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Health Care Utilization By Immigrants With Multimorbidity: A Population Based Cross-sectional Study Of The 2015-2016 Canadian Community Health Survey (CCHS)

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Abstract

Immigrants face unique healthcare barriers, which can negatively impact their health and health service use. Those with multimorbidity face a particular challenge as multimorbidity is associated with increased need for healthcare. The purpose of this study was to compare healthcare utilization, as measured by number of visits to family physicians and specialists, between immigrants and Canadian-born populations with multimorbidity, stratified by sex and for specific chronic diseases. A cross-sectional analysis using 2015-2016 Canadian Community Health Survey (CCHS) was conducted. After adjusting for relevant covariates, no statistically significant differences in visits to family physicians or specialists were observed between immigrants and Canadian-born populations with multimorbidity. However, female immigrants with multimorbidity had significantly fewer visits to family physicians than Canadian-born females, while immigrant women with mental illnesses and respiratory diseases revealed significant underutilization of family physician services. Future research should elucidate healthcare barriers to utilization, with an emphasis on immigrants with multimorbidity.

Keywords

Immigrant health, Access to health care, Health care utilization, Health care, Canada, Family physicians, General practitioners, Specialists, Number of visits, Multimorbidity, Immigrants with multimorbidity

Summary for Lay Audience

Multimorbidity, defined as the coexistence of at least two chronic diseases, has a significant negative impact on health-related quality of life and may result in increased utilization of health services and costs to healthcare. Individuals with multiple chronic diseases require integrated healthcare and continuation of treatment. Primary care can best serve this purpose as it is the first point of contact for healthcare in Canada. However, prior research suggests that despite universal healthcare system, immigrants face several barriers when accessing healthcare which may result in a lower utilization of health services, particularly those related to primary care. Reports also suggest that in addition to their unique health needs, women of certain ethnicities encounter these access barriers to a greater extent because of their culturally perceived health knowledge and socially constructed roles. Thus, the purpose of this study was to compare healthcare utilization between immigrants and Canadian-born populations with multimorbidity as well as to examine sex-specific disparities in service utilization. Using the 2015-2016 Canadian Community Health Survey, two health outcomes: visits to family physicians and specialists in the preceding 12 months were used to describe healthcare utilization. Overall, there were no significant differences in the use of these health services. However, when assessing males and females separately, female immigrants with multimorbidity had lower rates of family physician visits than Canadian-born females, while male immigrants had comparable rates of visits to their Canadian-born peers. For disease-specific outcomes, female immigrants made fewer visits to family physicians for mental illnesses and chronic respiratory diseases. The frequency of visits to specialists was comparable between immigrants and Canadian-born populations with multimorbidity, regardless of sex or disease. This underutilization of family physician services by female immigrants may be explained by their roles in the family, their relative lack of sociocultural integration, financial independence, knowledge gap, and systemic issues within Canada's health care system. Future research should emphasize longitudinal studies to track the health status of immigrants over time, particularly those who have multimorbidity, and pragmatic public health policies should be implemented to reduce cultural and social barriers to care with a special focus on female immigrants.

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Chapter 1

1 Introduction

1.1 Immigration in Canada

Immigration has historically been a major driving force in Canada's demographic growth and sustained economic development.[1] According to the 2016 Canadian census, immigrants make up a sizable portion of the Canadian population, accounting for 21.9% of the total, a figure that is expected to rise to between 24.5% and 30% by 2036.[2] Between 2011 and 2016, nearly 1.2 million new immigrants settled permanently in Canada.[2] As per a recent estimate by Statistics Canada, immigrants accounted for 82% of Canada's overall population growth in 2018-2019.[3] Given the rapid rate of international migration in recent decades, immigrants are expected to contribute significantly to all aspects of social and economic development in the coming years.[2]

Equally important to consider is the health status of immigrants as it reflects the general health of Canadians.[4,5] In particular, it is imperative that immigrants, like other population groups, have equal access to health care and resource in order to facilitate their post-migration optimal health and overall well-being. However, despite universal health care and public health initiatives, current evidence suggests that immigrants continue to face inequity in health care access and subsequent disparities in service utilization when compared to the native-born population in Canada.[6]

1.2 Canada's Immigration Health Policy

Every application for immigration to Canada goes through a medical assessment that makes sure the entry of a prospective immigrant poses minimal risk to the public health of Canadians, places fewer social and health demands to the health care system, and brings significant productivity in the labor force.[1] Medical assessment rules out applicants with severe health conditions (e.g., venereal diseases, active tuberculosis) that could jeopardize public safety or place an undue burden on the health care system (e.g., serious neurological disorders, illness requiring permanent institutional services).[7] While the medical admissibility test ensures newcomers in Canada have better overall health status than the

average Canadian, it does not necessarily filter out all applicants with chronic health conditions (e.g., diabetes, cardiovascular diseases, musculoskeletal disorders) that are typically deemed to pose no immediate threat to public health, nor does the immigration legislation guarantee the maintenance of such health status of immigrants through years.[1,7]

1.3 The Healthy Immigrant Effect

Immigrants are more likely to have better physical and mental health upon arrival in the host country partly because of the screening programs that are part of the Canadian immigration process, as well as immigrant's self-selection process where relatively healthy and financially capable individuals are more likely to migrate.[1,7] However, immigrants appear to gradually lose their health advantage and become more susceptible to disease.[1,4,8,9] Contributing factors, in addition to aging, may include acculturation stress, lack of social/cultural support, difficulty accessing health services, adaptations to an unhealthy lifestyle, and socio-economic discrimination.[8,10,11] Several theories have been proposed to explain the healthy immigrant effect. Adapting to an unhealthy lifestyle in the host country, including poor diet, excessive smoking/drinking, and a lack of physical activity have been hypothesized to contribute to the decline of health among immigrants.[12] While the impact of an unhealthy lifestyle cannot be ruled out entirely, it is rather unlikely to be a significant driving factor given how quickly immigrant health converges to that of native-born Canadians.[4,6] Another possible explanation is the enormous stress that immigrants endure during their acculturation period, which may have a negative effect on their health.[6,13] Acculturation is the process by which immigrants adapt to the host culture's norms. Although acculturation as a concept is difficult to define and quantify, it is frequently operationalized by researchers as a proxy for a number of factors, including length of residency in the host country, adaptation to cultural traditions, and connectedness to social networks.[6] A more plausible explanation for the healthy immigrant effect is limited access to and utilization of health care services.[6,8] Due to the difficulties immigrants face on a linguistic, socio-economic, and cultural level, as well as a relative lack of knowledge about Canada's health care system and a difference in culturally perceived health practices, immigrants are more likely to experience poor access to care and underuse health services compared to their non-immigrant peers.[11,14,15,16,17] As a result, it is critical

to understand potential barriers to health care in order to compare health service utilization between the immigrant and non-immigrant populations.

1.4 Multimorbidity and Primary Health Care Use

Multimorbidity, defined by the co-existence of two or more chronic diseases, is a growing concern for health systems worldwide.[18] The aging population, increased prevalence of certain chronic diseases (e.g., diabetes, hypertension), and advancements in medical science all contribute to the rise in the prevalence of multimorbidity.[19] This means more people now than ever are living longer with functional health problems. In addition to reduced functional capacity, increased psychologic distress, and a general decline in health-related quality of life, people with multiple chronic diseases are more likely to utilize health care resources such as frequent visits to the family physicians and increased referrals to specialists.[20,21]

Unlike managing a single chronic disease for which established clinical guidelines are available, managing a patient with multimorbidity is more complicated.[22] To cope with multifaceted health care needs, holistic approaches and continuity of care are essential.[20,22] Hence, primary care plays a vital role in managing people with multimorbidity as primary care services revolve around patients' overall well-being rather than just diseases.[23] Additionally, they serve as a referral source for specialized services when necessary.[24]

In Canada, primary health care is the first point of contact for accessing health services. This includes family physician services, preventative screening, health promotion programs, primary maternity care, basic emergency care, and referral to specialist care.[25] Regular access to and utilization of these services is vital for immigrants to maintain their health status. A lack of access to and utilization of these services may result in a delay in diagnosis procedures, increasing the risk of complications in patients with chronic diseases and eventually leading to excessive emergency hospital care.[26] Immigrants are more likely than Canadian-born people to use emergency hospital services, which can add to the cost of health care in the long run.[26] Additionally, emergency care for non-emergency health needs may overcrowd emergency departments and lengthen the wait times for those who truly require inpatient admission to the emergency unit.[27] The importance of primary care

is particularly noticeable among patients with multiple chronic diseases because the services offered by primary care physicians attribute predominantly to the management of multimorbidity.[28] According to Cassel et al., people with multimorbidity were found to visit family physicians 2.5 times more often than those without.[28]

1.5 Multimorbidity and Immigrant Population

Depending on immigration status, the patterns and prevalence of multimorbidity may vary significantly.[29,30] Lenzi et al. estimated the multimorbidity prevalence for immigrants and non-immigrants to be 9.3% and 14.4%, respectively, while Roberts et al. reported a prevalence of 2.3% for recent immigrants (those who have been in Canada for 0-9 years), 11.6% for established immigrants (those who have been in Canada for 10 or more years), and 13.7% for non-immigrants in Canada.[29,30] This suggests that over time immigrants become increasingly susceptible to the burden of multiple chronic diseases.

Individuals with multimorbidity are a more vulnerable group who have greater health needs and require integrated care.[29] Immigrants affected by multimorbidity may have an even greater risk given the barriers they face regarding access to care. One in every four immigrants who experience a health decline has difficulty accessing health services.[31] Immigrants may encounter barriers to health care access which can be classified broadly into three categories: financial, socio-cultural, and structural.[32] Evidence suggests that immigrants are less likely to be financially stable upon arrival because they struggle to find suitable jobs in Canada's competitive labor market, in part due to language barriers and a lack of social networks.[32,33] This is accompanied by cultural constraints that have been demonstrated to exist for certain immigrant subgroups.[11,14,16,34] As a large proportion of immigrants come from developing countries with different health care systems, it can be difficult for them to adjust to the way the Canadian health care system works.[11,35] Social stigma, fear of communication, particularly among women of certain ethnic backgrounds, and a disparity in overall health perceptions complicate matters further.[15,16,36] Additionally, structural barriers originating at the administrative level of Canada's health care system, such as a shortage of culturally competent family physicians, longer wait times for health care, and, to a degree, indirect racial discrimination, can limit immigrants' access to health care.[14,15,16] This lack of access to care may be even more concerning for immigrants with

multimorbidity, as people with multiple chronic diseases have greater needs for integrated health care on a regular basis.[22]

1.6 Research Objectives

Although immigrants as a group are reported to underutilize health care services, [37,38] the majority of studies in Canada on immigrant health and service utilization have focused on either access to a regular health care provider [11,35,39,40] or on the use of hospital resources such as emergency department visits and hospitalization.[41,42,43] Some studies have looked into the pattern of immigrant's use of physician services, and the findings have been inconclusive.[1,10,27,44,45,46] In some of those studies, immigrants were found to be under utilizers of health care services, [27,44] while others found no significant difference in their utilization when compared to non-immigrants.[1,10] There is even evidence suggesting increased use of healthcare by immigrants.[45,46] Despite their importance as a measure of health outcomes, physician services in primary care and specialized care settings require further research to ascertain any differences between immigrant and non-immigrant populations. Additionally, there is a knowledge gap about health care utilization among immigrants who are multimorbid. There have been no previous studies in Canada that specifically focus on the multimorbid population while evaluating health care utilization by immigration status.

Furthermore, disease-specific utilization of health care services needs more attention, as the current body of knowledge is quite limited in this regard. Due to genetic predisposition and socio-cultural influences, different diseases may have varying degrees of health consequences for different subpopulations. In Canada, for example, immigrants compared to Canadian-born had a 20% increased likelihood of reporting diabetes and a 25% – 50% decreased likelihood of reporting arthritis, cancer, and COPD/asthma according to an estimate by Statistics Canada.[47]. Similarly, immigrants have a higher rate of hepatitis C infection than native-born Canadians, as many immigrants come from countries where hepatitis C infection is more common.[48] Additionally, in some ethnic cultures, the need for medical treatment with mental illnesses such as depression is often stigmatized and overlooked.[49] Furthermore, women of certain ethnicities were found to have a higher risk of developing cervical cancer due to lower PAP screening rates and an increased likelihood

of HPV infection (Human Papilloma Virus).[50] Social stigma and culturally perceived health beliefs have been reported to contribute to the lack of screening tests for cervical cancer among women of certain ethnic groups.[17,50]

Similarly, there is little evidence of sex-based disparities in health care utilization between immigrants and non-immigrants. In the general Canadian population, sex-specific differences in morbidity and access to care have been well documented.[7,51] However, compared to Canadian-born women, immigrant women may face greater challenges to access due to their unique health needs, such as those that arise during pregnancy and post-partum, as well as those related to cancer screening.[14,50,52] Moreover, immigrant women's socially constructed roles can lead to financial dependence [53,54] and cultural/religious beliefs may also impede their access to health care, resulting in poor health.[11,17] As such, the aim of this study is to address the following research questions using a population-level cross-sectional public use microdata file (PUMF) from the 2015-2016 cycle of the Canadian Community Health Survey (CCHS).

1. Is there a significant difference in the number of visits to family physicians and specialist medical doctors between immigrants and Canadian-born populations with multimorbidity, after adjusting for relevant covariates?
2. After adjusting for relevant covariates, does sex affect the nature of the association between immigration status and the number of visits to family physicians and specialist medical doctors?
3. How does the utilization pattern differ in the presence of a specific chronic disease (e.g., diabetes, cancer, chronic respiratory disease, chronic cardiovascular disease and mental illness) while adjusting for relevant covariates?

Chapter 2

2 Literature Review

2.1 Introduction

Given the relative lack of research on health care utilization among immigrants with multimorbidity, this literature review focused primarily on previous studies that examined access to and utilization of health care services in general immigrant populations or in immigrant populations with specific chronic diseases. To our knowledge, there is only one previous Canadian study that reported on multimorbidity and health care utilization stratified by immigrant status.[55] Importantly, that study used different outcome measures as it examined acute service utilization such as hospitalization and emergency department visits.[55] Thus, given the expected differences in age and multimorbidity distributions between recent and established immigrants, this literature may be less informative for the older immigrant population with multimorbidity.

Although a considerable amount of research on immigrant health care utilization exists in the literature, the findings are inconsistent and lack a clear pattern. While some studies have identified immigrants as under utilizers of health care,[8,27,44,56,57] others have found no significant difference in their utilization when compared to non-immigrants.[1,10,58,59,60] There is even evidence suggesting increased health care use by immigrants.[45,46] These inconsistent and inconclusive results may be explained in part by variations in health outcome measurement, differences in study method and sample size, or by contextual factors within the health care system. Before delving into the literature on immigrant health service use, it is necessary to discuss the potential barriers to care and predictors of health care utilization.

Even though the terms "access" and "utilization" have distinct definitions, they are closely related and frequently used interchangeably in the literature.[61] Access to health care refers to an individual's ability or potential to place himself or herself in a position to receive health care services.[61] Utilization, on the other hand, reflects the actual delivery of health services based on the presumption of access.[61] Access to health care is a component of service utilization, which takes a variety of other factors into account. As a result, factors

that act as barriers to care have a similar potential to influence an individual's use of health care services.[62] Numerous socio-demographic, cultural, contextual, and need-based factors affecting immigrant access to and utilization of health care services have been well documented in the literature.[15,16,17,32,36]

2.2 Conceptual Framework

The Behavioral Model, developed by Andersen, is one of the most widely accepted conceptual frameworks for explaining how individuals use health care.[63] Several revisions have been made to the original behavioral model in order to address some of the earlier critics. For this thesis, the version revised by Andersen and Newman was used.[64] The model considers an individual's health-seeking behavior to be a function of three distinct domains: predisposing factors, enabling factors, and need factors. Each domain is composed of several components that influence how health services are used.[64,65] When the use of health services is solely driven by need-related factors, such as the number of chronic diseases, access to health care in Canada can be assumed to be equitable, given the country's universal health care system. However, in practice, health service utilization is almost always driven by a combination of predisposing, enabling, and need-driven factors, thereby contributing to inequitable access.[66] While inequity in access to care is largely defined by enabling factors (e.g., income, insurance, having a regular health care provider, and geographic location), understanding differences in health care use requires consideration of a variety of other factors.[65] For instance, a lower service utilization is more than just an indication of lower access to care; it is a composite of factors that predispose an individual to seek health care and factors generated by health-related needs.[66] While it is not the primary objective of this study to investigate each component of the Andersen model, it is worthwhile to discuss the potential barriers and predictors described in the model to gain a comprehensive overview of immigrants' use of health care services.

2.2.1 Predisposing Factors

Predisposing factors are characteristics that incline an individual to engage in specific health-seeking behaviours prior to the state of being ill.[64] These factors can influence an individual's likelihood to use a health service. They include demographic factors such as

race, ethnicity, age, and sex; social-structure related factors such as education, marital status, and a sense of community belonging; and health attitude or beliefs such as knowledge about the health care system, cultural perceptions of health, and health behaviours.[64,65]

2.2.2 Enabling Factors

Enabling factors have the potential to facilitate or impede access to care, thereby affecting how health care services are used.[64] These include insurance coverage, language proficiency, income, having a regular source of health care, and geographical location.[65]

2.2.3 Need Factors

Need factors reflect the severity of an individual's illness. These are the functional health problems that drive people to access and utilize necessary health services immediately.[65] Health needs can be perceived or evaluated. Perceived need reflects an individual's perception about their physical and mental well-being, their functional activity, and their judgment on whether or not to seek support from health care providers.[65] Evaluated needs, on the other hand, are medically diagnosed health issues that are the most immediate cause of service use.[64] The following section discusses a number of factors influencing immigrant health care utilization based on evidence from prior research and the assumption of this conceptual framework.

2.3 Factors Affecting Health Care Access and Utilization

2.3.1 Socio-economic and Demographic Factors

Immigrants are generally considered to be less financially secure than non-immigrants.[33] This is more relevant to recent immigrants as they go through the process of acculturation in the host country.[67] It takes time for immigrants to settle down in a new environment, upgrade and match their academic credentials to Canadian standards, and find employment. Collectively, a lack of socio-economic resources may deter them from receiving routine primary and preventative health care. By contrast, the duration of stay in Canada appears to correlate with the progressive improvement of immigrants' low income rates.[33,67]

Marital status is another factor that may influence an immigrant's health care utilization, as previous Canadian studies have demonstrated.[66,68] When age and other socio-economic status are taken into account, being single has been linked to lower health care access than being married/common-law/partnered.[66,68]

Disparities among immigrants due to ethnic or cultural variations have also been well documented. Recent immigrant women of Hispanic, black, and Asian ethnic origin had significantly lower rates of pap smear testing for cervical cancer than Canadian-born white women.[50] While the rate of pap smear testing has increased for the majority of ethnic groups since immigration, immigrant women of Asian origin continued to have significantly lower rates even after 15-20 years in Canada.[50] Similarly, for dental care, when compared to Europeans, Asian ethnic immigrants reported significant underutilization.[69] Furthermore, Quan et al., using data from the 2001 Canadian Community Health Survey (CCHS), found that immigrants from non-white ethnic backgrounds were less likely to seek specialist care, participate in cancer screening programs, and use hospital services than white immigrants.[34] Disparities exist even within the region-specific subgroups of ethnic immigrants. Among Asian ethnic groups, for example, Korean and Japanese were the least frequent users of physician services, while South Asians were the most frequent.[34] Additionally, Chinese and Korean immigrants utilized hospital services at a lower rate than West Asians and Arabs.[34] In another study, immigrants from Hong Kong had higher utilization of mental health services than immigrants from Macau and Taiwan.[66] Therefore, based on the current literature, it is evident that immigrant’s health care access is significantly influenced by their socio-economic status and demographic variables.

2.3.2 Language Difficulties

Being unable to communicate effectively in English or French can discourage immigrants from approaching health care providers and may account for some of their underutilization of health services. Immigrants generally prefer to visit a physician of similar linguistic origin to someone with native English speaking ability, even if they have to travel a long distance to see the physician of their choice.[39] The use of interpreters has been shown to exaggerate rather than minimize the context.[36,70] The impact of language as a barrier is far

greater among older immigrants.[71] This is because, as people age, their capacity for learning diminishes, making it more difficult to learn a new language.

2.3.3 Lack of Societal Integration

Immigrants may feel socially isolated due to a lack of societal integration and community involvement. For example, people with a low sense of community belonging in Canada were found to be more likely to have unmet health care needs and limited access to family physicians.[72,73] Social support is critical for immigrants, particularly recent immigrants, to navigate the complex cascade of acculturation smoothly. Support from friends/family and the workplace were found to be associated with improved mental health and healthy behaviours.[68] According to a study by Lai et al., older Chinese immigrants with frequent friend/family contacts and social interactions were more likely to seek health care than those who were more socially isolated.[68]

2.3.4 Knowledge Gap about Canada's Health Care System

Immigrants' lower use of health services may be explained in part by their relative lack of knowledge about the health care system. [16,35,36,68] It is necessary to distinguish between the services offered by family physicians and specialist medical doctors in order to ensure that these services are accessible, applicable, and useful. [35,36] Self-reported unmet health needs are expected to be greater among immigrants who lack appropriate access to care.[74] The knowledge gap is also linked to ethnic/cultural diversity, as immigrants from certain ethnic groups may hold health beliefs that differ from what is perceived to be common in western culture.[75,76]

2.3.5 Trust Issue with Health Care Personnel

Qualitative research indicates that immigrants lack trust in health care personnel.[11,15,35,36] Many factors can contribute to this, including physicians being too culturally stereotypical and discriminative to actively listen to patients' problems, too conservative approach by physicians to prescribe medications, and patients' inability to see the diagnosis/lab reports.[11,15,35,77] Since the structure of primary care and specialized care may differ between Canada and the immigrant's country of origin, immigrants may sometimes prefer to bypass

a primary physician and go straight to a specialist.[11,35] The inability to directly access a specialist or the waiting time for a referral from a family physician may result in a misconception, jeopardizing effective communication between physicians and patients. Another issue, primarily seen among female immigrants, is confidentiality disclosure, which may add to mistrust and dissatisfaction among women from certain countries because they are hesitant to share sensitive information with health care providers. [15,35]

2.3.6 System Related Problems

Canada's health care system has been deemed by many immigrants as too slow, not being compassionate enough in protecting cultural/religious sensitivity, and to some extent, racially discriminatory.[11,14,15] The current body of knowledge indicates that immigrants are dissatisfied with the lengthy wait times for emergency department services, medical imaging services such as X-ray and MRI, inaccessibility of family physicians, and difficulties in obtaining referrals to specialist care from family physicians.[11,14 ,15,35] These problems are not necessarily limited to immigrants but may apply to all Canadians. However, the magnitude of these problems appears to be greater for immigrants than for non-immigrants, given their high expectations of Canada's health care system prior to their arrival.[11]

2.3.7 Enabling Factors

Geography is another well-documented barrier in access to care. Although the majority of immigrants live in large urban areas, recent immigrants, in particular, may face geographical barriers to accessing physician services due to their relative lack of convenient transportation.[39] Often, they rely on public transportation to travel to distant health facilities, which increases their likelihood of missing scheduled appointments or makes them lose interest in the service entirely. Older age among immigrants was also associated with lower health service use, either because they lacked the financial means to purchase a personal vehicle or were physically incapable of driving.[11,39] Furthermore, remote and rural areas may lack immigrant-serving agencies (e.g., Ontario Council of Agencies Serving Immigrants, Multicultural Liaison Officer Program) in comparison to large metropolitan areas.[71] These publicly funded organizations work to improve the socio-

cultural well-being of ethnocultural communities and to facilitate their integration into the host country.[78] Additionally, certain provincial restrictions, such as a mandatory three-month waiting period before being covered by insurance (e.g., British Columbia, Ontario, Quebec, and New Brunswick), may limit immigrants' access to health care.[11,79] This forces immigrants to either seek expensive private insurance or choose not to receive services during that time period.[11,79]

Although health care insurance does not play as large a role in Canada as it does in other countries, such as the United States, a lack of insurance coverage can still partially explain lower access and utilization of health services, as suggested by previous studies.[10,11,80] Despite Canada's universal public health policy, certain aspects of health care remain uninsured, including the majority of prescription medications, dental care, and visits to physiotherapists and psychologists.[81,82] It has been reported that for some uninsured immigrants, paying for prescribed medications and other paid health care services such as dental visits may prove financially challenging which could result in a lower use of those services.[11] Immigrants who are unemployed or self-employed do not have access to the extended insurance plan that employers often provide.[83] While this situation applies to both immigrants and non-immigrants, it appears as though immigrants are in a more disadvantageous position, as evidenced by the higher unemployment rate among immigrants, particularly recent immigrants, when compared to native-born Canadians.[84] According to a report by Statistics Canada, immigrants who arrived within five years had an unemployment rate of 11.3% in 2020, compared to 6.8% for native-born Canadians.[84]

Prior research has examined the effect of time since immigration on health care access and resource utilization. [32,44,73,85] The longer immigrants stay in Canada, the more accustomed they become to the host environment. In comparison to recent immigrants, established immigrants are more likely to have a regular source of health care (e.g., a family physician), a better understanding of the health system (e.g., negative perceptions appear to fade over time), increased use of preventative and primary health services, a stronger social network, and financial stability. [32,73 ,85]

Having a regular health care provider has been associated with increased primary and preventative health care utilization and decreased reliance on emergency services.[26,86] Even if access does not necessarily guarantee increased utilization of health care services, it does provide a solid foundation that may facilitate actual service use for immigrants.[87]

2.3.8 Sex and Gender Differences in Access to and Utilization of Health Care

While immigrants, regardless of sex, have less access to health care services,[68] women are more vulnerable than men in this regard.[11,88] Immigrant women are more likely than Canadian-born women to have unmet medical needs, lower rates of preventive screening tests, such as mammograms for breast cancer, pap smears for cervical cancer, and higher levels of psychological distress. [17,50,74,89,90] Numerous factors could play a role in this, including the unique health challenges women face during pregnancy and postpartum, as well as the socially constructed roles of women in certain immigrant populations.[14,17,52] Reduced access to health care for immigrant women may be explained in part by their culturally sensitive health behaviours, language barriers, social stigma, and a lack of knowledge about the Canadian health system.[11,17,35] Religious beliefs, such as a preference for female physicians, also restrict their access to care, as does their inferior economic status and lack of community activities.[11,52] Poor access to care has also been linked to a lack of formal education among south Asian women.[91] Moreover, females often fall into the dependent category of immigration, such as sponsored family members or live-in caregivers.[54] Evidence suggests that women with insecure immigration status are more likely to depend on third parties or their male partners for financial and emotional support.[53] This dependence may have a detrimental effect on their health seeking behaviours, resulting in decreased access to primary and preventative care.

2.4 Utilization of Primary Health Care and Specialist Care among Immigrants with multimorbidity

In this thesis, the focus is on the use of primary care services, as measured by the number of consultations with family physicians, and specialized medical care services, as measured by the number of consultations with specialist medical doctors. Since, there is a lack of

studies that specifically focus on the multimorbid populations while evaluating health care utilization by immigration status, the following sections contain a comprehensive review of the existing Canadian literature on health service utilization by immigrants in general, followed by studies from other countries and studies focusing on specific chronic diseases.

2.4.1 Canadian Literature on Health Care Utilization by Immigrants

In this section, the available quantitative literature on health care utilization by immigrants was reviewed. Specifically, the review concentrated on the utilization of primary care and specialized health care. Eleven Canadian studies were identified that used visits to physician services (e.g., family physicians, specialist physicians, or both) by immigrants as an outcome measure and included the Canadian-born population as a reference group.[1,5,8,10,27,44,45,46,58,59,60] Along with physician services, a number of these studies looked at other outcomes, such as emergency department visits[10,58,59] and hospital overnight stays.[1] Studies on immigrants' use of health services requiring out-of-pocket payments, such as dental care,[69,92] as well as studies on preventative health behaviours, such as mammography screening,[56,89] use of flu shots,[93] and pap smear testing were also reviewed.[57,94]

Using longitudinal data from the National Population Health Survey (NPHS), Newbold found no statistically significant difference in the use of family physician services by immigrants and non-immigrants.[10] While immigrants' visits to specialist doctors, nurses, and hospitalizations did not differ significantly, visits to family physicians were significantly lower when the country of origin was compared to those born in Canada, as stated by Laroche [1] However, because these studies used older data sources (from 1985 to 1999), it is difficult to relate the findings to the current state of affairs, as immigrant demographics and socio-cultural involvement have shifted dramatically over the last few decades. For example, in comparison to the 1990s, when Europeans would constitute the majority of the immigrant population, recent decades have seen a rapid influx of Asian and African immigrants over Europeans.[95]

Wen, Goel, and Williams reported a comparable rate of specialist visits between immigrant and non-immigrant populations using the 1990 Ontario Health Survey (OHS).[58] This study

focused exclusively on immigrants in Ontario and used self-reported health status and age as control variables. However, inadequate adjustment for a variety of predisposing and enabling factors may raise concerns about the validity of the study. On the other hand, Chappel and LAI compared older Chinese immigrants' visits to family physicians, specialists, and home care services to those of the general Canadian population.[59] They found that regardless of the type of health services used, there was no difference in outcomes by immigration status. However, a small sample size (850 respondents), restricted selection of the study population (older Chinese over 65 years), and a lack of a consistent reference group limited the findings of this study. Similarly, Latif and Miles found no significant difference in the number of family physician visits.[60] In contrast to Newbold's findings, Latif and Miles also found that a longer period of residency was not associated with an increase in visits to family physicians. Only older immigrants aged 55 and over were included in the study.

Alternatively, there are studies that revealed significant disparities in health care utilization between immigrants and non-immigrants, with immigrants being characterized as under users of services. McDonald and Kennedy observed a lower rate of family physician visits among recent immigrants during their first year of residence, but that rate eventually converged to that of native-born Canadians.[8] The study only assessed health care services in terms of family physician visits and whether a health professional checked blood pressure within the previous 12 months, which may not be sufficient to determine the overall pattern of health care utilization among immigrants. Additionally, reported visits to family physicians were analyzed dichotomously rather than the frequency of visits. The frequency of visits is generally considered a more efficient indicator of health care use as it can account for more unobserved heterogeneity than simply categorizing by whether someone visited a family physician or not.[60] In another study, Deri found that immigrants visited family physicians and specialists at a lower rate than non-immigrants based on the NPHS.[44] Again, this study relied on an older data source from 1994, and physician services were quantified by a dichotomous variable.

Several other studies looking at different measures of health care services, such as preventative screening and dental care, have reported a lower utilization by immigrants.

For example, Shields and Wilkins showed a pattern of underutilization in mammography screening, and Lofters et al. found a lower rate of pap smear testing among immigrants compared to Canadian-born.[56,57] Similarly, a lower use of dental services was reported by Bedos et al., whereas Newbold observed a higher likelihood of visiting dentists among foreign-born people compared to Canadian-born.

Bieser and Hou concluded that recent immigrants without any chronic disease were less likely to seek help from family physicians, whereas established immigrants were more likely to visit family physicians than their non-immigrant peers without chronic diseases.[5] This study did not account for a number of explanatory predictors described in Andersen's Behavioral Model. On the other hand, Tiagi reported that the frequency of visits to primary care physicians by immigrants was significantly lower than that of their Canadian-born counterparts regardless of the length of residency.[27]

Interestingly, there is even evidence for higher health care utilization by the immigrant population in literature. Blais examined the propensity for medical service use among various ethnic groups in Quebec, Canada. While ethnic groups had a higher rate of specialist doctor consultations than native Quebecers, no statistically significant differences were observed with respect to family physician visits or by the site of treatment facilities (e.g., outpatient clinic or private office).[45] Similar findings were also suggested by Wen, Goel, and Williams (1996), who reported a higher incidence of family physician visits among immigrants of different ethnic groups relative to native-born Canadians.[58] Another Canadian study by Muggah et al. analyzed data from 137 primary care practices across Ontario and found an increased number of primary care consultations among immigrants compared to native-born Canadians.[46] However, small practice-based studies like this often have limitations related to external validity, and hence, generalizability is usually a compromising issue.

In summary, out of 11 Canadian studies that specifically compared immigrant's use of family physicians or/and specialist services against Canadian-born, five of them found no statistically significant difference,[1,10,58,59,60] while four reported underutilization by immigrants.[5,8,27,44] Out of those four studies, two studies found differential utilization by

recent immigrants only [8,44] while the remaining two studies did consider immigrants as a single group in their analysis.[5,27] However, in the case of preventative health behaviours such as mammography screening,[56,89] pap smear testing,[57,94] and dental care,[92] a relatively consistent pattern of underutilization by immigrants was observed.

2.4.2 Health Care Utilization by Immigrants Globally

In this section, a total of twelve studies from other parts of the world were explored. Seven studies from European countries with comparable universal health care systems to Canada were included: two studies from Spain,[96,97] one study each from Italy,[98] Norway,[99] Switzerland,[100] and France,[101] as well as one study involving multiple European countries.[102] Furthermore, three studies from the United States (US),[103,104,105] and two systematic reviews[106,107] that analyzed studies from around the world (e.g., Canada, US, and Europe) were included. These studies provided a more comprehensive overview of immigrants' use of primary and specialty care services.

Like Canada, heterogeneity in study findings was evident all over the world. Several studies in the US have found that immigrants underutilize health services. Using the 2002 Medical Expenditure Panel Survey (MEPS), for instance, Xu and Borders observed lower rates of service use among immigrants in terms of preventative and non-preventative physician visits,[103] while Ye et al. reported lower rates of general and specialist physician consultations among foreign-born Asian Americans compared to their US-born peers.[104] Pylypchuck and Hudson (2009) compared immigrant and native-born Americans on a variety of preventative health care measures (e.g., visits to any health care provider, cholesterol screening, mammogram screening, dental checkups, and pap smear testing) and found that immigrants had lower rates of utilization for all of these measures.[105] Disparities in health care use were also reported in Italy. Deluca et al. observed a lower utilization of specialty doctor care and a higher usage of emergency department services among immigrants than native Italians, despite no significant difference in family physician visits.[98] A study in Spain by Sanz et al. explored gender-specific service utilization in which immigrant men were the under users of health care services while immigrant women had a similar pattern of utilization as Spanish-born women.[96] Another study in Spain by Anton and Bustillo reported no statistically significant difference in family physician

visits.[97] In Norway, Diaz et al. observed a significantly lower rate of family physician visits by immigrants using administrative databases.[99] Similar underutilization of primary and preventative health care among immigrants was also reported in Switzerland and France by Tzogiou et al. and Berchet, respectively.[100,101] According to Solé-Auró et al., who analyzed data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which included data from 11 European countries, older immigrants (aged 50 and older) were 6% to 27% more likely to consult with family physicians compared to non-immigrants with similar characteristics.[102]

Contrasting findings in primary health care utilization were also mentioned by Uiters et al. in their systematic review which included 37 research papers from seven different countries. Immigrants used primary physician services at a significantly higher rate in 20.2% of outcome measures, while 27.4% reported lower utilization. The remaining studies (nearly 44%) found no difference in the use of primary health care services between immigrants and non-immigrants.[106] One possible conclusion drawn from this review is that countries with strong primary health care systems, such as those that provide universal health care, are more likely to exhibit similar patterns of utilization than countries that do not provide free access to health care, such as the US. This is most likely why most studies in the US report a relatively consistent pattern of underutilization by immigrants, especially with primary care. Another systematic review by Santamera et al. had similar findings in which immigrants with universal health coverage showed either lower or comparable utilization of primary care and specialized care services compared to native-born people.[107]

2.4.3 Health Care Utilization by Immigrants with Specific Chronic Diseases.

The presence of multimorbidity can significantly influence immigrant's frequency of health service utilization, especially in primary care. Yet, no studies on health care utilization by immigrants with multimorbidity were found in the existing literature. Only a few studies focused on immigrants with specific chronic diseases. Eleven related studies were included that compared immigrant’s use of physician services to non-immigrants for specific chronic diseases.[108,109,110,111,112,113,114,115,116,117,118] Among them, four studies focused on diabetic patients,[108,109,110,111] one on asthma patients,[112] one on cancer,[116] and four on

patients with mental health problems.[113,114,115,118] No Canadian studies were found that specifically examined the pattern of the primary care physician or specialist visits made by immigrants with cardiovascular diseases apart from one study that investigated the pattern of preventative health behaviours such as cholesterol screening.[117]

In comparison to non-immigrants with diabetes, Wang et al. found a significant difference in visits to primary care physicians among diabetic immigrants living in British Columbia and Ontario.[108] Similar findings were also reported by Hayman et al. and Marchesini et al..[109,110] According to Chen et al., Chinese immigrants had significantly more visits to psychiatrists for mental disorders than their non-immigrant peers, despite having fewer visits to family physicians and hospitals.[118] According to Durbin et al., visits to psychiatrists and hospitals were significantly lower among immigrants than among Canadian-born for non-psychotic mental health symptoms.[113] This finding is consistent with Kirmayer et al., who compared psychological distress in immigrants from Vietnam and the Philippines to those born in Canada and found a significantly lower use of medical specialist services by immigrants for mental health issues. However, this study had a small sample size, included immigrants from only two countries, and was limited to a single province. Thus, the generalizability of these results may be seriously impacted given the nature of the survey. Underutilization was also reported by Harris et al., who explored ethnic/racial differences in mental health service utilization,[119] Javier et al., who analyzed differences in the use of physician services by immigrant children with asthma [112] and Stimpson et al., who analyzed the trend of cholesterol screening between immigrant and Canadian-born populations.[117] Differences in health care utilization by immigrants have also been reported by Chu et al., who used administrative data to compare the use of aggressive care and supportive care among patients with end-of-life cancer. Immigrants received more aggressive care, measured by at least two emergency department visits or intensive care unit admissions within 30 days of the death, and received less supportive care, measured by physician calls or in-home nurse visits within six months of death.[116]

2.5 Rationale for the Proposed Research

The existing body of evidence has certain limitations that warrant further research. For instance, much of the prior research on immigrant health service utilization has either relied

on regional samples [45,46,58,59,66] or focused on older immigrants,[59,60] or used convenience sampling design,[59] rather than random sampling. Methodological issues were also evident, as some studies failed to adequately describe health service use from the perspective of a conceptual framework (e.g., Behavior Model by Andersen). [46,58] Inappropriate selection of covariates or a lack of adjustment for these variables can significantly obscure the true effect in a multivariable model. There were also differences in study design, ranging from secondary analysis of cross-sectional data to administrative data-based analysis to mixed-methods. Additionally, the majority of studies conducted in Canada used older data sources.[1,8,10,44, 58] Thus, these differences in study design and sample size may account for some of the observed inconsistencies in the study findings, while the remaining discrepancies may be a result of the employment of different outcome measures. For example, some studies focused on out-of-pocket health services (e.g., dental care),[69,92] while others examined free-of-charge services such as those provided by family physicians and specialists.[1,8,10,44] Similarly, some studies drew conclusions based on immigrants' use of emergency services,[41,43] while others focused on preventative health behaviours [56,57,93] as outcome measures to represent health care utilization.

More importantly, none of the previous studies assessed the immigrant population with multimorbidity and their use of physician services (e.g., family physicians, specialists). Evidence is also limited for disease-specific physician service utilization among immigrants. Considering the barriers immigrants face when accessing health care and the importance of these health services in managing patients with multimorbidity, more research is needed to establish a better understanding of multimorbidity among immigrants in order to develop more targeted, culturally sensitive public health initiatives.

2.6 Research Hypotheses

Based on the literature review, it is evident that immigrants face multiple barriers to health care access which have been shown to have a negative impact on their health and health care utilization. Female immigrants, in particular, are more likely to face those barriers given their socially constructed roles in respective communities, certain health beliefs and health needs and relative lack of financial independence.[11,17,53,54] In comparison to the native-born population in Canada, there is evidence of both underutilization [5,8,27,44] and

comparable utilization[1,10,58,60] of primary and specialized health care by immigrants. Additionally, studies on specific chronic diseases consistently show that immigrants use health services at a lower rate than their native-born counterparts. [108,109,112,113,115] For example, the decreased use of primary care and specialized care among immigrants with mental health problems and diabetes has been well documented in the literature.[108,109,114,118] Moreover, management of multimorbidity requires the continuation of health care, especially primary care, and preventative screening services. Taking all this evidence into account, it is anticipated that there is a significant difference in the number of visits to family physicians and specialists between immigrant and non-immigrant populations with multimorbidity. It is also expected that female immigrants with multimorbidity will use these services at a lower rate than native-born females, owing to the additional barriers to the health care they face.

Thus, the research hypotheses for this study are as follows:

1. After adjusting for relevant covariates, the frequency of visits to family physicians and specialist doctors is lower in immigrants than in Canadian-born populations with multimorbidity.
2. Female immigrants with multimorbidity visit family physicians and specialist doctors less frequently than Canadian-born females, whereas it is anticipated that there will be no significant difference in the number of visits between male immigrants and their Canadian-born male peers with multimorbidity.
3. Immigrants make fewer visits to family physicians and specialists for disease-specific health problems.

Table 1: Summary of Studies on Health Care Utilization by Immigrants

Author Name/Year	Study Design	Country	Sample Population	Measure of Outcome(s)	Results/Findings
Newbold (2009) [10]	• Longitudinal portion of the National Population Health Survey (NPHS) • 1994/95 to 2000/01 cycles.	Canada	• Sample size 17,276 • Immigrants 1,305 • Age 20 and over	• GP visits in the past 12 months. • Hospital use in the past 12 months.	• No statistically significant difference in GP visits and hospital use between immigrants and non-immigrants after adjusting for covariates.
McDonald & Kennedy (2004) [8]	• Secondary cross-sectional analysis • Pooled data from NPHS 1996 cycle and CCHS 2000/2001 cycle	Canada	• Pooled Sample size 139,931 • Immigrants 18,754 • Age 20 to 65	• Family physician visits in the last 12 months (binary outcome) • Blood pressure measure	• Recent immigrants were associated with a lower use of family physicians and blood pressure measures as opposed to non-immigrants. • Established immigrants had higher use of these services than Canadian-born.
Laroche (2000) [1]	• Secondary cross-sectional analysis • General Social Survey (GSS) cycles 1985 and 1991	Canada	• Sample size 1985 cycle 11,200 1991 cycle 11,924 • Immigrants 1,700 from each cycle • Age 15 or over; noninstitutionalized population	• Number of GP visits • Number of medical specialist visits • Number of nurse visits • Number of in-hospital stays	• GP visits were lower among people born outside Canada compared to those born in Canada. • No difference in specialist visits, nurse visits, and in-hospital stays between the groups.
Wen, Goel, and Williams (1996) [57]	• Secondary cross-sectional analysis • Ontario Health Survey (OHS) 1990 cycle.	Ontario, Canada	• Sample size 38,519 • Age 16 to 64	• Number of GP visits • Number of specialist visits • Emergency department (ED) visits	• Immigrants had higher GP visits, lower ED visits, and similar specialist visits compared to non-immigrants.
Chappel & LAI	• Simple random sampling	Victoria and Vancouver,	• Sample size 850	• Physician care services including	• No significant difference in physician service utilization

(1998) [58]	• Face to face interviews	British Columbia, Canada.	• Older Chinese immigrants age 65 and over	GP visits, specialist services, and ER visits. • Home care services	between Chinese-born and Canadian-born elders.
Deri (2004) [44]	• Secondary cross-sectional analysis • NPHS 1994/95, 1996/97 and 1998/99 cycles	Canada	• Pooled Sample size 72,533 • Immigrants 12,757 • Age 12 to 65	• GP visits (binary outcome) • Specialist visits (binary outcome) • Dental visits • Having a regular doctor	• Recent immigrants utilized physician services at a lower rate than established or Canadian-born individuals. • The longer the length of residency, the more comparable the utilization rate between immigrants and non-immigrants.
Latif & Miles (2012) [59]	• Secondary cross-sectional analysis • NPHS 1997-1998 cycle	Canada	• Sample size 4,560 • Immigrants 910 • Older Canadians age 55 and over	• Number of GP visits • Gender-specific difference in GP visits by immigration status	• No significant difference was observed in GP visits by immigration status regardless of gender status. • Length of residency in Canada was not related to increased use of service utilization.
Bieser & Hou (2014) [5]	• Secondary cross-sectional analysis • CCHS cycle 2009-2010	Canada	• Sample size 98,346 • Recent immigrants 3,587 • Established immigrants 10,810 • Age 20 to 74	• Family physician visits • Labour force participation	• Recent immigrants with or without chronic health problems were less likely to work than Canadian-born with similar characteristics. • Recent immigrants with or without any chronic disease made lower family physician visits while established immigrants made higher visits compared to Canadian-born of similar characteristics.

Blais & Maiga (1999) [45]	• Secondary cross-sectional analysis • Quebec Health Survey (QHS) 1987 and Quebec Health Insurance Board (QHIB) claims data	Quebec, Canada	• Sample size 1,182 • Native Quebecers 591 • Foreign-born ethnic people 591 • Age 15 and over	• Number of medical visits (GP visits, specialist visits) in different settings including private offices, outpatient clinics, hospital inpatient care	• Immigrants had higher rates of specialist visits than Quebecers in private office settings. • No difference in GP visits.
Muggah et al. (2012) [46]	• Practise-based cross-sectional analysis • Mixed methods study design • 137 primary care practices through Ontario from 2005 to 2006.	Ontario, Canada	• Sample size 5,269 • Immigrants 1,099	• Number of self-reported medical visits • First contact access and utilization to a primary care provider.	• Recent immigrants (<5 years of stay) made higher family physician visits than did Canadian-born in capitation community health center practices while these differences were not observed for Fee-For-Service practices. • There was no significant difference in the first contact access score or the first contact utilization score between the groups.
Chen et al. (2010) [117]	• Retrospective cohort • Linked data using Landed Immigrant Data System (LIDS) and BC Linked Health Data (BCLHD) from 1992 to 2001	British Columbia, Canada	• Sample size 4,748 • Chinese immigrants 786 • Non-immigrants 3,962 • Age 15 and over	• GP visits • Specialists visits (psychiatrists) • Psychiatric hospitalizations • Utilization of psychiatric medications.	• Chinese immigrants made higher visits to psychiatrists for severe mental disorders than did their non-immigrant peers. • Chinese immigrants made lower visits to GPs and had fewer hospitalizations for mental disorders than their non-immigrant peers.
Tiagi (2016) [27]	• Secondary cross-sectional analysis • CCHS PUMF 2008-2009 cycle	Canada	• Sample size 112,203 • Age 18 and over	• Visits to emergency departments (ED) • Visits to family physicians	• Intensity of using physician services (visits to family physicians) was significantly lower among

					immigrants than non-immigrants.
Xu & Borders (2008) [102]	• Secondary cross-sectional analysis • Medical Expenditure Panel Survey (MEPS) 2002 cycle	US	• Sample size 27,744 • Age 18 and over	• Number of preventative visits • Number of non-preventative visits	• Lower utilization by immigrants in both preventative and non-preventative health visits compared with US-born people.
Ye et al. (2012) [103]	• Secondary cross-sectional analysis • National Health Interview Survey (NHIS) from 2003 to 2005	US	• Sample size 2,500 • Asian Americans Foreign-born 1,998 US-born 502 • Age 18 to 64	• Visits to general doctors • Visits to specialists • Emergency room (ER) visits	• Fewer visits to general doctors and specialists by foreign-born Asian Americans than native-born Asian Americans. • No difference in ER visits
Pylypchuk & Hudson (2009) [104]	• Cross-sectional study design • MEPS from 2000-2004 cycles	US	• Sample size 62,250 • Age 25 to 64	• Visits to the health providers • Dental visits, flu shots • Cholesterol checkup • Prostate examination • Mammogram	• Immigrants regardless of citizenship status were less likely to utilize preventative health measures than native-born populations. • Differences were higher among non-citizen immigrants.
Deluca et al. (2013) [97]	• Secondary cross-sectional study • Italian Health Conditions Survey (IHCS) 2004-2005 cycle	Italy	• Sample size 102,857 • Age below 65	• GP visits • Specialist visits • ER services • Medical consultations	• No difference in GP visits between immigrants and the Italian-born population. • Immigrants had lower use of specialist services and made fewer medical telephone consultations than did Italian-born. • ER visits were higher among immigrants.
Sanz et al. (2011) [95]	• Secondary cross-sectional study	Spain	• Sample size 13,305 • Spanish-born 11,610 • Foreign-born 1,695	• Gender-specific measures of health care utilization - GP visits	• Health care utilization differed by country of origin and by gender status.

	• National Health Survey (NHS) 2006 cycle		• Age 16 to 74	- Specialist visits - Emergency services - Hospitalizations	• Immigrant women made similar GPs and specialists visits as did Spanish women • Immigrant men made fewer specialist doctor visits and emergency visits than did Spanish men, while GP visits were similar between the two groups.
Diaz et al. (2015) [98]	• Registry based study • National Population Register and The Norwegian Health Economics Administration Databases in 2008	Norway	• Sample size 3 ,739 244 • Immigrants 10.4% • Age 15 or over	• Use of GP and emergency care (yes/no) • Intensity of GP visits and emergency care visits (frequency)	• A lower proportion of immigrants used GP services, but the intensity of visiting GPs was higher (2% - 15%) among those immigrants than that of Norwegian people. • A higher proportion of immigrants used emergency services than Norwegian people. However, the intensity of visits (frequency) was similar.
Tzogiou et al. (2021) [99]	• Secondary cross-sectional analysis • 2012 Swiss Health Survey (SHS) and 2010 Health Monitoring of the Migrant Population in Switzerland (GMM II)	Switzerland	• Pooled sample size 19,991 • Immigrants 25%. • Age 17 to 73	• Visits to doctors • Visits to ED	• First-generation immigrants were less likely to visit a doctor and more likely to visit ED than non-immigrants.
Berchet (2013) [100]	• Cross-sectional study • French Health, health care and insurance survey of 2006 and 2008 waves	France	• Sample size 12,999 • Immigrants 1,065 • Age 18 and over	• Visits to GPs • Visits to specialists	• Immigrant had a lower propensity of visiting both GPs and specialists.

Anton & Bustillo (2010) [96]	• Secondary cross-sectional study • National Health Survey 2006-2007 cycle	Spain	• Sample size 25,000 • Age 16 and over	• GP visits • Specialist visits, • In-hospital length of stay • ER visits	• No difference in GP visits and in-patient hospital stays between immigrants and Spanish-born people. • Lower access and higher intensity to specialist doctor visits by immigrants compared to Spanish-born.
Solé-Auró et al. (2015) [101]	• Secondary cross-sectional analysis • Survey of Health, Ageing, and Retirement in Europe (SHARE) 2004	11 European countries	• Sample size 27,395 • Immigrants 2,220 • Age 50 and over	• GP visits • In-hospital stays	• Immigrants made more visits to GPs and stayed more days in hospitals than did non-immigrants. • Differences were also significant across countries.
Uiters et al. (2009) [105]	• A systematic review on studies published from 1980 to May 2013 • All studies were peer-reviewed, original and quantitative in nature.	Seven countries	• This review included 37 publications from seven western industrialized countries including Canada, US and rest from Europe. • Studies that focused on adults were only reviewed.	• GP Visits • Specialist visits • ER care.	• Countries with universal health care had relatively better equity in access, and thus, utilization pattern was relatively comparable between immigrants and non-immigrants. • Studies in the US showed a consistent underutilization pattern of primary health care services by immigrants. • High methodological quality and accuracy tend to reduce differences between the groups.
Santamera et al. (2016) [106]	• A systematic review on studies published between June 2013 to February 2016 • Original articles with quantitative study	Multiple countries	• This review included 36 publications with 28 selected from Europe, 5 from Canada, and rest	• Seven outcome measures of health care utilization were included including GP consultations, specialist care, dental	• Immigrants were generally under users of health care services in comparison to the native-born population. • Studies from countries with universal health care

	design were only selected.		from other countries. • Age 18 and over	services, mental care, ER services, and medication resource utilization.	reported equal or a lower use of primary care or/and specialist care services by immigrants compared to non-immigrants.
Javier et al. (2007) [111]	• Secondary cross-sectional study • California Health Interview Survey (CHIS) 2001 and 2003 cycles	US	• Sample size 2,600 • Children with physician diagnosed asthma • Immigrant children 895 • Age 1 to 11	• A regular source of care • Visits to the doctors • ER visits • Perceived health status	• Immigrant children with asthma were less likely to have a regular source of care, less likely to make visits to doctors and more likely to report poor health compared to children with asthma from non-immigrant families.
Wang et al. (2012) [107]	• Retrospective cohort • Immigrants who landed between 1985 to 1999 in BC or QC • Citizenship and Immigration Canada administrative data systems were linked with provincial health insurance databases.	British Columbia and Quebec, Canada	• Equal sample size for Immigrants and Canadian-born; BC 275,517 QC 288,105 • Age 20 and over	• Prevalence of diabetes • Physician service utilization	• Immigrant women in both provinces had a higher prevalence of diabetes than non-immigrant women. • Diabetic immigrants had lower physician visits than Canadian-born with diabetes.
Hyman et al. (2013) [108]	• Secondary cross sectional study • Convenience sampling design • Participants were included from com-munity health centres (CHCs), diabetes clinics, diabetes education centres and	Greater Toronto Area, Canada	• Sample size 102 • Black-Caribbean 48 • Canadian-born 54 • Age 35 to 64 with type-2 diabetes	• Diabetes self-management practices • Sources and providers of diabetes care	• Black-Caribbean immigrants with diabetes had better self-management health practices than native-born Canadians including regular A1C checking, eye screening, non-smoking and reduced carbohydrate consumption. • Black-Caribbean were more likely to seek health care

	immigrant serving organizations.				from community health centres and dieticians than their Canadian–born peers.
Kirmayer et al. (2007) [114]	• Cross-sectional study • Telephone survey • Random sampling design	Montreal, Canada	• Sample size 1,700 • Immigrants 776 • Non-Immigrants 924 • 5 different ethnocultural groups	• Use of health care services for mental illnesses.	• Immigrants had similar utilization of general medical services compared to Canadian-born. • Immigrants in general had significantly lower rates of mental health care for psychological distress. • Ethnic variations to mental health care were significant among immigrants.
Chu et al. (2021) [115]	• Retrospective cohort study • Linked administrative and physician claims databases .	Ontario, Canada	• Sample size 242,556 • Immigrants 13,085 • Canadian-born 229,471 • Cancer patients who died between 2004-2015 and aged 18 or over at the time of death.	• Aggressive health care was measured by at least two ED visits or ICU admissions within 30 days of death • Supportive health care was measured by physician calls or in-home nurse visits within six months of death	• Immigrants received more aggressive care than Canadian-born with south Asians having the highest rate and western Europeans having the lowest rate of aggressive health care. • Immigrants received lower supportive care than non-immigrants.
Marchesini et al. (2020) [109]	• Retrospective cohort study • Linked administrative databases under ARNO Observatory in 2010	Italy	• Immigrants 10,336 • Italians 10,378 • Matched by sex, age and residency • No restriction on age	• Prevalence of drug treated diabetes • Hospitalization rates • In-hospital length of stay • Type and comparative rate of	• Immigrants had a 55% higher risk of developing diabetes than Italians. • Similar hospitalization rate but longer in-hospital stays among immigrants compared to Italians.

				medication consumption	• Immigrants had a higher likelihood of taking oral anti-diabetic medications and a lower likelihood of taking lipid lowering and antithrombotic medications compared to Italians.
Grant & Retnakaran (2012) [110]	• Cross-sectional secondary analysis • CCHS cycles of 2005 and 2007.	Canada	• CCHS 2005 Immigrants 1,174 Canadian-born 6,484 • CCHS 2007 Immigrants 645 Canadian-born 2,960 • Only type-2 diabetes	• Diabetes self-care • Utilization of different measures of health care including - hemoglobin testing - urine protein test - eye examination • Health status of diabetic patients.	• Immigrants had a similar likelihood of self-care practices including blood glucose monitoring and physical inactivity tracking but a lower likelihood with weekly foot examination compared to Canadian-born. • No statistical difference in self-perceived mental or general health status. • Healthcare utilization was similar between immigrants and Canadian-born.
Durbin et al. (2015) [113]	• Cross-sectional study • Linked administrative databases (CIC, RPDB and OHIP claims data)	Ontario, Canada	• 912,114 immigrants who landed between April 1993 to March 2012 • Non-immigrants 908,329 matched by sex and date of birth.	• Primary mental health care • Specialized mental health care including visits to psychiatrists and hospitals (ED visits and inpatient admissions)	• Visits to psychiatrists and hospitals were significantly lower among immigrants than Canadian-born for non-psychotic mental health symptoms. • Primary care visits among immigrants varied depending on their region of origin.
Roberts & Crockford (1997) [112]	• Retrospective case study • Descriptive in nature	Calgary, Canada	• Sample size 36 • Asian Canadians 11	• Visits to adolescent inpatient psychiatric unit	• Fewer Asian Canadians were admitted to psychiatric unit compared to white Canadians.

	• Data extracted from Foothills Hospital in Calgary between January 1991 to November 1996		• White Canadians 25		• In-hospital length of stay was similar between the groups in the study.
Stimpson et al. (2012) [116]	• Secondary cross-sectional study • The National Health and Nutrition Examination Surveys (NHANES) from 1988 to 2008	US	• Sample size 17,118 • Mexico-born immigrants 4,090 • Age 20 to 74	• Cholesterol screening • Access to health care	• Mexican immigrants had lower rates of cholesterol screening than the US-born population. • Access to health care improved the screening rate among Mexican immigrants but the difference was still statistically significant, particularly with recent immigrants (<5 years stay)

Notes: Different terminologies has been used in literature to describe primary care providers including GP, family physicians, family doctors. **Acronyms**: GP= General Practitioners; ER=Emergency room; ED=Emergency department; ICU=Intensive care unit; QC=Quebec; BC=British Columbia; CCHS=Canadian Community Health Survey; PUMF= Public use micro data file; CIC= Citizenship and Immigration Canada; RPDB= Registered Persons Database; OHIP= Ontario Health Insurance Plan.

Chapter 3

3 Methods

3.1 Data Source

This study used public use micro-data file (PUMF) from the 2015-2016 cycle of the Canadian Community Health Survey (CCHS). Despite the accessibility of more recent CCHS cycles, the 2015-2016 cycle was chosen based on the availability of required outcome variables for the proposed research question, as the survey contents of CCHS vary year to year to some extent. CCHS is an annual survey conducted by Statistics Canada in collaboration with the Canadian Institute for Health Information (CIHI) and the Public Health Agency of Canada (PHAC). The survey collects health-related data from all provinces and territories in Canada and thus supports a variety of national and provincial health surveillance programs.[120,121] Since 2001, CCHS has been serving the purpose of collecting data and drawing population level estimates about Canadians, their health status, health utilization and health determinants. All Canadians aged 12 or older are included in the target population, with the exception of members of the Canadian Forces, the institutionalized population, Indigenous people living on reserves and other settlements, children in foster care, and residents of remote Quebec health regions.[120] This survey covers approximately 97% of Canadians and 130,000 respondents are expected to be sampled every two years to ensure the survey estimates are reliable at the health region (HR) level.[120,121] For the 2015-2016 cycle, the survey sampled approximately 110,000 respondents.

3.2 Sample Technique

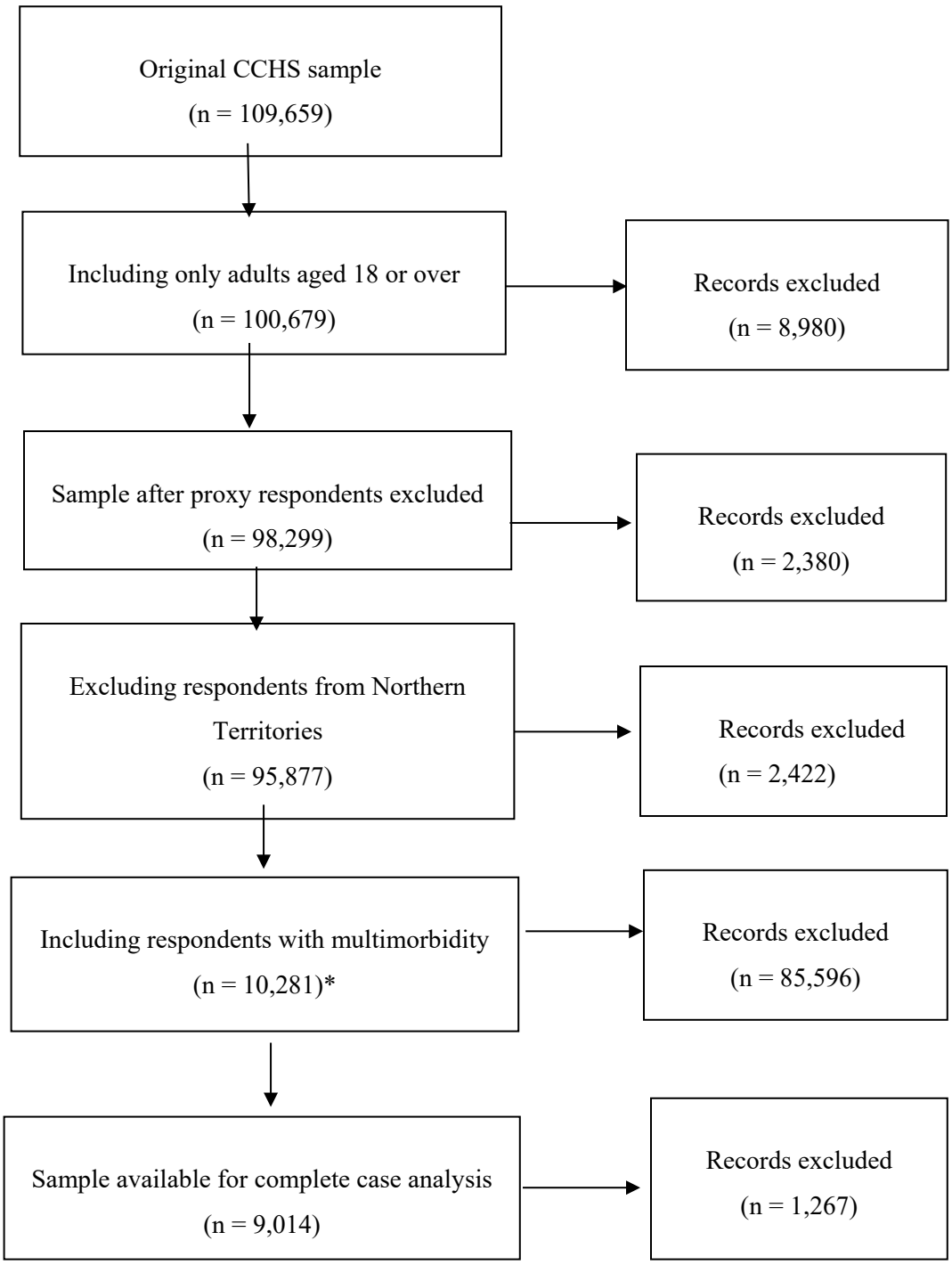
The sampling technique for CCHS is complex and involves multistage sample allocation. Using population proportion to size, the sample is first allocated to provinces, and then to HRs within each province.[120,121] Starting from 2015-2016, CCHS adopted two different sampling frames to sample the population. Under the area frame, households were sampled to target people aged 18 or older, whereas the Canadian Child Tax Benefit frame (CCTB) targeted people aged between 12 and 17. After identifying a household as a sampling unit,

the subsequent selection of a respondent from that household was implemented through various selection probability algorithms based on age and household composition.[120] Data collection for CCHS 2015-2016 was carried out using computer-assisted personnel and telephone interviews. The survey was primarily conducted in English or French. In the event of a language barrier, Statistics Canada Regional Offices assigned authorized personnel with multilingual competencies.[120]

3.3 Study Sample

Respondents aged 18 or older were considered for this study. Proxy responses were not included. Respondents from ten Canadian provinces were only included as the sample size for immigrants with multimorbidity living in the Northern Territories was too small. Since the target population was Canadians with multimorbidity, only respondents with two or more disease groups were included. These disease groups were identified and screened using the CCHS dataset in accordance with the PHAC's selection criteria.[30,122] After excluding respondents who did not meet these inclusion criteria, the sample size was 10,281. This was followed by a complete case analysis in which respondents with missing values from each of the study variables of interest were excluded, yielding a final analytical sample of 9,014.

PRISMA Flow Diagram



* Multimorbidity was defined as being affected by at least 2 chronic disease groups.

3.4 Analytical Variables

3.4.1 Dependent Variables

Health care utilization was quantified in this study by the number of physician consultations made in the preceding 12 months. To represent the number of physician consultations, two outcome variables were chosen.

1. Number of consultations with family physicians.
2. Number of consultations with specialists.

Number of family physician visits: In the CCHS PUMF, the number of family physician visits in the last 12 months was derived using the answers to the following two questions:

(1) “In the past 12 months, 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?”

(2) “How many times in the last 12 months?”

Number of specialist doctor visits: The following two questions were used to determine the number of specialist consultations in the previous 12 months:

(1) “In the past 12 months, have you seen or talked to any other medical doctor or specialist such as a surgeon, allergist, orthopaedist, urologist/gynaecologist, or psychiatrist about your physical, emotional, or mental health?”

(2) “How many times in the last 12 months?”

Nine chronic diseases were identified for the multimorbidity sample from the CCHS using the Public Health Agency of Canada's selection criteria. In the CCHS, a disease was considered chronic if it was expected to persist or had already persisted for six months or more and was confirmed by a physician.[120]In the CCHS, respondents were asked the following questions about each chronic disease.

Chronic Diseases	**Questions Asked in the CCHS**
Heart Disease	"Do you have heart disease?"
Stroke	"Do you suffer from the effects of a stroke?"
Asthma	"Do you have asthma?"
Chronic Obstructive Pulmonary Disease (COPD)	"Do you have chronic bronchitis, emphysema or chronic obstructive pulmonary disease or COPD?"
Cancer in last 6 months Cancer in lifetime	"Do you have cancer?" "Have you ever been diagnosed with cancer?"
Diabetes	"Do you have diabetes?"
Anxiety Disorder	"Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or a panic disorder?"
Mood Disorder	"Do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia?"

3.4.2 Independent Variables

Immigrant status (key exposure variable): In the CCHS PUMF, a dichotomous variable was used to determine if the respondents were landed immigrants/non-permanent residents or non-immigrants/Canadian-born. The following question elicited responses:

"Are you now, or have you ever been a landed immigrant in Canada?"

3.4.3 Covariates Selection

We used Andersen and Newman's behavioral model as a conceptual framework to examine quantifiable predictor variables for health care service utilization. This model serves as a guide for selecting covariates for the study.[64,123] Based on prior literature, [27,45,124,125] the following factors described in the behavioral model were included as covariates in this study.

3.4.3.1 Predisposing Factors

Age: This was a categorical variable with 14 categories in the CCHS PUMF. For this study, the age categories were recoded into four groups (18-34 years, 35-49 years, 50-64 years, and 65 and older) to ensure that they were representative of different stages of life with distinct predisposing characteristics, while also ensuring that each divided group had an approximately equal proportion of respondents.

Sex: In CCHS, sex was listed as a dichotomous variable with two levels (male, female). Responses were derived from the following question: “What was your sex at birth?”

Marital status: In CCHS, marital status was defined as a categorical variable with four levels (married, common law, single and widowed/separated/divorced). Several previous studies used two categories in which married and common law/partnered were grouped together, while single and widowed/separated/divorced were merged into another category.[39,68,126,127] Some studies using the CCHS have also used three categories in which married and common law were grouped together and the other two groups were single and widowed/separated/divorced.[27,39,124,128] For this study, three categories were used because each group had a sufficient sample size.

Cultural/racial background: While the CCHS master file contains data on specific racial groups, the PUMF contains only two broad categories (e.g., white and non-white, which includes Indigenous people) due to confidentiality disclosure.

Education: In the original dataset, education was classified as a categorical variable with three levels: less than secondary school, secondary school, and post-secondary. The same

categories were retained in this study because they were consistent with other literature using the CCHS.[32,124]

Sense of belonging to the local community: The same classification listed in the CCHS PUMF file with four levels (very strong, somewhat strong, somewhat weak and very weak) was used. This variable represents the level of social connectedness and was found to be associated with the mental and psychological well-being of individuals in previous studies.[129,130]

3.4.3.2 Enabling Factors

Total household income: The same five categories listed in CCHS PUMF data file were used. These are: <$20,000, 20,000-39,999, 40,000-59,999, 60,000-79,999, >$80,000.

Insurance coverage for prescribed medicine: It was a dichotomous variable in the CCHS PUMF data file, and the same categories were kept in this analysis. The variable was derived using the following question:

"Do you have insurance (any private, government or employer-paid plans) that covers all or part of the cost of your prescription medications?"

Province of residence: In CCHS PUMF, place of residence was categorized into 13 regions (ten provinces and three territories). This variable was recoded into five groups. They are Ontario, Quebec, British Columbia, the Prairies (Alberta, Saskatchewan, and Manitoba) and Atlantic Canada (Nova Scotia, Prince Edward Island, New Brunswick, and Newfoundland and Labrador). The grouping of several provinces, as with Atlantic Canada and The Prairies, was done to compensate for the small sample sizes from some individual provinces while maintaining the geographical distribution and ensuring that each geographic region had an approximately equal proportion of respondents. Similar categorization was also found in past literature.[131,132]

Having a regular health care provider: Access to health care (e.g., having a regular health care provider) can influence how health services are utilized (e.g., number of physician visits). As a result, having a regular health care provider was included as a

covariate in the study to account for the potential effect this variable may have on the outcomes. According to some studies, Canadians who do not have a regular health care provider have fewer family physician visits and are less likely to engage in preventative health care measures than those who do.[86,125] It was a dichotomous variable (yes/no) in the CCHS dataset and the same categories were kept in the analysis.

3.4.3.3 Need Factors

Perceived health: Self-reported perceived health is a frequently used factor in determining the need for health care. Individuals with poor perceived health are more likely to use health care services than those with good or excellent perceived health.[133] In the CCHS, perceived health was provided as a categorical ordinal variable with five levels (excellent, very good, good, fair, poor). In this study, all the categories were preserved as the sample size was sufficient.

Body Mass Index: Obesity, being a risk factor for chronic diseases, is associated with increased health care utilization.[10] However, it is important to note that the inclusion of BMI as a need-based factor may be disputed as it could also be considered as a predisposing factor. Weight status was classified into four categories in the CCHS PUMF. Categories were underweight (BMI < 18.5), normal weight (BMI 18.5-24.9), overweight (BMI 25-29.9) and obese (BMI ≥ 30). Underweight and normal weight were regrouped into a single category and the remaining two categories were kept intact.

3.5 Definition of Multimorbidity

As there are currently no consistent international guidelines for defining or measuring multimorbidity, estimates tend to vary significantly depending on how researchers choose and describe chronic diseases for the purpose of their study.[29,134] This selection process is often influenced by the availability of the data, the nature of the data source being studied, the size of the sample, and the target population of interest.[29,134] Definition of multimorbidity in primary care settings generally includes a broader range of diseases.[135,136] A validated list of twenty chronic diseases has been proposed by Fortin et al. based on their impact on primary care patients.[135] However, the public health definition of multimorbidity usually consists of a much smaller range of diseases.[30,137] For example,

Roberts et al. used nine chronic diseases in multimorbidity measurement, which was validated by the PHAC.[30] According to the 2019 Canadian Chronic Disease Indicators (CCDI) report (using data from the 2017 CCHS cycle), the estimated prevalence of multimorbidity, defined as the coexistence of at least two diseases from a predefined list of five major chronic disease groups (e.g., cardiovascular disease, respiratory disease, diabetes, cancer and mental illness), was 8.9% among people aged 20 or older, while the prevalence was 18.4% when the definition included ten common chronic diseases.[122] Hence, depending on the definition, multimorbidity prevalence can vary significantly.

The PHAC definition of multimorbidity was used in this study.[138] Multimorbidity was defined as the concurrent presence of at least two chronic disease groups selected from a predetermined set of five groups.[138] Nine chronic diseases were screened, including asthma, chronic obstructive pulmonary disease (COPD), heart disease, stroke, diabetes, cancer diagnosed in the last six months, cancer in a lifetime, mood disorder, and anxiety disorder from the CCHS 2015-2016 dataset, which belonged to the five major chronic disease groups outlined by the PHAC. These were cardiovascular diseases (heart disease and/or stroke), respiratory diseases (asthma and/or COPD), diabetes, cancer (cancer diagnosed in the last six months and/or cancer in a lifetime) and mental illnesses (mood disorders and/or anxiety disorders). Health outcomes were self-reported. However, prior research has established the acceptability of self-reported outcome measures for defining multimorbidity.[139,140] Selected variables that represented the chronic diseases were all binary variables in the CCHS dataset. A dichotomized composite variable was created called multimorbidity using these variables. For COPD ‘valid skip’ was considered as ‘no disease’ because questions regarding COPD were only asked of people aged 35 or over.

3.6 Statistical Analysis

This was a secondary cross-sectional study using CCHS PUMF from 2015-2016. To account for the complex nature of CCHS, each respondent in the sample was given a sampling weight that corresponded to a certain number of individuals in the covered Canadian population. Sampling weights were adjusted for each step of statistical analysis to make the results representative of the population. In bivariate and multivariate analysis, bootstrap weights were also applied to adjust the variance estimates. Bootstrap data was

merged with the CCHS dataset based on a common identifier for each respondent. Data with missing values were provided for descriptive statistics, while statistical analysis, including bivariate and multivariable regression was performed with complete case data in which respondents with missing information were excluded. A sensitivity analysis was also carried out using multiple imputations to assess if missing values had any effect on the results.

3.6.1 Descriptive Statistics

Unweighted sample frequencies and weighted percentages of population were reported for all independent study variables in the overall sample and sex-specific subsamples.

3.6.2 Bivariate Analysis

Bivariate analysis was performed to assess the association between independent and dependent variables (family physician visits and specialist visits). For both outcomes, the mean and standard error were calculated. Negative binomial regression was used to examine statistical significance for all unadjusted bivariate associations.

3.6.3 Multivariable Regression Analysis

Given the distribution of outcome variables, statistical models were fitted using negative binomial regression. The number of physician visits (family physician visits and specialist visits) is a non-negative integer count variable. Poisson regression, negative binomial regression, and zero-inflated Poisson/negative binomial regression are recommended methods for analyzing count data. The appropriate method was determined by running the statistical model through all of these regression techniques and comparing the differences between predicted probabilities and observed values at various distributional data points for outcomes. Poisson regression was not appropriate as the data was overdispersed. Further, to account for excess zeroes, a comparison was made between zero-inflated and regular negative binomial regression using Vuong and Clarke's test.[141] Vuong test is designed to compare the fit of two non-nested models based on the null hypothesis that two models are equally far from the true model while the alternative hypothesis declares one of them being closer than the other.[141] This test makes probabilistic predictions using

likelihood ratio estimations to determine whether the inclusion of a zero-inflated model improves the regular Poisson/negative binomial model significantly.[142] These tests did not yield statistically significant evidence in favor of the zero-inflated model. As a result, negative binomial regression was chosen as the method that best fits the data. Negative binomial regression is a variant of Poisson regression specifically designed for over-dispersed count data when conditional variance exceeds conditional mean.[143] The coefficients estimated by this model describe the expected increase or decrease in log counts for a variable of interest when compared to a reference group, assuming all other independent variables remain constant. The results can also be interpreted using the incidence rate ratio (IRR).

The first model was the unadjusted model which looked at the crude association between the key predictor (immigrant status) and outcomes (family physician visits and specialist doctor visits). In the first adjusted model, the outcome variables were regressed against the key predictor and additional independent variables in order to account for the potential effect of those covariates. Multivariable negative binomial regressions were performed on complete case data by excluding respondents with missing values from the observations. The second and third adjusted models were the sex-specific models in which the association between immigrant status and the number of visits to family physicians and specialist doctors were measured in male and female subsamples, respectively. Each model was run separately for family physician visits and specialist visits. The analysis process included the use of sampling weights and bootstrap weights. The overall fit of the model was determined using F-statistics. A p-value of 0.05 indicated the model's statistical significance. For all the adjusted models, coefficients with standard errors, p-values, and incident rate ratios (IRR) at 95% confidence intervals (CI) were reported.

The variance inflation factor (VIF) was used to analyze the multicollinearity between independent variables. The VIF parameter denotes the inflation in the variance of an estimated coefficient that is attributable to multicollinearity. VIF >10 is generally considered problematic for regression analysis. [144]

3.7 Sensitivity Analysis

Sensitivity analysis using multiple imputations was conducted to account for the missing values. To impute missing values, all variables used in the adjusted multivariable regression analysis were also included in the imputation model. Multiple imputations were performed using fully conditional specification (FCS), which treats each imputed variable as having its own unique conditional distribution unlike Markov Chain Monte Carlo (MCMC) method, which assumes an overall multivariate normal distribution (MVN) for all imputed variables.[144] FCS method was preferred over MVN because the variables to be imputed had different distributional patterns.[145] For instance, the distribution of outcome variables (e.g., number of family physician visits and number of specialist visits) was count in nature and we used negative binomial regression for them. In comparison, the independent variables were a mix of categorical (binary, multinomial, and ordinal) variables for which logistic regressions with certain specifications were used. Twenty-five imputations were performed and the imputed datasets were analyzed to obtain a pooled estimate of parameters. Findings from multiple imputations did not change the results obtained from the complete case analysis.

Chapter 4

4 Results

4.1 Descriptive Statistics

Figures 1 and 2 illustrate the distribution of visits to family physicians and specialists, respectively, for both Canadian-born and immigrants with multimorbidity.

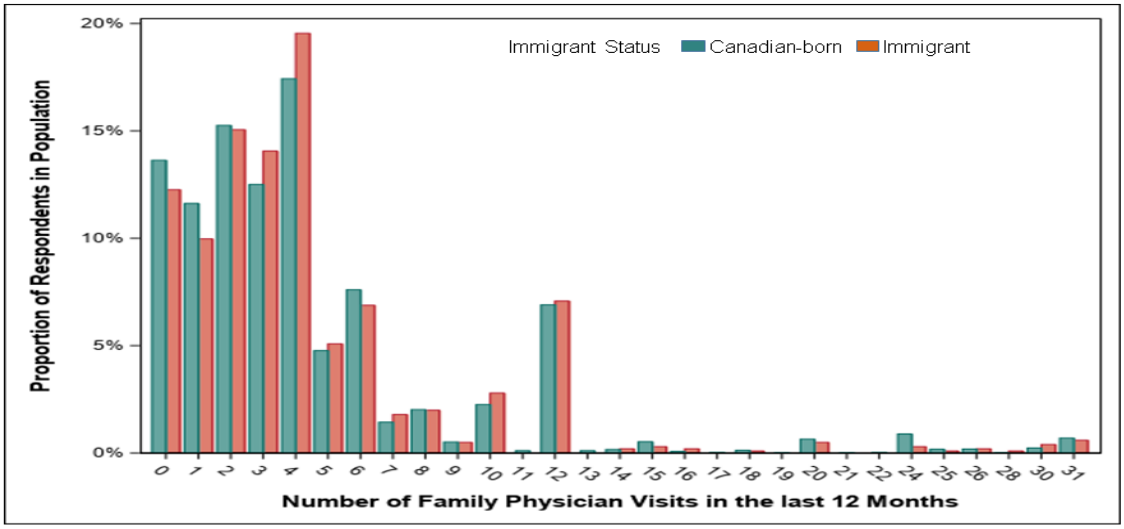


Figure 1: Frequency of Family Physician Visits among Sample with Multimorbidity by Immigrant Status in the last 12 Months

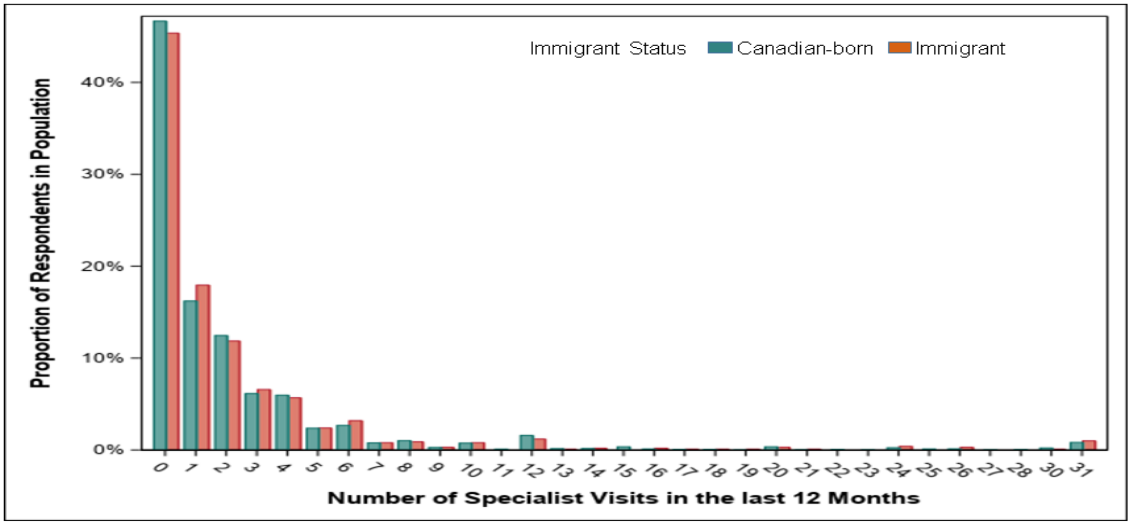


Figure 2: Frequency of Specialist Visits among Sample with Multimorbidity by Immigrant Status in the Last 12 Months

The baseline characteristics of study variables by immigrant status are summarized in Tables 2 and 3. Immigrants in the multimorbidity sample represent 16.9% of the Canadian population, with women accounting for 58.3%. In the overall multimorbidity sample containing both males and females, half reported having completed post-secondary education, 78.8% were covered by insurance, and 91.2% had a regular health care provider. Almost 40 % of the total sample were 65 years or older, and 15.1% reported being non-white. Males compared to females tended to be older, more overweight, more educated, married and in better financial condition.

When compared to native-born Canadians, a greater proportion of immigrants with multimorbidity were male (45.8% vs 40.9%), non-white (47.4% vs 8.9%), had a post-secondary education (61.1% vs 48.5%) and were 65 years or older (50.5% vs 38.6%). In comparison to immigrants, a higher proportion of Canadian-born with multimorbidity reported being obese (34.6% vs 27.2%) and single (20% vs 11.3%). The majority of immigrants with multimorbidity resided in Ontario (55.8%), followed by British Columbia (19.6%), and Quebec (12.7%), while only 1.3% resided in the Atlantic provinces.

Table 2: Descriptive Characteristics of the Study Variables in Overall Sample and by Immigrant Status

	Total Multimorbid Sample n=10281	**Non-immigrants with multimorbidity n=8826**	**Immigrants with multimorbidity n=1151**
Characteristics	n (%)	n (%)	n (%)
Immigrant Status by Length of Stay*			
Non-immigrant	8826 (79.1)		
Recent Immigrant (0-9 Years residency)	51 (1.2)		
Established Immigrant (>=10 years residency)	1004 (13.9)		
Missing	400 (5.8)		
Predisposing Factors			
Sex			
Male	4132 (41.7)	3504 (40.9)	515 (45.8)
Female	6149 (58.3)	5322 (59.1)	636 (54.2)
Missing			
Age			

18-34	728 (10.7)	676 (11.6)	36 (5.5)
35-49	1163 (15.4)	1040 (15.5)	90 (13.9)
50-64	3070 (33.1)	2716 (34.3)	276 (30.1)
65 and older	5320 (40.9)	4394 (38.6)	749 (50.5)
Missing			
Education			
Less than secondary	2778 (23)	2504 (24.2)	175 (15.4)
Secondary	2363 (25)	2050 (25.3)	244 (21.9)
Post-secondary	4979 (50)	4146 (48.5)	707 (61.1)
Missing	161 (1.9)	126 (2)	25 (1.6)
Marital Status			
Married/common-law	4678 (55.9)	3963 (54.8)	578 (61.2)
Widow/separated/divorced	3757 (25.4)	3196 (25.1)	444 (27.2)
Single	1820 (18.5)	1650 (20)	123 (11.3)
Missing	26 (0.2)	17 (0.1)	6 (0.4)
Racial/cultural Status			
White	8866 (80.4)	8021 (90.5)	799 (51.2)
Non-white	1109 (15.1)	758 (8.9)	338 (47.4)
Missing	306 (4.5)	47 (0.6)	14 (1.4)
Sense of Community Belonging			
Very strong	1959 (16.6)	1682 (16.5)	234 (18.3)
Somewhat strong	4395 (43.3)	3776 (43)	491 (44.5)
Somewhat weak	2416 (25.4)	2102 (26)	250 (23.5)
Very weak	1296 (12.4)	1106 (12.7)	140 (10.4)
Missing	215 (2.4)	160 (1.8)	36 (3.4)
Enabling Factors			
Income			
Less than $20,000	2154 (15.8)	1882 (15.2)	193 (16.3)
$20,000 to $39,999	2971 (24.5)	2513 (24.6)	328 (21.6)
$40,000 to $59,999	1784 (17.7)	1543 (17.7)	195 (17.7)
$60,000 to $79,999	1152 (13)	997 (13.6)	134 (11)
$80,000 or more	2212 (29)	1886 (28.9)	299 (33.2)
Missing	8 (0.1)	5 (0.1)	2 (0.1)
Insurance			
Yes	8245 (78.8)	7295 (82.6)	894 (78.1)
No	1753 (16.9)	1498 (16.9)	248 (20.9)
Missing	283 (4.3)	33 (0.5)	9 (1)
Has Regular Health Care Provider			
Yes	9491 (91.2)	8210 (92.6)	1082 (93.4)
No	695 (7.1)	607 (7.2)	69 (6.6)
Missing	95 (1.7)	9 (0.2)	0 (0)
Province			
Ontario	3425 (40.3)	2776 (36.2)	519 (55.8)
Quebec	2069 (22.3)	1872 (24.1)	108 (12.7)
British Columbia	1311 (12.9)	998 (11.7)	288 (19.6)
The Prairies	1919 (15.8)	1699 (17.4)	196 (10.6)
Atlantic Canada	1557 (8.7)	1481 (10.5)	40 (1.3)
Missing			

Need Factors			
Self-perceived Health			
Excellent	381 (3.8)	306 (3.7)	62 (4)
Very good	1782 (18.4)	1555 (19.7)	180 (13.2)
Good	3604 (36.3)	3086 (35.5)	418 (41.9)
Fair	2856 (26.5)	2477 (26.9)	291 (23.1)
Poor	1627 (14.9)	1376 (14.1)	196 (17.7)
Missing	31 (0.2)	26 (0.2)	4 (0.1)
Body Mass Index			
Normal /underweight	2996 (31.3)	2488 (29.6)	401 (38.4)
Overweight	3285 (31.5)	2793 (31.7)	401 (31.2)
Obese	3602 (33.2)	3207 (34.6)	308 (27.2)
Missing	398 (4)	338 (4.1)	41 (3.2)

Notes: n =Unweighted frequency of sample; % =Weighted percentage of population; *Length of stay was not included in the final analysis as sample size within recent immigrants with multimorbidity was insufficient.

Table 3: Descriptive Characteristics of the Study Variables in Sex-Specific Multimorbidity Subsamples by Immigrant Status.

	Male Sample n=4132		**Female Sample n=6149**	
	Non-immigrant n=3504	**Immigrant n=515**	**Non-immigrant n=5322**	**Immigrant n=636**
Characteristics	n (%)	n (%)	n (%)	n (%)
Predisposing Factors				
Age				
18-34	177 (8.3)	11 (3.5)	499 (13.9)	25 (7.2)
35-49	303 (12.7)	32 (13.5)	737 (17.5)	58 (14.3)
50-64	1156 (38.2)	119 (28.7)	1560 (31.5)	157 (31.3)
65 and older	1868 (40.9)	353 (54.3)	2526 (37.1)	396 (47.2)
Missing				
Education				
Less than secondary	989 (24)	69 (12.9)	1515 (24.3)	106 (17.5)
Secondary	783 (24.5)	95 (22.4)	1267 (25.9)	149 (21.6)
Post-secondary	1681 (49.8)	341 (63.1)	2465 (47.6)	366 (59.3)
Missing	51 (1.8)	10 (1.6)	75 (2.2)	15 (1.6)
Marital Status				
Married/common-law	1922 (63.5)	317 (72.5)	2041 (48.8)	261 (51.7)
Widow/separated/divorced	909 (16.2)	140 (16.7)	2287 (31.2)	304 (36.1)
Single	667 (20.1)	55 (10.6)	983 (19.9)	68 (11.9)
Missing	6 (0.1)	3 (0.3)	11 (0.1)	3 (0.4)
Racial/cultural Status				
White	3196 (91.1)	354 (53.4)	4825 (90.1)	445 (49.4)
Non-white	288 (8.3)	154 (45)	470 (9.4)	184 (49.5)

Missing	20 (0.7)	7 (1.6)	27 (0.6)	7 (1.1)
Sense of Community Belonging				
Very strong	681 (16.9)	106 (23.7)	1001 (16.2)	128 (13.8)
Somewhat strong	1556 (44.5)	211 (38.4)	2220 (41.9)	280 (49.6)
Somewhat weak	818 (25.6)	125 (28.1)	1284 (26.3)	125 (19.6)
Very weak	387 (10.8)	55 (7.1)	719 (14.1)	85 (13.1)
Missing	62 (2.2)	18 (2.7)	98 (1.6)	18 (3.9)
Enabling Factors				
Income				
Less than $20,000	566 (11.4)	65 (14.4)	1316 (17.9)	128 (18)
$20,000 to $39,999	956 (24.2)	149 (21.6)	1557 (24.8)	179 (21.6)
$40,000 to $59,999	682 (18.3)	84 (17.7)	861 (17.4)	111 (17.7)
$60,000 to $79,999	426 (12.1)	56 (8)	571 (14.6)	78 (13.6)
$80,000 or more	872 (33.9)	159 (38)	1014 (25.4)	140 (29.1)
Missing	2 (0.1)	2 (0.3)	3 (0.1)	0 (0)
Insurance				
Yes	2896 (82.6)	399 (77.3)	4399 (82.6)	495 (78.8)
No	599 (17.1)	111 (21.6)	899 (16.8)	137 (20.3)
Missing	9 (0.2)	5 (1.1)	24 (0.7)	4 (0.9)
Has Regular Health Care Provider				
Yes	3246 (91.8)	483 (92)	4964 (93.1)	599 (94.7)
No	253 (7.9)	32 (8)	354 (6.7)	37 (5.3)
Missing	5 (0.3)	0 (0)	4 (0.2)	0 (0)
Province				
Ontario	1083 (34.4)	234 (54.9)	1693 (37.5)	285 (56.6)
Quebec	770 (24.6)	57 (12.8)	1102 (23.8)	51 (12.7)
British Columbia	364 (11.6)	123 (19.5)	634 (11.8)	165 (19.7)
The Prairies	671 (18)	82 (11.5)	1028 (17)	114 (9.9)
Atlantic Canada	616 (11.4)	19 (1.4)	865 (9.9)	21 (1.2)
Missing				
Need Factors				
Self-perceived Health				
Excellent	128 (3.9)	23 (3.7)	178 (3.5)	39 (4.4)
Very good	588 (19.1)	79 (14.7)	967 (20.1)	101 (11.9)
Good	1203 (34.9)	182 (39.5)	1883 (35.9)	236 (44)
Fair	1005 (27.5)	141 (24.9)	1472 (26.5)	150 (21.6)
Poor	572 (14.5)	89 (17.3)	804 (13.8)	107 (18)
Missing	8 (0.2)	1 (0.1)	18 (0.2)	3 (0.2)
Body Mass Index				
Normal /underweight	864 (24.9)	162 (34.3)	1624 (32.9)	239 (41.9)
Overweight	1284 (38.4)	219 (36.4)	1509 (27)	182 (26.8)
Obese	1318 (35.7)	130 (28.4)	1889 (33.9)	178 (26.2)
Missing	38 (1)	4 (0.9)	300 (6.3)	37 (5.1)

Notes: n =Unweighted frequency of sample; % =Weighted percentage of population

4.2 Bivariate Analysis

The frequency of family physician and specialist visits was compared by immigration status and all other relevant covariates (see Table 4 and Table 5). On average, visits to family physicians and specialists among immigrants with multimorbidity were comparable to those born in Canada. The mean number of family physician visits among immigrants with multimorbidity was 4.4±0.3 while for non-immigrants it was 4.5±0.1. Similarly, immigrants with multimorbidity had an average of 2.1±0.2 visits to specialists in comparison to 2.4±0.1 among non-immigrants. There were, however, significant associations between the outcome variables and other predisposing, enabling and need factors. For example, females with multimorbidity, in general, had a higher number of visits to family physicians and specialists than males with multimorbidity. Age appears to have an effect on the frequency of visits to family physicians and specialists in the female subsample, as increasing age was associated with a decrease in the frequency of visits to family physicians and specialists. Women with higher academic qualifications, such as secondary and post-secondary education, made significantly more visits to specialists and family physicians than women with less than secondary education. Men demonstrated this trend only for specialist visits. Lower household income was associated with an increase in both family physician and specialist visits. Enabling factors such as insurance coverage and a regular health care provider were found to be positively associated with an increased family physician and specialist visits. In terms of need-based factors, self-perceived fair or poor health status was associated with a higher frequency of family physician and specialist visits than those who reported being in excellent or very good health. Similarly, individuals who are obese made significantly more visits to family physicians than individuals who are normal weight/underweight.

Table 4: Number of Family Physician Visits by Categories of Independent Variables

	Total Sample n=9014		**Male Sample n=3748**		**Female Sample n=5266**	
	Mean (SE)	P value	Mean (SE)	P value	Mean (SE)	P value
Immigrant Status (Key Predictor)						
Non-immigrant	4.5 ± 0.1		4.1 ± 0.1		4.7 ± 0.1	
Immigrant	4.4 ± 0.3	0.843	4.4 ± 0.5	0.515	4.4 ± 0.3	0.965

Predisposing Factors						
Age						
18-34	4.7 ± 0.4		3.5 ± 0.5		5.3 ± 0.5	
35-49	4.8 ± 0.3		4.7 ± 0.7		4.9 ± 0.4	
50-64	4.8 ± 0.2	**<0.001**	4.4 ± 0.3	**<0.001**	5.1 ± 0.2	**<0.001**
65 and older	3.9 ± 0.1		3.8 ± 0.1		4 ± 0.1	
Marital Status						
Married/common-law	4.4 ± 0.1		4 ± 0.2		4.8 ± 0.2	
Widow/divorced/separated	4.6 ± 0.2	0.102	4.6 ± 0.3	**0.005**	4.7 ± 0.2	0.519
Single	4.3 ± 0.2		4.2 ± 0.3		4.3 ± 0.3	
Education						
Less than secondary	4.3 ± 0.2		4.5 ± 0.5		4.1 ± 0.3	
Secondary	4.6 ± 0.2	**<0.001**	4.2 ± 0.3	0.108	5 ± 0.2	**<0.001**
Post-secondary	4.4 ± 0.1		3.9 ± 0.2		4.8 ± 0.2	
Racial/cultural Status						
White	4.4 ± 0.1		4.1 ± 0.1		4.6 ± 0.1	
Non-white	4.9 ± 0.3	**<0.001**	4.5 ± 0.6	**0.016**	5.2 ± 0.3	**<0.001**
Sense of Community Belonging						
Very strong	4.7 ± 0.3		4.2 ± 0.5		5.1 ± 0.3	
Somewhat strong	4.2 ± 0.1	**<0.001**	4.1 ± 0.2	0.392	4.2 ± 0.1	**<0.001**
Somewhat weak	4.7 ± 0.2		4.2 ± 0.3		5 ± 0.3	
Very weak	4.6 ± 0.3		3.8 ± 0.3		5.1 ± 0.4	
Enabling Factors						
Income						
Less than $20,000	4.8 ± 0.3		5.2 ± 0.4		4.7 ± 0.3	
$20,000 to $39,999	4.4 ± 0.2		4.1 ± 0.2		4.5 ± 0.2	
$40,000 to $59,999	4.7 ± 0.3	**<0.001**	4.3 ± 0.5	**<0.001**	5.1 ± 0.4	0.061
$60,000 to $79,999	4.3 ± 0.3		3.3 ± 0.3		4.8 ± 0.4	
$80,000 or more	4.2 ± 0.2		4 ± 0.2		4.4 ± 0.2	
Insurance Coverage						
Yes	4.6 ± 0.1	**<0.001**	4.3 ± 0.2	**<0.001**	4.8 ± 0.1	**0.008**
No	3.8 ± 0.2		3.3 ± 0.3		4.2 ± 0.2	
Has Regular Health Care Provider						
Yes	4.6 ± 0.1		4.3 ± 0.2		4.8 ± 0.1	
No	2.5 ± 0.3	**<0.001**	2.3 ± 0.3	**<0.001**	2.6 ± 0.5	**<0.001**
Province						
Ontario	4.6 ± 0.2		4.3 ± 0.3		4.8 ± 0.2	
Quebec	2.5 ± 0.1		2.4 ± 0.2		2.6 ± 0.2	
British Columbia	5.7 ± 0.3	**<0.001**	5.1 ± 0.4	**<0.001**	6.1 ± 0.4	**<0.001**
The Prairies	5.2 ± 0.2		4.5 ± 0.3		5.8 ± 0.3	
Atlantic Canada	5.3 ± 0.3		5.4 ± 0.5		5.2 ± 0.3	
Need Factors						
Perceived Health						
Excellent	2.7 ± 0.3		2.7 ± 0.5		2.7 ± 0.3	
Very good	3.2 ± 0.1		3 ± 0.2		3.3 ± 0.2	
Good	4 ± 0.1	**<0.001**	3.5 ± 0.2	**<0.001**	4.3 ± 0.2	**<0.001**

Fair	4.9 ± 0.2		4.7 ± 0.3		5.1 ± 0.3	
Poor	7 ± 0.4		6.7 ± 0.6		7.3 ± 0.4	
Body Mass Index						
Normal/Underweight	4.3 ± 0.2		4.2 ± 0.4		4.3 ± 0.2	
Overweight	4.2 ± 0.1	**<0.001**	3.8 ± 0.2	**<0.001**	4.6 ± 0.2	**<0.001**
Obese	4.8 ± 0.2		4.4 ± 0.2		5.1 ± 0.2	

Notes: Values are expressed as mean ± standard error; Mean=Average number of family physician visits by categories of independent variables; SE=Standard Error of mean; P-values are calculated at 95% CI; Significant associations ($p \leq 0.05$) are marked in bold.

Table 5: Number of Specialist Visits by Categories of Independent Variables

	Total Sample n=9014		**Male Sample n=3748**		**Female Sample n=5266**	
	Mean (SE)	P value	Mean (SE)	P value	Mean (SE)	P value
Immigrant Status (key Predictor)						
Non-immigrant	2.4 ± 0.1		2.1 ± 0.1		2.6 ± 0.1	
Immigrant	2.1 ± 0.2	0.642	2.3 ± 0.3	0.106	2 ± 0.3	0.059
Predisposing Factors						
Age						
18-34	3.1 ± 0.4		2.3 ± 0.5		3.4 ± 0.5	
35-49	3 ± 0.2		3.1 ± 0.4		3 ± 0.3	
50-64	2.5 ± 0.2	**<0.001**	2.2 ± 0.2	**<0.001**	2.7 ± 0.2	**<0.001**
65 and older	1.8 ± 0.1		1.8 ± 0.1		1.7 ± 0.1	
Marital Status						
Married/common-law	2.2 ± 0.1		2.1 ± 0.1		2.4 ± 0.2	
Widow/divorced/separated	2.5 ± 0.2	**<0.001**	2.3 ± 0.2	0.058	2.5 ± 0.2	**0.003**
Single	2.6 ± 0.2		2.4 ± 0.3		2.7 ± 0.3	
Education						
Less than secondary	1.6 ± 0.1		1.7 ± 0.2		1.6 ± 0.2	
Secondary	2.5 ± 0.2	**<0.001**	2.4 ± 0.2	**<0.001**	2.6 ± 0.2	**<0.001**
Post-secondary	2.6 ± 0.1		2.2 ± 0.1		2.8 ± 0.2	
Racial/cultural Status						
White	2.4 ± 0.1		2.2 ± 0.1		2.5 ± 0.1	
Non-white	2.1 ± 0.2	0.499	2.1 ± 0.3	0.881	2.1 ± 0.3	0.313
Sense of Community Belonging						
Very strong	2.6 ± 0.2		2.3 ± 0.3		2.9 ± 0.4	
Somewhat strong	2.1 ± 0.1	**<0.001**	2 ± 0.1	**<0.001**	2.2 ± 0.2	**<0.001**
Somewhat weak	2.3 ± 0.2		2.1 ± 0.2		2.5 ± 0.2	
Very weak	2.7 ± 0.3		2.5 ± 0.3		2.8 ± 0.4	
Enabling Factors						
Income						
Less than $20,000	2.8 ± 0.2		3.2 ± 0.4		2.7 ± 0.3	

$20,000 to $39,999	2 ± 0.1		1.8 ± 0.2		2.2 ± 0.2	
$40,000 to $59,999	2.2 ± 0.2	**<0.001**	2 ± 0.2	**<0.001**	2.4 ± 0.2	**<0.001**
$60,000 to $79,999	2.1 ± 0.2		1.9 ± 0.2		2.3 ± 0.3	
$80,000 or more	2.5 ± 0.2		2.2 ± 0.2		2.8 ± 0.3	
Insurance Coverage						
Yes	2.5± 0.1	**<0.001**	2.3 ± 0.1	**<0.001**	2.7 ± 0.1	**<0.001**
No	1.6 ± 0.1		1.6 ± 0.2		1.6 ± 0.1	
Has Regular Health Care Provider						
Yes	2.4 ± 0.1		2.2 ± 0.1		2.5 ± 0.1	
No	1.3 ± 0.2	**<0.001**	1.1 ± 0.2	**<0.001**	1.5 ± 0.3	**<0.001**
Province						
Ontario	2.7 ± 0.2		2.5 ± 0.2		2.9 ± 0.2	
Quebec	2 ± 0.1		1.9 ± 0.2		2.1 ± 0.2	
British Columbia	2.3 ± 0.2	**<0.001**	2 ± 0.2	**<0.001**	2.4 ± 0.3	**<0.001**
The Prairies	2 ± 0.2		1.9 ± 0.2		2.2 ± 0.2	
Atlantic Canada	2.1 ± 0.2		1.9 ± 0.2		2.2 ± 0.2	
Need Factors						
Perceived Health						
Excellent	1.9 ± 0.4		1.4 ± 0.3		2.2 ± 0.7	
Very good	1.7 ± 0.2		1.3 ± 0.2		1.9 ± 0.3	
Good	1.9 ± 0.1	**<0.001**	1.8 ± 0.1	**<0.001**	2 ± 0.2	**<0.001**
Fair	2.4 ± 0.1		2.4 ± 0.2		2.4 ± 0.2	
Poor	4.3 ± 0.3		3.7 ± 0.4		4.7 ± 0.5	
Body Mass Index						
Normal/underweight	2.4 ± 0.2		2.5 ± 0.2		2.4 ± 0.2	
Overweight	2.1 ± 0.1	**<0.001**	1.9 ± 0.1	**<0.001**	2.2 ± 0.2	**0.005**
Obese	2.5 ± 0.1		2.2 ± 0.2		2.8 ± 0.2	

Notes: Values are expressed as mean ± standard error; Mean=Average number of specialist visits by categories of independent variables; SE=Standard Error of mean; P-values are calculated at 95% CI; Significant associations ($p \leq 0.05$) are marked in bold.

4.3 Multivariable Regression Analysis

Tables 6 and 7 depict the regression estimates for the number of family physician visits and specialist visits respectively.

Table 6: Regression Estimates for Visits to Family Physicians in Multimorbidity Sample

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
Variables									
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Immigrant Status (Key Predictor)									
Non-immigrant									
Immigrant	-0.069 (0.051)	0.176	0.93 (0.84-1.03)	0.025 (0.083)	0.763	1.03 (0.87-1.21)	-0.146 (0.064)	**0.022**	0.86 (0.76-0.98)
Predisposing Factors									
Age									
18-34									
35-49	-0.145 (0.102)	0.154	0.87 (0.71-1.06)	0.157 (0.209)	0.453	1.17 (0.78-1.76)	-0.242 (0.111)	**0.030**	0.79 (0.63-0.98)
50-64	-0.221 (0.091)	**0.016**	0.80 (0.67-0.96)	0.022 (0.189)	0.907	1.02 (0.70-1.48)	-0.254 (0.098)	**0.010**	0.78 (0.64-0.94)
65 and older	-0.349 (0.089)	**<0.001**	0.70 (0.59-0.84)	-0.009 (0.182)	0.962	0.99 (0.69-1.42)	-0.429 (0.099)	**<0.001**	0.65 (0.54-0.79)
Marital Status									
Married/common-law									
Widow/divorced/separated	0.049 (0.046)	0.290	1.05 (0.96-1.15)	0.080 (0.077)	0.299	1.08 (0.93-1.26)	0.019 (0.055)	0.731	1.02 (0.91-1.14)
Single	-0.078 (0.067)	0.245	0.92 (0.81-1.06)	0.137 (0.114)	0.230	1.15 (0.92-1.43)	-0.193 (0.078)	**0.013**	0.82 (0.71-0.96)
Education									
Less than secondary									
Secondary	0.059 (0.063)	0.348	1.06 (0.94-1.20)	-0.062 (0.112)	0.582	0.94 (0.75-1.17)	0.134 (0.067)	**0.046**	1.14 (1.00-1.31)
Post-secondary	0.073 (0.053)	0.168	1.08 (0.97-1.19)	-0.069 (0.095)	0.467	0.93 (0.77-1.12)	0.169 (0.059)	**0.004**	1.18 (1.05-1.33)
Racial/cultural Status									

White									
Non-white	0.042 (0.059)	0.481	1.04 (0.93-1.17)	0.001 (0.103)	0.994	1.00 (0.82-1.22)	0.075 (0.074)	0.313	1.08 (0.93-1.25)
Sense of Community Belonging									
Very strong									
Somewhat strong	-0.148 (0.050)	**0.003**	0.86 (0.78-0.95)	-0.038 (0.083)	0.647	0.96 (0.82-1.13)	-0.208 (0.061)	**0.001**	0.81 (0.72-0.92)
Somewhat weak	-0.061 (0.064)	0.338	0.94 (0.83-1.07)	0.032 (0.106)	0.764	1.03 (0.84-1.27)	-0.107 (0.073)	0.143	0.89 (0.78-1.04)
Very weak	-0.187 (0.081)	**0.021**	0.83 (0.71-0.97)	-0.253 (0.122)	**0.039**	0.78 (0.61-0.99)	-0.159 (0.095)	0.093	0.85 (0.71-1.03)
Enabling Factors									
Income									
less than $20,000									
$20,000 to $39,999	0.001 (0.058)	0.981	1.00 (0.89-1.22)	-0.113 (0.098)	0.248	0.89 (0.74-1.08)	0.050 (0.072)	0.487	1.05 (0.91-1.21)
$40,000 to $59,999	0.089 (0.081)	0.272	1.09 (0.93-1.28)	-0.004 (0.154)	0.981	0.99 (0.74-1.35)	0.131 (0.079)	0.100	1.14 (0.98-1.33)
$60,000 to $79,999	0.002 (0.078)	0.976	1.00 (0.86-1.17)	-0.232 (0.132)	0.079	0.79 (0.61-1.03)	0.111 (0.094)	0.238	1.12 (0.93-1.35)
$80,000 or more	-0.066 (0.071)	0.355	0.94 (0.81-1.08)	-0.086 (0.129)	0.505	0.92 (0.71-1.18)	-0.057 (0.079)	0.471	0.94 (0.81-1.10)
Insurance									
No									
Yes	0.207 (0.051)	**<0.001**	1.23 (1.11-1.36)	0.273 (0.093)	**0.003**	1.31 (1.09-1.58)	0.169 (0.054)	**0.002**	1.18 (1.07-1.32)
Has Regular Health Care Provider									
No									
Yes	0.565 (0.122)	**<0.001**	1.76 (1.39-2.24)	0.511 (0.189)	**0.007**	1.67 (1.15-2.41)	0.599 (0.157)	**<0.001**	1.82 (1.34-2.48)
Province									
Ontario									
Quebec	-0.521 (0.058)	**<0.001**	0.59 (0.53-0.66)	-0.471 (0.091)	**<0.001**	0.62 (0.52-0.75)	-0.558 (0.074)	**<0.001**	0.57 (0.49-0.66)

British Columbia	0.295 (0.055)	**<0.001**	1.34 (1.21-1.49)	0.251 (0.082)	**0.002**	1.29 (1.09-1.51)	0.319 (0.069)	**<0.001**	1.38 (1.19-1.58)
The Prairies	0.166 (0.052)	**0.002**	1.18 (1.07-1.31)	0.113 (0.085)	0.181	1.12 (0.95-1.32)	0.189 (0.065)	**0.004**	1.21 (1.06-1.37)
Atlantic Canada	0.129 (0.058)	**0.025**	1.14 (1.02-1.27)	0.234 (0.102)	**0.023**	1.26 (1.03 - 1.54)	0.060 (0.061)	0.324	1.06 (0.94-1.19)
Need Factors									
Perceived Health									
Excellent									
Very Good	0.149 (0.115)	0.193	1.16 (0.93-1.46)	0.055 (0.198)	0.782	1.06 (0.72-1.56)	0.230 (0.124)	0.064	1.26 (0.99-1.61)
Good	0.420 (0.112)	**<0.001**	1.52 (1.22-1.89)	0.261 (0.191)	0.172	1.29 (0.89-1.89)	0.528 (0.118)	**<0.001**	1.69 (1.34-2.14)
Fair	0.641 (0.115)	**<0.001**	1.89 (1.51-2.38)	0.479 (0.196)	**0.015**	1.61 (1.09-2.37)	0.757 (0.124)	**<0.001**	2.13 (1.67-2.72)
Poor	0.948 (0.119)	**<0.001**	2.58 (2.04-3.27)	0.827 (0.208)	**<0.001**	2.29 (1.52-3.44)	1.04 (0.128)	**<0.001**	2.83 (2.20-3.64)
Body Mass Index									
Normal/underweight									
Overweight	0.004 (0.049)	0.933	1.00 (0.91-1.11)	-0.071 (0.080)	0.375	0.93 (0.79-1.09)	0.073 (0.056)	0.194	1.08 (0.96-1.20)
Obese	0.058 (0.048)	0.229	1.06 (0.96-1.16)	0.005 (0.083)	0.953	1.00 (0.85-1.18)	0.089 (0.056)	0.110	1.09 (0.98-1.22)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold.

Table 7: Regression Estimates for Visits to Specialists in Multimorbidity Sample

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
Variables									
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Immigrant Status (Key Predictor)									
Non-immigrant									
Immigrant	-0.060 (0.099)	0.546	0.94 (0.77-1.14)	0.024 (0.136)	0.862	1.02 (0.78-1.34)	-0.149 (0.149)	0.320	0.86 (0.64-1.16)
Predisposing Factors									
Age									
18-34									
35-49	-0.219 (0.142)	0.122	0.80 (0.61-1.06)	0.032 (0.272)	0.907	1.03 (0.61-1.76)	-0.329 (0.172)	0.057	0.72 (0.51-1.01)
50-64	-0.491 (0.137)	**<0.001**	0.61 (0.47-0.80)	-0.396 (0.263)	0.132	0.67 (0.40-1.13)	-0.496 (0.171)	**0.004**	0.61 (0.44-0.85)
65 and older	-0.673 (0.136)	**<0.001**	0.51 (0.39-0.67)	-0.441 (0.259)	0.090	0.64 (0.39-1.07)	-0.769 (0.175)	**<0.001**	0.46 (0.33-0.65)
Marital Status									
Married/common-law									
Widow/divorced/separated	0.155 (0.084)	0.065	1.17 (0.99-1.38)	0.086 (0.110)	0.433	1.09 (0.88-1.35)	0.197 (0.117)	0.091	1.22 (0.97-1.53)
Single	-0.002 (0.114)	0.985	0.99 (0.79-1.25)	0.068 (0.161)	0.674	1.07 (0.78-1.47)	-0.044 (0.152)	0.774	0.96 (0.71-1.29)
Education									
Less than secondary									
Secondary	0.332 (0.094)	**<0.001**	1.39 (1.16-1.67)	0.274 (0.137)	**0.045**	1.32 (1.01-1.72)	0.368 (0.132)	**0.005**	1.44 (1.12-1.87)
Post-secondary	0.455 (0.084)	**<0.001**	1.58 (1.34-1.86)	0.302 (0.124)	**0.015**	1.35 (1.06-1.73)	0.570 (0.121)	**<0.001**	1.77 (1.39-2.24)
Racial/cultural Status									
White									

Non-white	-0.237 (0.102)	**0.020**	0.79 (0.65-0.96)	-0.132 (0.154)	0.394	0.88 (0.65-1.19)	-0.266 (0.146)	0.069	0.77 (0.58-1.02)
Sense of Community Belonging									
Very strong									
Somewhat strong	-0.237 (0.099)	**0.017**	0.79 (0.65-0.96)	-0.118 (0.117)	0.314	0.89 (0.71-1.12)	-0.272 (0.136)	**0.046**	0.76 (0.58-0.99)
Somewhat weak	-0.245 (0.107)	**0.022**	0.78 (0.64-0.96)	-0.155 (0.150)	0.303	0.86 (0.64-1.15)	-0.259 (0.140)	0.065	0.77 (0.59-1.02)
Very weak	-0.201 (0.126)	0.110	0.82 (0.64-1.05)	-0.044 (0.171)	0.798	0.96 (0.68-1.34)	-0.256 (0.168)	0.129	0.77 (0.56-1.08)
Enabling Factors									
Income									
less than $20,000									
$20,000 to $39,999	-0.181 (0.103)	0.080	0.83 (0.68-1.02)	-0.408 (0.159)	**0.011**	0.66 (0.49-0.91)	-0.069 (0.137)	0.610	0.93 (0.71-1.22)
$40,000 to $59,999	-0.137 (0.104)	0.190	0.87 (0.71-1.07)	-0.271 (0.165)	0.100	0.76 (0.55-1.05)	-0.078 (0.145)	0.588	0.92 (0.69-1.23)
$60,000 to $79,999	-0.138 (0.137)	0.315	0.87 (0.66-1.14)	-0.234 (0.176)	0.184	0.79 (0.56-1.12)	-0.103 (0.195)	0.598	0.90 (0.62-1.32)
$80,000 or more	-0.057 (0.118)	0.631	0.94 (0.75-1.19)	-0.210 (0.169)	0.215	0.81 (0.58-1.13)	0.019 (0.161)	0.909	1.02 (0.74-1.39)
Insurance									
No									
Yes	0.335 (0.087)	**<0.001**	1.39 (1.18-1.66)	0.228 (0.152)	0.134	1.26 (0.93-1.69)	0.421 (0.109)	**<0.001**	1.52 (1.23-1.89)
Has Regular Health Care Provider									
No									
Yes	0.562 (0.131)	**<0.001**	1.75 (1.36-2.27)	0.673 (0.198)	**0.001**	1.96 (1.33-2.89)	0.507 (0.177)	**0.004**	1.66 (1.17-2.35)
Province									
Ontario									
Quebec	-0.164 (0.094)	0.080	0.85 (0.71-1.02)	-0.140 (0.125)	0.260	0.87 (0.68-1.11)	-0.165 (0.140)	0.240	0.85 (0.64-1.12)
British Columbia	0.094 (0.105)	0.368	0.91 (0.74-1.12)	-0.221 (0.137)	0.107	0.80 (0.61-1.05)	0.020 (0.154)	0.897	1.02 (0.75-1.38)

The Prairies	-0.294 (0.085)	**0.001**	0.75 (0.63-0.88)	-0.275 (0.133)	**0.039**	0.76 (0.59-0.99)	-0.302 (0.107)	**0.005**	0.74 (0.59-0.91)
Atlantic Canada	-0.265 (0.089)	**0.003**	0.77 (0.64-0.91)	-0.249 (0.126)	**0.047**	0.78 (0.61-0.99)	-0.273 (0.121)	**0.025**	0.76 (0.59-0.97)
Need Factors									
Perceived Health									
Excellent									
Very Good	-0.059 (0.218)	0.785	0.94 (0.61-1.44)	-0.079 (0.242)	0.742	0.92 (0.57-1.48)	0.029 (0.313)	0.924	1.03 (0.56-1.90)
Good	0.161 (0.207)	0.437	1.17 (0.78-1.76)	0.235 (0.222)	0.289	1.27 (0.82-1.96)	0.189 (0.303)	0.532	1.21 (0.67-2.19)
Fair	0.447 (0.209)	**0.033**	1.56 (1.04-2.36)	0.532 (0.221)	**0.016**	1.70 (1.10-2.63)	0.481 (0.309)	0.121	1.62 (0.88-2.97)
Poor	1.002 (0.214)	**<0.001**	2.72 (1.79-4.14)	0.964 (0.234)	**<0.001**	2.62 (1.66-4.15)	1.100 (0.314)	**<0.001**	3.01 (1.62-5.56)
Body Mass Index									
Normal/Underweight									
Overweight	-0.079 (0.078)	0.310	0.92 (0.79-1.08)	-0.179 (0.115)	0.117	0.84 (0.67-1.05)	-0.025 (0.106)	0.816	0.98 (0.79-1.20)
Obese	0.034 (0.084)	0.688	1.03 (0.88-1.22)	-0.127 (0.121)	0.292	0.88 (0.69-1.12)	0.147 (0.113)	0.193	1.16 (0.93-1.45)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold.

4.3.1 Outcome: Number of Visits to Family Physicians

4.3.1.1 Association between Immigration Status and Number of Family Physician Visits by Sex

After adjusting for relevant predisposing, enabling and need factors, the number of visits to family physicians in the overall sample (model 1) did not differ significantly by immigration status. However, sex-specific model with female subsample (model 3) revealed significant differences. Female immigrants with multimorbidity made significantly fewer visits to family physicians than Canadian-born females with multimorbidity (IRR 0.86, 95% CI: 0.76-0.98), while no statistically significant difference was observed between Canadian-born and immigrant males with multimorbidity (IRR 1.03, CI:0.87-1.21).

4.3.1.2 Association between Predisposing, Enabling and Need factors and Visits to Family Physicians

In the multivariable regression model, increasing age among females was significantly associated with a decrease in the frequency of family physician visits. For example, females aged 50-64 had a 22% lower rate of family physician visits in the preceding 12 months (IRR 0.78, CI: 0.64-0.94), while females aged 65 or over had a 35% lower rate of visits (IRR 0.65, CI: 0.54-0.79) than the reference age group of 18-34. After adjusting for other covariates, enabling factors such as insurance, having a regular health care provider, and province of residence retained their significant association with the outcome variable in both male and female subsamples. Individuals with insurance had 1.23 times the rate of visits to family physicians (IRR 1.23, CI: 1.11-1.36) as those without insurance, and those with a regular health care provider had 1.76 times the rate of visits to family physicians (IRR 1.76, CI: 1.39-2.24) as those without a regular health care provider. Similarly, compared to the reference province (Ontario), residents from the other provinces, except for residents from Quebec, reported a significantly higher number of consultations with family physicians. British Columbia residents had the highest rate of family physician visits (IRR 1.34, CI: 1.21-1.49), followed by residents of the Prairies (IRR 1.18, CI:1.07-1.31), and Atlantic Canada (IRR 1.14, CI:1.02-1.27). The reason why residents from Quebec had

a lower rate of family physician visits may be attributable to the fact that in Canada, Quebec has the highest proportion of residents without a regular family physician.[146] When all other variables were held constant, those who reported their health status as fair or poor had 1.89 (IRR 1.89, CI: 1.51-2.38) and 2.58 (IRR 2.58, CI: 2.04-3.27) times the rate of visits to family physicians, respectively, compared to those who reported being in excellent health condition. Additionally, those who reported a very weak sense of community belonging had a 17% lower rate of family physician visits (IRR 0.83, CI: 0.71-0.97) than those who reported a very strong sense of community belonging.

In the male multimorbidity subsample, marital status, racial status, education, income, and weight status had no statistically significant association with the number of family physician visits. Within the female multimorbidity subsample, however, having a post-secondary education was associated with an increased use of family physician services (IRR 1.18, CI: 1.05-1.33) compared to those who had less than secondary education. Being single was also significantly associated with a decreased use of family physician visits among females (IRR 0.82, CI:0.71-0.96).

4.3.2 Outcome: Number of Visits to Specialists

4.3.2.1 Association between Immigration Status and Number of Specialist Visits by Sex

In multivariable regression analysis, when models were adjusted for relevant predisposing, enabling, and need factors, no statistically significant association was observed between immigration status and the number of specialist visits in the overall multimorbidity sample (model 1) as well as in the sex-specific subsamples of multimorbidity (model 2 and model 3).

4.3.2.2 Association between Predisposing, Enabling and Need factors and Number of Visits to Specialists

Similar to the family physician outcome, visits to specialists were significantly associated with a variety of factors in the female subsample, including respondents' age, education, insurance coverage, availability of a regular health care provider, and province, even after adjusting for all relevant variables. Males with post-secondary education had 1.35 times

the rate of specialist visits (IRR1.35, CI:1.06-1.73) than those with less than secondary education, and those with a regular health care provider had 1.96 times the rate of specialist visits (IRR 1.96, CI:1.33-2.89) than those without. In both males and females, poor self-perceived health was a significant predictor of increased specialist consultations ($p<0.001$), with males and females reporting 2.62 and 3.01 times the rate of specialist visits, respectively (IRR 2.62, CI:1.66-4.15; IRR 3.01, CI:1.62-5.56), compared to those who reported their health as excellent.

4.4 Subgroup Analysis

4.4.1 Association between Immigration Status and Number of Family Physician and Specialist Visits for Specific Chronic Diseases.

To investigate the effects of specific chronic diseases on immigrant use of physician services (e.g., visits to family physicians and specialists), five disease-specific subsamples were created from the original sample (n=9,014). These included respiratory disease (n=4,569), cardiovascular disease (n=3,612), cancer (n=3,766), diabetes (n=3,854), and mental illness (n=4,528).

4.4.2 Multivariable Regression Analysis for Specific Chronic Disease Subsamples

Immigrants with diabetes, cancer, or chronic cardiovascular diseases had no statistically significant difference in the frequency of visits to family physicians or specialists compared to the Canadian-born population (see Table 8 and Table 9). There were, however, significant differences in family physician visits with mental illnesses and chronic respiratory diseases. Female immigrants with respiratory diseases had an 19% lower rate of family physician visits (IRR 0.81, 95% CI: 0.68-0.97) than Canadian-born females with similar characteristics. Furthermore, with mental illness, female immigrants had a rate of family physicians visits that was only 0.79 times that of Canadian-born females (IRR 0.79, CI: 0.67-0.92), while no statistically significant difference was observed for the male subsample (IRR 1.04, CI:0.74-1.45).

Table 8: Regression Estimates for Visits to Family Physicians for Specific Chronic Diseases

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Chronic Disease Groups									
Chronic Respiratory Condition	-0.195 (0.074)	**0.008**	0.82 (0.71-0.95)	-0.201 (0.137)	0.141	0.82 (0.63-1.07)	-0.206 (0.089)	**0.021**	0.81 (0.68-0.97)
Chronic Cardiovascular Disease	0.126 (0.069)	0.069	1.13 (0.99-1.30)	0.134 (0.095)	0.160	1.14 (0.95-1.38)	0.090 (0.103)	0.385	1.09 (0.89-1.34)
Diabetes	-0.014 (0.070)	0.838	0.99 (0.86-1.13)	0.009 (0.106)	0.927	1.01 (0.82-1.24)	-0.016 (0.093)	0.866	0.98 (0.82-1.18)
Cancer	-0.005 (0.066)	0.940	0.99 (0.87-1.13)	0.028 (0.093)	0.764	1.03 (0.86-1.23)	-0.049 (0.093)	0.602	0.95 (0.79-1.14)
Mental Illness	-0.176 (0.082)	**0.031**	0.84 (0.71-0.98)	0.038 (0.170)	0.823	1.04 (0.74-1.45)	-0.241 (0.083)	**0.004**	0.79 (0.67-0.92)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold; Regression estimates for immigrant status are only presented in which non-immigrants were the reference group; Statistical models were adjusted for relevant covariates (age, racial/cultural status, marital status, income, education, sense of community belonging, province, insurance, has regular health care provider, perceived health and BMI).

Table 9: Regression Estimates for Visits to Specialists for Specific Chronic Diseases

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Chronic Disease Groups									
Chronic Respiratory Condition	-0.104 (0.178)	0.559	0.90 (0.64-1.28)	-0.019 (0.264)	0.940	0.98 (0.58-1.65)	-0.237 (0.232)	0.307	0.79 (0.50-1.24)
Chronic Cardiovascular Disease	-0.015 (0.135)	0.914	0.99 (0.76-1.28)	-0.051 (0.159)	0.751	0.95 (0.69-1.29)	-0.052 (0.244)	0.831	0.95 (0.59-1.53)
Diabetes	-0.037 (0.132)	0.776	0.96 (0.74-1.25)	-0.171 (0.176)	0.331	0.84 (0.59-1.19)	0.130 (0.231)	0.572	1.14 (0.72-1.79)
Cancer	0.049 (0.133)	0.710	1.05 (0.81-1.36)	0.165 (0.181)	0.363	1.18 (0.83-1.68)	-0.095 (0.174)	0.585	0.91 (0.65-1.28)
Mental Illness	-0.208 (0.134)	0.122	0.81 (0.62-1.06)	-0.026 (0.209)	0.900	0.97 (0.65-1.47)	-0.315 (0.178)	0.077	0.73 (0.51-1.04)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold; Regression estimates for immigrant status are only presented in which non-immigrants were the reference group; Statistical models were adjusted for relevant covariates (age, racial/cultural status, marital status, income, education, sense of community belonging, province, insurance, has regular health care provider, perceived health and BMI).

4.5 Sensitivity Analysis Using Multiple Imputations

Our sample had 12.3% missing records. To account for the impact of missing values, a sensitivity analysis was performed using multiple imputations. The results of multiple imputations were comparable to those of the complete case analysis. After adjusting for relevant covariates, there was no significant difference in the estimates for the number of visits to family physicians and specialists between immigrants and non-immigrant populations with multimorbidity. The reported outcomes in the sex and disease-specific subsamples were also comparable to the findings in the complete case population. Multivariable regression estimates for multiple imputations are presented in Tables 10, 11, 12, and 13.

Table 10: Regression Estimates for Visits to Family Physicians in Multimorbidity Sample using Multiple Imputations

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
Variables									
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Immigrant Status (Key Predictor)									
Non-immigrant									
Immigrant	-0.075 (0.052)	0.148	0.93 (0.84-1.03)	-0.029 (0.078)	0.708	0.97 (0.83-1.13)	-0.092 (0.061)	**0.048**	0.90 (0.82-0.99)
Predisposing Factors									
Age									
18-34									
35-49	-0.127 (0.097)	0.193	0.88 (0.73-1.07)	0.235 (0.192)	0.219	1.27 (0.87-1.84)	-0.223 (0.102)	**0.029**	0.80 (0.66-0.98)
50-64	-0.222 (0.091)	**0.014**	0.80 (0.67-0.96)	0.135 (0.184)	0.463	1.14 (0.79-1.64)	-0.309 (0.094)	**0.001**	0.73 (0.61-0.88)
65 and older	-0.335 (0.088)	**<0.001**	0.72 (0.60-0.85)	0.079 (0.174)	0.651	1.08 (0.77-1.52)	-0.439 (0.091)	**<0.001**	0.64 (0.54-0.77)
Marital Status									
Married/common-law									
Widow/separated/divorced	0.048 (0.043)	0.266	1.05 (0.96-1.14)	0.079 (0.069)	0.247	1.08 (0.95-1.24)	0.029 (0.053)	0.575	1.03 (0.93-1.14)
Single	-0.076 (0.063)	0.227	0.93 (0.82-1.05)	0.128 (0.102)	0.211	1.14 (0.93-1.39)	-0.166 (0.074)	**0.025**	0.85 (0.73-0.98)
Education									
Less than secondary									
Secondary	0.053 (0.063)	0.397	1.05 (0.93-1.19)	-0.060 (0.100)	0.547	0.94 (0.77-1.15)	0.109 (0.069)	0.113	1.12 (0.97-1.28)
Post-secondary	0.093 (0.054)	0.085	1.09 (0.99-1.22)	-0.015 (0.086)	0.862	0.99 (0.83-1.17)	0.167 (0.058)	**0.004**	1.18 (1.05-1.32)
Racial/cultural Status									

White									
Non-white	0.040 (0.064)	0.529	1.04 (0.92-1.18)	0.049 (0.106)	0.638	1.05 (0.85-1.29)	0.050 (0.067)	0.459	1.05 (0.92-1.20)
Sense of Community Belonging									
Very strong									
Somewhat strong	-0.163 (0.051)	**0.001**	0.85 (0.77-0.94)	-0.049 (0.078)	0.528	0.95 (0.82-1.11)	-0.229 (0.057)	**<0.001**	0.79 (0.71-0.89)
Somewhat weak	-0.102 (0.058)	0.080	0.90 (0.81-1.01)	-0.005 (0.097)	0.959	0.99 (0.82-1.20)	-0.161 (0.066)	**0.015**	0.85 (0.75-0.97)
Very weak	-0.209 (0.076)	**0.006**	0.81 (0.69-0.94)	-0.259 (0.113)	**0.021**	0.77 (0.62-0.96)	-0.207 (0.089)	**0.019**	0.81 (0.68-0.97)
Enabling Factors									
Income									
Less than $20,000									
$20,000 to $39,999	-0.004 (0.058)	0.942	0.99 (0.89-1.12)	-0.033 (0.094)	0.723	0.97 (0.80-1.16)	0.016 (0.069)	0.819	1.02 (0.89-1.16)
$40,000 to $59,999	0.063 (0.073)	0.387	1.06 (0.92-1.23)	0.024 (0.138)	0.860	1.02 (0.78-1.34)	0.089 (0.073)	0.221	1.09 (0.95-1.26)
$60,000 to $79,999	-0.038 (0.076)	0.622	0.96 (0.83-1.12)	-0.179 (0.120)	0.137	0.84 (0.66-1.06)	0.020 (0.090)	0.821	1.02 (0.85-1.22)
$80,000 or more	-0.072 (0.066)	0.273	0.93 (0.82-1.06)	-0.039 (0.118)	0.742	0.96 (0.76-1.21)	-0.076 (0.073)	0.298	0.93 (0.80-1.07)
Insurance									
No									
Yes	0.208 (0.050)	**<0.001**	1.23 (1.11-1.36)	0.267 (0.089)	**0.003**	1.31 (1.09-1.55)	0.167 (0.052)	**0.001**	1.18 (1.07-1.31)
Has Regular Health Care Provider									
No									
Yes	0.512 (0.119)	**<0.001**	1.67 (1.32-2.11)	0.507 (0.168)	**0.003**	1.66 (1.19-2.31)	0.515 (0.154)	**0.001**	1.67 (1.24-2.26)
Province									
Ontario									
Quebec	-0.469 (0.058)	**<0.001**	0.63 (0.56-0.70)	-0.468 (0.087)	**<0.001**	0.63 (0.53-0.74)	-0.463 (0.074)	**<0.001**	0.63 (0.54-0.73)

British Columbia	0.300 (0.053)	**<0.001**	1.35 (1.22-1.50)	0.248 (0.082)	**0.002**	1.28 (1.09-1.50)	0.339 (0.067)	**<0.001**	1.40 (1.23-1.59)
The Prairies	0.167 (0.048)	**<0.001**	1.18 (1.08-1.30)	0.087 (0.078)	0.265	1.09 (0.94-1.27)	0.215 (0.058)	**<0.001**	1.24 (1.11-1.39)
Atlantic Canada	0.125 (0.063)	**0.046**	1.13 (1.00-1.28)	0.205 (0.105)	0.052	1.23 (1.00-1.51)	0.093 (0.059)	0.118	1.09 (0.98-1.23)
Need Factors									
Perceived Health									
Excellent									
Very Good	0.121 (0.111)	0.276	1.13 (0.91-1.40)	0.054 (0.175)	0.759	1.06 (0.75-1.49)	0.166 (0.133)	0.211	1.18 (0.91-1.53)
Good	0.362 (0.108)	**0.001**	1.44 (1.16-1.77)	0.276 (0.173)	0.110	1.32 (0.94-1.85)	0.414 (0.126)	**0.001**	1.51 (1.18-1.94)
Fair	0.600 (0.112)	**<0.001**	1.82 (1.46-2.27)	0.485 (0.171)	**0.005**	1.62 (1.16-2.27)	0.667 (0.129)	**<0.001**	1.95 (1.51-2.51)
Poor	0.934 (0.114)	**<0.001**	2.54 (2.04-3.18)	0.836 (0.184)	**<0.001**	2.31 (1.61-3.31)	1.001 (0.135)	**<0.001**	2.72 (2.09-3.54)
Body Mass Index									
Normal/underweight									
Overweight	0.003 (0.049)	0.949	1.00 (0.91-1.10)	-0.063 (0.073)	0.388	0.94 (0.81-1.08)	0.049 (0.056)	0.382	1.05 (0.94-1.17)
Obese	0.090 (0.049)	0.067	1.09 (0.99-1.21)	0.021 (0.077)	0.788	1.02 (0.88-1.19)	0.126 (0.058)	0.031	1.13 (1.01-1.27)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold.

Table 11: Regression Estimates for Visits to Specialists in Multimorbidity Sample using Multiple Imputations

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
Variables									
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Immigrant Status (Key Predictor)									
Non-immigrant									
Immigrant	-0.090 (0.093)	0.331	0.91 (0.76-1.09)	-0.061 (0.124)	0.625	1.06 (0.83-1.36)	-0.196 (0.133)	0.140	0.82 (0.63-1.07)
Predisposing Factors									
Age									
18-34									
35-49	-0.282 (0.142)	**0.049**	0.75 (0.57-0.99)	0.103 (0.259)	0.691	1.11 (0.67-1.84)	-0.421 (0.145)	**0.004**	0.66 (0.49-0.87)
50-64	-0.536 (0.133)	**<0.001**	0.59 (0.45-0.76)	-0.319 (0.247)	0.197	0.73 (0.45-1.18)	-0.566 (0.142)	**<0.001**	0.57 (0.43-0.75)
65 and older	-0.724 (0.132)	**<0.001**	0.48 (0.37-0.63)	-0.421 (0.238)	0.078	0.66 (0.41-1.05)	-0.823 (0.144)	**<0.001**	0.44 (0.33-0.58)
Marital Status									
Married/common-law									
Widow/separated/divorced	0.149 (0.078)	0.056	1.16 (0.99-1.35)	0.062 (0.098)	0.528	1.06 (0.88-1.29)	0.226 (0.106)	**0.033**	1.25 (1.02-1.54)
Single	-0.007 (0.102)	0.945	0.99 (0.81-1.21)	0.001 (0.142)	0.994	1.00 (0.76-1.32)	-0.002 (0.127)	0.989	0.99 (0.78-1.28)
Education									
Less than secondary									
Secondary	0.257 (0.096)	**0.007**	1.29 (1.07-1.56)	0.266 (0.131)	**0.042**	1.30 (1.01-1.69)	0.253 (0.124)	**0.041**	1.29 (1.01-1.64)
Post-secondary	0.421 (0.087)	**<0.001**	1.52-(1.29-1.81)	0.329 (0.116)	**0.005**	1.39 (1.11-1.74)	0.497 (0.115)	**<0.001**	1.64 (1.31-2.06)
Racial/cultural Status									
White									

Non-white	-0.182 (0.103)	0.076	0.83 (0.68-1.02)	-0.149 (0.136)	0.273	0.86 (0.66-1.12)	-0.188 (0.133)	0.159	0.83 (0.64-1.08)
Sense of Community Belonging									
Very strong									
Somewhat strong	-0.242 (0.089)	**0.007**	0.79 (0.66-0.94)	-0.118 (0.109)	0.284	0.89 (0.72-1.10)	-0.289 (0.115)	**0.012**	0.75 (0.59-0.94)
Somewhat weak	-0.227 (0.096)	**0.018**	0.80 (0.66-0.96)	-0.155 (0.126)	0.220	0.86 (0.67-1.09)	-0.219 (0.120)	0.068	0.80 (0.63-1.02)
Very weak	-0.157 (0.117)	0.180	0.85 (0.68-1.07)	-0.039 (0.152)	0.795	0.96 (0.71-1.29)	-0.203 (0.141)	0.150	0.82 (0.62-1.08)
Enabling Factors									
Income									
Less than $20,000									
$20,000 to $39,999	-0.218 (0.103)	**0.035**	0.80 (0.66-0.98)	-0.388 (0.152)	**0.011**	0.68 (0.50-0.91)	-0.139 (0.119)	0.246	0.87 (0.69-1.10)
$40,000 to $59,999	-0.107 (0.107)	0.319	0.90 (0.73-1.11)	-0.218 (0.167)	0.192	0.80 (0.58-1.12)	-0.058 (0.133)	0.663	0.94 (0.73-1.23)
$60,000 to $79,999	-0.115 (0.139)	0.411	0.89 (0.68-1.17)	-0.227 (0.171)	0.184	0.79 (0.57-1.11)	-0.062 (0.185)	0.739	0.94 (0.65-1.35)
$80,000 or more	-0.047 (0.116)	0.685	0.95 (0.76-1.19)	-0.182 (0.166)	0.274	0.82 (0.59-1.13)	0.043 (0.143)	0.766	1.04 (0.79-1.38)
Insurance									
No									
Yes	0.326 (0.087)	**<0.001**	1.39 (1.17-1.65)	0.219 (0.133)	0.099	1.24 (0.96-1.61)	0.415 (0.099)	**<0.001**	1.51 (1.25-1.84)
Has Regular Health Care Provider									
No									
Yes	0.458 (0.149)	**0.002**	1.58 (1.18-2.12)	0.605 (0.198)	**0.002**	1.83 (1.24-2.70)	0.372 (0.189)	**0.050**	1.45 (1.00-2.10)
Province									
Ontario									
Province	-0.193 (0.088)	**0.028**	0.82 (0.69-0.98)	-0.117 (0.116)	0.312	0.89 (0.71-1.12)	-0.224 (0.120)	0.062	0.79 (0.63-1.01)
British Columbia	-0.099 (0.097)	0.303	0.90 (0.75-1.09)	-0.177 (0.129)	0.173	0.84 (0.65-1.08)	-0.022 (0.132)	0.866	0.98 (0.76-1.27)

The Prairies	-0.298 (0.082)	**<0.001**	0.74 (0.63-0.87)	-0.235 (0.120)	**0.050**	0.79 (0.62-1.00)	-0.328 (0.096)	**0.001**	0.72 (0.59-0.87)
Atlantic Canada	-0.261 (0.089)	**0.003**	0.77 (0.65-0.92)	-0.217 (0.122)	0.075	0.80 (0.63-1.02)	-0.282 (0.116)	**0.015**	0.75 (0.60-0.95
Need Factors									
Perceived Health									
Excellent									
Very Good	-0.064 (0.192)	0.739	0.94 (0.64-1.37)	-0.088 (0.212)	0.677	0.92 (0.60-1.39)	0.023 (0.267)	0.931	1.02 (0.61-1.73)
Good	0.157 (0.183)	0.393	1.17 (0.82-1.68)	0.177 (0.196)	0.366	1.19 (0.81-1.76)	0.205 (0.257)	0.423	1.23 (0.74-2.03)
Fair	0.420 (0.183)	**0.022**	1.52 (1.06-2.18)	0.482 (0.196)	**0.014**	1.62 (1.10-2.38)	0.464 (0.257)	0.071	1.59 (0.96-2.63)
Poor	0.932 (0.189)	**<0.001**	2.54 (1.75-3.67)	0.889 (0.204)	**<0.001**	2.43 (1.63-3.63)	1.03 (0.266)	**<0.001**	2.81 (1.67-4.73)
Body Mass Index									
Normal/Underweight									
Overweight	-0.046 (0.076)	0.546	0.95 (0.82-1.11)	-0.119 (0.103)	0.246	0.89 (0.72-1.09)	-0.007 (0.103)	0.949	0.99 (0.81-1.22)
Obese	0.062 (0.086)	0.470	1.06 (0.89-1.26)	-0.104 (0.115)	0.366	0.90 (0.72-1.13)	0.160 (0.102)	0.118	1.17 (0.96-1.44)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold.

Table 12:Regression Estimates for Visits to Family Physicians for Specific Chronic Diseases using Multiple Imputations

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Chronic Disease Groups									
Chronic Respiratory Condition	-0.175 (0.070)	**0.013**	0.84 (0.73-0.96)	-0.184 (0.132)	0.163	0.83 (0.64-1.08)	-0.167 (0.085)	**0.050**	0.85 (0.72-0.99)
Chronic Cardiovascular Disease	0.066 (0.068)	0.335	1.07 (0.93-1.22)	0.057 (0.085)	0.501	1.06 (0.89-1.25)	0.053 (0.093)	0.568	1.05 (0.88-1.27)
Diabetes	-0.018 (0.069)	0.789	0.98 (0.86-1.12)	-0.059 (0.097)	0.547	0.94 (0.78-1.14)	0.071 (0.092)	0.440	1.07 (0.89-1.29)
Cancer	-0.010 (0.066)	0.880	0.99 (0.87-1.13)	-0.048 (0.089)	0.591	0.95 (0.80-1.13)	-0.005 (0.088)	0.958	0.99 (0.84-1.18)
Mental Illness	-0.179 (0.073)	**0.014**	0.84 (0.72-0.96)	-0.018 (0.136)	0.893	0.98 (0.75-1.28)	-0.205 (0.088)	**0.019**	0.81 (0.69-0.97)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold; Regression estimates for immigrant status are only presented in which non-immigrants were the reference group; Statistical models were adjusted for relevant covariates (age, racial/cultural status, marital status, income, education, sense of community belonging, province, insurance, has regular health care provider, perceived health and BMI).

Table 13:Regression Estimates for Visits to the Specialists for Specific Chronic Diseases using Multiple Imputations

	Total Sample (Model 1)			**Male Subsample (Model 2)**			**Female Subsample (Model 3)**		
	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)	Co-efficient (SE)	P Value	IRR (95% CI)
Chronic Disease Groups									
Chronic Respiratory Condition	-0.110 (0.152)	0.466	0.89 (0.67-1.21)	0.172 (0.201)	0.393	1.19 (0.80-1.76)	-0.273 (0.193)	0.158	0.76 (0.52-1.11)
Chronic Cardiovascular Disease	-0.028 (0.123)	0.818	0.97 (0.76-1.24)	-0.029 (0.135)	0.830	0.97 (0.74-1.27)	-0.098 (0.186)	0.596	0.91 (0.63-1.30)
Diabetes	-0.068 (0.129)	0.599	0.93 (0.73-1.20)	-0.152 (0.153)	0.321	0.86 (0.64-1.16)	0.048 (0.197)	0.809	1.05 (0.71-1.54)
Cancer	0.066 (0.121)	0.586	1.07 (0.84-1.35)	0.176 (0.162)	0.279	1.19 (0.87-1.64)	-0.040 (0.156)	0.795	0.96 (0.71-1.30)
Mental Illness	-0.244 (0.124)	**0.049**	0.78 (0.61-0.99)	0.034 (0.175)	0.847	1.03 (0.73-1.46)	-0.379 (0.162)	**0.019**	0.69 (0.49-0.94)

Notes: SE=Standard Error of mean; IRR=Incident Rate Ratio; CL=Confidence Interval; Significant associations ($p \leq 0.05$) are marked in bold; Regression estimates for immigrant status are only presented in which non-immigrants were the reference group; Statistical models were adjusted for relevant covariates (age, racial/cultural status, marital status, income, education, sense of community belonging, province, insurance, has regular health care provider, perceived health and BMI).

Chapter 5

5 Discussion and Conclusion

5.1 Number of Visits to Family Physicians and Specialists

As no previous study in health care utilization has focused on immigrants with multimorbidity as a target population, all references and comparisons of study findings from this thesis were essentially limited to previous studies that examined the utilization patterns of general immigrant populations or focused on specific chronic diseases. In the overall multimorbidity sample, the number of visits to family physicians and specialists by immigrants in the preceding 12 months was comparable to that of native-born Canadians, contradicting our first hypothesis that there would be a significantly lower number of physician visits among immigrants with multimorbidity compared to the native-born populations with multimorbidity. By contrast, these findings are consistent with those of Laroche, Newbold, Latif and Miles.[1,10,60] However, neither of these studies focused on immigrants with multimorbidity, nor did they analyze physician service utilization by sex or for specific chronic diseases. Additionally, while the results in the male subsample were comparable between immigrants and Canadian-born individuals, the female subsample revealed a significant difference in family physician visits. This finding supports the thesis's second hypothesis, which assumed that female immigrants with multimorbidity would use less health care than Canadian-born females with multimorbidity.

Female immigrants, after adjusting for relevant covariates, were associated with a lower frequency of family physician visits than native-born females. This finding corroborated Straiton et al.'s observation that immigrant women make fewer visits to family physicians for mental health problems.[147] In contrast to our findings, Li and Ru reported comparable utilization of family physician services between chronically ill immigrant and Canadian-born women.[148] Again, these discrepancies in study findings are largely due to the heterogeneity of the study populations and study designs. Li and Ru, for example, obtained

the chronic disease sample by screening people who answered yes to at least one of the 17 chronic diseases listed in the CCHS dataset. Furthermore, the frequency of physician consultations was not taken into account because the outcome was a yes/no binary response.[148]

The lower number of visits to family physicians by female immigrants with multimorbidity can be explained by the multiple barriers to health care they face.[11,36,53] Apart from linguistic, financial, and structural constraints, their attitude towards health and cultural beliefs, as demonstrated by prior research, also contribute to the lack of access.[17,35] Another consideration is that the majority of immigrant women enter Canada under the family reunification category or as live-in caretakers, and are likely to have lower levels of education, financial independence, and social integration.[17,53,54]

5.2 Socio-cultural and Financial Integration of Immigrants

In terms of other risk and enabling factors, immigrants with multimorbidity had a higher level of post-secondary education, were more non-white, and were more likely to be married than native-born Canadians of similar characteristics. This could be a result of shifting immigration policies and immigrants' gradual socio-economic assimilation over time. Canadian immigration policy has evolved significantly over the years, from more restrictive to more receptive to cultural diversity.[149] The Canadian immigration model is largely characterized by two distinct features: skill-based selection and multiculturalism.[149,150] Since the introduction of multiculturalism as an official policy in 1971, and the enactment of a legislative framework in 1988, socio-cultural integration has been a critical component of this model.[149,150] This is reflected in the rapid influx of migrants from diverse ethnic backgrounds from all over the world, in contrast to earlier eras when European immigrants constituted the majority of Canada's immigrant population.[150] This is in line with the demographic characteristics of our sample of immigrants, as we observed a sizable proportion of immigrants are of non-white origin. In this study, social integration was represented by a sense of belonging to a local community.

Although our study identified a weak sense of community belonging as a significant predictor for lower family physician visits, it is important to note that the concept of social integration is difficult to capture using a single variable or question as provided by the CCHS.

Immigrants who are selected on the basis of their skills are more likely to be job-ready and contribute to the Canadian economy.[151] Recent decades have seen a dramatic increase in the number of economic migrants over family reunification (immigrants sponsored by family) as a result of a shift in emphasis toward selecting skilled migrants.[150,152] This may be reflected in the relatively high proportion of immigrants with post-secondary education in our multimorbidity sample compared to native-born Canadians. Other Canadian investigations have produced similar results.[151,153] However, selecting highly qualified and educated immigrants does not necessarily imply that they will be accepted into the labor market proportionately. In line with previous research, our findings indicate that immigrants continue to be in a worse financial position than non-immigrants, particularly in high-demand professional positions.[154,155] According to a recent report by Statistics Canada, immigrants have a much higher rate of overeducation than native-born Canadians, with university graduates accounting for only 38% of growth in high-skilled jobs between 2001 and 2016, compared to 60% for native-born graduates.[154] This suggests that immigrants may face discriminatory barriers in the competitive labor market, most likely as a result of the devaluation of their foreign academic credentials, communication barriers, and a lack of social networks.[155]

5.3 Number of Family Physician and Specialist Visits for Specific Chronic Diseases

For this thesis, a subgroup analysis of immigrants' disease-specific health care utilization was conducted. The findings indicate that immigrants have a significantly lower rate of family physician visits for chronic respiratory diseases and mental illnesses than native-born Canadians which partially supports the third hypothesis of this thesis, as it was

expected that immigrants with specific chronic diseases would underutilize physician services in comparison to native-born Canadians affected by the same disease. This finding concurs with prior research, as several studies reported similar findings. [90,114,118,147] Again, female immigrants reported significantly fewer visits to family physicians compared to Canadian-born females, while for male immigrants the number of visits was lower with respiratory diseases but not statistically significant when adjusted for relevant covariates. The importance of mental health care may be overlooked among women of certain ethnic groups due to social stigma, cultural beliefs and lack of knowledge about Canadian health care.[156]

Studies are very sparse for respiratory disease-specific health service utilization among immigrants. However, our findings corroborated those of Javier et al..[112] Javier et al. found that immigrant children with asthma had a lower rate of physician services, including annual specialist visits, and a lack of a consistent source of health care, when compared to children from non-immigrant families.[112]

Both immigrants and non-immigrants had comparable patterns of family physician visits for cancer, diabetes, and chronic cardiovascular diseases. For immigrants with diabetes, the rate of family physician visits and specialist visits was similar to that of native-born Canadians. These findings contrast previous Canadian research by Wang et al., who found that immigrants with diabetes in Ontario and British Columbia use physician services at a significantly lower rate than non-immigrants diabetics.[108] Additionally, Hayman et al. reported that recent immigrants with diabetes use health care at a lower rate than Canadian-born diabetics.[109] Similar findings were also reported in Italy by Marchesini et al..[110] The findings from the current study, however, are similar to those of another Canadian study by Grant and Retnakaran, which employed CCHS data and found no significant difference between these two groups in terms of health care usage and self-care management of diabetes.[111] This inconsistency in results could possibly be related to the differences in study designs, data sources, and measures of selected outcomes. Reports suggest that in Canada, immigrants have a higher prevalence of diabetes than native-born Canadians, with

a 40% increased risk of progressing from prediabetes to diabetes.[157] With diabetes, differential utilization of health services was frequently reported when the immigrant population was stratified by ethnic origin, country of origin, or time since immigration, in contrast to studies that used the data from CCHS, which has certain limitations with regard to a number of those critical variables. As a result, our findings for the diabetic subsample, as well as those for cardiovascular disease and cancer, should be interpreted with caution, and future research should focus on a more comprehensive stratification of the immigrant community to provide a better understanding of the disparities in their health care use patterns.

In terms of specialist visits, the rate ratios were comparable between immigrant and non-immigrant populations across all disease groups. This could be because specialist visits in Canadian health care are heavily reliant on referrals from primary care physicians, and while immigrants are less likely to visit a family physician, they may have a similar or even higher rate of referrals to specialists.[158] As previously discussed, immigrants' lack of health knowledge and reliance on traditional home care, as well as language and administrative barriers, may discourage them from seeking primary and preventative care on a routine basis. Another factor to consider is that the outcome variable – “Visits to the Specialist” is insufficiently detailed in the CCHS to allow for the comparison of intricate differences in disease-specific use of specialist services.

5.4 Strengths

This was a secondary cross-sectional study of a nationally representative population with a relatively large sample size. To our knowledge, this is the first study to compare the use of primary physician services and specialist services between immigrant and Canadian-born populations with multimorbidity. Sex differences between immigration status and the number of visits to family physicians and specialist doctors were also analyzed. Furthermore, the study also examined the use of those health services for specific chronic diseases by immigration status.

Within the limited scope of the dataset, we adjusted a number of predisposing, enabling, and need factors supported by Andersen and Newman's behavioral model that lends weight to the findings. For example, very few studies have used sense of community belonging as a covariate. The definition of multimorbidity and selection of chronic diseases were consistent with those established by the PHAC, which makes the findings more comparable to other studies using the same definition. Additionally, the study used data from the CCHS 2015-2016 cycle, as opposed to many previous studies that used older data sources.

Cross-sectional secondary analysis is often plagued by missing values or an inadequate response rate. In this study, the problem was addressed by performing a sensitivity analysis with multiple imputations for each variable of interest that had missing data points. Multiple imputation results were comparable to those obtained from the complete case analysis. This indicates that the results were not biased by missing values.

5.5 Limitations

The CCHS PUMF has many constraints that can limit the scope of a secondary investigation. These limitations are almost always unavoidable, prompting caution when extrapolating the findings to other study contexts. To begin, the CCHS is based on self-reported health data and allows for proxy responses, which have been shown to underestimate immigrant utilization of physician services.[159] Although this issue was circumvented by eliminating proxy respondents from the sample, the validity of self-reported health outcomes remains a concern due to subjective preferences and recall bias.[160] However, evidence suggests that self-reported outcome measures can be sufficiently valid and reliable for determining health status and morbidity.[139,161] Self-reported outcomes in health service utilization were found to have high concordance with administrative data in a study by Short et al., especially with younger and more educated male participants and a relatively shorter recall period.[162]

Secondly, despite being an important predictor, immigrants' length of residency could not be incorporated into the study due to the small sample size. After dividing immigrants with

multimorbidity into recent and established immigrants, samples sizes were not sufficient enough to carry out further analysis (see Table 2). Given that recent immigrants are more likely to be younger and have a lower prevalence of chronic diseases, this thesis acknowledges the expected differences in age distribution and multimorbidity prevalence between recently migrated immigrants and more established immigrants. In the CCHS PUMF, time in Canada since immigration was classified as a dichotomous variable, with recent immigrants defined as those who have been in Canada for 0-9 years and established immigrants as those who have been in Canada for 10 or more years. Although, it should be noted that this broad classification (0-9 years and 10 or more years) itself is not particularly useful, as prior research has shown that a shorter time interval would allow for a better assessment of the trend in immigrant health status and service usage.[40]

Another limitation is that cross-sectional data only provides a snapshot of time rather than establishing causality between the independent and dependent variables as a longitudinal study would. Furthermore, more detailed information about visits to specialist doctors would have been significantly more informative for disease-specific outcomes. Unfortunately, in the CCHS, "Visits to Specialists" is a composite variable that refers to visits to any specialist doctors, independent of practice specialization.

Finally, and perhaps most importantly, the CCHS lacks several key research variables that would have been pertinent for the current study. Certain variables (e.g., immigration category, country of birth) that could have been significant in explaining health care utilization among immigrants with multimorbidity were either unavailable in the dataset or restricted for public use. For example, racial/cultural status was limited to white and non-white in PUMF for confidential issues. Additionally, certain variables had a high percentage of non-respondents. As a result, we were unable to conduct a more in-depth examination of the cultural or racial differences in primary health care utilization among various ethnic groups. Immigrants' usage of health services is often influenced by their country of origin and ethnicity.[34,66] This is especially true among female immigrants as they tend to be affected more by cultural or religious barriers.[11,17] In some settings, allied

healthcare professionals other than family physicians and specialist medical doctors may have a role in multimorbidity management that could not be evaluated in this study due to a lack of study variables. Similarly, rural/urban status and category of immigration were considered, but there were no related variables in the CCHS to conduct these stratified analyses. There is a need for research on urban-rural disparities in healthcare utilization because the geographic location may have an impact on healthcare use while unmet health care needs and use of health services may differ significantly depending on whether an immigrant entered Canada as a principal applicant via economy class, was sponsored by the family, or landed as a refugee.[163] Also, it is worth noting that the CCHS dataset does not provide any information on the severity of chronic diseases which could lead to residual confounding.

5.6 Scope of Future Studies

Future research should prioritize immigrants with multimorbidity as a target population for public health intervention and conduct in-depth analyses of their unmet health care needs and health care utilization. This could include stratification based on ethnicity and country of origin, as cultural barriers are not only a major barrier to immigrant access to and use of health care, particularly among female subgroups, but also one of the most difficult to address, given Canada's relative lack of culturally sensitive primary care physicians.[15] Additionally, stratified analysis by the length of residency should be considered to account for unobserved heterogeneity in the distribution of multimorbidity among immigrants, as the risk of multimorbidity can vary significantly over the course of an immigrant's stay in the host country.

Prospective research should also segment the immigrant population with multimorbidity according to the primary health care settings in which they receive care. Immigrants, particularly recent immigrants, are less likely than non-immigrants to have a regular family physician, which may drive them to seek immediate care at walk-in clinics.[40] Immigrants who face multiple barriers to care frequently prefer walk-in clinics due to their convenient

location, extended operating hours, and lack of waiting time for appointments that they would otherwise have to make with their family physicians.[164] However, it has been well documented that the service provided by walk-in clinics lacks continuity of care, which can be a concern for people with multiple chronic diseases.[165] Given the importance of follow-up and continuation of treatment for people with multimorbidity, whether an immigrant seeks health care at a family physician's office or a walk-in clinic can have a significant impact on the quality of care. Therefore, future studies may benefit by stratifying the sample by an indicator measuring access to the family physician. Similarly, in-depth comparisons should also be made by the type of primary care being received (e.g., preventative health screening, maternal care).

In terms of qualitative research, a broader range of focus groups should be sampled for in-depth interviews, with a particular emphasis on immigrants who live outside of major cities, in order to elicit any unobserved differences in the use of health care services by immigrants. Historically, the majority of qualitative research on immigrant health care access has taken place in larger metropolitan areas such as Toronto or Montreal. Furthermore, qualitative research can provide more insights on the indirect discrimination that immigrants face within the health care system, as well as on gender disparities. All of this can assist public health policymakers in developing appropriate policies and programs to assist immigrants, particularly female immigrants, in reducing cultural and social barriers to care.

This thesis sought to focus on the public health perspective of multimorbidity and thus included five major chronic disease groups (i.e., chronic cardiovascular disease, chronic respiratory disease, diabetes, cancer, and mental illness) in accordance with the PHAC's selection criteria, which are significantly associated with morbidity, mortality and health care costs in the Canadian population. Future research may also examine other chronic diseases, such as musculoskeletal disorders (e.g., arthritis) and digestive system disorders (e.g., gastroenteritis and irritable bowel syndrome), to ascertain the extent to which immigrant and non-immigrants use primary care services for those health problems.

Finally, future research should incorporate longitudinal data to shed more light on this topic. Because multimorbidity necessitates ongoing medical evaluation, a follow-up study would track changes in immigrant health as well as changes in their service use patterns over time. Furthermore, administrative data would provide more assurance than self-reported health outcomes.

5.7 Conclusion

This thesis expands on prior research that examined the relationship between health care utilization and immigrant status, but with a different target population and secondary outcomes. The study revealed some similarities and significant differences in the use of physician services between immigrants and their Canadian-born counterparts with multimorbidity. Female immigrants with multimorbidity consulted family physicians at a lower rate than Canadian-born women while no substantial differences were observed between male immigrants and their Canadian-born peers with multimorbidity. Moreover, when compared to Canadian-born females, female immigrants with mental problems and chronic respiratory diseases made fewer visits to family physicians. Furthermore, analysis of disease-specific subsamples revealed no significant differences between immigrants and non-immigrants for chronic cardiovascular diseases, diabetes, or cancer regardless of their sex status. However, given the multiple barriers that immigrants face in accessing health care, as well as the limitations inherent in a cross-sectional PUMF, these differences may be more significant than they appear and warrant further examination.

Thus, future qualitative research could elucidate these health care barriers in greater detail, with an emphasis on immigrant women. Quantitative studies should incorporate longitudinal data to track immigrants' health status and health-related quality of life over time, particularly among those with multimorbidity, while more subjective measures such as unmet health care needs and utilization of specific types of primary health care should be explored using finer stratification of immigrant subgroups.

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