factors Contributing to Utilization of Health Care

The conceptual framework developed by Andersen and Newman describes utilization of health care as a health behaviour, determined by environment and individual factors (see Error! Reference source not found.). Environment factors include the characteristics of the health care delivery system such as the volume and distribution of its resources, and the organization of the system that delivers these resources. Examples of environment factors include ratios of health personnel and facilities to population, price of health services, region of country and urban-rural character) [24].

Characteristics of the individual utilizing care can be divided into three types of factors [24]–[26]:

(1) Predisposing factors describe an individual's propensity to use services. Predisposing factors may include demographic variables (age, sex, marital status and past illness), social structure (education, race, occupation, family size, ethnicity, religion and residential mobility) and beliefs (values concerning health and illness, attitudes towards health services and knowledge about disease);

(2) Enabling factors describe an individual's ability to secure health services, and may include income, insurance, having access to a regular source of care and type of regular source of care; and

(3) Need factors describe an individual's illness level and may include perceived illness (disability, symptoms, diagnoses and general state of health) and evaluated illness (symptoms and diagnoses).

The three categories of factors may overlap in some cases; for example, education may be considered a predisposing factor or an enabling factor, as it can affect both an individual's propensity to use services and their ability to secure health services. Barriers identified in the literature can be broadly categorized based on Andersen and Newman's framework for utilization of health care. Andersen and Newman's framework

is most frequently applied to quantitative studies that look at specific and quantifiable predictor variables for utilization of health care. However, the framework is also helpful for identifying common themes in the qualitative literature, with the caveat that categories may overlap and some reported barriers may fit into more than one category. It is important to note that the qualitative literature focuses on barriers to access of health care, while Andersen and Newman's framework focuses on factors involved in utilization of health care.

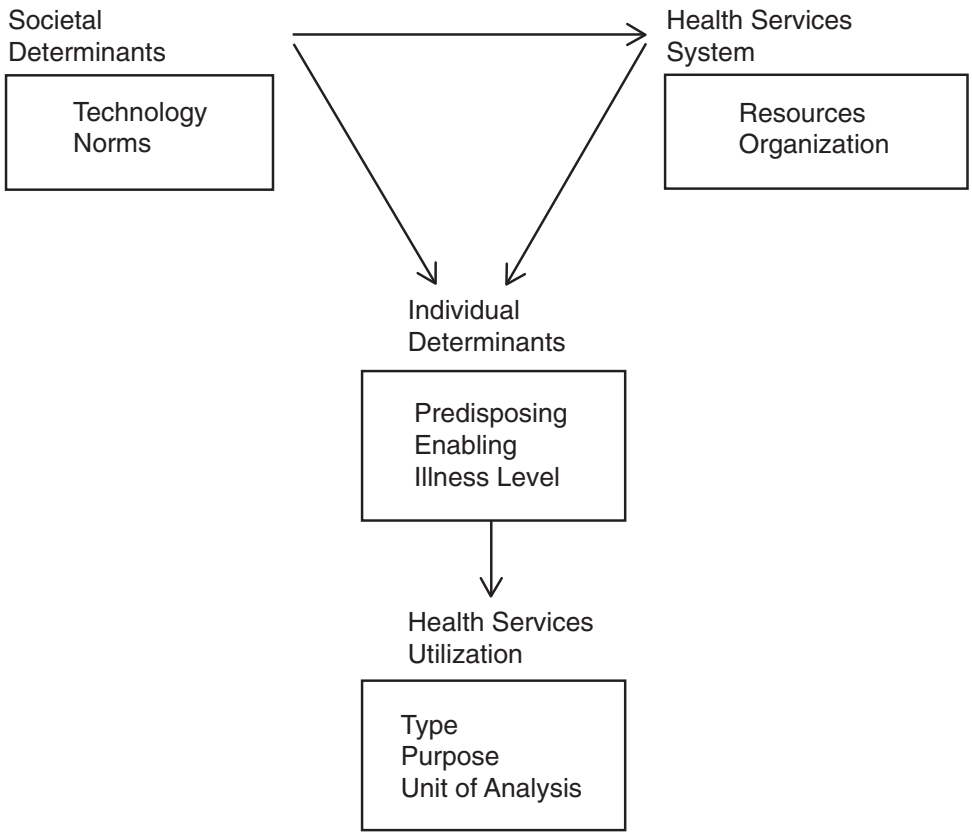

Figure 1. Andersen and Newman's framework for healthcare utilization, reproduced with permission from R. Andersen and J. F. Newman, "Societal and Individual Determinants of Medical Care Utilization in the United States," Milbank Q., vol. 83, no. 4. Dec. 2005 [24]

2.1.1 Terminology

Both the quantitative and qualitative literature have often used "access" interchangeably with "utilization". Within this thesis, Andersen and Newman's definition is used: utilization of health care is a health behaviour that results from the user's predisposing, enabling and need characteristics and the characteristics of the health care system [22], [24]. The two outcome measures used in this thesis, having a regular health care provider and number of medical consultations, are measures of utilization. Meanwhile, the term access refers to enabling factors, particularly factors in the health care system, such as measures of wait time, costs, and geographic distance to the health care provider [22], [24], [27].

2.1.2 Predisposing Factors: Knowledge of Health Care System, Differences in Treatment Preferences and Negative Perceptions of Services

2.1.2.1 Knowledge of Health Care System

In the qualitative literature. immigrant patients frequently had inadequate knowledge about available services [7], [28]. This was particularly true for aspects of the Canadian health care system that may not be universal to other countries. For example, patients had difficulty understanding the role of family physicians as gatekeepers to access of specialists in the Canadian health care system [8], [9]. The role of home care was also poorly understood [7]. Lack of knowledge about available health care services was also associated with dissatisfaction with the services provided, mistrust, and ineffective use of available services [8], [9]. From the physician perspective, barriers to caring for immigrant patients include inappropriate use of health resources and poor compliance [29], both of which may be in part related to lack of knowledge by immigrant patients.

2.1.2.2 Differences in Treatment Preferences

Differences in treatment preferences led to barriers to health care, and sometimes aligned with differences in cultural beliefs. Some patients preferred approaches to care that were perceived as more holistic, such as naturopaths or traditional medical practitioners from their part of the world, to conventional Western medicine [11]. Others preferred to use

herbal and natural remedies, and sometimes did not disclose the use of these remedies to physicians, because of a perceived misalignment in preferences [10].

2.1.2.3 Negative Perceptions of Services

Negative perceptions of the Canadian health care services were common among immigrants. The Canadian health care system was seen as too impersonal, too cautious, or too slow [6], [9], [11], [13]. In some cases, negative perceptions of services were related to cultural perceptions about medical care. Many participants perceived a mismatch between their approach to health and healing and the care provided by doctors trained within the Canadian system [6]. Some participants expressed the belief that medical care "back home" was superior to that in Canada [6]. These perceptions can result in transnational health care seeking, a relatively common practice, in which immigrant patients return to their country of origin to seek medical care [13].

2.1.3 Enabling Factors: Availability, Accessibility, Accommodation, Affordability and Acceptability

Researchers have expanded upon the variables used to operationalize enabling factors by using Penchanksy and Thomas's model of access to health care. Access to health care has been defined by Penchansky and Thomas as a measure of the "fit" between the characteristics and expectations of the clients and the characteristics of the provider and health care system. These authors describe access as having five dimensions [27]: availability, accessibility, accommodation, affordability, and acceptability.

2.1.3.1 Availability

Availability is the relationship between the volume and type of existing services and the clients' needs. This dimension includes the availability of physicians and specialized programs and services. Studies on immigrant health care utilization, found there was frustration with the difficulty experienced in finding a family physician [11], or physicians who spoke the same language as the patient [7], [13].

2.1.3.2 Accessibility

Accessibility is the relationship between the location of supply and the location of the clients. This dimension includes the client's resources for transportation, travel time, distance and cost. The qualitative literature shows that some immigrant patients faced geographic barriers to accessing their physicians. Geographic barriers were more pronounced in those who were unable to drive or did not have access to a car, such as seniors [6], [7], [13] and recent immigrants [6]. Immigrant patients with geographic barriers often relied on public transit or, in some cases, were unfamiliar with the public transit system and could therefore only access sources of care within walking distance [1]. Geographic barriers are complicated by language barriers, which led some immigrant patients to seek a same-language physician, even if this meant travelling much longer distances [7], [13].

2.1.3.3 Accommodation

Accommodation is the relationship between the organization of the services and the client's ability to accommodate these factors. This may include appointment systems, hours of operation, walk-in facilities, and telephone services. Administrative barriers were those associated with service delivery, and often aligned with negative perceptions of services by immigrants. These barriers included long waiting lists, inconvenient office hours, and health care providers being too busy [28]. Immigrants were also deterred by certain physician-specific policies, such as only addressing one issue per visit [11]. Although it might be expected that administrative barriers would be universal to immigrants and non-immigrants, a study of family caregivers to older patients found that recent immigration was associated with more reporting of administrative barriers, suggesting that these barriers may be exacerbated by lack of familiarity with the health care system [30].

2.1.3.4 Affordability

Affordability refers to the relationship between the cost of services and the clients' income, ability to pay and health care insurance. This may include the client's perception

of worth relative to cost and the total cost. The literature suggests that, although health care in Canada is publicly funded, cost was a barrier for accessing aspects of care not covered by provincial health plans, such as prescription medications, dental care, vision care, and physiotherapy [6]. Many immigrants, particularly elderly immigrants who are no longer employed, or those who are unemployed or self-employed, do not have extended health insurance, which is typically provided by employers [13]. In some cases, immigrants who did not have coverage for prescription medications avoided seeing a physician, because they knew they could not afford to comply with treatment recommendations [6]. A significant economic barrier for accessing care for many immigrant patients is the three-month waiting period required by four Canadian provinces (British Columbia, New Brunswick, Ontario and Quebec) before immigrants receive publicly funded health care [6]. Patients frequently avoided seeking care during the waiting period [6], [10].

2.1.3.5 Acceptability

Acceptability describes the relationship between clients' attitudes about personal and practice characteristics of providers and the actual characteristics of the providers. Acceptability includes culturally appropriate care, and language barriers.

Culturally appropriate care was important to many immigrants, leading to a demand for physicians who shared a cultural background with patients [6]. A study of mainland Chinese patients found that traditional Chinese health beliefs, such as the concept of yin/yang and the medicinal power of certain foods, was important to patients. Physicians who shared a cultural background with patients and understood these traditional beliefs may be better able to fulfill these patients' culturally specific health needs [12]. Some immigrants felt that the health care system was not adaptable to their cultural beliefs, such as the belief that traditional food is important to good health. For example, the lack of traditional foods in hospitals and long term care facilities was seen as a barrier for immigrant seniors [7]. Gender and culture can also interact to create barriers to health care. Female immigrant patients sometimes preferred female physicians, particularly for primary care or specialties such as gynecology, due to a variety of cultural factors.

Women who cited cultural or religious reasons for not wanting to see a male physician more frequently mentioned lack of availability of female physicians as a barrier to access of care [6].

From the physician perspective, communication and cultural barriers were also perceived as the most significant barriers in providing health care for immigrant patients [29]. The cultural background of the health care provider was an important contributor; Canadian-born physicians were more likely than immigrant physicians to find the care of immigrants more difficult than the care of non-immigrants [29]. Some patients reported racial discrimination from health care providers [13].

Language barriers were pervasive for immigrants with limited English or French proficiency, and being unable to express themselves or understand medical advice was a significant deterrent to seeking care [8], [9]. If same-language physicians were available, patients would frequently seek this option [9], [10], even if it meant travelling longer distances to access a physician [13]. Although some patients had access to interpreters, the presence of interpreters was sometimes a barrier itself, as patients felt the physician addressed themselves to the interpreter, or the interpreter did not perform their function appropriately [8]. Unofficial interpreters, such as friends or family members, were sometimes used, leading to further difficulties around confidentiality, imperfect knowledge of English by the interpreter, and interpreters sometimes deciding to omit sensitive information to the patient, such as disclosures of terminal illnesses [7], [13]. Language barriers were particularly pronounced in elderly patients, who may have less ability or opportunities to learn a new language despite being in their new country for a long period of time [7].

2.1.4 Need Factors

2.1.4.1 Need for Support

The existing qualitative literature did not take into account the individual's need for services based on their health condition. However, two studies identified themes related to the individual's need for two types of support: support from the health care system and

support from their social network. The process of adjusting to a new country can be immensely stressful, and this stress can have impacts on health, including somatization [9]. However, immigrant patients were sometimes unwilling to ask for needed support from health care providers such as time off work [9]. Patients benefited from social support from their peers, and suffered if they did not have such supports [10]. In particular, their social network was key in helping patients learn to navigate the health care system and connect to key resources such as locating a family physician [10].

2.2 Utilization of Health Care by Immigrants

The Andersen and Newman framework has been used in previous studies to identify and classify potential predictors for utilization of health care by immigrants [14], [15], [21]. In this thesis, two health behaviours are considered: having a regular health care provider and number of medical consultations in the past year.

2.3 Having a Regular Health Care Provider

Canadians who have a regular doctor are less than half as likely to report difficulty accessing routine care, relative to Canadians who lacked a regular doctor [31]. Having a regular doctor may therefore be viewed as a measure for having routine and preventative care.

Having a regular doctor was the most frequently used outcome measure among studies of utilization of health care by immigrants. It should be noted that while most of the existing literature uses the terminology of having a regular doctor [14], [15], [17], [19], [21], [23], the most recent CCHS asks about having a regular health care provider [32]. Therefore, although the outcome measure used in this thesis is having a regular health care provider, when referring to the existing literature, the term “having a regular doctor” is used if this is the outcome measure used in the respective study.

Much of the literature related to having a regular doctor focuses on immigrant status as the primary exposure variable [21], or comparisons of the effect of immigrant status between Canada and the United States [13]–[16], [20]. In one comparison of non-

immigrants to immigrants based on the 2002-2003 Joint Canada-United States Survey of Health, there was no significant difference between immigrants to Canada and non-immigrants in having a regular doctor [21]. Another secondary data analysis based on the same dataset focused on the roles of insurance and immigrant status, in Canada relative to the United States [14]. Although this analysis controlled for other important covariates derived from Andersen and Newman's model, it did not report on adjusted measures for the effects of these covariates on immigrants to Canada having a regular doctor [14].

Only a few studies examined and reported on the effect of predisposing, enabling and need variables on having a regular doctor for immigrants to Canada. One analysis based on data from the Canadian Community Health Survey from 2000 to 2010, with race as the primary exposure of interest, found that non-white immigrants were less likely to have a regular doctor than white immigrants, although these differences were smaller than those previously reported in the United States. Amongst immigrants overall, women, those married/common-law/partner, those with less than college education, and those with higher income were more likely to have a regular doctor [17].

Another study based on the 2007-2008 dataset of the Canadian Community Health Survey found that language proficiency did not have an effect on having a regular doctor for immigrants to Canada [16]. In a separate analysis of the 2002-2003 Joint Canada-United States Survey of Health, the joint effect of immigration status with other sociodemographic variables such as race/ethnicity, education and income quintile was examined. In this analysis, foreign-born whites were less likely to have a regular doctor than native-born whites. There was no effect of immigration status for non-white minorities. There was no effect of education or income quintile on having a regular doctor [15].

2.4 Number of Medical Consultations

There is a gap in the literature for studies of factors related to the utilization of health care by immigrants; in particular, number of medical consultations in the past year. Only one study included number of medical consultations in the past year as an outcome variable

[20] . Two studies used consultation with a health professional in the last year as a dichotomous outcome measure to represent utilization of health services [15], [17]. However, this dichotomous variable provides less information about the extent of utilization, than the number of medical consultations in the past year which is a count variable.

In a practice-based cross-sectional primary study which used number of medical consultations as an outcome measure [20], it was found that immigrants had more primary care visits in the past year relative to the Canadian-born. This may indicate immigrants have higher utilization than non-immigrants. However, this was a small practice-based study based in Ontario, and therefore may not be generalizable to the Canadian immigrant population. Only self-reported primary care visits were included, and therefore specialist visits were not captured. In addition, respondents were sampled from primary care practices; as a result, immigrants who were not attached to a family doctor, and therefore may face the greatest barriers to accessing and utilizing health care, were not captured in this study.

2.5 Effect of Time since Immigration on Utilization of Health Care

Four Canadian studies included time since immigration in the analysis of having a regular doctor [16], [17], [19], [31]. No studies were identified that examined the effect of time since immigration on number of medical consultations.

Longitudinal data from the National Population Health Survey showed that immigrants with greater time since immigration were more likely to have a regular doctor [19]. This study was limited by the relatively small sample size of 869 immigrants in the dataset.

The analysis by Lebrun et al. based on the Canadian Community Health Survey found that, among immigrants to Canada, recent immigrants who had been in Canada for less than ten years were less likely to have a regular doctor than more established immigrants [16]. This analysis was limited because it included a comparison to data from the National Health Interview Survey (NHIS) from the United States. As a result, only dependent and independent variables used in both surveys could be included in the final

analysis of the Canadian dataset. For example, region of residence within Canada was not included in this analysis. Region of residence may be an important confounding variable because health care is funded and delivered on a provincial level in Canada. In addition, this analysis used data from the 2007-2008 iteration of the Canadian Community Health Survey.

The study by Siddiqi et al. in 2016 [17] based on data from the Canadian Community Health Survey from 2000 to 2010 also reported the effect of covariates separately for recent immigrants (less than 10 years in Canada) and established immigrants (more than 10 years in Canada). However, time since immigration was not analyzed as an independent variable. Therefore, it was not possible to determine the effect of time since immigration on having a regular doctor.

In another study by Degelman (2016) [31] based on the 2011-2012 dataset of the Canadian Community Health Survey, recent immigrants who had been in Canada for less than 10 years were found to be less likely to have a regular doctor than non-immigrants, while established immigrants who had been in Canada for more than 10 years were more likely to have a regular doctor. The primary limitation of this study was that it excluded respondents aged 65 and older. Elderly immigrants represent a particularly vulnerable segment of the population, as they may face additional barriers related to culture, language and economics, and therefore need to be studied.

Only one of the studies on the effect of time since immigration included an analysis of number of medical consultations. Muggah et al. found in a small practice-based study that immigrants with time since immigration less than 5 years had 11.5 self-reported primary care visits in the past year, compared with 6.2 visits in Canadian-born, 7.4 visits in immigrants with time since immigration of 5 to 10 years, 7.4 in immigrants with time since immigration of 10 to 20 years and 6.3 in immigrants with time since immigration over 20 years. This may indicate that recent immigrants have higher utilization than either established immigrants or the Canadian-born, and that with increasing time since immigration, the utilization patterns of established immigrants approach that of the Canadian-born. However, as mentioned above, this was a small practice-based study

with many limitations, and therefore the results may not be generalizable to the broader Canadian immigrant population.

The existing literature has limitations related to sample size and study design, which make it difficult to draw meaningful and generalizable conclusions from these studies regarding the effect of time since immigration on utilization of health care. Therefore, there is a gap in the quantitative literature for an analysis of recent data to examine the effect of time since immigration on utilization of health care by immigrants in Canada.

2.6 Objectives and Hypotheses

The research objectives of the thesis are:

1. To examine the relationship between having a regular health care provider and time since immigration, and

2. To examine the relationship between number of medical consultations in the past year and time since immigration.

Based on the existing literature, the hypotheses were that, after controlling for significant predisposing, enabling and need factors,

1. Recent immigrants (those who immigrated to Canada less than ten years ago) will be more likely to have a regular health care provider than established immigrants (those who immigrated to Canada ten or more years ago), and

2. Recent immigrants will have fewer medical consultations in the past year than established immigrants.

Table 1. Description of studies examining utilization of health care for immigrants in Canada

Study	Study Design	Location	Study Population	Outcome Measures	Utilization of Health Care
Degelman (2016) [23]	Quantitative; secondary data analysis of Canadian Community Health Survey 2011-2012	Canada	73,958 respondents age 18-65 years	Having a regular doctor	New immigrants were less likely, and established immigrants were more likely, than non-immigrants to have a regular doctor
Lebrun (2012) [16]	Quantitative; secondary data analysis of Canadian Community Health Survey 2007-2008 and National Health Interview Survey 2007-2008	Canada, US	12,780 foreign-born, non-elderly adults age 18-64 years	Having a usual source of care, consultation with a health professional in the past year, dentist visit in the past year, consultation with an eye doctor in the past year, flu shot in the past year, Pap test in the past 3 years	Recent immigrants (length of stay < 10 years) and those with limited English proficiency had lower utilization of health care
Lebrun (2010) [21]	Quantitative; secondary data analysis of Joint Canada-United States Survey of Health (JCUSH) 2002-2003	Canada, US	2729 Canadian survey respondents (473 foreign born and 2256 native born)	Having a regular doctor, patient perception of quality of care, having a Pap test	Immigrants had lower utilization of health care than non-immigrants for some measures (having a Pap test) but not others (having a regular doctor or for reporting good/excellent quality of care)
Lebrun (2011) [15]	Quantitative; secondary data analysis of Joint Canada-United States Survey of Health (JCUSH) 2002-2003	Canada, US	2729 Canadian survey respondents (473 foreign born and 2256 native born)	Having a regular doctor, consultation with a health professional in the past year, having a dentist visit in the past year, having a Pap test in the past three years, reported unmet health care needs in the past 12 months	Demographic and socioeconomic barriers for utilization of health care (minority race, lower education, lower income) were more prevalent among immigrants than non-immigrants

Study	Study Design	Location	Study Population	Outcome Measures	Utilization of Health Care
Muggah (2012) [20]	Mixed methods, practice-based cross-sectional study 2005-2006	Ontario	5361 adult patients of 137 primary care practices across Ontario, of which 1099 were immigrants	First Contact Access (survey measures of ability to access primary care provider), First Contact Utilization (survey measures of utilization of primary care provider), number of self-reported visits to the practice in the past year	First Contact Access and First Contact Utilization scores were similar between immigrants and Canadian-born. Recent immigrants (length of stay < 5 years) had 11.5 self-reported primary care visits in the past year, compared with 6.2 visits in Canadian-born
Quesnel-Vallee (2011) [19]	Quantitative; secondary data analysis of longitudinal National Population Health Survey 1994-2006	Canada	7268 adult survey respondents, of whom 869 were immigrants	Having a regular doctor, having unmet medical need in the past 12 months .	Immigrants (white and non-white) had similar odds of having a regular doctor as the Canadian born individuals. White male immigrants and non-white female immigrants reported fewer unmet health care needs in the past 12 months than their Canadian born counterparts
Siddiqi (2009) [14]	Quantitative; secondary data analysis of Joint Canada-United States Survey of Health 2002-2003	Canada, US	3469 Canadian survey respondents, of whom 659 were immigrants	Having a regular doctor, having unmet medical needs	Canadian immigrants were more likely to lack a regular medical doctor than non-immigrants. Unmet medical needs did not differ between immigrants and non-immigrants
Siddiqi (2016) [17]	Quantitative; secondary data analysis of Canadian Community Health Survey (CCHS) 2000-2010	Canada, US	581,989 Canadian survey respondents	Having a regular doctor in the past year	Racial disparities exist among immigrants: Asian and South Asian groups were more likely than whites to have a regular doctor, while Latin Americans were less likely
Surood (2010) [18]	Quantitative; telephone survey of older (55 years or older) South Asian immigrants	Calgary, Alberta	220 elderly immigrant South Asians who responded to a telephone survey	Number of types of Western health services used	Predictors for use of fewer types of Western health services: shorter length of stay, more access barriers related to cultural incompatibility, higher level of agreement with traditional South Asian health beliefs, and weaker South Asian ethnic identity

Table 2. Description of studies examining barriers to health care for immigrants in Canada

Study	Study Design	Location	Study Population	Barriers Identified
Asanin (2008) [6]	Qualitative: focus groups	Dixie-Bloor neighbourhood in city of Mississauga, Ontario	53 immigrant participants from 21 countries	Cultural barriers Economic barriers Geographic barriers
Dastjerdi (2012) [8]	Qualitative: grounded theory with semi-structured individual interviews	Mid-size city in Western Canada	17 Iranian-Canadian participants	Cultural barriers Economic barriers Lack of knowledge of health care system Language barriers
Dastjerdi (2012) [9]	Qualitative: narrative inquiry	Greater Toronto Area, Ontario	50 Iranian-Canadian health care providers and social workers	Lack of knowledge of health care system Language barriers Negative perceptions of services Need for support
Dean (2010) [11]	Qualitative: in-depth interviews	Dixie-Bloor neighbourhood in city of Mississauga, Ontario	23 immigrant participants	Administrative barriers Negative perceptions of services
Koehn (2009) [7]	Qualitative: focus groups	Greater Vancouver, British Columbia	(1) 26 health care providers (2) 56 seniors recruited from ethno-specific seniors' groups (Punjabi, Vietnamese and Hispanic)	Administrative barriers Cultural barriers Geographic barriers Lack of knowledge of health care system Language barriers
Lai (2008) [30]	Quantitative; cross-sectional telephone survey	Calgary, Alberta	315 Chinese-Canadian caregivers	Administrative barriers Cultural barriers Language barriers Negative perceptions of services

Study	Study Design	Location	Study Population	Barriers Identified
Lai (2013) [28]	Quantitative; structured telephone interviews	Calgary, Alberta	17 aging (age > 55) South Asian immigrant participants	Administrative barriers Cultural barriers Lack of knowledge of health care system Language barriers
Lum (2016) [10]	Qualitative: phenomenological approach; semi-structured interviews	Greater Niagara Region, Ontario	13 immigrant participants	Differences in treatment preferences Economic barriers Geographic barriers Language barriers Need for support
Papic (2012) [29]	Quantitative; cross-sectional survey	Montreal, Quebec	598 family physicians	Cultural barriers Differences in treatment preferences Lack of knowledge of health care system Language barriers
Wang (2015) [13]	Mixed methods: (1) Quantitative: secondary data analysis from Canadian Community Health Survey data; (2) Qualitative: focus groups with grounded theory approach	(1) Canada; (2) Toronto, Ontario	(1) Immigrant respondents to Canadian Community Health Survey: 351 Korean / 36,884 foreign-born / 124,946 native-born (2) 54 immigrant participants of focus groups	Cultural barriers Economic barriers Geographic barriers Negative perceptions of services
Wang (2008) [12]	Mixed methods: (1) Quantitative: questionnaire, field visits to Chinese-speaking family physicians, secondary data analysis of Census (2) Qualitative: focus groups	Scarborough, Ontario and North York, Ontario	(1) 154 Mainland Chinese immigrant respondents to questionnaires, in two neighbourhoods (2) 15 immigrant participants of focus groups	Difference in treatment preferences Language barriers Negative perceptions of services

Chapter 3

3 Methods

3.1 Research Design

A secondary cross-sectional data analysis was conducted using the 2015-2016 dataset for the Canadian Community Health Survey (CCHS) [32].

Consistent with previous literature [14], [15], [21], Andersen and Newman's framework was used in the identification of variables that may influence utilization of health care. According to this model, there are three categories of factors that may affect utilization of health care at the individual level: predisposing factors, enabling factors and need for services [22], [24]–[26]. Predisposing factors are sociodemographic factors that might affect an individual's predisposition to utilize health care. Enabling factors are individual or community resources that may facilitate utilization of health care. Need factors are factors that generate need for health care services [24]–[26].

3.2 Data Sources and Data Collection

This study used the public use microdata file (PUMF) from the 2015-2016 CCHS which was retrieved using the <odesi> platform. <odesi> provides access to data from Statistics Canada via the Data Liberation Initiative [33]. The CCHS is a cross-sectional survey, conducted by Statistics Canada to collect information on health status, health care utilization and determinants of health. The CCHS includes participants 12 years of age and older from all provinces and territories in Canada, but excludes individuals who live on reserves and other Aboriginal settlements, full-time members of the Canadian forces, institutionalized individuals and residents of some remote regions of the country [32].

3.3 Sampling Techniques

The Canadian Community Health Survey [32] used a complex sampling technique, with a multi-stage sample allocation strategy, in order to ensure fair distribution of the sample.

The country was divided into 110 health regions. The sample was first distributed among the provinces proportional to the population. Within each province, the sample was allocated proportional to the population in each health region. Two different sampling frames were used, list frames for ages 12 to 17 years and area frames for age 18 years and above. Note, that for this current study, the sample was restricted to those 18 years of age and older. Once a household was selected as the sampling unit using area frames, the selection of the interviewee from the household was based on a selection weight multiplicative factor which was determined by the age of each member of the household and the number of household members.

Data for the 2015-2016 CCHS survey were collected using computer assisted personal and telephone interviews. Survey participants were given the option to complete the interview in English or French; if the participant did not speak either language, they were transferred to an interviewer with the necessary language competency [32].

3.4 Variable Selection

3.4.1 Dependent Variables

Two dependent variables were selected to represent utilization of health care: 1) having a regular health care provider, and 2) number of medical consultations. Having a regular health care provider, such as doctor, is a dependent variable commonly found in existing literature reporting quantitative secondary data analyses of population-based surveys [5, 6, 7, 8, 10, 12]. However, number of medical consultations has seldom been studied as an outcome measure for immigrant utilization of health care [20]. These two dependent variables had relatively low rates of missing data for immigrant respondents in the 2015-2016 CCHS. The dependent variables were identified in the dataset from the following questions:

(1) Has a regular health care provider: identified using variable **PHC_020 - "**Do you have a regular health care provider? By this, we mean one health professional that you regularly see or talk to when you need care or advice for your health". This was a dichotomous variable, with "Yes" or "No" as possible survey responses.

(2) Number of medical consultations, i.e. number of consultations with a family doctor, medical doctor or other specialist: variable **CHPDGMDC**. This was a count variable, and derived from the answer to two other questions: (a) "Have you seen or talked to any of the following health professionals about your physical, emotional or mental health: a family doctor or general practitioner? – how many times (in the past 12 months)?" and (b) "Have you seen or talked to: any other medical doctor or specialist such as surgeon, allergist, orthopaedist, urologist/gynecologist or psychiatrist about your physical, emotional or mental health? – how many times (in the past 12 months)?"

3.4.2 Independent Variables

Independent variables were selected based on Andersen and Newman's framework [26], which conceptualizes utilization of health care based on predisposing, enabling and need factors.

3.4.2.1 Primary Exposure

Time in Canada since immigration: **SDCDGRES.** This was a categorical, dichotomous variable in the original PUMF data file with two values: 0-9 years (recent immigrants), and 10 or more years (established immigrants). The same categories were preserved in the data analysis. This was the exposure variable of interest.

3.4.2.2 Predisposing Factors

(1) Sex: **DHH_SEX**. This was a dichotomous variable in the original PUMF data file with two possible values: male and female. The same categories were preserved in the analysis.

(2) Age: **DHH_AGE**. This was a categorical variable in the original PUMF data file, with fourteen categories expressed in years: 18-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80+. This variable was recoded for the analysis into four categories: 18-39 years, 40-64 years, 65-79 years, 80+ years. There is a great deal of variability in the literature in definitions of age categories.

For this analysis, age was recoded to four categories to represent important life stages that are hypothesized to have distinct predisposing characteristics. In particular, unlike a similar analysis by Siddiqi et al. [14], age group 80 or more years was coded separately, because those 80 years and older are known to have more multimorbidity than other age groups [34].

(3) Region of residence: **GEO_PRV.** This was a categorical variable in the original PUMF data file, with categories for each province/territory in Canada: Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Yukon, Northwest Territories and Nunavut. This variable was re-coded for the analysis into three categories representative of distinct geographic regions: Western Canada, Central Canada, and Atlantic Canada and Northern Territories. Due to the small sample size of respondents who met the inclusion criteria and were from the Northern Territories (Yukon, Northwest Territories and Nunavut), this group was collapsed with those from Atlantic Canada to form one category.

(4) Marital status: **DHHGMS**. This was a categorical variable with four values in the original PUMF data file: married, common-law, widowed/divorced/separated and single. This variable was re-coded for the analysis into three categories: married or common-law, widowed/divorced/separated and single. This corresponds with other secondary data analyses [16], [21]. Some analyses treated marital status as a dichotomous variable [14], [17] with values of married/common-law or unmarried. However, the category of widowed/divorced/separated was preserved in this analysis as it is conceivable that being widowed, divorced or separated may affect one's predisposition to utilizing care differently than being single.

(5) Cultural/racial background: **SDCDGCGT**. This was a categorical, dichotomous variable in the original PUMF data file with two values: white and non-white. The same categories were preserved in the data analysis. Although information was collected in the master file about specific racial groups, this information was suppressed in the PUMF data file due to small sample sizes.

(6) Sense of belonging to local community: **GEN_030**. This was a categorical variable in the original PUMF data file with four values: very weak, somewhat weak, somewhat strong and very strong. The same categories were preserved in the data analysis.

3.4.2.3 Enabling Factors

(1) Total household income: **INCDGHH**. This was a categorical variable with five possible values in the original PUMF data file: <$20,000, 20,000-39,999, 40,000-59,999, 60,000-79,999, >$80,000. Some of the previous literature used income quintiles [15], [17], [21]; however, the 2015-2016 CCHS dataset did not report exact income, and therefore income quintiles could not be determined. Instead, for this analysis, the categories used in the original data file were preserved.

(2) Education: **EHG2DVR3.** This was a categorical variable with three possible values in the original PUMF data file: less than secondary school, secondary school and post-secondary. The same categories were preserved for the data analysis. This categorization was similar to other articles in the literature [15], [16], [19], [21].

(3) Knowledge of official languages: **SDC_025**. This was a categorical variable with four possible values in the original PUMF data file: English only, French only, English and French, and neither English nor French. This was re-coded for the analysis to a dichotomous variable with two values: proficient in official languages (English only, French only, or English and French) and not proficient in official languages (neither English nor French). Knowledge of official languages was dichotomized to reflect bilingualism in Canada, as those who speak English, French or both languages are unlikely to face language barriers when accessing health care, while those who speak neither language are likely to face language barriers. Only one of the articles identified in the literature review included language proficiency as an independent variable [14], and these authors similarly treated language proficiency as a dichotomous variable.

(4) Insurance for prescription medications: **INS_005.** This was a categorical variable with two possible values in the original PUMF data file: yes and no. The same categories were preserved for the data analysis.

(5) For the analysis of number of medical consultations, having a regular health care provider: **PHC_Q020** was included as an enabling factor. This was done to account for a potential confounding factor, as those without a regular health care provider may have fewer medical consultations due to lack of a regular health care provider. Canadians who have a regular doctor are less than half as likely to report difficulty accessing routine care, relative to Canadians who lacked a regular doctor [31]. Since family physicians in Canada also act as a gatekeeper for other specialized medical services, Canadians with a regular doctor have more specialist visits than those without a regular doctor [35]. Including having a regular health care provider as an independent variable in the analysis of number of medical consultations ensured that access (having a regular health care provider) was appropriately accounted for as a potential enabling factor for utilization (number of medical consultations). As described above, having a regular health care provider was a dichotomous variable, with “Yes” or “No” as possible survey responses.

3.4.2.4 Need Factors

(1) Perceived health: **GEN_005**. This was a categorical variable with five possible values in the original PUMF data file: poor, fair, good, very good and excellent. The same categories were preserved for the data analysis. Some healthy respondents may not have a regular health care provider or have few consultations with a health professional in the past year, despite having good access to health care if required. Therefore, self-reported health was included in the analysis as an independent variable. Some previous analyses collapsed those with poor or fair health into a single category [14], [17], however the decision was made to preserve all five categories in this analysis as there was sufficient sample size in each category. Those with self-reported poor health may have the greatest need for health care, and

therefore represent an important category to examine in determining utilization of health care by immigrants.

(2) Number of chronic medical conditions. This variable was not present in the original PUMF data file, but was derived based on responses to questions regarding the presence of the following medical conditions: joint pain in the last 3 months (**CCC_010**), asthma (**CCC_015**), COPD (**CCC_030**), sleep apnea (**CCC_035**), scoliosis (**CCC_040**), fibromyalgia (**CCC_045**), arthritis (**CCC_050**), back problems (**CCC_055**), osteoporosis (**CCC_060**), high blood pressure (**CCC_065**), high blood cholesterol/lipids (**CCC_075**), heart disease (**CCC_085**), stroke (**CCC_090**), diabetes (**CCC_095**), cancer (**CCC_130**), migraine headaches (**CCC_140**), mood disorder (**CCC_195**), anxiety disorder (**CCC_200**). It is important to note that this is not an exhaustive list of medical conditions; however, the number of medical conditions does provide an approximation of the degree of need for medical care. The decision was made to use all of the chronic conditions that were included in the CCHS survey. While it is recognized that the conditions included may have varying clinical significance, it was not possible to determine the severity of a medical condition based on the limited information in the survey results. Variables that were not included under the chronic conditions category but were addressed in other parts of the survey were not included in the count of chronic conditions (e.g. glaucoma, cataracts). In addition, joint pain > 30 days was not included as it was redundant with another more inclusive variable: joint pain in the last 3 months. Number of chronic medical conditions was coded as a categorical variable with four possible values: zero medical conditions, one medical condition, two medical condition, and three or more medical conditions. Multimorbidity data supports this categorization, as those with three or more conditions seem to have distinct characteristics from those with zero, one or two medical conditions [34], [36].

3.5 Inclusion Criteria

Respondents to the CCHS 2015-2016 survey who identified themselves as immigrants and were 18 years of age and older were included in this study. Immigrants were

identified using Question **SDC_Q007**: “Are you now, or have you ever been a landed immigrant in Canada”. Respondents who answered "YES” were included in the analysis. Those who were 18 years of age and older were identified using the response to the question **ANC1_Q05**: “What is the respondent’s age?”

For the outcome having a regular health care provider (Objective 1), the sample was further restricted to respondents who had answered the regular provider (**PHC_020**) and time since immigration questions (**SDCDGRES**). This sample is referred to as Sample 1 in the thesis.

For the outcome number of medical consultations (Objective 2), the sample was restricted to respondents who answered the questions regarding number of consultations (**CHPDGMDC**) and time since immigration (**SDCDGRES**)**.** This sample is referred to as Sample 2.

3.6 Data Analysis and Interpretation

A cross-sectional secondary data analysis was conducted. For each step of the analysis, sampling weights were applied using the variable **WTS_M** to account for the portion of the population represented by each survey participant. Due to the complex survey design of the CCHS, the analysis needed to account for the fact that the CCHS is not a simple random sample. For the 2015-2016 CCHS dataset that was used in this analysis, Statistics Canada provided a separate file including bootstrap weights which were used to adjust the variance estimates to account for the complex sampling structure of the CCHS data. The bootstrap dataset was merged with the CCHS dataset using each respondent’s identifier, which was common to both datasets. The multivariate analysis used the bootstrap weights to adjust the variance estimates. Cases with missing data on any of the responses were not included in the data analysis. The analysis was conducted in Stata software version 16.0 [37].

3.6.1 Having a Regular Health Care Provider

3.6.1.1 Descriptive Analysis

Using Sample 1, weighted frequencies, using sampling weights, were reported for the categorical dependent variable (has a regular health care provider) and the independent variables.

3.6.1.2 Bivariate Analysis

In the bivariate analysis, the dependent variable (having a regular health care provider) was compared against each independent variable using chi square test. Sampling weights were applied for the bivariate analysis. The bivariate analysis was used to screen potential co-variates to include in the regression analysis.

In addition, a bivariate analysis was conducted to compare the main exposure variable (time since immigration) and the other independent variables. Sampling weights were applied for the bivariate analysis. This bivariate analysis was used to screen potential interactions to include in the regression analysis. It also shed light on the characteristics of recent and established immigrants.

3.6.1.3 Multivariate Analysis

Multivariate logistic regression was used to determine the relationship between **PHC_020** (Has a regular health care provider) and all independent variables. Logistic regression is a statistical model that predicts a dichotomous outcome variable by estimating the odds ratio for each significant independent variable, after controlling for all other independent variables [38], [39]. The odds ratio quantifies the relationship between an exposure and an outcome, and is defined as the ratio of the odds of an outcome occurring with a particular exposure, compared to the odds of the outcome occurring in the absence of the exposure [40].

Sampling weights and bootstrap weights were applied for the multivariate analysis. First, all variables were entered in the logistic regression model. Wald statistic was used to determine the independent variables that had a statistically significant effect on the

outcome variable (having a regular health care provider). Interaction terms for time since immigration with age, time since immigration with knowledge of official languages and time since immigration with sense of community, and for sex with age, were also entered into the model. Only those independent variables and interaction terms that were found to be significantly associated with the dependent variable were included in the final model.

The final model was then run and the p-value, odds ratio and confidence intervals of the odds ratio were reported for each independent variable. The fit of the model was assessed using Hosmer and Lemeshow goodness of fit test [38], [41]. Collinearity statistics were determined using the variance inflation factor for each variable, which is an indicator of how much of the inflation of the standard error could be caused by collinearity [39]. Values above 10 were considered problematic [42].

3.6.1.4 Supplementary Analysis

There was a considerable proportion of missing data for the time since immigration variable (11.5%), in contrast to the other independent variables that had low amounts of missing data (0% to 6.1%). To assess the representativeness of Sample 1, and assess the robustness of the regression analyses, a series of supplementary analyses were conducted without the time since immigration variable. These supplementary analyses were conducted on adult immigrants for whom it was known whether the respondent had a regular health care provider. This sample is referred to as Sample 1A. The analyses replicated the descriptive, bivariate and multivariate analyses outlined above but omitted the time since immigration variable. The details for these analyses are presented in Appendix A.

3.6.2 Number of Medical Consultations in the Past Year

3.6.2.1 Descriptive Analysis

Using Sample 2, the mean and standard deviation were reported for the continuous dependent variable (number of consultations with medical doctor in the past year).

Weighted frequencies, using sampling weights, were reported for the independent variables.

3.6.2.2 Bivariate Analysis

In the bivariate analysis, number of consultations with medical doctor in the past year was compared against each independent variable using analysis of variance. The variable "Has a regular health care provider" was included as an independent variable for this analysis, since immigrants with a regular health care provider could be expected to have more medical consultations. The dependent variable (number of consultations) was compared against each independent variable. Sampling weights were applied for the bivariate analysis. The bivariate analysis was used to screen potential co-variates to include in the regression analysis.

A bivariate analysis was also conducted to compare the main exposure variable (time since immigration) and the other independent variables for Sample 2. Sampling weights were applied for the bivariate analysis. This bivariate analysis was used to screen potential interactions to include in the regression analysis and to describe the characteristics of recent and established immigrants in Sample 2.

3.6.2.3 Multivariate Analysis

Negative binomial regression was used to compare number of consultations with medical doctor in the past year against all independent variables. Negative binomial regression is a statistical model that predicts an over-dispersed count variable, by estimating the incident rate ratio for each significant independent variable, after controlling for all other independent variables [38], [43]. The incident rate ratio compares the rate of an incidence in the group of interest to the rate of the incidence in a comparison group [40]. Sampling weights and bootstrap weights were applied for the multivariate analysis.

All independent variables were entered into the initial negative binomial regression model. F statistic was used to determine the independent variables that had a statistically significant effect on the outcome variable (number of consultations). Interaction terms for time since immigration with age, time since immigration with knowledge of official

languages and time since immigration with sense of community, and for age with sex, were also entered into the model. For any significant interactions, a new composite variable was created with response categories for each combination of responses from the component variables.

The final model was then run and the p-value, beta value, incident rate ratio and confidence intervals of the incident rate ratio were reported for each independent variable to determine the effect of each independent variable on the dependent variable after adjusting for all other independent variables. The fit of the model was assessed using the chi-square goodness of fit test, which is a non-parametric test used to indicate whether the observed values differ significantly from the expected value [43]. Collinearity statistics were determined using the variance inflation factor for each variable, which is an indicator of how much of the inflation of the standard error could be caused by collinearity [39]. Values above 10 were considered problematic [42].

3.6.2.4 Supplementary Analysis

Given that there was a considerable proportion of missing data for the time since immigration variable (11.5%), supplementary analyses to assess the representativeness of Sample 2, and assess the robustness of the negative binomial regression analyses, were conducted without the time since immigration variable. These supplementary analyses were conducted on adult immigrants with known number of consultations. This sample is referred to as Sample 2A. The analyses replicated the descriptive, bivariate and multivariate analyses outlined above but omitted the time since immigration variable. The details of these analyses are presented in Appendix B.

3.7 Ethical Considerations

The CCHS dataset is a publicly available dataset that is de-identified and ensures the confidentiality of respondents. Participation in the survey was voluntary and informed consent was obtained. The present study was a secondary analysis of these data. Consistent with Article 2 of the Tri-Council Policy Statement[44], there was no need to

obtain informed consent as a part of this study. Further, certain variables that risk re-identification such as complete postal code are suppressed in the public file.

Chapter 4

4 Results

This chapter reports the results for the analyses conducted to meet Objectives 1 and 2 using Samples 1 and 2 respectively, as described in the Methods chapter. Section 4.1 reports the analyses concerning the outcome, having a regular health care provider, and Section 4.2 reports the analyses concerning the outcome, number of medical consultations in the past year.

There were 15,947 adult immigrant respondents to the CCHS 2015-2016. To derive Sample 1, the 39 individuals who did not answer the regular health care provider question (**PHC_020**) and 1,831 who did not answer time since immigration question (**SDCDGRES**) were excluded. Sample 1 consisted of the 14,077 remaining respondents.

To derive Sample 2, the 223 individuals who did not answer the number of consultations question (**CHPDGMDC**) and 1,812 individuals who did not answer the time since immigration (**SDCDGRES**) question were excluded from the 15,947 adult immigrant respondents to the CCHS 2015-2016. Sample 2 consisted of the 13,912 remaining respondents.

4.1 Having a Regular Health Care Provider

4.1.1 Descriptive Statistics

Table 3 reports the descriptive statistics for Sample 1 (n=14,077), which included all adult immigrant respondents who answered the questions regarding having a regular health care provider (**PHC_020**) and time since immigration (**SDCDGRES**). Eighty four percent of respondents in Sample 1 had a regular health care provider. The majority of immigrants had been in Canada for 10 or more years (76.1%), were less than 65 years old (77.5%), were in a non-white cultural/racial group (64.7%), had a post-secondary education (70.4%), and were proficient in at least one of Canada's official languages (95.8%). Over half (56.3%) reported being in very good or excellent health, and 35.6% reported no medical conditions.

Table 3. Descriptive statistics for having a regular health care provider and independent variables for Sample 1 (n=14,077)

	n (%)
Outcome measures	
Has a regular health care provider	
No regular health care provider	2,226 (15.8)
Has a regular health care provider	11,851 (84.2)
Independent variables	
Primary exposure	
Time since immigration	
< 10 years	3,371 (23.9)
≥ 10 years	10,705 (76.1)
Predisposing factors	
Sex	
Male	6,883 (48.9)
Female	7,184 (51.1)
Age	
18-39 years	4,443 (31.6)
40-64 years	6,460 (45.9)
65-79 years	2,549 (18.1)
≥80 years	625 (4.4)
Region of residence	
Western Canada	4,577 (32.5)
Central Canada	9,381 (66.6)
Atlantic Canada and Northern Territories	119 (0.8)
Marital status	
Single	2,443 (17.4)
Widowed/divorced/separated	1,925 (13.7)
Married or common-law	9,650 (68.8)
Cultural/racial background	
White	4,912 (35.3)
Non-white	9,018 (64.7)
Sense of belonging to local community	
Very weak	1,006 (7.6)
Somewhat weak	3,055 (23.1)
Somewhat strong	6,390 (48.3)
Very strong	2,774 (21.0)
Enabling factors	
Total household income	
No income or less than $20,000	1,036 (7.4)
$20,000-$39,999	2,363 (16.8)
$40,000-$59,999	2,290 (16.3)
$60,000-$79,999	2,156 (15.3)
$80,000 or more	6,227 (44.3)
Education	
Less than secondary school	1,342 (9.7)
Secondary school	2,747 (19.9)
Post-secondary	9,736 (70.4)
Knowledge of official languages	
Not proficient in official languages	590 (4.2)
Proficient in official languages	13,479 (95.8)

	n (%)
Insurance for prescription medications	
No insurance	3,886 (27.9)
Insurance	10,045 (72.1)
Need factors	
Perceived health	
Poor	474 (3.4)
Fair	1,189 (8.5)
Good	4,458 (31.8)
Very good	4,521 (32.2)
Excellent	3,385 (24.1)
Number of medical conditions	
Zero	5,009 (35.6)
One	3,328 (23.6)
Two	1,969 (14.0)
Three or more	3,770 (26.8)

4.1.2 Bivariate Analysis

4.1.2.1 Bivariate Analysis of Having a Regular Health Care Provider, against Independent Variables

A bivariate analysis was conducted using chi square tests to compare the outcome (has a regular health care provider) against each independent variable (see **Table 4**). All the independent variables examined were found to be significantly associated with the outcome, with the exception of region of residence. Eighty percent of those with a health care provider were established immigrants, relative to fifty seven percent of those without a health care provider. In terms of predisposing factors, compared to those without a regular health care provider, a higher proportion of those with a regular health care provider were female (53.0% versus 40.9%), age 65 or older (25.3% versus 7.7%), and married/common-law (71.5% versus 54.7%). In terms of enabling factors, immigrants with a regular health care provider had higher household income, relative to those without a regular health care provider. In terms of need factors, a higher proportion of immigrants with a regular health care provider had poor or fair self-perceived health (12.8% versus 6.6%), and three or more medical conditions (29.8% versus 10.8%), compared to immigrants without a health care provider.

Table 4. Bivariate analysis of has a regular health care provider against each independent variable for Sample 1 (n = 14,077)

	Has a regular health care provider		
	Yes	**No**	**p-value**
	n (%)	n (%)	
Primary exposure			
Time since immigration			<0.001
< 10 years	2,421 (20.4)	950 (42.7)	
≥ 10 years	9,430 (79.6)	1,276 (57.3)	
Predisposing factors			
Sex			<0.001
Male	5,568 (47.0)	1,315 (59.1)	
Female	6,283 (53.0)	911 (40.9)	
Age			<0.001
18-39 years	3,216 (27.1)	1,226 (55.1)	
40-64 years	5,631 (47.5)	828 (37.2)	
65-79 years	2,407 (20.3)	142 (6.4)	
≥80 years	596 (5.0)	29 (1.3)	
Region of residence			0.106
Western Canada	3,896 (32.9)	681 (30.6)	
Central Canada	7,855 (66.3)	1,526 (68.6)	
Atlantic Canada and Northern Territories	101 (0.8)	18 (0.8)	
Marital status			<0.001
Single	1,687 (14.3)	756 (34.0)	
Widowed/divorced/separated	1,673 (14.2)	251 (11.3)	
Married or common-law	8,434 (71.5)	1,216 (54.7)	
Cultural/racial background			<0.001
White	4,240 (36.2)	672 (30.5)	
Non-white	7,484 (63.8)	1,534 (69.5)	
Sense of belonging to local community			<0.001
Very weak	790 (7.2)	216 (9.9)	
Somewhat weak	2,422 (21.9)	632 (29.0)	
Somewhat strong	5,432 (49.2)	959 (44.0)	
Very strong	2,403 (21.8)	371 (17.0)	
Enabling factors			
Total household income			<0.001
No income or less than $20,000	737 (6.2)	298 (13.4)	
$20,000-$39,999	1,947 (16.4)	416 (18.7)	
$40,000-$59,999	1,897 (16.0)	393 (17.7)	
$60,000-$79,999	1,844 (15.6)	312 (14.0)	
$80,000 or more	5,422 (45.8)	805 (36.2)	
Education			<0.001
Less than secondary school	1,215 (10.4)	127 (5.8)	
Secondary school	2,311 (19.9)	436 (19.9)	
Post-secondary	8,103 (69.7)	1,633 (74.3)	
Knowledge of official languages			<0.001
Not proficient in official languages	542 (4.6)	48 (2.2)	
Proficient in official languages	11,307 (95.4)	2,172 (97.8)	
Insurance for prescription medication			<0.001
No insurance	3,194 (27.1)	691 (32.0)	
Insurance	8,573 (72.9)	1,472 (68.0)	

	Has a regular health care provider		
	Yes	**No**	**p-value**
Need factors			
Perceived health			<0.001
Poor	448 (3.8)	25 (1.1)	
Fair	1,067 (9.0)	122 (5.5)	
Good	3,855 (32.7)	603 (27.1)	
Very good	3,747 (31.8)	773 (34.8)	
Excellent	2,684 (22.7)	701 (31.5)	
Number of medical conditions			<0.001
Zero	3,810 (32.1)	1,199 (53.9)	
One	2,771 (23.4)	558 (25.1)	
Two	1,741 (14.7)	228 (10.3)	
Three or more	3,530 (29.8)	241 (10.8)	

4.1.2.2 Bivariate Analysis of Time since Immigration against Having a Regular Health Care Provider and Independent Variables

Table 5 reports the outcome, having a regular provider, and independent variables by time since immigration, comparing recent (<10 years) and established immigrants (10+ years). Twenty four percent of respondents in Sample 1 were recent immigrants, while the remaining seventy six percent were established immigrants. A higher proportion of established immigrants had a regular health care provider (88.1%) compared to recent immigrants (71.8%). There were also important differences in predisposing, enabling and need factors between recent and established immigrants. In terms of predisposing factors, a larger proportion of established immigrants were over 65 years old (28.3% versus 4.1%) and white (40.2% versus 19.6%), compared to recent immigrants. In terms of enabling factors, established immigrants had higher household incomes than recent immigrants, and a higher proportion of established immigrants had insurance coverage for prescription medications relative to recent immigrants (73.8% versus 66.6%). However, a lower proportion of established immigrants had a post-secondary education (68.7%), relative to recent immigrants (75.8%). In terms of need factors, a larger proportion of established immigrants had poor or fair self-perceived health (13.6% versus 6.2%) and three or more medical conditions (31.6% versus 11.4%), compared to recent immigrants.

Table 5. Bivariate analysis of time since immigration against having a regular health care provider and independent variables for Sample 1 (n=14,077)

	Time since immigration < 10 years (n = 3,371)	Time since immigration ≥ 10 years (n = 10,705)	p-value
	n (%)	n (%)	
Outcome measures			
Has a regular health care provider			< 0.001
No regular health care provider	950 (28.2)	1,276 (11.9)	
Has a regular health care provider	2,421 (71.8)	9,430 (88.1)	
Independent variables			
Predisposing factors			
Sex			0.638
Male	1,628 (48.3)	5,265 (49.1)	
Female	1,743 (51.7)	5,466 (50.9)	
Age			< 0.001
18-39 years	2,143 (63.6)	2,302 (21.5)	
40-64 years	1,088 (32.3)	5,391 (50.2)	
65-79 years	125 (3.7)	2,427 (22.6)	
≥80 years	14 (0.4)	611 (5.7)	
Region of residence			< 0.001
Western Canada	1,347 (39.9)	3,230 (30.2)	
Central Canada	1,991 (59.0)	7,390 (69.0)	
Atlantic Canada and Northern	34 (1.0)	85 (0.8)	
Territories			
Marital status			< 0.001
Single	770 (22.9)	1,673 (15.7)	
Widowed/divorced/separated	203 (6.0)	1,722 (16.2)	
Married or common-law	2,394 (71.1)	7,256 (68.1)	
Cultural/racial background			< 0.001
White	656 (19.6)	4,256 (40.2)	
Non-white	2,687 (80.3)	6,332 (59.8)	
Sense of belonging to local community			0.434
Very weak	221 (6.8)	785 (7.9)	
Somewhat weak	786 (24.0)	2,268 (22.8)	
Somewhat strong	1,554 (47.6)	4,836 (48.6)	
Very strong	705 (21.6)	2,069 (20.8)	
Enabling factors			
Total household income			< 0.001
No income or less than $20,000	362 (10.8)	673 (6.3)	
$20,000-$39,999	670 (19.9)	1,693 (15.8)	
$40,000-$59,999	624 (18.5)	1,666 (15.6)	
$60,000-$79,999	507 (15.0)	1,649 (15.4)	
$80,000 or more	1,205 (35.8)	5,022 (46.9)	
Education			< 0.001
Less than secondary school	216 (6.5)	1,126 (10.7)	
Secondary school	592 (17.7)	2,155 (20.6)	
Post-secondary	2,533 (75.8)	7,203 (68.7)	
Knowledge of official languages			0.006
Not proficient in official languages	187 (5.6)	403 (3.8)	
Proficient in official languages	3,179 (94.4)	10,300 (96.2)	

	n (%)	n (%)	
Insurance for prescription medications			< 0.001
No insurance	1,100 (33.4)	2,786 (26.2)	
Insurance	2,196 (66.6)	7,848 (73.8)	
Need factors			
Perceived health			< 0.001
Poor	47 (1.4)	426 (4.0)	
Fair	161 (4.8)	1,028 (9.6)	
Good	1,010 (30.0)	3,449 (32.3)	
Very good	1,118 (33.2)	3,404 (31.9)	
Excellent	1,030 (30.6)	2,356 (22.1)	
Number of medical conditions			< 0.001
Zero	1,818 (53.9)	3,191 (29.8)	
One	809 (24.0)	2,518 (23.5)	
Two	359 (10.6)	1,611 (15.0)	
Three or more	385 (11.4)	3,385 (31.6)	

4.1.3 Multivariate Analysis

Table 6 reports the final model for the logistic regression with the outcome, having a regular health care provider. The first model included all independent variables and the interactions for time since immigration with age, knowledge of official languages and sense of community. Based on this first model, a final model was run with non-significant terms removed. The independent variables, insurance, race and knowledge of official languages were found to be non-significant and therefore were not included in the final model. There was no significant interaction between time since immigration and age, knowledge of official languages or sense of community, or between age and sex, and therefore these interaction terms were not included in the final model. Collinearity statistics were conducted with all independent variables included in the first model, and showed low correlation between the variables, with all variance inflation factor values less than 10.

The final model was statistically significant, $F(23, 978) = 22.09$, $p < 0.001$. The Hosmer-Lemeshow goodness of fit test yielded a non-significant result ($p=0.434$), suggesting good fit of the model to the data.

4.1.3.1 Effect of Time Since Immigration on Having a Regular Healthcare Provider

Time since immigration was the primary exposure variable. After controlling for other significant predictors, established immigrants (who had been in Canada for 10 or more years) were 1.75 times more likely to have a regular health care provider than recent immigrants (in Canada for less than 10 years) (OR = 1.75, 95% CI: 1.45-2.10).

4.1.3.2 Effect of Predisposing Factors on Having a Regular Healthcare Provider

After controlling for other significant predictors, female immigrants were more likely than male immigrants to have a regular health care provider (OR = 1.72, 95% CI: 1.47-2.03). Relative to the 18-39-year age group, older age groups were more likely to have a regular health care provider. Married or common-law immigrants were more likely to have a regular health care provider than single immigrants (OR = 1.89, 95% CI: 1.50-2.38). Immigrants with somewhat strong (OR = 1.68, 95% CI: 1.21-2.32) or very strong (OR = 1.79, 95% CI: 1.25-2.57) sense of belonging to the local community were more likely to have a regular health care provider than those with very weak sense of belonging to the local community.

4.1.3.3 Effect of Enabling Factors on Having a Regular Healthcare Provider

After controlling for significant predictors, relative to immigrants with a household income less than $20,000, those with higher income were more likely to have a regular health care provider. However, those with post-secondary education were less likely to have a regular health care provider than those with less than secondary education (OR = 0.73, 95% CI: 0.54-0.99).

4.1.3.4 Effect of Need Factors on Having a Regular Healthcare Provider

After controlling for other predictors, immigrants with very good (OR = 0.51, 95% CI: 0.27-0.94) and excellent (OR = 0.48, 95% CI: 0.26-0.90) self-perceived health were less likely have a regular health care provider. Conversely, those with higher number of medical conditions were more likely to have a regular health care provider.

Table 6. Logistic regression for having a regular health care provider, for Sample 1 (n=14,077)

	Coefficient (Standard Error)	t	Odds Ratio (95% CI)	p-value
Primary exposure				
Time since immigration				<0.001
0-9 years				
≥10 years	0.557 (0.095)	5.86	1.75 (1.45, 2.10)	<0.001
Predisposing factors				
Sex				<0.001
Male				
Female	0.544 (0.082)	6.62	1.72 (1.47, 2.03)	<0.001
Age				<0.001
18-39 years				
40-64 years	0.345 (0.100)	3.46	1.41 (1.16, 1.72)	0.001
65-79 years	1.026 (0.158)	6.51	2.79 (2.05, 3.80)	< 0.001
≥80 years	1.410 (0.260)	5.43	4.09 (2.46, 6.82)	< 0.001
Marital status				<0.001
Single				
Widowed/divorced/separated	0.132 (0.162)	0.82	1.14 (0.83, 1.57)	0.414
Married or common-law	0.636 (0.117)	5.42	1.89 (1.50, 2.38)	< 0.001
Sense of belonging to local community				<0.001
Very weak				
Somewhat weak	0.150 (0.174)	0.86	1.16 (0.82, 1.64)	0.391
Somewhat strong	0.517 (0.165)	3.14	1.68 (1.21, 2.32)	0.002
Very strong	0.584 (0.184)	3.17	1.79 (1.25, 2.57)	0.002
Enabling factors				
Total household income				<0.001
No income or < $20,000				
$20,000-$39,999	0.536 (0.162)	3.30	1.71 (1.24, 2.35)	0.001
$40,000-$59,999	0.725 (01.67)	4.33	2.06 (1.49, 2.87)	<0.001
$60,000-$79,999	0.946 (0.180)	5.26	2.58 (1.81, 3.67)	<0.001
$80,000 or more	1.039 (0.156)	6.68	2.83 (2.08, 3.84)	<0.001
Education				0.033
Less than secondary school			-	-
Secondary school	-0.185 (0.182)	-1.02	0.83 (0.58, 1.19)	0.307
Post-secondary	-0.314 (0.156)	-2.01	0.73 (0.54, 0.99)	0.045
Need factors				
Self-perceived health				0.035
Poor		-		
Fair	-0.546 (0.351)	-1.55	0.58 (0.29, 1.15)	0.121
Good	-0.542 (0.313)	-1.73	0.58 (0.31, 1.08)	0.084
Very good	-0.676 (0.314)	-2.15	0.51 (0.27, 0.94)	0.031
Excellent	-0.734 (0.320)	-2.29	0.48 (0.26, 0.90)	0.022
Number of medical conditions				<0.001
Zero			-	-
One	0.243 (0.105)	2.31	1.27 (1.04, 1.57)	0.021
Two	0.450 (0.129)	3.49	1.57 (1.22, 2.02)	0.001
Three or more	0.858 (0.142)	6.05	2.36 (1.79, 3.12)	<0.001

4.1.4 Supplementary analysis

The supplementary analysis for Sample 1A (n=15,908) is reported in Appendix A. Sample 1A included all adult immigrant respondents who answered the question regarding regular health care provider (**PHC_020**) irrespective of whether they answered the time since immigration question (**SDCDGRES**).

In order to assess the representativeness of Sample 1, an analysis of Sample 1A was conducted using chi square test to compare the characteristics of those with known time since immigration (i.e. Sample 1) to those with unknown time since immigration (see Appendix 1: Table A2). Those with unknown time since immigration were less likely to have a regular health care provider (65.8%), compared to those with known time since immigration (84.2%). Compared to respondents with known time since immigration, a larger proportion of respondents with unknown time since immigration were young, single, white, had low income, reported somewhat better health, and had fewer numbers of medical conditions. These differences in characteristics may contribute to the lower proportion of respondents with a regular doctor among those with unknown time since immigration, compared to those with known time since immigration.

The supplementary bivariate analysis of Sample 1A (Appendix A: Table A3) for having a regular health care provider, found all independent variables significant except region, consistent with that found in the analysis of Sample 1. The final model for the supplementary logistic regression of Sample 1A (Appendix 1: Table A4) included the same predictors as for Sample 1, found no significant interactions with time since immigration and found similar parameter estimates. The odds ratios in the multivariate analysis of Sample 1A were similar to those in the analysis of Sample 1, in terms of magnitude and direction.

The similarities in the bivariate and multivariate analyses of Sample 1 and Sample 1A suggest that, although there are differences between those with known and unknown time since immigration, the sample is not biased.

4.2 Number of Medical Consultations in the Past Year

4.2.1 Descriptive Statistics

Sample 2 (n=13,912) included all adult immigrant respondents who answered the questions regarding number of consultations (**CHPDGMDC**) and time since immigration (**SDCDGRES**). The mean number of medical consultations in the past year was 3.37±4.53. **Figure 2** shows the distribution of respondents by number of medical consultations. **Table 7** shows the descriptive statistics for Sample 2. The majority of immigrant respondents in Sample 2 had been in Canada for 10 or more years (76.0%), were less than 65 years old (77.7%), were in a non-white cultural/racial group (64.9%), had a post-secondary education (70.7%), and were proficient in at least one of Canada's official languages (96.0%). Over half (56.6%) reported being in very good or excellent health, and 35.7% reported no medical conditions.

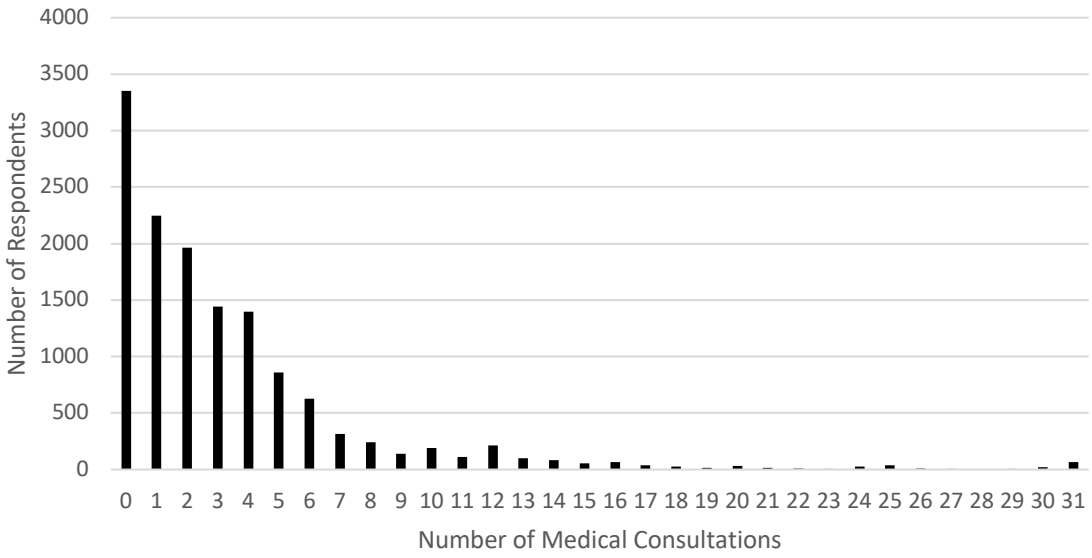

Figure 2. Distribution of respondents by number of medical consultations for Sample 2 (n=13,912)

Table 7. Descriptive statistics for independent variables for Sample 2 (n=13,912)

	n (%)
Primary exposure	
Time since immigration	
< 10 years	3,340 (24.0)
≥ 10 years	10,572 (76.0)
Predisposing factors	
Sex	
Male	6,836 (49.1)
Female	7,077 (50.9)
Age	
18-39 years	4,414 (31.7)
40-64 years	6,401 (46.0)
65-79 years	2,497 (17.9)
≥80 years	600 (4.3)
Region of residence	
Western Canada	4,545 (32.7)
Central Canada	9,249 (66.5)
Atlantic Canada and Northern Territories	119 (0.9)
Marital status	
Single	2,430 (17.5)
Widowed/divorced/separated	1,881 (13.6)
Married or common-law	9,542 (68.9)
Cultural/racial background	
White	4,831 (35.1)
Non-white	8,940 (64.9)
Sense of belonging to local community	
Very weak	994 (7.6)
Somewhat weak	3,042 (23.2)
Somewhat strong	6,329 (48.3)
Very strong	2,746 (20.9)
Enabling factors	
Total household income	
No income or less than $20,000	1,024 (7.4)
$20,000-$39,999	2,322 (16.7)
$40,000-$59,999	2,249 (16.2)
$60,000-$79,999	2,128 (15.3)
$80,000 or more	6,185 (44.5)
Education	
Less than secondary school	1,305 (9.5)
Secondary school	2,702 (19.8)
Post-secondary	9,660 (70.7)
Knowledge of official languages	
Not proficient in official languages	563 (4.0)
Proficient in official languages	13,342 (96.0)
Insurance for prescription medications	
No insurance	3,880 (27.8)
Insurance	9,938 (72.2)
Has a regular health care provider	
No regular health care provider	2,221 (16.0)
Has a regular health care provider	11,659 (84.0)

	n (%)
Need factors	
Perceived health	
Poor	440 (3.2)
Fair	1,165 (8.4)
Good	4,412 (31.8)
Very good	4,479 (32.3)
Excellent	3,368 (24.3)
Number of medical conditions	
Zero	4,972 (35.7)
One	3,314 (23.8)
Two	1,939 (13.9)
Three or more	3,687 (26.5)

4.2.2 Bivariate Analysis

4.2.2.1 Bivariate Analysis of Number of Medical Consultations against Independent Variables

A bivariate analysis was conducted using analysis of variance to compare the dependent variable (number of consultations) against each independent variable (see **Table 8**). All the independent variables examined were found to be significantly associated with the outcome (number of consultations). Recent immigrants had 2.97±4.45 consultations in the past year, compared to 3.50±4.50 consultations among established immigrants.

Table 8. Bivariate analysis of number of medical consultations against each independent variable for Sample 2 (n=13,912)

	Number of consultations	
	Mean (SD)	**p-value**
Primary exposure		
Time since immigration		<0.001
< 10 years	2.97 (4.45)	
≥ 10 years	3.50 (4.54)	
Predisposing factors		
Sex		<0.001
Male	2.99 (4.37)	
Female	3.75 (4.64)	
Age		<0.001
18-39 years	2.76 (4.29)	
40-64 years	3.39 (4.64)	
65-79 years	4.04 (4.38)	
≥80 years	4.92 (4.92	

	Number of consultations	
	Mean (SD)	**p-value**
Region of residence		<0.001
Western Canada	3.70 (4.81)	
Central Canada	3.21 (4.37)	
Atlantic Canada and Northern Territories	4.19 (4.73)	
Marital status		<0.001
Single	2.77 (4.36)	
Widowed/divorced/separated	4.02 (4.97)	
Married or common-law	3.41 (4.47)	
Cultural/racial background		<0.001
White	3.57 (4.60)	
Non-white	3.28 (4.49)	
Sense of belonging to local community		0.029
Very weak	3.60 (4.88)	
Somewhat weak	3.33 (4.79)	
Somewhat strong	3.18 (4.16)	
Very strong	3.31 (4.42)	
Enabling factors		
Total household income		<0.001
No income or less than $20,000	3.96 (5.63)	
$20,000-$39,999	3.63 (4.89)	
$40,000-$59,999	3.30 (4.33)	
$60,000-$79,999	3.30 (4.55)	
$80,000 or more	3.24 (4.22)	
Education		<0.001
Less than secondary school	4.04 (4.72)	
Secondary school	3.50 (4.96)	
Post-secondary	3.24 (4.36)	
Knowledge of official languages		<0.001
Not proficient in official languages	4.15 (4.11)	
Proficient in official languages	3.34 (4.54)	
Insurance for prescription medication		0.002
No insurance	3.20 (4.52)	
Insurance	3.47 (4.55)	
Has a regular health care provider		<0.001
No	1.51 (3.38)	
Yes	3.73 (4.63)	
Need factors		
Perceived health		<0.001
Poor	9.24 (8.21)	
Fair	5.74 (6.06)	
Good	3.58 (4.40)	
Very good	2.77 (3.56)	
Excellent	2.30 (3.54)	
Number of medical conditions		<0.001
Zero	2.02 (3.27)	
One	2.93 (3.81)	
Two	3.61 (4.58)	
Three or more	5.48 (5.63)	

4.2.2.2 Bivariate Analysis of Time since Immigration against Number of Medical Consultations and Independent Variables

Recent immigrants had fewer consultations within the last year (3.50 ± 4.50), compared to established immigrants (2.97 ± 4.45). **Table 9** reports the independent variables by time since immigration, comparing recent (<10 years) and established immigrants (10+ years). Twenty four percent of the respondents in Sample 2 were recent immigrants, while the remaining seventy six percent were established immigrants. There were also important differences in predisposing, enabling and need factors between recent and established immigrants. In terms of predisposing factors, a higher proportion of established immigrants were over 65 years old, compared to recent immigrants. In terms of enabling factors, established immigrants were more likely than recent immigrants to have a higher household income, and to have insurance coverage for prescription medications (73.9% versus 66.6%), but less likely to have a post-secondary education (68.9% versus 76.2%). A higher proportion of established immigrants had a regular health care provider (87.9%), compared to recent immigrants (71.5%). In terms of need factors, a higher proportion of established immigrants had poor or fair self-perceived health, and two or more medical conditions, relative to recent immigrants.

Table 9. Bivariate analysis for time since immigration against independent variables for Sample 2 (n=13,912)

		Recent immigrants (n = 3,340)	**Established immigrants (n = 10,572)**	**p-value**
		n (%)	**n (%)**	
Predisposing factors				
Sex				0.648
	Male	1,622 (48.6)	5,213 (49.3)	
	Female	1,718 (51.4)	5,356 (50.7)	
Age				< 0.001
	18-39 years	2,130 (63.8)	2,284 (21.6)	
	40-64 years	1,073 (32.1)	5,329 (50.4)	
	65-79 years	123 (3.7)	2,374 (22.5)	
	≥80 years	14 (0.4)	586 (5.5)	
Region of residence				< 0.001
	Western Canada	1,340 (40.1)	3,205 (30.3)	
	Central Canada	1,966 (58.9)	7,283 (68.9)	
	Atlantic Canada and Northern Territories	34 (1.0)	85 (0.8)	

	Recent immigrants (n = 3,340)	Established immigrants (n = 10,572)	p-value
	n (%)	n (%)	
Marital status			< 0.001
Single	765 (22.9)	1,665 (15.8)	
Widowed/divorced/separated	201 (6.0)	1,680 (16.0)	
Married or common-law	2,370 (71.0)	7,173 (68.2)	
Cultural/racial background			< 0.001
White	646 (19.5)	4,185 (40.0)	
Non-white	2,667 (80.5)	6,273 (60.0)	
12o;Enabling factors			
Has a regular health care provider			< 0.001
No regular health care provider	949 (28.5)	1,273 (12.1)	
Has a regular health care provider	2,385 (71.5)	9,274 (87.9)	
Total household income			< 0.001
No income or less than $20,000	360 (10.8)	664 (6.3)	
$20,000-$39,999	663 (19.9)	1,658 (15.7)	
$40,000-$59,999	613 (18.4)	1,636 (15.5)	
$60,000-$79,999	507 (15.2)	1,622 (15.3)	
$80,000 or more	1,195 (35.8)	4,990 (47.2)	
Education			< 0.001
Less than secondary school	208 (6.3)	1,097 (10.6)	
Secondary school	580 (17.5)	2,122 (20.5)	
Post-secondary	2,522 (76.2)	7,139 (68.9)	
Knowledge of official languages			0.007
Not proficient in official languages	180 (5.4)	383 (3.6)	
Proficient in official languages	3,155 (94.6)	10,187 (96.4)	
Insurance for prescription medications			< 0.001
No insurance	1,091 (33.4)	2,739 (26.1)	
Insurance	2,174 (66.6)	7,765 (73.9)	
Need factors			
Perceived health			< 0.001
Poor	45 (1.4)	395 (3.8)	
Fair	156 (4.7)	1,009 (9.6)	
Good	997 (29.9)	3,415 (32.4)	
Very good	1,106 (33.2)	3,373 (32.0)	
Excellent	1,029 (30.9)	2,340 (22.2)	
Number of medical conditions			< 0.001
Zero	1,810 (54.2)	3,162 (29.9)	
One	804 (24.1)	2,511 (23.7)	
Two	358 (10.7)	1,580 (14.9)	
Three or more	368 (11.0)	3,319 (31.4)	

4.2.3 Multivariate Analysis

The final model for the negative binomial regression for the outcome, number of medical consultations is shown in **Table 10.** The first model included all independent variables and the interactions for time since immigration with age, knowledge of official languages and sense of community, and for sex with age.

There was no significant interaction between time since immigration and age, knowledge of official languages or sense of community, and therefore these interaction terms were not included in the final model. There was a significant interaction between age and sex, and therefore a new composite variable was created with categories for each combination of responses from the component variables. The independent variables, time since immigration, marital status, cultural/racial background, sense of community, total household income, education, knowledge of official languages, and insurance for prescription medications, were found to be non-significant and therefore were not included in the final model.

Collinearity statistics were conducted with all independent variables included in the first model, and showed low correlation between the variables, with all variance inflation factor values less than 10. The final model was statistically significant, $F(17, 984) = 48.04$, $p < 0.001$.

4.2.3.1 Effect of Time Since Immigration on Number of Medical Consultations

Time since immigration was the primary exposure variable. After controlling for all other independent variables, time since immigration was not significantly associated with number of medical consultations.

4.2.3.2 Effect of Predisposing Factors on Number of Medical Consultations

Females age 18-39 had 1.57 times the number of medical consultations as the comparison group, males age 18-39. There was no significant difference between males age 18-39 and any of the other groups, after controlling for other independent variables. Relative to immigrants living in Western Canada, those living in central Canada had fewer medical consultations (IRR = 0.86, 95% CI: 0.80-0.92).

4.2.3.3 Effect of Enabling Factors on Number of Medical Consultations

After controlling for other independent variables, immigrants with a regular health care provider had 2.08 times the number of medical consultations (95% CI: 1.75, 2.47), relative to those who lacked a regular health care provider.

4.2.3.4 Effect of Need Factors on Number of Medical Consultations

After controlling for other significant predictors, better self-perceived health was associated with fewer medical consultations among immigrant respondents. Higher number of medical conditions was associated with more medical consultations.

Table 10. Negative binomial regression for number of medical consultations, for Sample 2 (n=13,912)

	Coefficient (Standard Error)	t	Incident Rate Ratio (95% CI)	p-value
Predisposing factors				
Sex and Age				
Male, Age 18-39 years				
Male, Age 40-64 years	-0.008 (0.083)	-0.10	0.99 (0.84, 1.16)	0.921
Male, Age 65-79 years	-0.035 (0.076)	-0.46	0.96 (0.83, 1.12)	0.642
Male, Age ≥80 years	0.164 (0.110)	1.50	1.18 (0.95, 1.46)	0.135
Female, Age 18-39 years	0.451 (0.081)	5.60	1.57 (1.34, 1.84)	<0.001
Female, Age 40-64 years	0.081 (0.073)	1.11	1.08 (0.94, 1.25)	0.269
Female, Age 65-79 years	-0.055 (0.081)	-0.68	0.95 (0.81, 1.11)	0.495
Female, Age ≥80 years	0.002 (0.085)	0.02	1.00 (0.85, 1.18)	0.985
Region of residence				
Western Canada				
Central Canada	-0.155 (0.037)	-4.12	0.86 (0.80, 0.92)	<0.001
Atlantic Canada and Northern	0.128 (0.109)	1.19	1.14 (0.92, 1.41)	0.236
Territories				
Enabling factors				
Has a regular health care provider				
No				
Yes	0.732 (0.088)	8.34	2.08 (1.75, 2.47)	<0.001
Need factors				
Self-perceived health				
Poor				
Fair	-0.396 (0.091)	-4.38	0.67 (0.56, 0.80)	<0.001
Good	-0.724 (0.071)	-10.24	0.48 (0.42, 0.56)	<0.001
Very good	-0.847 (0.074)	-11.47	0.43 (0.37, 0.50)	<0.001
Excellent	-0.912 (0.082)	-11.07	0.40 (0.34, 0.47)	<0.001
Number of medical conditions				
Zero				
One	0.374 (0.064)	5.89	1.45 (1.28, 1.64)	<0.001
Two	0.494 (0.057)	8.69	1.64 (1.47, 1.83)	<0.001
Three or more	0.812 (0.056)	14.59	2.25 (2.02, 2.51)	<0.001

4.2.4 Supplementary Analysis

The supplementary analysis for Sample 2A (n=15,724) is reported in Appendix B. Sample 2A included all adult immigrant respondents who answered the question regarding number of medical consultations (**CHPDGMDC**) irrespective of whether they answered the time since immigration question (**SDCDGRES**).

To assess the representativeness of Sample 2, an analysis of sample 2A was conducted using chi square test to compare the characteristics of those with known time since immigration (i.e. Sample 2) to those with unknown time since immigration (see Appendix 2: Table B2). Those with unknown time since immigration had fewer consultations, compared to those with known time since immigration. The two groups also differed in terms of many of the independent variables: age, region of residence, marital status, race and household income. A larger proportion of respondents with unknown time since immigration were young, single, white, had low income, reported better self-perceived health and had fewer medical conditions than respondents with known time since immigration.

The supplementary bivariate analysis of Sample 2 (Appendix 2: Table B3) was similar to that of Sample 2. The results of the final model for the supplementary negative binomial regression of Sample 2A (Appendix 2: Table B4) was similar to the model for Sample 2; the predictors were consistent between the two analyses, and incident risk ratios were similar in terms of magnitude and direction.

The similarities between the bivariate and multivariate analyses of Sample 2 and Sample 2A indicate that, although there are differences in the characteristics of those with known and unknown time since immigration, the sample is not biased.

Chapter 5

5 Discussion

This study examined the relationship between two measures of health care utilization (having a regular health care provider and number of medical consultations in the past year) and the length of time since immigration (recent versus established) for immigrants to Canada, using Andersen and Newman's Framework of Health Service Utilization.

5.1 Time Since Immigration

Immigrant respondents to CCHS 2015-2016 varied on a number of characteristics by time since immigration. A larger proportion of recent immigrants were younger, married, non-white, and more educated than established immigrants. A larger proportion of recent immigrants than established immigrants had lower income, lacked private insurance, had lower language proficiency, but reported better self-rated health and fewer medical conditions.

5.2 Having a Regular Health Care Provider

Eighty four percent of immigrant respondents to CCHS 2015-2016 had a regular health care provider. The 2015-2016 CCHS dataset used in this study also found that 84% of Canadian-born respondents had a regular health care provider [32]. This suggests that a similar proportion of immigrants have a regular health care provider as Canadian-born.

In a previous study based on data from the 2002-2003 Joint Canada-United States Health Survey, 84% of the Canadian-born and 79% of immigrants had a regular doctor [21]. In a more recent 2011-2012 CCHS dataset, 78% of non-immigrant males and 88% of non-immigrant females had a regular doctor, relative to 55% of recent immigrant males and 68% of recent immigrant females, and 84% of established immigrant males and 91% of established immigrant females [23]. In the present study, 84% of immigrants overall, 72% of recent immigrants and 88% of established immigrants had a regular doctor. Although a lower proportion of recent immigrants than established immigrants and the

Canadian population have a regular provider, there has been improvement in utilization by recent immigrants, as well as by immigrants overall, relative to previous studies.

While the most recently released iteration of the CCHS (2015-2016), which was used in this study, asked about having a regular health care provider, much of the previous literature examined having a regular doctor. However, in the 2015-2016 dataset used in this study, 98.1% of immigrant respondents reported that their regular health care provider was a family doctor, while 1.0% had a medical specialist, 0.3% had a nurse practitioner and 0.4% had another type of provider as their regular health care provider. This suggests that most respondents had a family physician as a regular doctor, so it is possible to make comparisons of the current dataset to previous data.

The study's first hypothesis was that established immigrants were more likely to have a regular health care provider than recent immigrants. This study found that, after controlling for other independent variables, established immigrants were 1.75 times more likely to have a regular health care provider compared to recent immigrants, supporting the hypothesis.

Previous studies had similar findings with respect to immigrants to Canada having a regular health care provider. Similarly to the present study, in the three previous studies which examined the effect of time since immigration on having a regular doctor, established immigrants were more likely to have a regular doctor than recent immigrants [23], [16], [19].

In the present study, age was a strong predictor for having a regular health care provider: relative to the 18-39 age group, immigrants over 65 were 2.79 times as likely, and those over 80 were 4.09 times as likely, to have a regular doctor. However, no interaction was observed in this study between time since immigration and age, for having a regular doctor. Similarly, in the previous literature, the effect of age on having a regular health care provider was similar in Canadian-born individuals, recent immigrants and established immigrants [17]. However, in a previous study of older South Asian immigrants, established immigrants had higher utilization of services than recent immigrants; other factors associated with higher utilization were reporting fewer barriers

related to cultural incompatibility, lower agreement with traditional South Asian health beliefs, and stronger South Asian ethnic identity [18]. Qualitative research has also identified cultural incompatibility, personal attitudes, administrative problems and circumstantial challenges such as lack of knowledge or difficulty with transportation as potential service barriers for elderly immigrants [28]. This suggests that older immigrants may face specific barriers related to immigration and time since immigration, which were not elucidated in this current study due to lack of variables related to cultural identity and health beliefs.

5.3 Number of Medical Consultations

The mean number of medical consultations in the past year for adult immigrant respondents to CCHS 2015-2016 was 3.37±4.53. This number of consultations for immigrant respondents was comparable to the Canadian-born (3.41±4.89) in the same dataset. The study's second hypothesis was that established immigrants would have more consultations in the past year than recent immigrants would. The unadjusted numbers showed that recent immigrants had fewer medical consultations than established immigrants (2.97±4.45 versus 3.50±4.50). However, after controlling for other independent variables, this study found that, contrary to the hypothesis, time since immigration did not have a significant effect on the number of consultations.

Only one previous study of immigrants to Canada examined the number of medical consultations in the past year. A practice-based cross-sectional study by Muggah et al. in 2012 found that recent Canadian born immigrants who had been in Canada less than 5 years had 11.5 primary care visits in the past year, relative to 6.2 in the Canadian-born, 6.3 among immigrants who had been in Canada for more than 20 years, and 7.4 among immigrant who had been in Canada for 5 to 20 years. However, the study by Muggah et al. did not control for other independent variables such as having a regular health care provider, education, income or language proficiency. Due to the study's practice-based design, only patients who received care at one of 137 family medicine practices in Ontario, were included in the study. Therefore, the findings from this study by Muggah et al. may not be generalizable to the broader Canadian immigrant population [20]. The

CCHS public dataset used in the present study reports time since immigration as a dichotomous variable with values of less than ten years or more than ten years. There may be an effect on number of medical consultations for very recent immigrants, but this could not be tested in this study. Previous secondary data analyses based on large datasets such as the CCHS did not examine number of medical consultations in the past year as a measure of health care utilization.

There are important characteristics of recent and established immigrants that may speak to differences in patterns of health care utilization, even though time since immigration does not affect the number of medical consultations.

One such characteristic, was where routine care was sought. In the 2015-2016 CCHS dataset, when asked "where do you usually go when you need immediate care for a minor health problem?", recent immigrants were less likely than established immigrants to go to a doctor's office (48.6% versus 64.4%) and more likely to go to a walk-in clinic (38.3% versus 25.8%). Walk-in clinics have previously been criticized for lack of continuity [45], "high volume, low intensity" care [46], relative to other models of primary care, and typically operate under a fee-for-service, rather than a capitation, model [45]. Recent immigrants' relatively high use of walk-in clinics may therefore be an indicator of differences in utilization of health care, although location of care was not studied as either an independent variable or an outcome measure in this study.

Another characteristic that may distinguish utilization by recent and established immigrants is the type of care being sought. In the present study, recent immigrants were significantly younger than established immigrants were, with 64% of recent immigrants being in the 18-39 age group, relative to only 22% of established immigrants in this age group. After controlling for other independent variables, females age 18-39 had a higher number of medical consultations than the other age groups. Females in this youngest age group are in their reproductive years, and this may explain the higher utilization of services after controlling for number of medical conditions and other significant variables. This reflects the type of care being sought. Younger (and more recent) female immigrants may be more likely to have frequent visits related to reproductive health, such

as prenatal visits, leading to higher number of medical consultations by relatively healthy women in this age group.

Therefore, while time since immigration was not a predictor for number of medical consultations, it may be a predictor for the location and type of care being sought. Further research is required to elucidate these factors.

In the present analysis, no interactions were found significant between time since immigration and age, language proficiency or sense of community for having a regular health care provider or the number of medical consultations. The selection of variables to test for interactions was based on previous findings in the literature where older immigrants with less time since immigration or more barriers related to cultural incompatibility had lower utilization of health services [17]. However, previous studies have not directly tested for interactions between time since immigration and other variables in utilization of care. The lack of interactions between these variables in the present study suggests that the relationship between time since immigration and having a regular provider or number of medical consultations does not vary by immigrants' age, language proficiency or sense of community.

The results of the present study show that although established immigrants to Canada were more likely to have a regular health care provider than recent immigrants, they did not differ from recent immigrants in terms of number of medical consultations in the past year.

5.4 Shifting Immigration Policy in Canada

Neither the existing literature nor the present study have delved into the reasons for the difference in having a regular health care provider between recent and established immigrants. However, two factors may be at play in the utilization of health care by recent and established immigrants: shifting immigration policy in Canada, and the economic and social integration of immigrants over time.

The differences in the profile of recent and established immigrants in Canada is due in part to changes in immigration policy over time. There are three main classes of immigrants to Canada: (1) Economic immigrants are selected for their ability to contribute to the nation's economy, based on a points system; (2) Immigrants sponsored by family (or "family class" immigrants) are sponsored by either a Canadian citizen or a permanent resident, because of their relationship as a spouse, partner, parent, grandparent, child or other relative of the sponsor; (3) Refugees are immigrants who are accepted into Canada on the basis of a well-founded fear of returning to their country of origin, which may include a fear of persecution based on race, religion, nationality, political opinion, or membership in a particular social group, persons affected by a civil war or armed conflict, or a massive violation of human rights [47].

Over the decades, immigration policy changes have resulted in accepting more immigrants in the economic class, and fewer from the family class and refugee class [48]. In 2015 and 2016, the years represented in the CCHS dataset used for this survey, 57.4% of immigrants who arrived in Canada were economic class [49].

The points system as a means of determining which applicants are accepted as economic class immigrants to Canada was introduced in the mid 1960s. At that time, points were assigned to applicants in specific occupations, based on a quarterly assessment of labour needs in Canada. In parallel to these changes in the selection of economic immigrants, policies such as the Canadian Multiculturalism Policy in 1971 were introduced to support multiculturalism by preserving cultural freedom, decreasing discrimination and facilitating intercultural exchange. In 1988, this policy was given a legislative framework through the introduction of the Canadian Multiculturalism Act [50].

In the early 1990s, the point system was altered to focus more on human capital, particularly education, as this was thought to be more directly related to long term economic outcomes. There was a corresponding shift from 10% of immigrants (aged 15 and over) entering Canada in the 1980s having a university degree, to 45% by 2005 [50].

This historical perspective of shifting immigration policy is consistent with the findings in this study in terms of the demographics of recent and established immigrants. Recent

immigrants were more likely to be younger and to have a post-secondary education than established immigrants (75.8% vs. 68.7%), in keeping with the increased emphasis in immigration policies on human capital. Recent immigrants were also more likely to be non-white (80.3% vs. 59.8%), which may reflect the policy and legislative changes in favour of multiculturalism, as well as global economic and political factors.

5.5 Economic and Social Integration of Immigrants

The primary goals of Canadian immigration policy include the promotion of economic and social integration of immigrants [50]. Our findings show that while there is a gap between recent and established immigrants in having a regular health care provider, comparisons with previous data [23] suggest that this gap is narrowing. The economic and social integration of immigrants over increasing time since immigration may partially mediate differences and similarities in health care utilization between recent and established immigrants.

5.5.1 Economic Integration

With regard to economic integration, despite the relatively high employment success of immigrants to Canada relative to immigrants to other countries [51], immigrants to Canada continue to be at a disadvantage in the labour market relative to the Canadian-born [52]. Many of the barriers faced by immigrants in general are exacerbated for recent immigrants. These barriers to economic integration include lack of language proficiency in official languages, lack of familiarity with cultural norms within the workplace, lack of employment networks or contacts, and lack of recognition of Canadian work experience and credentials [52].

Economic integration was identified in the present study by household income and, consistent with the premise that recent immigrants face greater economic barriers, recent immigrants in the present study had lower income than established immigrants. The existing qualitative literature confirms the important role of affordability as an enabling factor in health care utilization. Despite the publicly funded model of health care in

Canada, cost was a barrier for obtaining important health care related services such as prescription medications, dental care, vision care and physiotherapy [6].

In the present study, increasing household income was associated with increased odds of having a regular health care provider, but was not associated with number of medical consultations. This association may be related to increased resources amongst those with higher income to help them navigate the Canadian health care system. Previous studies have also shown that higher income is associated with higher utilization of health care by immigrants to Canada [16], [15], and fewer unmet health needs [19]. The qualitative literature has also frequently identified economic barriers as a barrier to utilization and access of health care for immigrants to Canada [6], [8], [10], [13].

5.5.2 Social Integration

Canada is generally seen as successful in promoting the social integration of its immigrants, based on the national value for cultural diversity within Canada and public support for immigration [51], although immigrants' actual experience of social integration is variable [53]. The Multiculturalism Policy introduced in 1971 and the legislative framework for this policy introduced through the Multiculturalism Act in 1988 have emphasized the importance of cultural freedom, discouraged discrimination, and are perceived as a strategy for the social integration of immigrants [51]. Specific programs are also in place to encourage settlement and integration, such as language training, fast-track citizenship and human rights and equality guarantees [51].

Social integration over time may mediate the effect of some of the predisposing and enabling factors identified in the qualitative literature, to produce differences in health care utilization between recent and established immigrants. In terms of predisposing factors, recent immigrants may have less knowledge of the health care system, and their treatment preferences and perceptions of services may also be more aligned to their country of origin, relative to more established immigrants who may have become more accustomed to the norms within the Canadian health care system. In terms of enabling factors, recent immigrants may face more cultural and language/communication barriers

(acceptability) and financial barriers (affordability). In terms of need factors, recent immigrants may have more need for support than established immigrants.

Only two variables were identified in the CCHS 2015-2016 dataset as relevant to social integration: sense of belonging to local community and language proficiency.

No differences were seen in the present study between recent and established immigrants in terms of the reported sense of belonging to local community. Sense of belonging to the local community was also similar between immigrant respondents and the Canadian-born, with 69.2% of immigrants and 66.5% of the Canadian-born reporting either somewhat strong or very strong sense of community. However, sense of belonging to local community is a complex concept, and likely was not captured through this single survey question.

In the present study, immigrants with higher sense of belonging to the local community were more likely to have a regular health care provider. This may be related to greater supports and resources and greater ability to navigate the health care system, for those immigrants who feel more sense of belonging.

Previous studies of immigrants' utilization of health care in Canada have not included sense of belonging to local community as an independent variable, and therefore no comparisons could be made to the existing quantitative literature. The qualitative literature has identified that adjusting to a new country can be very stressful and have health impacts [9], and that immigrants with social support fared better and were better able to navigate the health care system, including finding a family physician [10]. These findings are consistent with the present study, which found that increased sense of belonging to the local community was associated with increased odds of having a regular health care provider.

One survey of elderly South Asian immigrants to Canada found that cultural incompatibility was a predictor for decreased utilization [18]. Markers used in that study for cultural incompatibility were lack of other users or providers with a similar background, lack of providers who spoke the same language, and providers who did not

understand the user's culture [18]. Cultural incompatibility may overlap with sense of belonging to the local community for immigrants, as those with more cultural incompatibility may feel less sense of belonging to the local community.

The qualitative literature also points to the importance of culturally appropriate care [6], and beliefs by immigrants that the health care system is not adaptable to their beliefs [7], experiences of racial discrimination by health care providers [13], and beliefs by immigrants that providers of a similar cultural background may be able to provide care more appropriate to their needs [12]. These findings suggest that there is a role for interventions both within the health care system and within the larger public policy arena, to promote immigrant patients' sense of belonging to the local community and utilization of health care, and to ensure that culturally appropriate care is provided.

Although the differences in the present study in knowledge of official languages between recent immigrants (94.5%) and established immigrants (96.2%) are small, they were statistically significant. It is important to note that the CCHS questionnaire only inquired about whether the respondent could conduct a conversation in the official languages; however, it is certainly possible that there are larger differences between recent and established immigrants in terms of their ability to conduct more complex conversations about health and health care.

Knowledge of official languages was not significantly associated with either having a regular health care provider or number of medical consultations. Although knowledge of official languages was not identified as a predictor for either measure of utilization in this study, it is possible that immigrants face language or communication barriers that are more complex than knowledge of official languages and were therefore not captured in this study; for example, even those who report that they are able to conduct a conversation in English or French may have difficulty with the more complex communication required in interactions related to health care. A possible mitigating factor for language barriers in the Canadian context is the availability of same language health care providers. Indeed, among those immigrant respondents to the CCHS 2015-2016 who reported that they had a regular health care provider, 15.6% reported that they

communicated with their health care provider in a language other than English or French, 3.0% communicated in English and another language, and 0.2% communicated in French and another language. Previous qualitative literature supports that immigrants have a preference for same language health care providers [9], [10], [13], even if this meant traveling longer distances [13].

5.6 Strengths and Limitations

Unlike previous literature which compared utilization of health care between immigrants with non-immigrants, the present study focused on the immigrant population, with the primary exposure variable being time since immigration. This study also differed from previous studies of immigrant utilization of health care in Canada by examining two different outcome measures: having a regular health care provider and number of medical consultations in the past year. It was therefore possible to examine the factors that influence utilization of health care by immigrants at two different entry points to the health care system: finding a regular health care provider, and having a medical consultation.

There was a high proportion of missing data for the primary exposure variable: time since immigration. To determine whether this missing data biased the results, supplementary analyses were conducted, and showed that the independent variables and associated odds remained consistent, after excluding those with unknown time since immigration. Therefore, the missing data did not bias the results, but may have slightly overestimated the number of people with a regular health care provider.

As this was a secondary data analysis, the choice of independent and outcome variables was limited by variables available in the dataset and by the percentage of non-missing responses. Some variables of interest, such as unmet health care needs, had a high rate of missing data and therefore could not be included in the analysis. Meanwhile other variables had only a limited number of potential values. For example, although race was captured as a categorical variable in the survey, this information was suppressed in the public data file for confidentiality reasons, and only values of white and non-white were reported. Therefore, it was not possible to elucidate potential cultural barriers that may

be more prevalent in some racial groups. Other key variables that were considered for analysis but were not available in this dataset were rural/urban status and size of community. The CCHS PUMF dataset only captured time since immigration as a dichotomous variable with values of less than ten years or more than ten years; therefore, the effects of differing values of time since immigration on utilization of health care could not be fully assessed.

However, the present data analysis did include important sociodemographic independent variables, as well as two variables which have not been included in previous studies of immigrant utilization of health care. Sense of belonging to the local community was included as an important indicator of social integration. In the analysis of number of medical consultations, having a regular health care provider was included as an independent variable, to minimize confounding of the two outcome measures.

Another important limitation is that the CCHS only identifies immigrants based on the question "are you now, or have you ever been, a landed immigrant in Canada". Therefore, no distinction is made for other classes of immigrants, such as those who were previously refugees but are now landed immigrants. It would be important to study refugees separately from immigrants, since they face specific barriers to utilization of health care related to their refugee status or previous experiences in their home country.

In order to improve future research on utilization of health care, some changes may be considered to the Canadian Community Health Survey. Inconsistent terminology used across surveys, such as the use of "regular doctor" in previous surveys and "regular health care provider" in the recent 2015-2016 survey, make comparisons over time difficult. In addition, although the CCHS provides a large, national dataset and captures many important aspects of the health of Canadians, it does not capture some of the more complex concepts captured in the qualitative research on immigrant access to health care, such as patient satisfaction and social integration. There is a high proportion of missing data of important variables such as unmet health care needs (83%), because these are optional sections that individual provinces can choose to include or not. In particular, although the 2015-2016 dataset includes key questions on specific barriers faced by

respondents, such as wait times and geographic barriers, there was a lot of missing data because the questions were not given to respondents in each province. Future iterations of the CCHS may benefit from ensuring consistency across surveys as much as possible, including more common content across provinces, as well as from being informed by existing literature on access and utilization of health care specific to certain populations such as immigrants.

5.7 Directions for Future Research

The present study explored utilization of health care using two objective outcome measures: having a regular doctor and number of medical consultations in the past year. Future research could explore more subjective measures related to the immigrant experience of utilizing health care in Canada, such as unmet health needs, patient satisfaction and quality of care.

The present study investigated utilization of health care in general, but future research could look into specific types of health care that are particularly vulnerable to the effects of barriers. This may include care likely influenced by the age of immigrants (e.g. child and maternal care) and care that may be influenced by cultural beliefs (e.g. mental health, preventative care, and continuity of primary care). Future studies may also explore the location of care; for example, whether immigrants are seeking care at family physicians' offices, walk-in clinics, or emergency departments, and whether location of care is related to the quality of care received.

In order to assess the impact of different health care practices at the micro and macro level, future research may also compare utilization of health care before and after interventions that have been hypothesized to improve utilization for immigrants, such as availability of translators, same language physicians, culturally appropriate care, and addressing perceived or real discrimination by health care providers. Such research could be used to guide policy-making, with the goal of improving utilization of health care by immigrants in Canada.

The present study applied a quantitative approach to understanding the effect of time since immigration and other potential predictors on utilization of health care by immigrants. To develop a more in-depth understanding of the factors at play, qualitative research is necessary. Although there is a great deal of qualitative literature on access to health care by immigrants to Canada, there is little focus on the differing experiences of recent and established immigrants. Future research may use in-depth interviews or focus groups to explore recent and established immigrants' experiences of utilizing health care. In particular, the role of cultural beliefs related to health and health care, culturally appropriate care and the experience of migration in mediating recent and established immigrants' utilization of health care could be further explored through a qualitative approach.

Chapter 6

6 Conclusion

In this study, data from the 2015-2016 Canadian Community Health Survey was used to examine the relationship between health care utilization and length of time since immigration for immigrants to Canada, using Andersen and Newman's Framework of Health Service Utilization.

It was found that eighty four percent of immigrants to Canada had a regular health care provider, similar to the proportion of the Canadian-born. After controlling for other independent variables, established immigrants were 1.75 times more likely to have a regular health care provider compared to recent immigrants, in support of the study's first hypothesis.

The mean number of medical consultations in the past year for adult immigrant respondents to CCHS 2015-2016 was 3.37±4.53. Contrary to the study's second hypothesis, it was found that after controlling for other independent variables, time since immigration did not have a significant effect on the number of consultations.

The differences and similarities in health care utilization between recent and established immigrants observed in this study may be partially explained by shifting immigration policy and the economic and social integration of immigrants over time. Changes in immigration policy over the decades have resulted in the preference of economic immigrants over family class immigrants and refugees, and particularly those economic immigrants with more human capital, such as younger, educated immigrants. This has resulted in the changing profile of immigrants over time, with differences in the predisposing, enabling and need factors for utilizing health care. In this study, a larger proportion of recent immigrants were younger, more educated and non-white but had better self-rated health and fewer medical conditions, compared to established immigrants. In addition, the economic and social integration of immigrants over time has resulted in a narrowing gap in terms of health care utilization between recent and established immigrants, although a gap still persists.

Future research may explore utilization of health care based on more subjective measures such as unmet health needs, differentiate between utilization of specific types of health care, and explore the effect of policies that may improve the utilization of health care by immigrants to Canada. Qualitative research may further elucidate the specific barriers to utilization of healthcare by recent and established immigrants to Canada.

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Appendix A: Supplementary Analysis of Sample 1A

A Having a Regular Health Care Provider

To derive sample 1A, the 39 individuals who did not answer the regular health care provider (PHC_020) question were excluded from the 15,947 adult immigrant respondents to the CCHS 2015-2016, leaving 15,908 respondents in Sample 1A.

A-1 Descriptive Statistics

Descriptive statistics for the 15,908 respondents included in the analysis of sample 1A, are reported in Table A1. Eighty two percent of respondents in Sample 1A had a regular health care provider. The majority were under 65 years old (78.6%), were in a non-white cultural/racial group (63.8%), had a post-secondary education (70.2%) and were proficient in at least one of Canada's official languages (95.8%). Over half (57.3%) were in very good or excellent health, and 37.1% had no medical conditions.

Table A1. Descriptive statistics for Sample 1A (n=15,908)

	n (%)
Outcome measure	
Has a regular health care provider	
No regular health care provider	2,852 (17.9)
Has a regular health care provider	13,056 (82.1)
Independent variables	
Predisposing factors	
Sex	
Male	7,786 (48.9)
Female	8,121 (51.1)
Age	
18-39 years	5,458 (34.3)
40-64 years	7,045 (44.3)
65-79 years	2,706 (17.0)
≥80 years	699 (4.4)
Region of residence	
Western Canada	5,222 (32.8)
Central Canada	10,491 (66.0)
Atlantic Canada and Northern Territories	195 (1.2)
Marital status	
Single	3,083 (19.5)
Widowed/divorced/separated	2,067 (13.1)
Married or common-law	10,684 (67.4)

	n (%)
Cultural/racial background	
White	5,686 (36.2)
Non-white	10,026 (63.8)
Sense of belonging to local community	
Very weak	1,178 (7.9)
Somewhat weak	3,456 (23.1)
Somewhat strong	7,213 (48.3)
Very strong	3,088 (20.7)
Enabling factors	
Total household income	
No income or less than $20,000	1,273 (8.0)
$20,000-$39,999	2,683 (16.9)
$40,000-$59,999	2,585 (16.3)
$60,000-$79,999	2,424 (15.2)
$80,000 or more	6,938 (43.6)
Education	
Less than secondary school	1,502 (9.6)
Secondary school	3,155 (20.2)
Post-secondary	10,959 (70.2)
Knowledge of official languages	
Not proficient in official languages	672 (4.2)
Proficient in official languages	15,221 (95.8)
Insurance for prescription medications	
No insurance	4,423 (28.2)
Insurance	11,274 (71.8)
Need factors	
Perceived health	
Poor	538 (3.4)
Fair	1,291 (8.1)
Good	4,937 (31.1)
Very good	5,122 (32.3)
Excellent	3,970 (25.0)
Number of medical conditions	
Zero	5,905 (37.1)
One	3,708 (23.3)
Two	2,198 (13.8)
Three or more	4,097 (25.8)

A-2 Stratified Descriptive Analysis for Known vs. Unknown Time Since Immigration

In order to assess the representativeness of Sample 1, an analysis of Sample 1A was conducted using chi square test to compare the characteristics of those with known time since immigration (i.e. Sample 1) to those with unknown time since immigration (see Table A2). A higher proportion of those with known time since immigration had a regular doctor (84.2%), compared to those with unknown time since immigration (65.8%). Relative to those with known time since immigration, a higher proportion of

those with unknown time since immigration were younger, single, white, in a lower income category, and had zero medical conditions.

Table A2. Comparison of outcome measure (has a regular health care provider) and independent variables for known versus unknown time since immigration for Sample 1A (n=15,908)

	Time since immigration unknown (n=1,831)	Time since immigration known (n=14,077)	p-value
	n (%)	n (%)	
Outcome measure			
Has a regular health care provider			< 0.001
No regular health care provider	626 (34.2)	2,226 (15.8)	
Has a regular health care provider	1,205 (65.8)	11,851 (84.2)	
Independent variables			
Predisposing factors			
Sex			0.842
Male	903 (49.3)	6,883 (48.9)	
Female	928 (50.7)	7,194 (51.1)	
Age			< 0.001
18-39 years	1,015 (55.5)	4,442 (31.6)	
40-64 years	585 (31.9)	6,460 (45.9)	
65-79 years	157 (8.6)	2,549 (18.1)	
≥80 years	74 (4.0)	625 (4.4)	
Region of residence			< 0.001
Western Canada	645 (35.2)	4,577 (32.5)	
Central Canada	1,110 (60.6)	9,381 (66.6)	
Atlantic Canada and Northern Territories	76 (4.1)	119 (0.8)	
Marital status			< 0.001
Single	640 (35.2)	2,443 (17.4)	
Widowed/divorced/separated	142 (7.8)	1,925 (13.7)	
Married or common-law	1,034 (56.9)	9,650 (68.8)	
Cultural/racial background			< 0.001
White	774 (43.4)	4,912 (35.3)	
Non-white	1,008 (56.6)	9,018 (64.8)	
Sense of belonging to local community			0.115
Very weak	172 (10.0)	1,006 (7.6)	
Somewhat weak	402 (23.5)	3,055 (23.1)	
Somewhat strong	823 (48.1)	6,390 (48.3)	
Very strong	314 (18.3)	2,774 (21.0)	
Enabling factors			
Total household income			< 0.001
No income or less than $20,000	237 (13.0)	1,036 (7.4)	
$20,000-$39,999	320 (17.5)	2,363 (16.8)	
$40,000-$59,999	295 (16.1)	2,290 (16.3)	
$60,000-$79,999	268 (14.6)	2,156 (15.3)	
$80,000 or more	710 (38.8)	6,227 (44.3)	
Education			0.258
Less than secondary school	160 (9.0)	1,342 (9.7)	
Secondary school	408 (22.8)	2,747 (19.9)	
Post-secondary	1,223 (68.3)	9,736 (70.4)	

	Time since immigration unknown (n=1,831)	Time since immigration known (n=14,077)	p-value
	n (%)	n (%)	
Knowledge of official languages			0.780
Not proficient in official languages	82 (4.5)	590 (4.2)	
Proficient in official languages	1,742 (95.5)	13,479 (95.8)	
Insurance for prescription medications			0.220
No insurance	537 (30.4)	3,886 (27.9)	
Insurance	1,229 (69.6)	10,045 (72.1)	
Need factors			
Perceived health			< 0.001
Poor	65 (3.5)	474 (3.4)	
Fair	102 (5.6)	1,189 (8.5)	
Good	478 (26.1)	4,459 (31.8)	
Very good	601 (32.9)	4,521 (32.2)	
Excellent	584 (31.9)	3,385 (24.1)	
Number of medical conditions			< 0.001
Zero	897 (49.0)	5,009 (35.6)	
One	379 (20.7)	3,328 (23.6)	
Two	228 (12.5)	1,969 (14.0)	
Three or more	327 (17.8)	3,770 (26.8)	

A-3 Bivariate Analysis of Outcome, Having a Regular Health Care Provider, with Independent Variables

A bivariate analysis was conducted using chi square tests to compare the outcome (has a regular health care provider) against each independent variable (see Table A3). The findings in the bivariate analysis of Sample 1A were similar to the findings for Sample 1: all independent variables were found to be significantly associated with the outcome, has a regular health care provider, with the exception of region of residence.

Table A3. Bivariate analysis of dependent variable (has a regular health care provider) against each independent variable for Sample 1A (n = 15,908)

	Has a regular health care provider		p-value
	Yes	**No**	
Predisposing factors	n (%)	n (%)	
Sex			<0.001
Male	6108 (46.8)	1679 (58.9)	
Female	6948 (53.2)	1173 (41.1)	
Age			<0.001
18-39 years	3723 (28.5)	1736 (60.9)	
40-64 years	6119 (46.9)	925 (32.4)	
65-79 years	2547 (19.5)	159 (5.6)	
≥80 years	667 (5.1)	32 (1.1)	
Region of residence			0.1864
Western Canada	4284 (32.8)	938 (32.9)	
	8625 (66.1)	1866 (65.4)	
Central Canada	147 (1.1)	48 (1.7)	
Atlantic Canada and Northern Territories			
Marital status			<0.001
Single	1998	1085 (38.2)	
Widowed/divorced/separated	(15.4)	278 (9.8)	
Married or common-law	1789 (13.8)	1478 (52.0)	
	9205 (70.9)		
Cultural/racial background			<0.001
White	4844 (37.6)	841 (29.8)	
Non-white	8042 (62.4)	1984 (70.2)	
Sense of belonging to local community			<0.001
Very weak	889 (7.3)	289 (10.4)	
Somewhat weak	2653 (21.8)	803 (28.8)	
Somewhat strong	5994 (49.3)	1218 (43.7)	
Very strong	2611 (21.5)	477 (17.1)	
Enabling factors			
Total household income			<0.001
No income or less than $20,000	835 (6.4)	437 (15.4)	
$20,000-$39,999	2121 (16.2)	562 (19.7)	
$40,000-$59,999	2114 (16.2)	470 (16.5)	
$60,000-$79,999	2023 (15.5)	401 (14.1)	
$80,000 or more	5958 (45.6)	980 (34.4)	
Education			<0.001
Less than secondary school	1350 (10.5)	152 (5.4)	
Secondary school	2564 (20.0)	591 (21.0)	
Post-secondary	8889 (69.4)	2070 (73.6)	
Knowledge of official languages			<0.001
Not proficient in official languages	603 (4.6)	69 (2.4)	
Proficient in official languages	12444 (95.4)	2777 (97.6)	
Insurance for prescription medication			<0.001
No insurance	3493 (27.0)	929 (33.6)	
Insurance	9440 (73.0)	1834 (66.4)	

	Has a regular health care provider		p-value
	Yes	No	
Need factors			
Perceived health			<0.001
Poor	509 (3.9)	29 (1.0)	
Fair	1137 (8.7)	154 (5.4)	
Good	4193 (32.2)	744 (26.1)	
Very good	4130 (31.8)	992 (34.8)	
Excellent	3037 (23.3)	933 (32.7)	
Number of medical conditions			<0.001
Zero	4282 (32.8)	1623 (56.9)	
One	3034 (23.2)	673 (23.6)	
Two	1915 (14.7)	282 (9.9)	
Three or more	3824 (29.3)	273 (9.6)	

A-4 Multivariate Analysis

Table A4 reports the final model for the logistic regression with the outcome, having a regular health care provider. The first model included all independent variables and the interactions for time since immigration with age, knowledge of official languages and sense of community. Based on this first model, a final model was run with non-significant terms removed. The independent variables, insurance, race and knowledge of official languages were found to be non-significant and therefore were not included in the final model. There was no significant interaction between time since immigration and age, knowledge of official languages or sense of community, or between age and sex, and therefore these interaction terms were not included in the final model. Collinearity statistics were conducted for the independent variables and showed low correlation between the variables, with all variance inflation factor values less than 10.

The final model was statistically significant, $F(22, 979) = 28.85$, $p < 0.001$. The Hosmer-Lemeshow goodness of fit test yielded a non-significant result ($p=0.182$), suggesting good fit of the model to the data.

Table A4. Logistic regression for having a regular health care provider, for Sample 1A (n=15,908)

	Coefficient (Standard Error)	t	Odds Ratio (95% CI)	p-value
Predisposing factors				
Sex				<0.001
Male				
Female	0.537 (0.127)	7.23	1.71 (1.48, 1.98)	<0.001
Age				<0.001
18-39 years				
40-64 years	0.632 (0.167)	7.12	1.88 (1.58, 2.24)	< 0.001
65-79 years	1.385 (0.572)	9.68	3.99 (3.02, 5.29)	< 0.001
≥80 years	1.811 (1.452)	7.63	6.11 (3.84, 9.74)	< 0.001
Marital status				<0.001
Single				
Widowed/divorced/separated	0.187 (0.175)	1.28	1.21 (0.91, 1.60)	0.200
Married or common-law	0.547 (0.177)	5.35	1.73 (1.41, 2.11)	< 0.001
Sense of belonging to local community				<0.001
Very weak				
Somewhat weak				
Somewhat strong	0.143 (0.178)	0.93	1.15 (0.85, 1.56)	0.355
Very strong	0.508 (0.240)	3.51	1.66 (1.25, 2.21)	<0.001
	0.507 (0.264)	3.19	1.66 (1.21, 2.27)	0.001
Enabling factors				
Total household income				<0.001
No income or < $20,000				
$20,000-$39,999	0.592 (0.250)	4.28	1.81 (1.38, 2.37)	<0.001
$40,000-$59,999	0.921 (0.357)	6.49	2.51 (1.90, 3.32)	<0.001
$60,000-$79,999	1.089 (0.461)	7.02	2.97 (2.19, 4.03)	<0.001
$80,000 or more	1.282 (0.476)	9.70	3.60 (2.78, 4.67)	<0.001
Education				0.011
Less than secondary school				
Secondary school	-0.234 (0.130)	-1.43	0.79 (0.57, 1.09)	0.154
Post-secondary	-0.370 (0.100)	-2.57	0.69 (0.52, 0.92)	0.010
Need factors				
Self-perceived health				0.014
Poor				
Fair	-0.656 (0.179)	1.90	0.52 (0.26, 1.02)	0.058
Good	-0.664 (0.159)	-2.15	0.51 (0.28, 0.94)	0.032
Very good	-0.765 (0.143)	-2.49	0.46 (0.25, 0.85)	0.013
Excellent	-0.864 (0.131)	-2.77	0.42 (0.23, 0.78)	0.006
Number of medical conditions				<0.001
Zero				
One	0.287 (0.127)	3.01	1.33 (1.11, 1.61)	<0.001
Two	0.461 (0.204)	3.59	1.59 (1.23, 2.04)	<0.001
Three or more	0.951 (0.344)	7.15	2.59 (1.99, 3.36)	<0.001

Appendix B: Supplementary Analysis of Sample 2A

B Number of Medical Consultations

To derive sample 2A, the 223 individuals who did not answer the number of medical consultations question (**CHPDGMDC**) were excluded from the 15,947 adult immigrant respondents to the CCHS 2015-2016, leaving 15,724 respondents in Sample 2A.

B-2 Descriptive Statistics

There were 15,724 respondents in Sample 2A. The mean number of medical consultations in the past year was 3.31±4.53. The distribution of respondents by number of medical consultations is shown in Figure B1. Table B1 shows the descriptive statistics for Sample 2A. The majority of respondents in Sample 2A were over sixty-five years old (71.2%), were in a non-white cultural/racial group (64.0%), had a post-secondary education (70.4%) and were proficient in at least one of Canada's official languages (95.9%). In terms of need factors, over half of respondents were in very good or excellent health (57.6%), and 37.3% had no medical conditions.

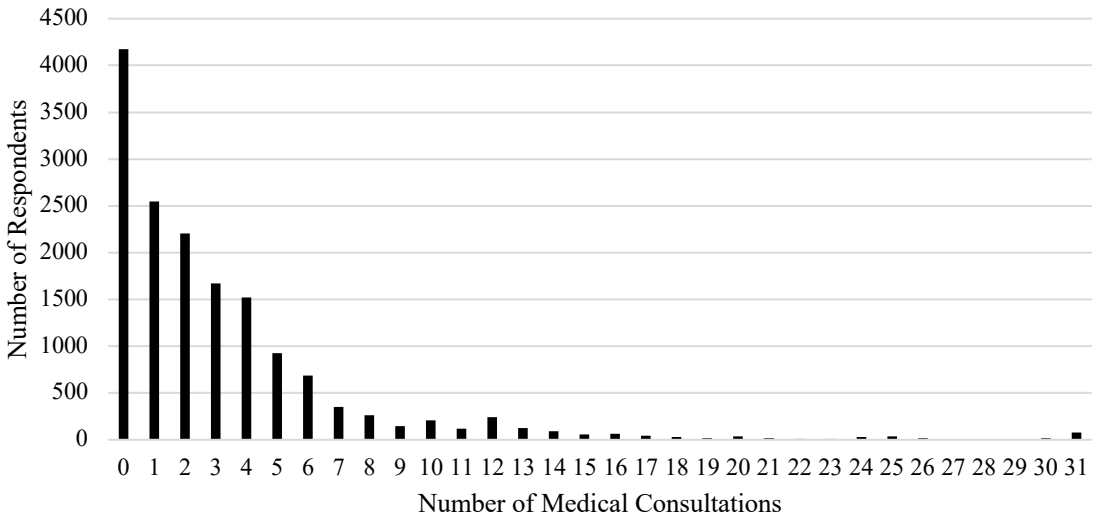

Figure B1. Distribution of respondents by number of medical consultations for Sample 2A (n=15,724)

Table B1. Descriptive statistics for Sample 2A (n=15,724)

	n (%)
Predisposing factors	
Sex	
Male	7,731 (49.2)
Female	7,993 (50.8)
Age	
18-39 years	5,427 (34.5)
40-64 years	6,976 (44.4)
65-79 years	2,648 (16.8)
≥80 years	672 (4.3)
Region of residence	
Western Canada	5,183 (33.0)
Central Canada	10,347 (65.8)
Atlantic Canada and Northern Territories	194 (1.2)
Marital status	
Single	3,068 (19.6)
Widowed/divorced/separated	2,022 (12.9)
Married or common-law	10,561 (67.5)
Cultural/racial background	
White	5,596 (36.0)
Non-white	9,939 (64.0)
Sense of belonging to local community	
Very weak	1,165 (7.9)
Somewhat weak	3,446 (23.3)
Somewhat strong	7,143 (48.2)
Very strong	3,055 (20.6)
Enabling factors	
Total household income	
No income or less than $20,000	1,259 (8.0)
$20,000-$39,999	2,638 (16.8)
$40,000-$59,999	2,542 (16.2)
$60,000-$79,999	2,393 (15.2)
$80,000 or more	6,886 (43.8)
Education	
Less than secondary school	1,459 (9.4)
Secondary school	3,106 (20.1)
Post-secondary	10,878 (70.4)
Knowledge of official languages	
Not proficient in official languages	643 (4.1)
Proficient in official languages	15,066 (95.9)
Insurance for prescription medications	
No insurance	4,363 (28.1)
Insurance	11,158 (71.9)

	n (%)
Need factors	
Perceived health	
Poor	503 (3.2)
Fair	1,264 (8.1)
Good	4,879 (31.1)
Very good	5,080 (32.4)
Excellent	3,951 (25.2)
Number of medical conditions	
Zero	5,865 (37.3)
One	3,692 (23.5)
Two	2,166 (13.8)
Three or more	4,001 (25.4)

B-2 Stratified Descriptive Analysis for Known vs. Unknown Time Since Immigration

To assess the representativeness of Sample 2, an analysis was conducted for Sample 2A using chi square test to compare the characteristics of those with known time since immigration (i.e. Sample 2) to those with unknown time since immigration (see Table B2). Respondents with unknown time since immigration had fewer medical consultations (2.82 ± 4.49) than those with known time since immigration (3.38 ± 4.53). A higher proportion of those with unknown time since immigration were younger, single, white, had lower income, reported better health and fewer medical conditions, compared to those with known time since immigration.

Table B2. Comparison of independent variables for known versus unknown time since immigration for Sample 2A (n=15,724)

	Time since immigration unknown (n=1,812)	**Time since immigration known (n=13,912)**	**p-value**
	n (%)	**n (%)**	
Predisposing factors			
Sex			0.900
Male	895 (49.4)	6,836 (49.1)	
Female	917 (50.6)	7,077 (50.9)	
Age			< 0.001
18-39 years	1,014 (55.9)	4,414 (31.7)	
40-64 years	575 (31.7)	6,401 (46.0)	
65-79 years	151 (8.3)	2,497 (17.9)	
≥80 years	72 (4.0)	600 (4.3)	

	Time since immigration unknown (n=1,812)	Time since immigration known (n=13,912)	p-value
	n (%)	n (%)	
			< 0.001
Region of residence	638 (35.2)	4,545 (32.7)	
Western Canada	1,098 (60.6)	9,249 (66.5)	
Central Canada	75 (4.2)	119 (0.9)	
Atlantic Canada and Northern Territories			
Marital status			< 0.001
Single	638 (35.5)	2,430 (17.5)	
Widowed/divorced/separated	141 (7.8)	1,881 (13.6)	
Married or common-law	1,019 (56.7)	9,542 (68.9)	
Cultural/racial background			< 0.001
White	765 (43.4)	4,831 (35.1)	
Non-white	1,000 (56.6)	8,940 (64.9)	
Sense of belonging to local community			0.109
Very weak	171 (10.1)	994 (7.6)	
Somewhat weak	404 (23.8)	3,042 (23.2)	
Somewhat strong	813 (47.9)	6,329 (48.3)	
Very strong	310 (18.2)	2,746 (20.9)	
Enabling factors			
Total household income			< 0.001
No income or less than $20,000	235 (13.0)	1,024 (7.4)	
$20,000-$39,999	317 (17.5)	2,322 (16.7)	
$40,000-$59,999	294 (16.2)	2,245 (16.2)	
$60,000-$79,999	264 (14.6)	2,128 (15.3)	
$80,000 or more	701 (38.7)	6,185 (44.5)	
Education			0.250
Less than secondary school	154 (8.7)	1,305 (9.5)	
Secondary school	404 (22.7)	2,702 (19.8)	
Post-secondary	1,218 (68.6)	9,660 (70.7)	
Knowledge of official languages			0.721
Not proficient in official languages	80 (4.4)	563 (4.0)	
Proficient in official languages	1,725 (95.6)	13,342 (96.0)	
Insurance for prescription medications			0.210
No insurance	533 (30.4)	3,830 (27.8)	
Insurance	1,220 (69.6)	9,938 (72.2)	
Need factors			
Perceived health			< 0.001
Poor	63 (3.5)	440 (3.2)	
Fair	99 (5.5)	1,165 (8.4)	
Good	466 (25.8)	4,412 (31.8)	
Very good	600 (33.2)	4,479 (32.3)	
Excellent	583 (32.2)	3,369 (24.3)	
Number of medical conditions			< 0.001
Zero	893 (49.3)	4,972 (35.7)	
One	377 (20.8)	3,314 (23.8)	
Two	227 (12.5)	1,939 (13.9)	
Three or more	314 (17.3)	3,687 (26.5)	

B-3 Bivariate Analysis of Outcome , Number of Medical Consultations, with Independent Variables

Analysis of variance was used in the bivariate analysis to compare the outcome (number of medical consultations) with each independent variable (see Table B3). The results of the bivariate analysis of Sample 2A were similar to the findings for Sample 2, with the exception that sense of community was not significant (p=0.055) in the bivariate analysis of Sample 2A, although it was significant in the analysis of Sample 2. All other independent variables were significantly associated with number of consultations.

Table B3. Bivariate analysis of number of medical consultations against each independent variable for Sample 2A (n=15,724)

	Number of consultations	
	Mean (SD)	**p-value**
Predisposing factors		
Sex		<0.001
Male	2.90 (4.33)	
Female	3.71 (4.67)	
Age		<0.001
18-39 years	2.70 (4.30)	
40-64 years	3.37 (4.63)	
65-79 years	4.03 (4.63)	
≥80 years	4.85 (5.04)	
Region of residence		<0.001
Western Canada	3.55 (4.72)	
Central Canada	3.19 (4.43)	
Atlantic Canada and Northern Territories	3.29 (4.33)	
Marital status		<0.001
Single	2.63 (4.28)	
Widowed/divorced/separated	3.97 (4.93)	
Married or common-law	3.39 (4.50)	
Cultural/racial background		<0.001
White	3.57 (4.66)	
Non-white	3.17(4.45)	
Sense of belonging to local community		0.055
Very weak	3.40 (4.74)	
Somewhat weak	3.22 (4.76)	
Somewhat strong	3.12 (4.13)	
Very strong	3.33 (4.60)	
Enabling factors		
Total household income		<0.001
No income or less than $20,000	3.74 (5.51)	
$20,000-$39,999	3.47 (4.76)	
$40,000-$59,999	3.34 (4.50)	
$60,000-$79,999	3.19 (4.41)	
$80,000 or more	3.20 (4.27)	

	Number of consultations	
	Mean (SD)	**p-value**
Education		<0.001
Less than secondary school	4.00 (4.86)	
Secondary school	3.44 (4.92)	
Post-secondary	3.18 (4.35)	
Knowledge of official languages		<0.001
Not proficient in official languages	3.95 (4.01)	
Proficient in official languages	3.28 (4.54)	
Insurance for prescription medication		<0.001
No insurance	3.06 (4.41)	
Insurance	3.44 (4.58)	
Has a regular health care provider		<0.001
No	1.44 (3.17)	
Yes	3.73 (4.68)	
Need factors		
Perceived health		<0.001
Poor	9.21 (8.16)	
Fair	5.75 (6.23)	
Good	3.54 (4.43)	
Very good	2.74 (3.57)	
Excellent	2.21 (3.43)	
Number of medical conditions		<0.001
Zero	1.98 (3.24)	
One	2.98 (3.92)	
Two	3.53 (4.63)	
Three or more	5.45 (5.67)	

B-4 Multivariate Analysis

The final model for the negative binomial regression of the outcome, number of medical consultations, is reported in Table B4. The first model included all independent variables and the interactions for time since immigration with age, knowledge of official languages and sense of community, and for sex with age. Based on this first model, a final model was run with non-significant terms removed. The independent variables, marital status, race, income, insurance, education and knowledge of official languages, were not significant and therefore were not included in the final model.

There was no significant interaction between time since immigration and age, knowledge of official languages or sense of community, and therefore these interaction terms were not included in the final model. There was a significant interaction between sex and age, and therefore a composite variable was created for sex and age. Collinearity statistics

were conducted for all independent variables in the first model and showed low correlation between the variables, with all variance inflation factor values less than 10. The final model was statistically significant, $F(17, 984) = 48.04$, $p < 0.001$.

Table B4. Negative binomial regression for number of medical consultations, for Sample 2A (n=15,724)

	Coefficient (Standard Error)	t	Incident Rate Ratio (95% CI)	p-value
Predisposing factors				
Sex and Age				
Male, Age 18-39 years				
Male, Age 40-64 years	-0.008 (0.082)	-0.10	0.99 (0.84, 1.16)	0.921
Male, Age 65-79 years	-0.035 (0.076)	-0.46	0.97 (0.83, 1.12)	0.642
Male, Age ≥80 years	0.164 (0.110)	1.50	1.18 (0.95, 1.46)	0.135
Female, Age 18-39 years	0.452 (0.081)	5.60	1.57 (1.34, 1.84)	<0.001
Female, Age 40-64 years	0.081 (0.073)	1.11	1.08 (0.94, 1.25)	0.269
Female, Age 65-79 years	-0.055 (0.081)	-0.68	0.95 (0.81, 1.11)	0.495
Female, Age ≥80 years	0.002 (0.085)	0.02	1.00 (0.85, 1.18)	0.985
Region of residence				
Western Canada				
Central Canada	-0.154 (0.037)	-4.12	0.86 (0.80, 0.92)	<0.001
Atlantic Canada and Northern	0.129 (0.109)	-1.19	1.14 (0.92, 1.41)	0.236
Territories				
Enabling factors				
Has a regular health care provider				
No				
Yes	0.732 (0.088)	8.34	2.08 (1.75, 2.47)	<0.001
Need factors				
Self-perceived health				
Poor				
Fair	-0.396 (0.090)	-4.38	0.67 (0.56, 0.80)	<0.001
Good	-0.725 (0.071)	-10.24	0.48 (0.42, 0.56)	<0.001
Very good	-0.847 (0.074)	-11.47	0.43 (0.37, 0.50)	<0.001
Excellent	-0.912 (0.083)	-11.07	0.40 (0.34, 0.47)	<0.001
Number of medical conditions				
Zero				
One	0.374 (0.064)	5.89	1.45 (1.28, 1.65)	<0.001
Two	0.495 (0.057)	8.69	1.64 (1.47, 1.83)	<0.001
Three or more	0.812 (0.056)	14.59	2.25 (2.02, 2.51)	<0.001

Curriculum Vitae

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Publications (cont'd):

Ravichandiran M, **Ravichandiran N,** Ravichandiran K, McKee N, Richardson D, Oliver M, and Agur A. (2011). "Neuromuscular partitioning in the extensor carpi radialis longus and
brevis based on intramuscular nerve distribution patterns: a three-dimensional modeling study." Clinical Anatomy. 2011 Aug 18. doi: 10.1002/ca.21246. **Published manuscript.**

Abstracts and Presentations: Peer-Reviewed

Ravichandiran N, Andrade A, Bigi S, MacGregor D, Moharir M, Askalan R, deVeber G (2013). "Time course of neurological deficits in pediatric arterial ischemic stroke"**.** American Academy of Neurology Conference, San Diego. **Platform presentation.**

Ravichandiran N, Andrade A, deVeber G (2012). "Time course of neurological deficits in pediatric arterial ischemic stroke". SickKids Summer Research Program Symposium, Toronto. **Poster presentation.**

Ravichandiran N, Baker R, von Schroeder H, Boyer M, Agur A (2011). "Morphology and relationships of the lateral antebrachial cutaneous nerve". American Association of Clinical Anatomy Conference, Columbus. **Poster presentation.**

Ravichandiran N, Agur A (2010). "Development of a learning module for imaging of the thorax with anatomical correlation". American Association of Clinical Anatomy Conference, Honolulu. **Poster presentation.**

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Ravichandiran N, Bejuk M, Shouldice M, Al-harthy N, Au H, Boutis K (2008). "Abuse Related Fractures: Analysis of Missed Cases". American Academic of Pediatrics Conference, Boston. **Poster presentation.**