EQUITY IN HEALTH CARE UTILIZATION AMONG FIRST NATIONS POPULATIONS LIVING OFF-RESERVE IN CANADA

by

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Table of Contents

List of Tables

List of Figures

ABSTRACT

Background: Reducing inequities (unfair inequalities) in health and health care is a primary goal of health policy in Canada. Inequity in utilization of care is a significant issue. Inequity may be present in the utilization of many types of health care services including but not limited to: primary care, specialist care, mental health care and dental care. Although the investigation of inequity in health care utilization is common in the general population and several subpopulations in Canada, little research has been done to assess inequities in health care utilization within Indigenous populations in this country. There are several reasons to investigate inequity in health care utilization among this population, including differences in health status, health care coverage and cultural/historical context.

Objective: To examine income-related inequity in four types of health care utilization within two off-reserve Indigenous populations in Canada *viz.* status and non-status First Nations, namely: primary care (general practitioner/nurse care), specialist care, dental care and mental health care utilization.

Methods: The study was conducted as a secondary analysis using a cross-sectional survey. We used the 2012 Aboriginal Peoples Survey (APS), which is a nationally representative survey of the off-reserve Indigenous populations in Canada administered through statistics Canada. The survey collects information on income, health care utilization, need and various other non-need variables required for the analysis. The target population for this research was adults ($>$18 years) who self-identified as a member of any First Nations group in Canada. Inequity was assessed using multiple methods: the Horizontal Inequity index (HI) was calculated for primary and specialist care to compare the degree of horizontal inequity between both status and non-status First Nations groups. The Concentration index (C) and logistic regression was employed for testing inequity in both mental and dental health care utilization for these populations.

Results: This research indicated significant inequities in health care utilization within First Nations peoples living off-reserve in Canada. Specifically, there is pro-rich inequity in primary care utilization for the total First Nations populations, HI: 0.2085 (95% CI: 0.1521, 0.2649) and for those in each status group individually (more pro-rich in the status population). Additionally, inequity in dental care utilization is present based on the concentration index of actual use for those who need care. We find pro-rich inequity in the total population, C: 0.0812 (95% CI: 0.0182, 0.1442) and in the non-status population, C: 0.1783 (95% CI: 0.0771, 0.2794). Results also show no evidence of inequity in specialist care utilization or mental health care utilization, although statistically insignificant point estimates for inequity are moderately pro-rich.

Conclusion: This research has filled a gap in the literature around inequity in health care utilization for off-reserve First Nations populations in Canada by measuring inequity within both status and non-status groups individually. These results have provided insight into income-related inequities in health care utilization for First Nations populations in Canada and may provide valuable evidence for policy makers in this area.

List of Abbreviations Used

CHA	Canada Health Act
SES	Socioeconomic status
APS	Aboriginal Peoples Survey
OOP	Out-of-pocket
VAC	Veterans Affairs Canada
NIHB	Non-Insured Health Benefits
HI	Horizontal inequity index
GP	General practitioner
NP	Nurse practitioner
PUMF	Public use microdata file
NHS	National Household Survey
SRH	Self-rated health
K10	Kessler psychological distress scale
VIF	Variance inflation factor
AIC	Akaike information criterion
BIC	Bayesian information criterion
CC	Concentration curve
C	Concentration index
TPF	Thunderbird Partnership Foundation
OR	Odds ratio
aOR	Adjusted odds ratio
CI	Confidence interval

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Chapter 1 Introduction

Reducing inequity (a difference that is deemed unfair) is a primary objective of health care systems in most countries, including Canada (1,2). Inequity can be present in health outcomes as well as several aspects of the health care system, such as financing, utilization, access, quality and allocation. Two important criteria for the health care system in Canada, universality and accessibility, are outlined in the Canada Health Act (CHA) and form the legislative basis for equity within the Canadian system. Equity in two aspects of the health care system, finance and utilization, are of particular importance for many policy objectives and is therefore important to provide justification of changes made to the health care system. In Canada, there are some studies analyzing inequity in health care utilization in the general population (3–6). These studies assess systematic associations between the use of health care after accounting for need of health care and socioeconomic status (SES). Despite the acknowledgement of the importance of equity in the Canadian health care system, studies have shown that inequity is present in various types of health care use, such as primary care, specialist care, mental health care and dental care (6,7). In addition, an analysis of overall health care system equity, showed that Canada has fallen behind other similar countries (8).

Many factors influence health care utilization of individuals, such as health care coverage, need for health care and experiences in the health care system. Each of these factors are especially applicable to Indigenous populations in Canada. Federal health coverage is available to certain Indigenous peoples, health indicators are poor in these populations signifying an increased need for health care and the historical impact of colonisation and cultural differences may influence the way these populations interact with the health care system. Nevertheless, very few studies in the current literature analyze health care utilization among Indigenous populations living in Canada (9,10). Further, studies in the area of Indigenous health in Canada have not analyzed inequity in health care utilization on a national scale, and fail to differentiate between Indigenous populations. This research has filled a gap in the literature by analyzing both the presence and magnitude of inequity in health care utilization among status and non-status First Nations peoples

living off-reserve in Canada using the 2012 Aboriginal[1] Peoples Survey (APS), a national survey produced by Statistics Canada. The Horizontal Inequity index (HI), the Concentration index (C) and logistic regression were used in order to measure and/or test inequity in primary care, specialist care, mental health care and dental care utilization within this population.

[1] The term Aboriginal is a Canadian definition which includes the three groups defined in the Constitution Act (1982): First Nations, Métis and Inuit. In this document the term Indigenous will be used as it is an internationally recognized and inclusive term for any individual who considers themselves related to the "First Peoples" (33).

Chapter 2 Background and Rationale

2.1 Inequity in Health Care

Equity is a concept that underlies many health-related policy objectives for governments around the world (1,11). The concept of equity is applicable not only for health outcomes of individuals, but also in many areas within the health care system (6,12,13), such as primary care, specialist care, mental health care and dental care (6,7). Looking specifically at equity in health care, different countries place emphasis on different aspects of equity, however a common view shared between many is that health care should be financed according to ability to pay (ATP) and used based on need for health care (14). The measures that account for these aspects of equity (financing and utilization) are common in the literature and are important for policy makers in this area as they align with the objectives of many health care systems. Although equity is recognized as important objective in many areas of health care, inequity remains a prominent issue (15,16).

In applied health research, inequality refers to a difference that may be fair, unfair or neither that exists among people or groups. In this understanding of the term, many inequalities are good and are in fact needed. Differences in the amount of health care used by an individual, for example, may be warranted by the amount of need for care that the individual has. Conversely, inequity refers to a difference that is deemed unfair or unjust (17). When it comes to health care utilization this translates into an appropriate amount of utilization of health care based on the health care needs of the individual in question. Equity can be conceptualized in one of two ways, horizontally or vertically. Horizontal equity (in the context of utilization) implies that those members of the population with the same level of health care need use equivalent amounts of health care. Conversely, vertical equity refers to different levels of health care utilization among those with different levels of health care need. Determining the appropriate difference in health care utilization as per the difference in health care need is difficult in practice, making the vertical measurement of inequity more challenging and therefore, less common in the health inequity literature (18). Measuring inequity empirically is almost always done from a horizontal perspective.

Multiple measurement approaches are used to analyze inequity in health care utilization in the literature. The difficulty common across all approaches lies in the disentanglement

of an individuals' need for health care and factors that influence use and are independent of need, often referred to as non-need factors. Common non-need factors considered include income or another measure of SES, and the assessment of inequity is often expressed as either pro-rich (inequitable favoring the rich) or pro-poor (inequitable favoring the poor). Determining what variable should be considered as a need or non-need variable is challenging. There are circumstances where the same variable may indicate either need or non-need. In the example of income, because of the association between income and health, this variable would be indicative of need in the absence of a direct measure of health (such as self-rated health or the presence of chronic conditions). However, income would indicate non-need after adjustment for a direct measure of health. Regression analyses can be used to determine whether health care utilization is associated with non-need factors after adjustment for need factors, which indicate inequity. Alternatively, based on the regression analyses, need-predicted use can be calculated and compared to observed utilization to determine inequity. The resulting need-standardized use is then used as evidence of inequity and indicates the degree of the association between income (or a chosen SES variable) and health care utilization across populations.

2.2 Inequity in Canada's Health Care System

The evolution of the Canadian health care system began with separation of legislative power between federal and provincial governments in the *Constitution Act, 1867* and culminated with the *Canada Health Act, 1984*. Improvements in the financing and delivery of health care in Canada have been guided by the single primary objective outlined in the CHA, which is to "facilitate reasonable access to health services without financial or other barriers" (2). In continuing to adapt and make improvements to the health care system in Canada, the satisfaction of this objective is paramount. Regulation of health care is primarily the responsibility of provincial and territorial governments in Canada, however, the federal government contributes financially to "medically necessary" health services. The CHA is the basis for the financial contribution from the federal government, which provides funding to the provinces and territories given they meet the criteria presented in the Act. This transfer of funds is called the Canada Health Transfer and is based on five criteria namely, universality, public administration, comprehensiveness, portability and

accessibility. Although equity is not explicitly written in this piece of legislation, the criteria of universality and accessibility provide the basis for equity as a fundamental part of the system (6,19,20).

For most Canadians, health care is primarily publicly financed with approximately 70% of funds being contributed by federal and provincial/territorial governments (some groups in Canada have varying coverage, which will be discussed further for Indigenous populations in Section 2.3.2.2). This figure has remained relatively constant for the past 20 years (21), with the other 30% being contributed privately through either private insurance or direct out-of-pocket (OOP) payments by the health care user. Publicly funded health care (referred to as Medicare) provides the insured access to "necessary" medical care. This varies by province and territory, but generally includes access to physician and hospital services and may additionally provide complete or partial coverage in several other areas, such as vision care, prescription drug coverage, ambulance services, long-term/palliative care, etc. Private insurance in Canada has varying degrees of coverage and is offered by several different providers. This may include coverage for prescription medication, dental care, rehabilitation and various other types of health care provided outside of hospitals. This insurance is often provided by employers or purchased on an individual level and covers certain services that are not deemed "medically necessary" and therefore not covered through provincial governments. Private insurance is more commonly acquired by those of higher SES, meaning that others may have to pay OOP for services that are left uncovered. In 2015, 14.2% of health care expenditures came from OOP payments with that percentage trending upwards (21). This cost has led to non-adherence for uncovered treatments and services (22). This disproportionately affects those of low SES in the population, and may contribute to inequity in use of health care (6,22,23). Additionally, there are other factors which may influence inequities in utilization in this country. As health care is the responsibility of the provincial and territorial governments some variation in coverage is inevitable, with different jurisdictions placing value in different areas. Further, additional health coverage through federal programs like that of Canadian veterans, through Veterans Affairs Canada (VAC) or for Indigenous populations, through the Non-Insured Health Benefits (NIHB) program may also contribute to variations in health care coverage between groups in Canada.

As evidenced by the discussion of Canada's health care system, there is a long-standing interest in reducing inequities in health care utilization in this country (24). Some studies assess these inequities in the general population (6) and in several sub-populations of Canada (3–5). There are many ways to measure inequity in practice with some testing for presence, while others evaluate inequity. A common way to quantify horizontal inequity in populations was developed by Wagstaff and van Doorslaer in 1992 (1). This method employs the use of a single index, called the Horizontal Inequity Index (HI), which acts as a standardized way to report inequity across populations. The measurement produces a single value which quantifies inequity, with positive (negative) values indicating a pro-rich (pro-poor) inequity is present. Studies using the HI often break utilization into types of health care such as: primary care visits, specialist visits, outpatient visits and dental care visits, among others. Based on a study by Allin in 2008, utilization of specialist and dental services across all Canadian provinces were pro-rich, while General practitioner (GP) visits were generally pro-poor in all provinces, except for Quebec. When considering only those with at least one physician visit, this inequity becomes significantly pro-poor for GP visits and even the HI approaches 0 for specialist visits (with a value close to 0 indicating almost no inequity in this area) (6). This may suggest a barrier to entry into the medical system for those of lower SES. This finding is supported by previous research in the area, including those on a national scale (25). Studies in mental health in Canada also show similar trends. Utilization of mental health care tends to be equitable when visiting a GP or other physician, however is pro-rich for utilization of non-physician services for mental health concerns (7,26). When looking at the utilization of dental care we tend to see larger inequities due primarily to lack of insurance for those of lower SES (27). Several studies have reported pro-rich inequity in dental health care utilization across this country (6,28).

Inequity is very much present in Canada's health care system; in a 2017 comparison of health care systems for 11 Organization for Economic Cooperation and Development (OECD) countries, Canada placed ninth overall and ninth in health care system equity, which included measurements of inequity in 11 aspects of the health care system, from areas of both access (timeliness, affordability, etc.) and care process (patient engagement, preventative care, etc.). Canada's cumulative score in this area placed them ahead of only France and the United States (8).

2.3 Inequity in an Indigenous Context

2.3.1 Indigenous populations in Canada

In Canada, there are three distinct Indigenous groups recognized by the Canadian Constitution: Inuit, Métis and First Nations (29). The Inuit are the Indigenous peoples living primarily in the arctic region of Canada. This is the smallest Indigenous group at approximately 65,000 people (30). The Métis people are those of mixed European and Indigenous descent and make up approximately 36% (587,545) of all Indigenous populations in Canada (30). Finally, the First Nations are the largest Indigenous group and comprise almost 60% (977,235) of the population of Indigenous peoples in Canada (30). There are over 600 First Nations across Canada each with distinct history and culture. First Nations can be further qualified based on where they live, their "status", band membership, etc. Understanding "Indian status" in Canada is not trivial and there are certain intricacies to this system that will not be discussed completely here. First, it is important to note that not having Indian status does not imply that one is not Indigenous, rather, it means that this individual has not met the qualifications laid out by the federal government under the *Indian Act*. These qualifications are made based primarily on lineage, but there are other ways in which Indigenous individuals have historically been stripped of their status (31). If an individual does meet these qualifications, they are registered in the Indian roll (a list of status individuals). The terms "status" and "registered" are used interchangeably however, status will be used in this document. First Nations peoples may also be members of a band. The legal definition of a band is a group of Indians for whom land has been set aside (a reserve) or who have been declared a band by the Governor General (31). A band member may also be considered a "Treaty Indian" if their band was party to a treaty, a formal agreement signed between the reigning monarch and legal Indians. Although not all "Treaty Indians" have Indian Status, these groups may be combined in some cases, such as in the data used for this research. A visual representation of the governmental classification of First Nations individuals is presented in Figure 1 (31).

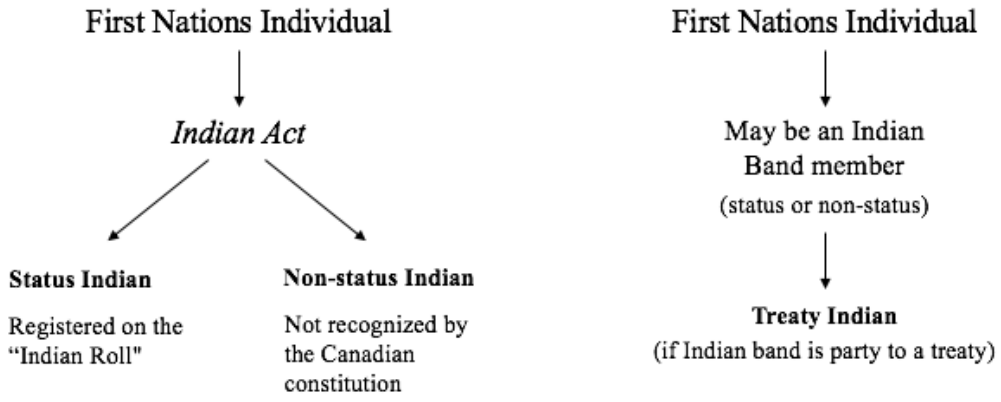


Figure 1: Classification of First Nations individuals in Canada.

In total, the population of Indigenous peoples living in Canada is growing and, in 2016 was almost 1.7 million (5% of the Canadian population) (30). In contrast to the general population, the population of Indigenous people is young, with an average age of 32.1 years, compared to the general population's average age of 40.9 years (30).

2.3.2 Rationale and need of investigation in Indigenous populations

There are several reasons why inequity may be a key concern for the Indigenous populations in Canada, and thus why this population deserves the attention of researchers in this area. First, there are known differences in health status between the Indigenous and non-Indigenous populations and gaps in these measures are much larger within the Indigenous populations (32). Secondly, financing of health care is variable in First Nations populations in this country. Status-Indian First Nations peoples may qualify for federal health coverage provided through the NIHB program, while those without status do not qualify. Issues of institutional, anti-Indigenous racism are apparent in Canada (33) and may contribute further to potential inequities in health care. Each of these concerns stem from colonialism and its ongoing impact on these populations.

2.3.2.1 Indigenous health in Canada

The impact of colonization has had serious effects on the health and well-being of Indigenous populations in Canada, as well as their interactions with the health care system (34). The loss of cultural traditions, being confined to reserves, being forced to attend Indian Residential Schools (IRSs), among other historical acts, have taken a toll on both

physical and mental aspects of health for this population. Some of the differences in health have been attributed to these historical events, especially in the case of mental health (35).

There are several factors that contribute to poorer health status among Indigenous populations, primarily concerning the social determinants of health (36). Lower quality of education, reduced employment opportunities, increased levels of poverty among others, have created such a major inequality in health status when compared to the general Canadian population (37) that health indicators for Indigenous Canadians are often similar to those of developing countries (38). The social determinants of health may affect health outcomes in many different ways. For example, a factor such as lowered SES may lead to food insecurity, which is directly linked to nutritional status (39). The relative cost of goods in remote areas, where Indigenous communities tend to be located, can augment this issue even further. These determinants may also cause secondary effects, which occur when certain negative behaviours are promoted or encouraged. For example, lowered SES increases poverty, which may force Indigenous families into poorer living situations, and increase the likelihood of participating in unhealthy behaviours, such as smoking, using drugs or consuming alcohol (40,41). These combined effects lead to higher prevalence and incidence rates of chronic diseases like diabetes and certain cancers (42), as well as a gradual increase in some infectious diseases such as HIV/AIDS and hepatitis C (38). Research around the combination of these effects has shown significant differences between the Indigenous and non-Indigenous populations in many respects concerning physical health including, but not limited to, decreased life expectancy (43), increased prevalence and incidence of chronic disease (40) and increased risk factors for these diseases (44).

Though Indigenous groups in Canada are often combined when it comes to large-scale studies, it is not surprising that there are significant differences across different First Nations, Inuit and Métis populations in relation to health and how the social determinants of health may impact them in different ways (45). Therefore, it is important to assess differences between and within Indigenous populations at national, regional and community levels to monitor the overall picture of health for the Indigenous peoples in Canada, as well as the health of each distinct group who are influenced by their own unique health determinants. The current literature that does separate Indigenous populations is

generally focused on prevalence and risk factors for chronic conditions (42,46,47). Several of these studies show major differences between various Indigenous populations, demonstrating the importance of analyses assessing each group separately. For example, a 2011 national report on diabetes revealed significant differences in rates of the disease between First Nations peoples living on-reserve (17.2%), First Nations peoples living off-reserve (10.3%), Métis (7.3%) and Inuit (6.8%) (48). Additionally, research has shown differences in psychological distress and suicidal behaviours among these populations (49), as well as socioeconomic inequalities in health (50). A common sentiment around heterogeneity in these studies is captured nicely by the *Blueprint on Aboriginal Health,* which states that there is no single framework that will work to improve the health of each of the Indigenous populations and they must be treated as separate entities (45).

2.3.2.2 Health care coverage for Indigenous peoples

In general, health coverage in Canada is provided through provincial/territorial governments, however, there are certain federal supports for specific groups within Canada. For Indigenous populations living in Canada, on-reserve First Nations may receive some direct health care services through federal programs funded by Indigenous Services Canada (ISC). These programs, like the National Native Alcohol and Drug Abuse Program (NNADAP), provide certain health care services directly to First Nations reserves (51). Additionally, most status-Indian First Nations and recognized Inuit peoples may qualify for the NIHB program. This program provides additional coverage for certain services not covered under Canada's Medicare such as dental and vision care, mental health services, medical transport, drug and pharmacy products and medical equipment (52). It is important to note that this program does not cover all Indigenous populations as non-status First Nations, some Inuit populations and Métis are excluded. For those individuals who are not covered by NIHB, primary care services are covered as a part of the provincial/territorial Medicare programs and therefore do not require OOP payments. For this reason, income should not in principle act as a barrier to access, although it could indirectly and other barriers may still be in place. Specialist care, which includes any other type of physician visit (surgeon, oncologist, psychiatrist, dermatologist, etc.), may or may not be covered without a private insurance plan (53). This distinction comes primarily from location of health care service (hospital or profit-making clinics) and means that income/location may

act as a barrier to service utilization for this population. Finally, dental care is left uncovered by all provincial and territorial plans and therefore will be accessed by those who are able to pay OOP or who are covered by a private insurance plan.

Studies have shown that Indigenous populations in Canada have a relatively lower level of access to primary care in the form of GPs/family physicians (54). This may lead to a decreased level of utilization based on availability of this type of care, particularly in those Indigenous populations who live in more remote locations. Those populations with limited physician availability, may have access to other primary care, in the form of a nurse practitioner (NP). There is evidence to suggest that NPs, especially in rural areas, may act as effective primary care reaching a wider range of those that may need it (55). For this reason, it is important to consider the contribution of NPs in the primary care setting.

In addition to decreased access to care there are other deterrents that may affect propensity to seek care. Qualitative research concerning interactions between Indigenous women and health care providers shows that trust in the health care system is contingent on the ability of the health care provider to overcome institutional and cultural barriers. It also suggests that more training may be required to provide culturally appropriate health care (56). It is impossible to contextualize the Indigenous experience in the health care system without discussing institutional, anti-Indigenous racism (33). Unfortunately, research and case studies have demonstrated that Indigenous peoples often have very difficult and different experiences in seeking care, when compared to their non-Indigenous counterparts (57,58). These experiences of improper treatment have resulted in limited use of many types of care and, in some cases, have led individuals to avoiding care altogether (59,60). A 2011 qualitative study of individuals' experiences in accessing emergency room care showed that Indigenous participants felt that they may have decreased chances of receiving help if identified as Indigenous or poor (57), evidence that institutional racism is present in the delivery of health care and that there is still much work to be done in this area. When assessing health care for Indigenous populations it is important that we keep these issues in mind and understand that they may have an impact on many aspects of health that is difficult to quantify (33).

2.3.3 Empirical evidence on inequities in health care among Indigenous populations

Measuring inequity in health care utilization is of interest because of differences in health status, health care coverage and the cultural/historical context of the Indigenous populations. Additionally, an expressed interest from stakeholders, including the Assembly of First Nations (AFN) (61) makes this area an important one in Canada. Despite several reasons to investigate health care utilization within the Indigenous populations of Canada, little has been done to date. Although there have been a few studies in Canada that focused on specific Indigenous populations (9,10), no studies have been done on a national scale. These studies, conducted in various Canadian provinces, have shown some differences in utilization patterns between Indigenous and non-Indigenous populations. However, this research tends to group Indigenous populations and generally reports inequality rather than inequity, as need for health care is not assessed. A study of Ontario's First Nation population reported a higher rate of utilization for ambulatory care, as well as a lower rate of utilization for referral care (usually specialist care) when compared to the general population (62). In Alberta, a population-based study showed that utilization rates were significantly lower for Indigenous peoples in both cardiology and ophthalmology specialty areas, when compared to both non-Indigenous people and those on welfare (10). A systematic review focused on patients with arthritis showed that Indigenous populations in Canada had comparable or (in some cases) greater use of primary care as well as comparable rates of hospitalization for arthritis related care (63). Some major differences were found in oral health as well, with studies in Canada and internationally showing, greater numbers of dental caries and untreated oral health concerns in Indigenous populations relative to their non-Indigenous counterparts (64,65). It is evident that use patterns vary based on the population and which type of health care is considered. It is clear that further investigation of inequity in health care utilization is warranted for this group.

Internationally, inequality in health care utilization is present, and inequity, although not commonly measured, is also present for Indigenous populations (16,66). The aforementioned systematic review also reported lower rates (27-85% fewer) of arthroplasty (surgeries) for Indigenous people with arthritis across Australia and New Zealand (63). International studies have shown that Indigenous populations often have higher burden of disease and need more health care, but use less than general populations (67,68). A recent

study from Australia showed no evidence of income-related inequity for GP use within Indigenous populations, but did show evidence of pro-rich inequity in specialist care utilization for the same population (66). This Australian study is the only one of its kind that specifically analyzes inequity in health care utilization within the Indigenous populations.

2.4 Gaps and Need for Future Research

Inequity in health care utilization in Canada remains an issue. Several studies support that inequities are present for the use of different types of care across different populations (6,7,26). Utilisation of general practitioners and other primary care tends to be equitable or pro-poor, whereas use of specialist physicians and other health care providers are generally pro-rich (6). An international report suggests that Canada is not performing well relative to other countries in this area (8).

The Canadian government has recognized the hardships faced by Indigenous populations and has taken some steps in an attempt to address the historical issues rooted in colonialism. The Truth and Reconciliation Commission of Canada (TRC) is one of those actions and was created in 2008 with the purpose of "contributing to truth, healing and reconciliation" between the Canadian government and those Indigenous to the land. In 2015 this commission created a document entitled *Calls to Action*, in which 94 calls to the Canadian government were addressed. Item 19 in this document calls the Canadian government to "identify and close the gaps in health outcomes between Aboriginal and Non-Aboriginal communities" (69). Several areas for improvement are identified in the *Calls to Action* prompting more research in these areas. An interest in the effect of the TRCs *Calls to Action,* as well as expressed interest from stakeholders has identified Indigenous health care inequity as an area for further investigation. Additionally, there are several reasons for a more in-depth look at inequity in health care utilization for Indigenous populations, with very little literature currently available in this area. Of the literature that does exist, most focuses on inequality in use and therefore does not account for need of health care and each distinct group of the Indigenous populations is rarely analyzed separately.

2.5 Objective

This study aimed to assess inequities in four different types of health care utilization among First Nations adults living off-reserve in Canada, looking at inequities within Status (registered) First Nations and non-Status (non-registered) First Nations populations. Specifically, the four different types of health care utilization to be assessed were primary care, specialist care, dental care and mental health care.

Chapter 3 Methods

3.1 Study Design and Data

This research was performed as a secondary analysis of cross-sectional survey data. The public use microdata file (PUMF) for the APS, 2012 was the source of data used for this study. The APS utilizes a stratified sampling design which samples based on ensuring representation in each "domain of estimation". These domains are created primarily based on geography, but are also divided based on age, education and Indigenous group (70). The survey collects general information on topics related to health, income, education, housing and employment (70). The survey is administered by Statistics Canada and funded through three federal departments; Indigenous Services Canada, Crown-Indigenous Relations and Northern Affairs Canada as well as Employment and Social Development Canada.

The target population for the APS is those who report "Aboriginal identity" or "Aboriginal ancestry", live in private dwellings and are not living on a First Nations' reserve. The sampling frame for the APS comes from those who have responded "yes" to belonging to an Aboriginal population, or to having Aboriginal ancestry on the National Household Survey (NHS, 2011). The 2012 APS had a 76.0% response rate and a sample size of 38,150 respondents. Statistics Canada used a stepwise method to calculate weights of the participants, where initial weights for each respondent were calculated based on weights in the NHS, and are then adjusted for non/partial response. The weights were subsequently readjusted using post-stratification to fit known totals for the population and the sigma-gap method was employed in order to reduce excessively large weights in certain stratum (70).

The analytical sample for this research was First Nations adults living off-reserve in Canada. There were a total of 6,584 eligible respondents in the PUMF for the APS 2012 with a weighted representation of 357,300 First Nations individuals. The reason for focusing on the First Nations comes from the engagement we have received through a nationally representative First Nations organization, discussed in more detail in section 3.4 below. Additionally, living off-reserve, as opposed to on-reserve, may impact both the health status of First Nations peoples (48) as well as the way that they access care (51). For

this reason this study will focus only on the off-reserve population as a way to limit heterogeneity in the analytical population.

3.2 Variables

Assessing income-related inequity in health care utilization for a population requires four general types of variables which were collected in the 2012 APS: income, the utilization of a specific type of health care, variables indicating need for health care, as well as variables that are known to be associated with health care utilization beyond need for health care, often termed as non-need factors. Regardless of the methods used to assess inequity for this study, all analyses were conducted using a combination of these four types of variables. Detailed variable descriptions can be found in Appendix C.

3.2.1 Income

Income can be measured on individual or household levels and can additionally be measured based on the source of the income in question. The APS reports household income (as a grouped variable) for the past calendar year as well as household size, providing enough information for adjusting household income for the household size in the analyses. The value of income includes any source, such as "work, investments, pension or government sources". Household income is often used in inequity research as it more accurately represents the available income for each member of the household than individual income (6).

3.2.2 Utilization

The utilization variable represents whether a certain type of health care was used, or how much was used, in a given time frame. In this project the variable was a binary measure (have or have not used) over the past 12 months and was categorized based on the type of health care (primary care [GP and/or NP] and specialist care). In the APS, participants were asked if they have "seen or talked to any of the following health professionals about their physical, emotional or mental health, in the past 12 months?" The health professionals used for this analysis were family doctor/GP, nurse and other doctor/specialist. For dental health care use, respondents were asked when the last time they visited a dental health professional was, with options in year increments up to 5 years ago. Although there is no consensus on the ideal frequency with which people should be receiving dental care (and

in fact evidence that there is large variability in the population depending on many risk factors (71)), we used the past 3 years to create a dichotomous use variable. Mental health care utilization was collected in the same variable that was used for physical health. There is unfortunately no distinction between type of visit in the data that is collected and therefore the same variable was used to understand use of primary care for both physical and mental health. The self-reported nature of these variables made them subject to a certain level of recall bias, which was an unavoidable limitation. The binary nature of the response was also a limiting factor; however, it is still a useful measure.

3.2.3 Need

Need is important to analyze in any inequity study and is the primary distinction between equity and equality in a population. Need is a legitimate reason that one should access care, and need for health care is generally measured by two types of variables, demographic and health status. For this research, the demographic variables used were both age and sex, which have shown to be linked to the health of Indigenous populations (42). The APS reports age as a categorical variable and sex as a dichotomous variable (male/female).

The other key variables associated with need for health care are health status variables such as, self-rated health and presence of chronic disease (72). Self-rated health (SRH) is a well validated measure of health status and has been shown to be predictive of other variables such as mortality (73–75). The 2012 APS queried subjects about their health as "not only the absence of disease or injury but also physical, mental and social wellbeing". The responses were reported as either excellent, very good, good, fair or poor. Chronic conditions were reported in a dichotomous fashion in the APS (present/not present) on several different types of disease including, but not limited to; asthma, diabetes, high blood pressure, arthritis and chronic obstructive pulmonary disease. Because of potential multicollinearity, the use of both SRH and presence of chronic conditions were only be employed upon checking multicollinearity. When considering need for mental health care a similar variable, self-rated mental health was used. In addition, the Kessler distress scale (K10) was employed to measure need for mental health care. The K10 is a well validated scale used to measure psychological distress that varies from 10 (no distress) to 50 (severe distress). Studies have shown that this scale is appropriate for use in Indigenous

populations living off-reserve (76). The cut-off for binary distress measured at K10>24 was used in this analysis based on previous research (77). For the analysis of both mental health and dental health care utilization, those studied were all those who are identified as needing these types of care. In the case of mental health, analysis was performed on a subset of the population who need mental health care, defined using poor/fair self-rated mental health or significant distress on the K10 scale. For dental care, the assumption was made that those who have not accessed dental care for at least three years are in need of care.

3.2.4 Non-need

A non-need variable is any variable that does not reflect a need for health care. Existing studies on equity in health care utilization use non-need variables other than income for calculation of predicted use and for the decomposition of inequity post-measurement of *HI* (78,79). Non-need variables that were tested for potential inclusion in the analysis were: education, employment status, marital status, household size, household condition, rurality, food security and Indigenous status (in non-stratified analyses). Each of these non-need variables are collected in a categorical fashion (more information on the specifics of these categories is available in Chapter 4 below. The non-need variables are used in this research only as a correction for factors that may influence the individual's propensity to seek medical care (79,80). These non-need variables (if not included) may confound the relationship by having an effect on both the income and utilization variables. Each of these non-need variables may be associated with health disparities in Indigenous populations in Canada based on literature related to deficits when compared to a general Canadian population (37).

3.3 Statistical Analysis

Inequity studies typically use two general methods to assess inequity in health care utilization, and this study employed the use of both methods. The first method uses a multiple regression model to assess the presence of income-related inequalities in health care. This approach provides a simple and effective way to test the presence of inequity by including need variables as well as non-need variables (such as high vs. low income) in the regression equation. In a perfectly equitable system after controlling for need we would

see no association between utilization and a non-need variable (such as income). This means that if an association between income and use is found after need-adjustment, the system can be termed inequitable. The significance of the regression coefficient is used as an indicator of the presence of inequity. In cases where it may be important to compare populations and quantify inequities, the *HI* approach may be better suited. This second method for assessing inequity was developed by van Doorslaer and Wagstaff in 1992 and is similar to the Lorenz curve or the Gini index common in economics literature (14). This similarity comes from the use of an individual's income or other non-need variable as a ranking for the population. This ranking, in conjunction with the assessment of need and other non-need variables allows for inequity to be described. When the ranking of a population is based on income as the non-need factor, the analysis is termed *income-related inequity*. This is important when drawing conclusions from the results of the study. For income-related analyses the inequities that are found can be judged as either pro-rich (need-standardized utilization favours those with higher income) or pro-poor (need-standardized utilization favours those with lower income).

Although the PUMF for the 2012 APS provides standard survey weights (used in all analyses), it does not provide bootstrap weights, which would be used to accurately report variance based on the survey design. For this reason, robust standard errors were employed in all regression calculations (including those for *HI* measurement) as a means to account for the potentially inaccurate variance estimations. All of the analyses outlined in this chapter were performed using STATA version 15.1

3.3.1 The regression approach

Multivariable logistic regression methods were used in order to test inequity. These analyses used binary utilization of care while controlling for several non-need factors that may have impacted one's propensity to seek and use care. If not included these variables may have confounded the true relationship.

In creating the multivariable regression models, the same general guidelines were followed to generate the most appropriate model for each type of utilization. For each outcome there was a list of potential explanatory variables (both need and non-need) that were tested. This list included: age, sex, self-rated health (primary and specialist care only), number of chronic conditions (primary and specialist care only), income, education,

employment status, marital status, rurality, food security (mental health care only) and Indigenous status (for non-stratified analyses). These variables were chosen based on availability in the survey, as well as inclusion in previous literature (6,81). With this list, each variable was first tested at the univariate (unadjusted) level. A lack of statistical improvement in the model, based on the Pearson Chi-square value, was the justification used to remove individual variables from the model. A p-value < 0.05 was used to determine statistical significance. The assessment of inequity came from the investigation of income as a predictor in the regression model. For this reason, income was always included in the model, regardless of statistical significance.

Additional testing for significance in interactions chosen based on multiple multivariable models allowed further model specification. The variance inflation factor (VIF) was used to determine multicollinearity between specific variables that posed a risk. The Akaike Information Criteria and Bayesian Information Criteria (AIC and BIC) were used to determine the most appropriate model. Each of the regression models were run with the entire population and subsequently stratified by First Nations status.

3.3.2 The concentration index

The concentration index (C) was used to quantify *inequality* in primary and specialist care utilization. The C was used to quantify *inequity* in dental and mental health care utilization because all the individuals considered in analyses of these types were deemed to have needed care. Any inequality identified The first step in evaluating income-related inequality using the C is to rank the population by the appropriate non-need factor, for this study we ranked individuals by both household size and income as a proxy for household income. By plotting cumulative use of care against the ranked population a concentration curve (CC) was created, which measures inequality of use in a population, with perfect equality as a diagonal line on the graph, visible in Figure 2. The C_h (actual health care use) can be derived from this curve as twice the area between the curve and the line of perfect equality. The equation for the C_h is as follows:

$$C_h = 1 - 2\int_0^1 L_h(p)dp, \quad (1)$$

where $L_h(p)$ is the function that represents health care utilization with respect to income. In practice, the simplest way to calculate C is through the use of Kakwani's "convenient regression" formula (82):

$$2\sigma_R^2\left(\frac{y_i}{\mu}\right) = \alpha + \delta R_i + \epsilon_i, \tag{2}$$

where the σ_R^2 represents the variance of the fractional rank, y_i is the use of individual i, μ is the average use value and R_i is the fractional rank of the individual. The value of δ and its standard error are direct approximations to the C.

The value of each of the concentration indices for actual use (C) are subsequently adjusted using the Wagstaff correction factor used for binary outcome variables (83). This correction is made by multiplying the final value of C/HI by $1/(1-\mu)$, where μ is the mean of the cumulative actual health care use.

The C ranges from -1 to 1 with positive (negative) values indicating that use favours the rich (poor). This value was calculated and compared across both status and non-status First Nations as well as the total population in this study.

3.3.3 The horizontal inequity index

When the use of care could also be based on need and non-need (as in the case of the analysis of primary and specialist care use), the assessment of inequity is more complex and requires an assessment of the need in the population. The assessment of need can be done using either indirect or direct need-standardization (see Appendix B for a brief discussion of direct and indirect need-standardization). For the purposes of this project, the indirect method of need standardization was used. The equation that approximates the concentration curve for the need-predicted use of health care is given by:

$$y_i = \alpha + \beta(inc_i) + \sum\nolimits_j \beta_j x_{ji} + \sum\nolimits_k r_k z_{ki} + \varepsilon_i, \tag{3}$$

where y_i is the utilization of health care for individual i, inc_i is the individual's income, the xs represent each variable used to assess need for health care (sex, age, SRH and chronic conditions) and the zs represent the non-need variables (education, employment

status, household size, marital status, rurality and Indigenous status). α, β and r represent regression parameters and ε_i represents an error term. The C_n (need-predicted use) was then calculated as in the previous section using need-predicted use rather than actual use. A visual representation of this can be seen in Figure 2.

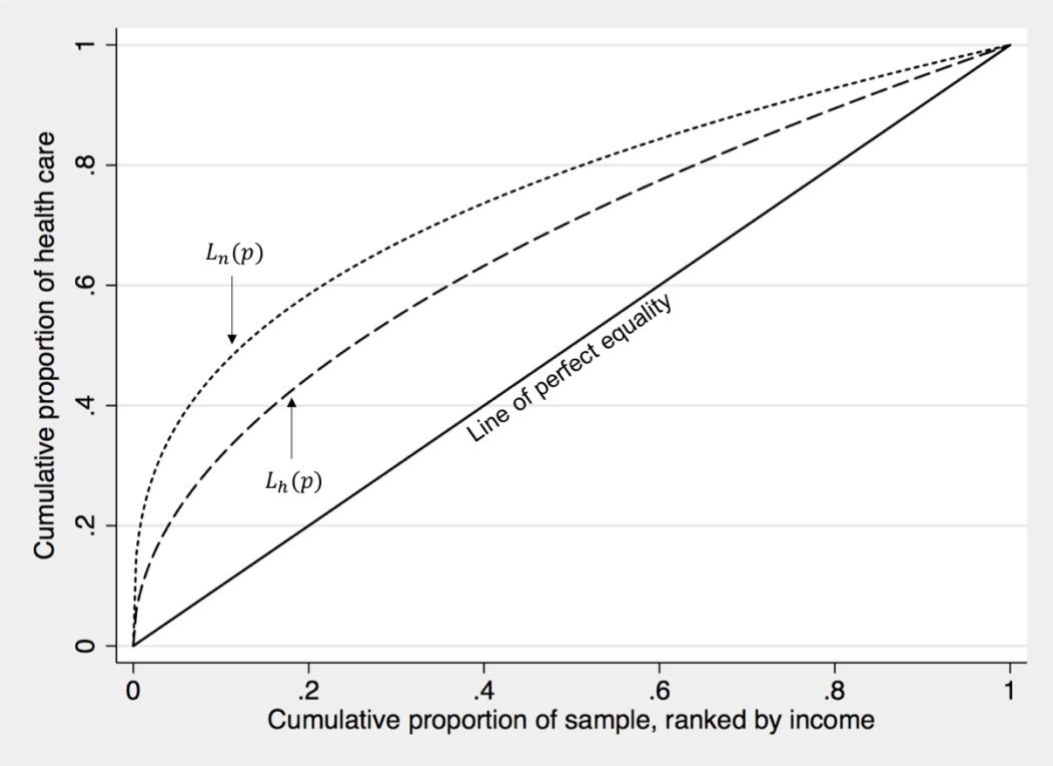


Figure 2: Concentration curves for actual health care utilization, $\boldsymbol{L_h(p)}$, and need-predicted utilization, $\boldsymbol{L_n(p)}$.

Calculation of the HI is done by measuring the C for the "need-standardized" use of care. This "need-standardized" value is calculated by creating a third CC based on both actual and need-predicted use of health care and measuring the C based on this third CC. This could also be conceptualized as the difference between the need-predicted concentration of health care use ($L_n(p)$) and the actual use of health care ($L_h(p)$) plotted in Figure 2. The HI index always falls in the range of -1 to 1. The following equation shows the calculation of the HI index.

$$HI = 2\int_0^1 [L_n(p) - L_h(p)]dp = CI_n - CI_h \quad (4)$$

A negative value of the HI index indicates that the utilization of health care being studied is inequitable and favours the poor, while a positive value of the HI index indicates a pro-rich inequity in utilization. A value of 0 indicates that utilization is equitable in the population.

This HI was used to quantify inequities in the utilization of two different health care services namely, primary and specialist care. For both of these types of health care, the HI was calculated for each of the status and non-status Indigenous populations and both of them combined. Using this approach we were able to reach the objective of the study by determining presence of inequity (based on statistical significance of HI) and severity of the inequity (based on the magnitude of the index).

As with the C, the value of the HI is also adjusted using the Wagstaff correction as it also uses a binary outcome variable (83). This correction is made by multiplying both the HI as well at its standard error by $1/(1-\mu)$, where μ is the mean of the need-standardized use of health care The indices reported in the results (Chapter 4) are "corrected" values.

When analyzing the results from both the C and HI it is important both to consider the index value and to look at the CCs (as plotted above). When the CC goes above and below the line of perfect equality it is possible for the value of the C or HI to appear closer to 0, which may mistakenly indicate no inequality or inequity when there actually is. For this reason, we must be cautious in the evaluation of these indices and make sure we have analyzed them completely prior to drawing conclusions.

3.3.4 Analytical samples

For all types of use (primary care, specialist care, dental care and mental health care), individuals were removed from the analytical sample if they were missing data for any of the variables included in the final multivariable logistic regression and subsequent analyses of the C and HI. In the case of primary and specialist care utilization, the analytical samples used were identical in order to ensure comparability between analyses. For these types of care both the regression approach as well as the C and HI were employed to assess inequity in this population.

Dental and mental health care posed a unique challenge as information on need of care (dental health) and health care utilization (mental health) were not directly available in the survey. For dental health care, because no need variables are collected, the analyses were done using the assumption that all individuals in the survey require dental care at least once every 3 years. Inequity was then assessed using both the regression approach as well as the C technique. As need was never collected, it was not possible to calculate the HI for this group. In the case of mental health, although need for care was collected in the survey, health care utilization was difficult to determine. The APS collects mental health care utilization in the same variable as physical health care as mentioned above (section 3.2.2). For that reason, we have reduced the analytical sample, using mental health care need variables, to only those who we believe were using primary care for mental health reasons. This subsample was defined using validated tools for measuring mental health. Individuals with a value >24 on the K10 distress scale or fair/poor self-rated mental health were included in this analysis. The use of K10>24 (moderate to severe psychological distress) has been validated as an appropriate cut-off for measuring binary distress in Indigenous populations in Canada (77). Inequity for this population was assessed using the regression approach and the C technique. Stratification of the subpopulation used for mental health care was deemed inappropriate based on the results of the stratified regression (see Chapter 4 below).

In the analysis of dental and mental health care, the C can be used to measure inequity (rather than inequality) as we are assuming that everyone in each analytical sample has need for the corresponding health care.

3.4 Data Access and Ethics

The data used for this study is publicly available and therefore required no ethics approval. This data was processed at Statistics Canada to ensure that no information is identifiable. Additionally, this project was conducted as part of a successful funding application entitled: "The Dynamics of Health Inequalities Faced by Indigenous Populations in Canada: What Factors Account for the Inequality", which has already been granted ethics approval by Dalhousie University (REB No: 2017-4295). This grant was approved by the Nova Scotia Health Research Foundation (NSHRF) in 2017.

As this research was an analysis of First Nations data from across the country, we have partnered with the Thunderbird Partnership Foundation (TPF), an organization that represents First Nations communities on a national scale. We are actively working with this organization to ensure that research is appropriately conducted and approved for publication. This thesis will not be made public unless approved by the TPF, additionally, any publication resulting from this research will be given to the TPF for approval prior to publication. There is ongoing debate around research ethics regarding the secondary use of health surveys of Indigenous populations (84), such as the APS. I have considered the ethical implications of using secondary data from Indigenous populations and have included my own reflection on this topic, which can be found in Appendix A.

Chapter 4 Results

4.1 Equity in Primary & Specialist Care

4.1.1 Descriptive results

Individuals included in the following analyses are those single-identity First Nations, who are 19 years of age or older and living off-reserve (in private dwellings) in Canada. The PUMF for the 2012 APS contains a total of 24,803 respondents, there were 6,584 respondents who met eligibility criteria. Of these individuals, 5,752 (weighted: 310,142) had no missing data on any of the variables that were included in the final primary and specialist care regression models. This sample included 1,730 and 4,022 non-status and status First Nations individuals, respectively. Individuals included in this analytical sample must have responded to both primary and specialist use questions in the survey. A total of three respondents were dropped because they had responded to only one of these two questions. All statistics reported are based on weighted representations for each individual and are therefore representative of the target population for this study.

Table 1: Descriptive statistics for individuals included in primary and specialist visits analysis: APS 2012.

	Non-status	**Status**	**Total**	*** Pearson Chi_2 value**
Variables	**Proportion**	**Proportion**	**Proportion**	**P-value**
Outcome variables				
Use of primary care in the past 12 months	0.830	0.819	0.823	0.706
Use of specialist care in the past 12 months	0.431	0.369	0.392	<0.001
Need variables				
Sociodemographic variables				
Sex				
Female	0.558	0.580	0.572	0.024
Age (years)				
19-24	0.137	0.152	0.147	
25-34	0.178	0.211	0.199	
35-44	0.231	0.215	0.221	
45-54	0.199	0.220	0.212	
55+	0.255	0.201	0.221	0.602

Health Variables				
Number of chronic conditions				
0 conditions	0.403	0.466	0.443	
1 condition	0.287	0.253	0.266	
2 conditions	0.139	0.141	0.140	
3 conditions	0.087	0.085	0.085	
≥4 conditions	0.085	0.056	0.066	0.001
Self-rated health				
Excellent	0.188	0.193	0.191	
Very good	0.295	0.285	0.289	
Good	0.285	0.292	0.289	
Fair	0.160	0.152	0.155	
Poor	0.072	0.079	0.077	0.604
Non-need variables				
Socioeconomic variables				
Individual income				
<$5,000	0.099	0.110	0.106	
$5,000 – $9,999	0.061	0.085	0.076	
$10,000 – $19,999	0.244	0.227	0.233	
$20,000 – $29,999	0.129	0.146	0.139	
$30,000 – $39,999	0.150	0.129	0.137	
$40,000 – $49,999	0.069	0.075	0.073	
≥$50,000	0.248	0.230	0.236	0.011
Education Level				
Grade 8 and less	0.070	0.063	0.066	
Some secondary	0.141	0.181	0.166	
Secondary diploma/Equivalent	0.320	0.315	0.317	
PS diploma (less than bachelors)	0.357	0.341	0.347	
Bachelor's degree or above	0.112	0.100	0.104	0.002
Employment status				
Employed	0.645	0.593	0.612	
Unemployed	0.063	0.089	0.079	
Not in the labour force	0.293	0.318	0.309	<0.001
Other non-need variables				
Household size				
1 person	0.157	0.144	0.149	
2 people	0.330	0.284	0.301	
3 people	0.208	0.214	0.212	

4 people	0.196	0.177	0.184	
≥5 people	0.109	0.181	0.154	<0.001
Marital status				
Married	0.382	0.324	0.345	
Common-law	0.158	0.170	0.166	
Separated/divorced/ widowed	0.169	0.148	0.156	
Single, never married	0.291	0.358	0.333	0.009
Rurality				
Census metropolitan area	0.566	0.491	0.519	
Other population centre	0.269	0.344	0.316	
Other – rural	0.165	0.165	0.165	<0.001
Sample size (n)	**1,730**	**4,022**	**5,752**	**---**

* The Pearson Chi^2 value shows differences between status and non-status populations on each of the variables in question.

Table 1 shows descriptive information for these individuals including the Pearson Chi-square value. This value indicates a statistically significant difference in the groups (status and non-status First Nations) when the p-value is below 0.05.

We see that the proportion of those who have used primary care (GP or nurse) in the past 12 months is 82.3% for the total population. Additionally, there is no statistically significant difference between the status groups. There is, however, a statistically significant difference when it comes to specialist care use, with non-status First Nations using more than their counterparts with Indigenous status. Interestingly, there is no statistical difference in the subjective measure of health (SRH: p=0.604), but there is a statistical difference in the objective measure of health with registered populations reporting less chronic conditions (p=0.001). This implies that the groups do not see their own health as different, but they are objectively different. We also observe a statistically significant difference between stratum in all non-need variables.

4.1.2 Regression results

The regression model specification was performed per the description in section 3.3.1. Variables were excluded from the model if they were statistically insignificant predictors in both strata for either of the types of analysis. For both analysis types (primary and specialist care) we find household condition and rurality to be insignificant predictors. Rurality, although not statistically significant, does appear to have a relationship with use,

where those living in more rural areas tend to use less care. Because we were unable to assess access in this study rurality was left in the final model. Collinearity and interactions were also explored as per the methods section. Collinearity of the health variables was investigated using the VIF. We found the VIFs to be 1.35 for the non-status population and 1.35 for the status population. These were determined as insignificant and so both need variables were included in the final model. Finally, there were certain relationships that warranted further investigation, including looking at interaction effects. Three specific variable combinations were inspected: age/sex, marital status/sex and employment status/age. The decision to include these interactions in the multivariable model was made based on improvements to both AIC and BIC.

Table 2: Univariate and multivariable logistic regression models (stratified and total) for use of primary care.

Primary Care	Non-status		Status		Total	
	Univariate	Multivariable	Univariate	Multivariable	Univariate	Multivariable
Variables	OR	aOR	OR	aOR	OR	aOR
Sex (male: ref.)						
Female	2.177***	2.254	2.382***	2.145**	2.301***	2.354***
Age (19-24: ref.)						
25-34	1.076	1.788	1.131	0.690	1.111	0.985
35-44	2.097**	1.342	2.059***	1.208	2.081***	1.433
45-54	2.048	3.304	1.822**	3.810*	1.892***	4.087*
55+	2.027*	3.898	3.243***	0.794	2.642***	1.487
Number of chronic conditions (0 conditions: ref.)						
1 condition	2.787***	2.805***	2.289***	2.299***	2.464***	2.497***
2 conditions	3.417***	2.667**	3.821***	3.762***	3.651***	3.280***
3 conditions	10.851**	8.799*	7.006***	6.171***	8.125***	7.023***
≥4 conditions	10.177**	8.687*	7.384***	7.516***	8.463***	7.351***
Self-rated health (excellent: ref.)						
Very good	1.811*	1.786*	1.112	0.909	1.328*	1.156
Good	1.693	1.509	1.463*	1.071	1.546**	1.198
Fair	2.921**	1.916	3.300***	1.871*	3.120***	1.838**
Poor	36.231***	16.611***	2.717*	0.819	4.370***	1.501
Individual income (<$5,000: ref.)						
$5,000 – $9,999	0.762	0.928	1.596	2.175**	1.260	1.660*
$10,000 – $19,999	1.572	1.314	2.015**	2.094**	1.878***	1.913**
$20,000 – $29,999	1.003	0.992	1.396	1.425	1.257	1.304
$30,000 – $39,999	1.078	1.093	1.552	2.136**	1.387	1.795*
$40,000 – $49,999	1.461	1.529	1.644	2.028*	1.588*	1.913**

≥$50,000	0.947	1.020	1.670*	2.250**	1.376	1.785**
Education Level (Grade 8 and less: ref.)						
Some secondary	0.593	0.759	0.594*	1.278	0.577*	1.010
Secondary diploma/Equivalent	0.535	0.899	0.840	1.845*	0.713	1.381
PS diploma (less than bachelors)	0.831	1.313	1.213	2.255**	1.059	1.746*
Bachelor's degree or above	0.752	1.468	1.656	2.594**	1.210	2.001*
Employment status (Unemployed: ref.)						
Employed	2.356*	3.884*	1.388	1.139	1.650**	1.753
Not in the labour force	3.104**	2.488	1.614*	0.836	1.993***	1.172
Household size (1 person: ref.)						
2 people	0.968	1.158	1.091	1.099	1.035	1.124
3 people	1.143	1.395	0.822	1.034	0.925	1.166
4 people	0.906	1.246	0.665	0.799	0.749	0.943
≥5 people	0.825	1.057	0.663	0.822	0.709	0.898
Marital status (Single, never married: ref.)						
Married	1.945**	1.468	1.664**	1.145	1.773***	1.193
Common-law	0.914	0.843	1.028	0.702	0.986	0.745
Separated/divorced/widowed	1.702	0.990	1.929**	0.756	1.836**	0.819
Rurality (Census metropolitan area: ref.)						
Other population centre	0.748	0.746	0.953	0.893	0.869	0.836
Other – rural	0.653	0.653	0.906	0.865	0.799	0.767
Indigenous status (non-status: ref.)						
Status	---	---	---	---	0.926	1.101
CONSTANT	---	0.348	---	0.558	---	0.431

Sample size (n)	**1,730**	**1,730**	**4,022**	**4,022**	**5,752**	**5,752**

Note: * p<0.05, ** p<0.01, *** p<0.001

Note: This table excludes the present interaction terms, which can be found in Appendix D.

Table 3: Univariate and multivariable logistic regression models (stratified and total) for use of specialist care.

Specialist Care	Non-status		Status		Total	
	Univariate	Multivariable	Univariate	Multivariable	Univariate	Multivariable
Variables	OR	aOR	OR	aOR	OR	aOR
Sex (male: ref.)						
Female	2.045***	3.073**	1.640***	2.027*	1.772***	2.191***
Age (19-24: ref.)						
25-34	1.419	1.131	1.277	1.131	1.321*	1.129
35-44	1.524	1.391	1.569**	1.167	1.561***	1.121
45-54	2.160**	0.060*	1.564*	2.237	1.755***	0.942
55+	1.907*	0.725	1.961***	1.839	1.962***	1.482
Number of chronic conditions (0 conditions: ref.)						
1 condition	1.601*	1.564*	1.859***	1.979***	1.770***	1.778***
2 conditions	3.926***	2.846***	2.635***	2.824***	3.058***	2.687***
3 conditions	6.394***	4.168***	4.840***	4.867***	5.361***	4.443***
≥4 conditions	4.782***	3.262**	9.131***	8.766***	6.829***	5.501***
Self-rated health (excellent: ref.)						
Very good	0.985	0.923	1.185	0.977	1.105	0.946
Good	1.799*	1.487	1.674**	1.255	1.718***	1.305
Fair	2.947***	2.438**	2.276***	1.263	2.516***	1.487*
Poor	10.172***	5.684***	4.445***	1.720	5.608***	2.343***
Individual income (<$5,000: ref.)						
$5,000 – $9,999	1.037	1.089	1.185	1.269	1.126	1.239
$10,000 – $19,999	1.258	1.399	1.141	0.987	1.196	1.052
$20,000 – $29,999	1.061	1.505	0.828	0.828	0.905	0.962
$30,000 – $39,999	0.881	1.338	0.608*	0.754	0.726	0.943
$40,000 – $49,999	0.660	1.092	0.979	1.159	0.853	1.093

≥$50,000	0.795	1.545	0.851	0.903	0.837	1.069
Education Level (Grade 8 and less: ref.)						
Some secondary	0.612	0.880	0.667	0.968	0.624*	0.879
Secondary diploma/Equivalent	0.596	1.171	0.917	1.546	0.769	1.361
PS diploma (less than bachelors)	0.771	1.473	0.953	1.559	0.872	1.512
Bachelor's degree or above	0.775	1.938	1.567	2.995***	1.182	2.337***
Employment status (Unemployed: ref.)						
Employed	1.506	0.656	1.360	1.456	1.424*	1.084
Not in the labour force	3.266***	3.029	2.055***	1.213	2.427***	1.627
Household size (1 person: ref.)						
2 people	1.155	1.116	0.947	1.087	1.030	1.108
3 people	1.071	1.028	0.767	1.075	0.868	1.024
4 people	0.858	0.943	0.802	1.014	0.824	0.974
≥5 people	0.690	0.773	0.718	0.959	0.702*	0.859
Marital status (Single, never married: ref.)						
Married	1.291	1.332	1.145	0.803	1.227	0.946
Common-law	1.110	1.547	1.154	0.753	1.145	1.016
Separated/divorced/widowed	1.495	0.545	1.617**	0.904	1.592**	0.666
Rurality (Census metropolitan area: ref.)						
Other population centre	0.871	0.856	0.866	0.858	0.847	0.847
Other – rural	0.730	0.731	0.857	0.945	0.799	0.828
Indigenous status (non-status: ref.)						
Status	---	---	---	---	0.773**	0.811*
CONSTANT	---	0.111**	---	0.108***	---	0.139***

Sample size (n)	**1,730**	**1,730**	**4,022**	**4,022**	**5,752**	**5,752**

Note: * p<0.05, ** p<0.01, *** p<0.001

Note: This table excludes the present interaction terms, which can be found in Appendix D.

For primary care, we see the income variable show a relatively weak association with use of care in the non-status population, with aORs in the range of 0.928 – 1.592 (none of which are statistically different from the reference group), the highest being for the $40,000 - $49,999 group. In the status group however, we see a much stronger association. The aORs are consistently above 2 and five out of six groups have a statistically significantly larger aOR for primary care utilization. The health-based variables tend to show a strong association with use. Specifically, number of chronic conditions appears to predict use quite well with all those who have more than zero chronic conditions having a significant increase in odds of using primary care (even in adjusted models). Overall, it appears that having 3 or more chronic conditions increases odds of primary care utilization to approximately six to eight times those with no chronic conditions. Additionally, SRH appears to predict use well in unadjusted models, however, after adjustment, the association is less strong, indicating that other variables included in the final model may have been accounting for some of this association.

The regression results for specialist care show some similarities to primary care. Health-based predictors show a strong association with use of care. Again, having at least one chronic condition significantly increases the odds of using specialist services (in all models). SRH appears to be a better predictor of specialist use for the non-status group, when compared to the status group especially in the multivariable models. The aORs remain significantly greater (compared to the reference group: excellent) for fair/poor SRH in the non-status group only. Contrary to our primary care results we see very little association with income. For the total population the aORs vary randomly across income groups and are all in the range of 1.239 – 0.943. This lack of significant difference is indicative that limited inequity is present in this population.

Across both utilization types and populations, we see a relatively consistent association between sex and health care utilization. Females have between approximately two to three times the odds of using services in all adjusted models.

4.1.3 Concentration and Horizontal Inequity indices

The C and HI were calculated as described in section 3.3. The variables included in the final multivariable regression were used to predict use of primary and specialist care. Each of these values was calculated for the overall eligible population and stratified based on

Indigenous status creating three values for each of these indices for both use types. The use of identical population and variables allows for direct comparison between these two analyses. The analytical samples used here are exactly as described above.

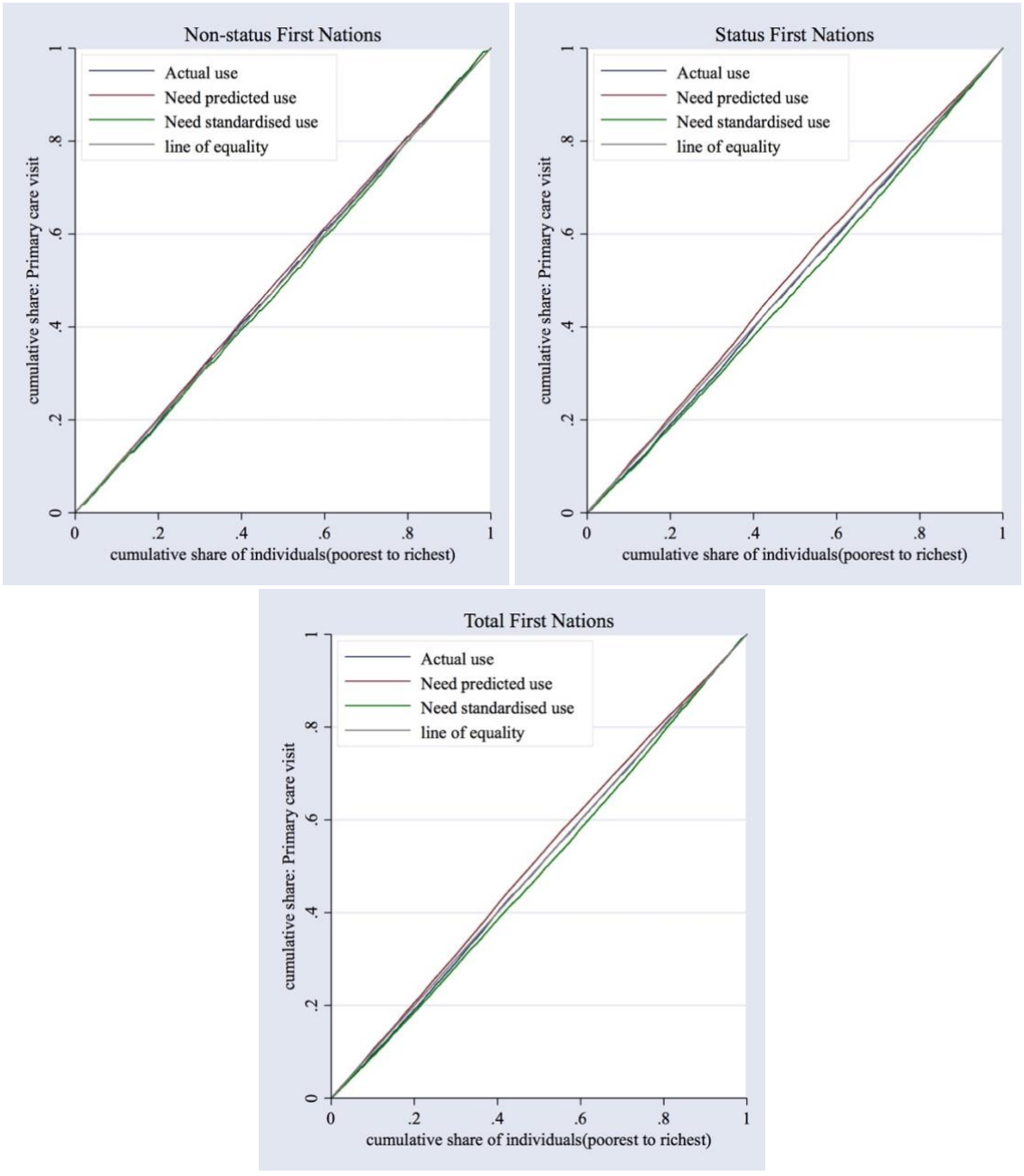


Figure 3: Concentration curves for analysis of primary care use for First Nations populations (non-status, status and unstratified).

Table 4: The Concentration and horizontal inequity indices for primary care use in each of the stratified populations.

Primary Care	Index value (corrected)	Std. Error (corrected)	95% CI	
Non-status				
Concentration index (actual use)	-0.0322	0.0584	-0.1467	0.0823
Horizontal inequity index	0.0546	0.0520	-0.0474	0.1566
Status				
Concentration index (actual use)	0.0576	0.0366	-0.0140	0.1293
Horizontal inequity index	0.1630	0.0328	0.0987	0.2273
Total First Nations				
Concentration index (actual use)	0.0271	0.0316	-0.0348	0.0890
Horizontal inequity index	0.1340	0.0283	0.0784	0.1895

The concentration curves depicted in Figure 3 show a clear difference in inequity between the status and non-status groups, with the status group experiencing much more income-based inequities in health care utilization. By looking at the need standardised use curve (green) we can see that the curve is below the line of perfect equality in each case indicating that inequity is pro-rich. As mentioned in section 3.3, a positive (negative) value of the C/HI indicates inequality/inequity favoring the rich (poor). Table 4 shows positive values of the HI, which are indicative of pro-rich inequity in each case. It is important to note that the inequity is greater in magnitude for the status population and statistically insignificant in the non-status group. The Cs for actual health care utilization show no statistical significance in any population indicating actual use of primary care is relatively equally spread across income groups.

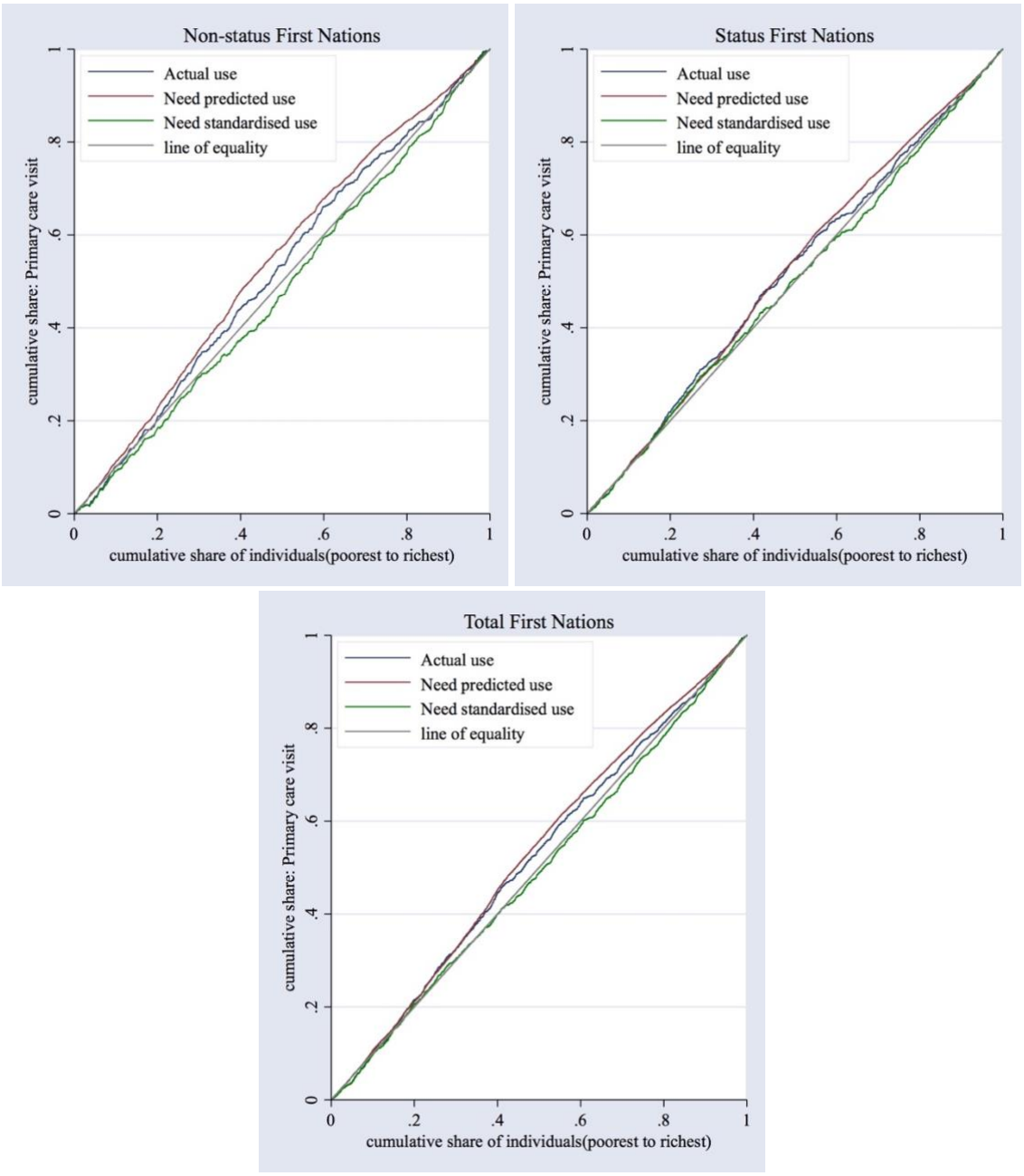


Figure 4: Concentration curves for analysis of specialist care use for First Nations populations (non-status, status and unstratified).

Table 5: Concentration and horizontal inequity indices for specialist care use in each of the stratified populations.

Specialist Care	Index value (corrected)	Std. Error (corrected)	95% CI	
Non-status				
Concentration index (actual use)	-0.0761	0.0446	-0.1635	0.0113
Horizontal inequity index	0.0556	0.0411	-0.0248	0.1361
Status				
Concentration index (actual use)	-0.0562	0.0300	-0.1150	0.0026
Horizontal inequity index	0.0057	0.0278	-0.0488	0.0601
Total First Nations				
Concentration index (actual use)	-0.0600	0.0250	-0.1091	-0.0109
Horizontal inequity index	0.0228	0.0237	-0.0236	0.0692

For specialist care the HI is positive and appears moderately pro-rich with no statistically significant results in any population, as shown in Table 5. Additionally, we see that inequality in specialist visit is present and favours the poor (only statistically significant for the unstratified population) based on each of the negative point estimates for C.

Missing data analyses show some differences in descriptive statistics between those who were included versus excluded, such as statistically significant differences in use, with those with missing data having lower rates of use in all categories. We also see lower levels of income and statistically different response to other SES related variables. Regression results show similar trends when those missing income (8.79% of the eligible population) are left in the model with a flag. A more comprehensive look at missing data analysis can be found in Appendix E.

4.2 Equity in Dental Care

4.2.1 Descriptive results

The analytical sample for dental care use is 5,831 respondents (weighted: 314,350) with no missing data for any of the final regression variables. These explanatory variables are listed in Table 6. Because no dental care need variables are reported in the APS 2012, we included all eligible individuals under the assumption that they all require dental care, and therefore each have "need" for this type of service.

Table 6: The description and summary statistics of variables used in dental care visit analysis: APS 2012

Variables	Non-status Proportion	Status Proportion	Total Proportion	* Pearson Chi_2 value P-value
Outcome variable				
Use of dental care in the past 3 years	0.773	0.846	0.819	<0.001
Explanatory variables				
Sociodemographic variables				
Sex				
Female	0.556	0.579	0.570	0.033
Age (years)				
19-24	0.137	0.150	0.145	
25-34	0.177	0.210	0.198	
35-44	0.230	0.215	0.220	
45-54	0.200	0.219	0.212	
55+	0.256	0.205	0.224	0.646
Socioeconomic variables				
Income (grouped)				
<$5,000	0.099	0.110	0.099	
$5,000 – $9,999	0.060	0.086	0.060	
$10,000 – $19,999	0.246	0.228	0.246	
$20,000 – $29,999	0.128	0.147	0.128	
$30,000 – $39,999	0.150	0.127	0.150	
$40,000 – $49,999	0.068	0.074	0.068	
≥$50,000	0.248	0.227	0.248	0.007
Education Level				
Grade 8 and less	0.070	0.066	0.067	
Some secondary	0.142	0.183	0.168	
Secondary diploma/Equivalent	0.319	0.314	0.316	
PS diploma (less than bachelors)	0.358	0.338	0.345	
Bachelor's degree or above	0.111	0.099	0.103	0.002
Employment status				
Employed	0.644	0.587	0.608	
Unemployed	0.063	0.088	0.079	
Not in the labour force	0.293	0.325	0.313	<0.001
Other explanatory variables				
Household size				

1 person	0.157	0.144	0.148	
2 people	0.333	0.287	0.304	
3 people	0.207	0.215	0.212	
4 people	0.196	0.176	0.183	
≥5 people	0.108	0.179	0.152	<0.001
Rurality				
Census metropolitan area	0.567	0.489	0.518	
Other population centre	0.268	0.343	0.315	
Other – rural	0.165	0.168	0.167	<0.001
Sample size (n)	**1,749**	**4,082**	**5,831**	**---**

* The Pearson Chi2 value shows differences between status and non-status populations on each of the variables in question.

Table 6 includes data from 88.0% of the total eligible population. This table reports the distribution of binary and categorical explanatory variables within these groups.

When looking at the outcome of interest in this analysis, use of dental care in the past 3 years, there is a statistically significant difference between strata (p = <0.001) with the status population using more dental care (84.6%) compared to those who do not have status (77.3%). We can see that each of the variables related to socioeconomic status (income, education and employment status) are different between groups (p = 0.007, 0.002, <0.001, respectively). There are only 2 variables (age and household condition) that are not statistically different between the status groups.

4.2.2 Regression results

Model specification was performed in the same fashion, described in section 3.3.1. In univariate analysis of the non-status population there are three explanatory variables that are deemed insignificant: household size, household condition and marital status. Among the status population two of these variables, household condition and marital status, are also statistically insignificant in their association with dental care use. These two variables were dropped from the multivariable model for that purpose. When looking at interactions there were two specific areas where an interaction may have been applicable in this analysis. These interactions were age/sex and employment status/age. Both of these interactions were left in the final model based on improved AIC and BIC values.

Table 7: Univariate and multivariable logistic regression models (stratified and total) for use of dental care.

Dental Care	**Non-status**		**Status**		**Total**	
	Univariate	**Multivariable**	**Univariate**	**Multivariable**	**Univariate**	**Multivariable**
Variables	**OR**	**aOR**	**OR**	**aOR**	**OR**	**aOR**
Sex (male: ref.)						
Female	1.687*	1.359	1.589**	1.213	1.642***	1.357
Age (19-24: ref.)						
25-34	0.695	2.052	0.641	0.656	0.677	1.389
35-44	0.676	0.985	0.627	0.486	0.636	0.818
45-54	0.583	0.354	0.334***	0.198	0.425***	0.303
55+	0.301**	0.489	0.205***	0.271	0.239***	0.413
Individual income (<$5,000: ref.)						
$5,000 – $9,999	0.681	0.723	1.179	1.285	0.977	0.999
$10,000 – $19,999	0.857	0.994	0.796	0.921	0.805	0.892
$20,000 – $29,999	0.819	1.014	0.648	0.580	0.717	0.730
$30,000 – $39,999	0.587	0.711	0.856	0.915	0.682	0.780
$40,000 – $49,999	1.215	1.856	1.918*	1.968	1.514	1.773
≥$50,000	3.717**	5.912***	1.129	1.103	1.741*	2.077**
Education Level (Grade 8 and less: ref.)						
Some secondary	1.73	1.376	2.081**	1.279	1.997***	1.274
Secondary diploma/Equivalent	2.881**	1.643	3.160***	1.753*	3.005***	1.627*
PS diploma (less than bachelors)	4.381***	2.939**	3.451***	1.876*	3.784***	2.213***
Bachelor's degree or above	5.864**	2.414	7.465***	3.593***	6.411***	2.787**
Employment status (Unemployed: ref.)						
Employed	1.789	3.826	1.254	1.552	1.360	2.479
Not in the labour force	1.170	7.250*	0.679	1.488	0.820	3.074

Household size (1 person: ref.)						
2 people	1.478	1.610	1.606*	1.474	1.532*	1.458*
3 people	2.061	1.504	1.748*	1.165	1.883**	1.308
4 people	1.758	1.090	3.056***	1.976**	2.292***	1.482
≥5 people	2.026	1.466	2.265**	1.439	2.286***	1.383
Rurality (Census metropolitan area: ref.)						
Other population centre	0.620*	0.715	1.024	1.141	0.865	0.916
Other – rural	0.486*	0.775	0.557**	0.653*	0.535***	0.639*
Indigenous status (non-status: ref.)						
Status	---	---	---	---	1.609***	1.652***
CONSTANT	---	0.819	---	4.144	---	1.494
Sample size (n)	**1,749**	**1,749**	**4,082**	**4,082**	**5,831**	**5,831**

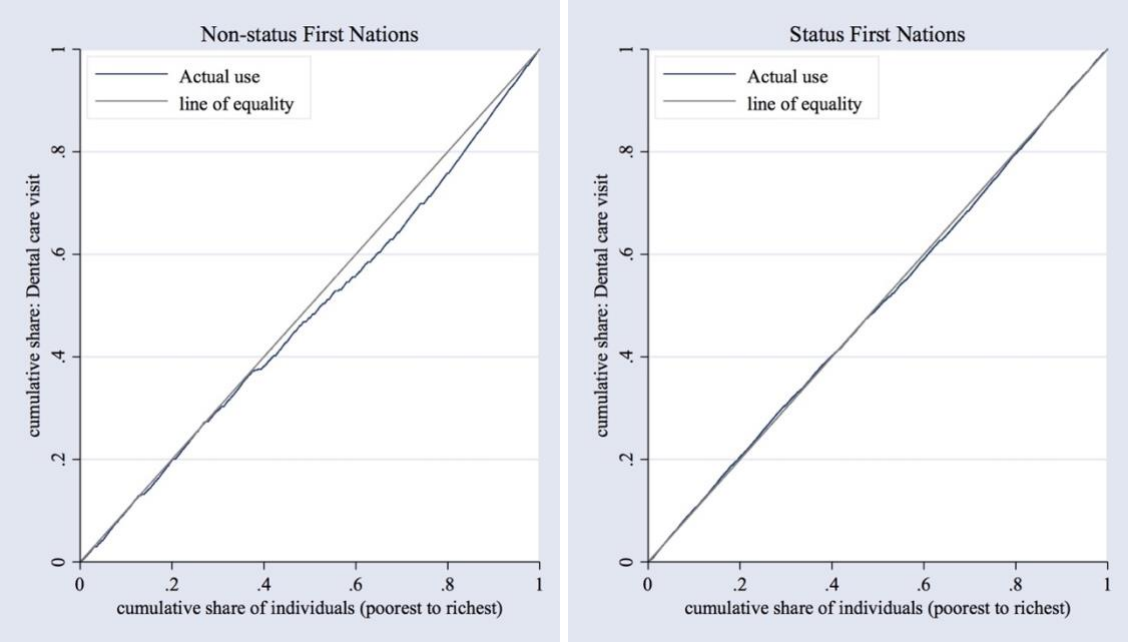
Note: * p<0.05, ** p<0.01, *** p<0.001

Note: This table excludes the present interaction terms, which can be found in Appendix D.

In contrast with primary and specialist care, age had a negative relationship with use of dental care. Although the relationship is not as strong in multivariable models the unadjusted ORs show decreases in odds of use as individuals age in both groups. The association between dental care utilization and income is positive and stronger for the non-status population. Specifically, those with an individual income > $40,000 appear to have much higher odds of use. Other SES variables such as education and employment are also positively associated with use of dental care. Being female also increases the odds of seeing a dental professional, however this relationship is not significant in adjusted models.

4.2.3 Concentration index

The Cs were calculated as described in section 3.3. The calculation of HI was not completed for this analysis as need-standardization is not possible. The C for actual use of dental care was calculated for the overall eligible population and stratified based on Indigenous status creating three values for this index. The assumption that need is present for everyone in this analysis means that the evaluation of the C represents inequity in this type of utilization. The analytical sample used here is exactly as described above.



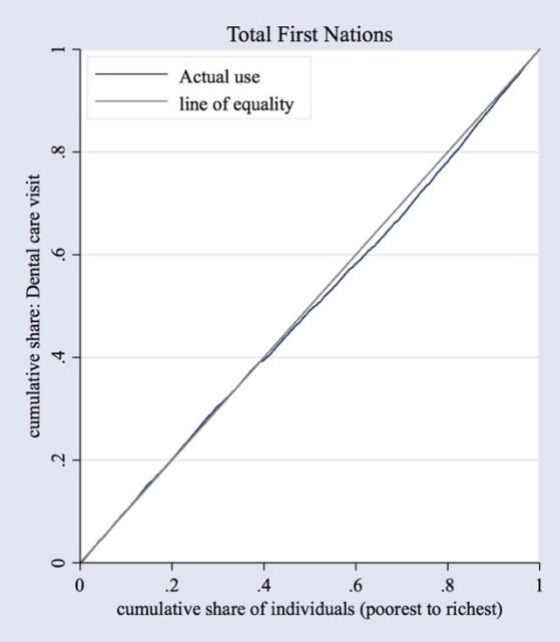


Figure 5: Concentration curves for actual use of dental care for First Nations populations (non-status, status and unstratified).

Table 8: Concentration indices for dental care use.

Dental care	**Index value (corrected)**	**Std. Error (corrected)**	**95% CI**	
Non-status				
Concentration index (actual use)	0.1783	0.0516	0.0771	0.2794
Status				
Concentration index (actual use)	0.0178	0.0408	-0.0622	0.0977
Total First Nations				
Concentration index (actual use)	0.0812	0.0321	0.0182	0.1442

In Figure 5 we see the CCs for actual use of dental care. In the non-status population, the CC is far below the line of equality indicating that use of care is unequal and favours the rich. In the status group we see a much more equal distribution of use and in Table 8 we can see that the value of C for this group is not statistically different from zero.

As with primary and specialist results, additional analysis including missing data can be found in Appendix E.

4.3 Equity in Mental Health Care

4.3.1 Descriptive results

As previously discussed in the methods section (Chapter 3) the mental health care analysis was done slightly differently as there was no direct collection of mental health care utilization in the APS, 2012. Use of mental health care was collected in combination with physical health care, and therefore the population was modified to include those who we expected to be using primary care for mental health purposes. The available "need" variables were used to identify a subset of the population with genuine need for mental health care. In this case, exclusion from the analysis was done not only based on missingness of data, but also based on meeting certain criteria on two need variables (self-rated mental health and K10 psychological distress scale). Respondents were included in this analysis, if they had responded fair/poor on the self-rated mental health question or if they had a K10 score >24 corresponding to severe psychological distress. Only one of these criteria must be met, which is why it is possible to have lower K10 scores or higher self-rated health and still meet inclusion criteria. A total of 905 individuals (weighted: 54,189) were included in the final mental health care analysis. There were 985 respondents who met need criteria and 80 additional observations were removed because of missing data.

Table 9: The description and summary statistics of variables used in mental health care analysis: APS 2012

	Non-status	Status	Total	* Pearson Chi2 value
Variables	**Proportion**	**Proportion**	**Proportion**	**P-value**
Outcome variables				
Use of primary care in the past 12 months	0.935	0.864	0.892	0.429
Need variables				
Health Variables				
Mean – Kessler (K10) psychological distress	27.8	27.0	27.2	---
Self-rated mental health				
Excellent	0.007	0.012	0.010	
Very good	0.031	0.069	0.054	
Good	0.238	0.196	0.212	
Fair	0.577	0.558	0.566	
Poor	0.148	0.165	0.158	0.700
Explanatory variables				
Sociodemographic variables				
Sex				
Female	0.686	0.652	0.665	0.752
Age (years)				
19-24	0.103	0.175	0.147	
25-34	0.171	0.197	0.187	
35+	0.726	0.628	0.666	0.758
Socioeconomic variables				
Income (grouped)				
<$5,000	0.161	0.119	0.135	
$5,000 – $9,999	0.063	0.139	0.11	
$10,000 – $19,999	0.419	0.355	0.38	
$20,000 – $29,999	0.089	0.194	0.153	
$30,000 – $39,999	0.119	0.077	0.093	
≥$49,999	0.149	0.116	0.129	0.161
Education Level				
Grade 8 and less	0.065	0.084	0.077	
Some secondary	0.251	0.265	0.259	
Secondary diploma/Equivalent	0.371	0.284	0.318	
PS diploma (less than bachelors)	0.314	0.367	0.346	0.944
Employment status				

Employed	0.456	0.409	0.428	
Unemployed	0.063	0.147	0.114	
Not in the labour force	0.482	0.444	0.459	0.016
Other non-need variables				
Rurality				
Census metropolitan area	0.584	0.566	0.573	
Other population centre	0.253	0.335	0.303	
Other – rural	0.162	0.099	0.124	0.001
Food security				
Often not secure	0.142	0.180	0.165	
Sometimes not secure	0.304	0.319	0.313	
Never not secure	0.554	0.501	0.522	0.517
Sample size (n)	**287**	**618**	**905**	**---**

* The Pearson Chi^2 value shows differences between status and non-status populations on each of the variables in question.

The individuals in this table correspond to 15.2% of all First Nations individuals represented in the APS. Table 9 displays descriptive information for these individuals included in the analysis.

A high proportion (89.2%) of the total included population made use of primary care services in the 12 months prior to survey collection. There are very few explanatory variables in this analysis that are statistically different between strata at the 0.05 level. Only employment status and rurality differ. This is (in part) due to the relatively low number of respondents who met the inclusion criteria for this type of analysis.

4.3.2 Regression results

The statistical significance of predictors in univariate logistic regression models are used as a starting point for variable inclusion. Because of the reduced sample size, the threshold for variable inclusion was modified to 0.1 rather than 0.05, as before. Additionally, categorical variables were collapsed in cases where cell sizes were ≤ 10 observations, collapsed variables include age, income and education. We find 7 out of 11 predictor variables to be insignificant, namely, sex, income, education, household size, household condition, marital status and rurality. Although not statistically significant, sex appears to have an important effect and thus, was left in the model. Income and education

are important socioeconomic variables for which we would like to make conclusion about and so they too remained in the model. Rurality allowed a measure of access which is not available in the APS. The remaining three variables, household size, household condition and marital status were removed from the multivariable model.

Two interactions are explored in the mental health analysis. These interactions are age/sex and employment status/age. Both of these interactions are explored and determined to add to the model. Reduced AIC and BIC values are used to justify the inclusion of these interaction terms.

Table 10: Univariate and multivariable logistic regression models for use of mental health care.

Mental Health Care	**Total**	
	Univariate	**Multivariable**
Variables	**OR**	**aOR**
Sex (male: ref.)		
Female	1.488	1.554
Age (19-24: ref.)		
25-34	1.197	0.555
35+	2.504*	3.179
Individual income (<$5,000: ref.)		
$5,000 – $9,999	1.461	2.230
$10,000 – $19,999	2.236	2.850*
$20,000 – $29,999	2.281	2.812
$30,000 – $39,999	1.717	2.591
≥$40,000	2.877*	3.972*
Education Level (Grade 8 and less: ref.)		
Some secondary	0.955	1.678
Secondary diploma/Equivalent	1.461	2.522
PS diploma or above	1.690	2.847
Employment status (Unemployed: ref.)		
Employed	2.355	3.286
Not in the labour force	3.936**	2.524
Rurality (Census metropolitan area: ref.)		
Other population centre	1.684	1.878
Other – rural	2.289	1.956
Food security (often not secure: ref.)		
Sometimes not secure	0.704	0.675

Never not secure	1.321	1.180
Indigenous status (non-status: ref.)		
Status	0.441*	0.503
CONSTANT	---	0.563
Sample size (n)	**905**	**905**

Note: * p<0.05, ** p<0.01, *** p<0.001
Note: This table excludes the present interaction terms, which can be found in Appendix D

Table 10 shows the results from both univariate and multivariable models. Age has a variable association with use in this population, however, in general utilization tends to increase as you age. We see an apparent association between income and mental health care use with aORs above one in every category (range 2.230 – 3.972), however, this value is only statistically significant in the highest income category (≥$40,000). Additionally, we see positive association with other SES variables, such as education and employment status. These adjusted associations indicate a potential pro-rich inequity in this population.

4.3.3 Concentration index

The reduced population associated with mental health care means that the stratum-specific ORs would not have been accurate. This is due to low stratum-specific cell sizes for certain categorical variables, especially those with many categories, like income. It would be inappropriate to analyze these stratum specific regression models and use them in the calculation of the C indices, and so only the total model was used. This decision was supported by the lack of difference found between strata during descriptive analysis (Table 9).

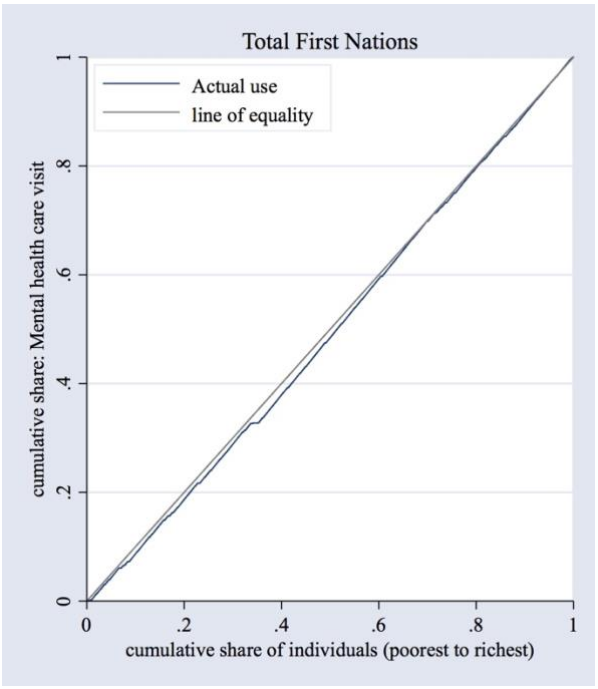


Figure 6: Concentration curve (unstratified) for actual use of mental health care for First Nations populations.

Table 11: Concentration index for mental health care utilization.

Mental health care	**Index value (corrected)**	**Std. Error (corrected)**	**95% CI**	
Concentration index (actual use)	0.1756	0.1014	-0.0233	0.3742

For mental health care use we can see a moderately pro-rich inequality in actual use of care, based on the CC in Figure 6. The index value presented in Table 11 confirms this result and shows that the value is not statistically significant. The confidence interval on this point estimate is very large because of the reduced sample size.

Additional missing data analysis can be found in Appendix E.

Chapter 5 Discussion

The primary objective of this study was to assess inequities in four different types of health care utilization among First Nations adults living off-reserve in Canada. This objective was met through the description of these populations, the testing of inequity using multivariable regression and the evaluating inequity through the C and HI. This study was an important evaluation of inequity within these Indigenous populations living off-reserve in Canada, where most studies focus on comparing to the general Canadian population.

Our descriptive results indicate that primary care was used at least once within 12 months by 82.3% of the total sample and specialist care was used by 39.2% in the same time frame. For primary care, there was no statistical difference in utilization between status groups, whereas for specialist use, non-status individuals use significantly more care ($p<0.001$). Data published from the CCHS in 2003 shows that primary and specialist care utilization values in the general population are slightly lower at 81.6% and 29.0% respectively (85). These of course, do not account for need for care and therefore may not tell the whole story. Dental care was used by 81.9% of the total sample in the 3 years prior to survey collection. There is a statistically significant difference in dental care utilization between the stratification groups with status individuals having a higher proportion of use ($p<0.001$) compared to their non-status counterparts. Although this 3-year measure is not commonly reported in the literature, a study published using the 2014 CCHS found that in Ontario, 72.2% of people had used dental care in the past year (86), which is larger than the analogous measure in our analytical sample, where 59.9% of First Nations individuals had used dental care in the past year. Use of primary care in the previous 12 months for those with a need for mental health care is 89.2% in the total population with a non-significant difference ($p=0.429$) in use between status groups. Although not statistically significant, it appears as though non-status respondents have a higher proportion of use compared to status respondents (93.5% and 86.4% respectively).

In assessing the associations with utilization for both primary and specialist care, across all univariate and multivariable models, we see a statistically significant increase in the odds of utilization for females. This result is supported by previous research in other populations (86) and is logical based on physiological differences between the sexes. The income variable in the regression analyses shows that there is a strong positive adjusted

association with primary care use for status individuals, but that this association is not as strong in the non-status group. This is supported by the HI reported for the status group: 0.1630 (95% CI: 0.0987, 0.2273) and non-status group: 0.0546 (95% CI: -0.0474, 0.1566). In both cases inequity is present and is and pro-rich, although only statistically significant in the status population. This result is not typical in the general population of Canada, where use of GP services actually tend to be pro-poor (6,25). A study performed for Indigenous populations in Australia, shows a similar pro-rich result, however the magnitude is lesser and in very few subpopulations are the results statistically significant (66). It is important to note that these are not perfect comparisons primarily because of the type of use (GP versus "Primary care") and also because of varying methods for the HI index calculation in these studies. This assessment of income as it pertains to specialist care shows very little association with use after adjustment. The HIs for each group and in total show no statistically significant difference from zero indicating no evidence to suggest income-based inequity in specialist care utilization among these populations. This is again, contrary to what is observed in the general Canadian population and in Indigenous populations elsewhere, where specialist services tend to be more pro-rich (6,66).

The C for actual use of health care in both primary and specialist categories are more pro-poor (more negative) than the need-standardized estimations. This indicates that actual use of care is more equal or even unequal favoring the poor. Because those of lower SES tend to have more need for care this result is in line with previous research in other Canadian populations (87). When looking specifically at specialist care the index values are non-significantly different from zero in five out of six cases. The C for specialist use in the total population is the only one that is significant and pro-poor, -0.0600 (95% CI: -0.1091, -0.0109).

In dental care analyses the association with income tends to be minor, until an individual income around $40,000 is reached. At high levels of income, the association is quite strong in the non-status population (aOR: 5.91), and much less strong in the status population (aOR: 1.10). These associations would imply a pro-rich inequity for dental care, especially in the non-status population. As expected from our regression result and previous literature (6,66) we do find a pro-rich inequity in dental health care utilization in the total population, 0.0812 (95% CI: 0.0182, 0.1442). Upon stratification we see that there is a large difference

between status groups, where those with status only have a marginally pro-rich C, 0.0178 (95% CI: -0.0622, 0.0977), and the non-status group is statistically significantly pro-rich, 0.1783 (95% CI: 0.0771, 0.2794). This illustrates that the status population, who have dental coverage from the federal government, have a more equitable distribution of use for that type of care.

Similar trends to the primary care analysis can be viewed in the analysis of mental health care. In the logistic regression model we see positive associations with age, income, education and employment. This association with income would suggest a minor pro-rich inequity in utilization for this care. The reported C (for the total population) indicates that use of primary care in this subpopulation with mental health care need is pro-rich, but not statistically significant 0.1760 (95% CI: -0.0226, 0.3746]).

A deeper understanding of the way that First Nations populations use care is needed in order to address issues created by colonialism (34) and described in section 2.3.2 above. The results discussed here may have important policy implications for First Nations groups. In Canada, where many policies are generated around Indigenous status our stratified analysis based on status group may provide a useful piece of evidence for decision makers. The stratified analyses show important differences between Indigenous groups especially in use of dental care. Based on our results, dental care, which is covered for status individuals through the NIHB program, is much more equitable in the covered population when compared to those who are not covered (the non-status population). Other results such as the pro-rich inequity in primary care utilization could provide evidence for programs providing primary care to those Indigenous populations who may need more.

These results may also provoke further research in this area. This study focused on the largest Indigenous group (the First Nations) in Canada, however, there are gaps in the understanding of inequity in health care utilization for other Indigenous groups in this country as well, including the Métis and Inuit. Additionally, a longitudinal analysis of inequities in these populations may uncover the effects of previous policy change and inform future changes. Similar analyses could be performed using other cycles of the APS, which is completed approximately every 5 years.

Knowledge translation was an important part of the research process for this study. This project was conducted under the supervision of a research team with expertise in health

care inequalities and context expertise in Indigenous health. The complex nature of inequity analysis means that this study may not be easily understood by members of the general population or, more importantly, the study population. In addition to contributing to any publication that may result from this study the TPF may also provide an avenue for translation of knowledge, whereby a summary of results may be given to this organization for further distribution to their stakeholders. Additionally, I hope to attend Indigenous health conferences, in order to disseminate the knowledge gained from this research. These conferences focus on bringing both stakeholders and researchers together in order to help communication and understanding between these groups, something that I believe to be very important in this area of research. Two members of my thesis committee have content expertise and experience in the area of Indigenous health research and have been able to provide me with guidance for the novel application of this method to the Indigenous context. Additionally, multiple members of the research team have established relationships with Indigenous stakeholders and government policy makers as well as other interest groups in order to ensure a smooth and respectful exchange of knowledge.

5.1 Strengths

The primary strength of this project is that it has filled an important gap in the literature pertaining to inequity in health care utilization for the Indigenous populations in Canada. This analysis is the first of its kind in Canada and uses the nationally collected APS survey which is representative of the off-reserve Indigenous populations in Canada. Further, the analysis *within* both of the First Nations populations has allowed a deeper understanding of the variations between these groups. The use of analogous statistical methods in assessing both the C and the HI across these populations has allowed for comparison between groups. The results of this study may provide policy makers with evidence for decisions about the health care of Indigenous populations. Additionally, the results may promote further study in this area.

5.2 Limitations

This research is descriptive and classifies as a secondary analysis of cross-sectional data, which means that no causal inference should be drawn from the results.

There are some important limitations to the APS that stem from a sampling method which is based on the NHS. A study conducted in 2017 found that the census (or NHS in 2011) has underestimated the size of the urban Indigenous populations in Toronto by a factor of 2-4 times (88). There are multiple reasons for which this underrepresentation may be present. The first is that the Indigenous populations may have lower response rate to the census (or NHS, 2011) (88) limiting the sampling frame for the APS. Secondly, the census collects information on households in Canada and therefore does not account for homeless populations (88). Indigenous peoples who are homeless will not have been included in the APS for that reason. It is important to consider these limitations as they may have an impact on our measurement of inequity, especially if those Indigenous peoples with very low income are being excluded. In conducting further research it will be useful to employ other Indigenous-led survey programs, such as the First Nations Regional Health Survey, which tend to report better response rates and may sample from a more representative population.

Several of the variables used for the analyses are self-reported and, in some cases, are collected retrospectively. This means that the variables may be subject to certain measurement biases, specifically reporting and recall bias, among others. There is no reason to believe that bias would be dependent on any individual value used in this study and was therefore deemed uniform throughout the population. Additionally, the income variable used in this study represents "personal sources" of income, making it an assessment of individual income rather than household income. Generally, household income is more desirable for inequity studies as it better represents the total income available to each individual in the home.

As previously mentioned in the results section (Chapter 4) there are a large number of respondents who had to be excluded from the analytical samples for reasons of missing data. The missing data represents 13.2%, 12.0% and 9.8% of the total eligible population for primary and specialist care, dental care and mental health care respectively. The differences that are found between those who are included and excluded (explored in more detail in Appendix E) would suggest that the estimates provided in the above (Chapter 4) have biased the results toward more negative values of the calculated indices. This would imply that our results may be underestimates of inequity when pro-rich (biased toward the null) and overestimates of inequity when pro-poor (biased away from the null).

In applying this analysis method to Indigenous populations, we are making the assumption that access to health care does not affect use for these populations. We have seen that systemic issues such as racialization in the system, as well as geographical barriers given that Indigenous populations tend to live in more rural areas (54), may be present. In the regression analyses we see reduced odds of visiting primary, specialist and dental care in both status groups for those living in rural areas. This is likely due to a lack of access to care, although there is no way to test this with the data available.

Chapter 6 Conclusion

Reducing inequity of any kind is an important aspect of the Canadian health care system (2). In order to reduce these inequities it is important to understand their area and severity. Studies have shown the presence of inequity in many areas and populations across the country (6,7). Here, we have investigated one specific type of inequity (inequity in health care utilization) for First Nations populations living in Canada. There are many reasons why inequity is an important problem to understand in this population. Each of these reasons stem from the issue of colonialism and the impact that it has had on this population over several hundred years (34). This is a large population in Canada for which these inequities have yet to be properly understood.

This study finds that systemic inequities are present in the use of health care for these populations. Specifically, we see inequity in primary care utilization, based on both regression analysis as well as the calculation of the HI index. We have found that inequity is present and pro-rich in the entire population as well as for each subgroup. For dental care use, pro-rich inequity is concentrated in the non-status group and is very inequitable. Finally, no evidence of inequity in specialist or mental health care utilization is present for these populations, although point estimates for inequity are moderately pro-rich as well.

As previously mentioned, this research investigates one type of inequity in a subpopulation of the Indigenous peoples living in Canada. Much more work needs to be done in order to gain a more holistic understanding of the health of these Indigenous populations. This includes further research in this area, specifically for other Indigenous populations in Canada, including those living both on and off reserve, and using additional data sources, such as the FNRHS and other cycles of the APS.

The goal of this research was to gain a deeper understanding of the inequities at play in this population in order to elicit positive change and benefit the health of the population as a whole. I believe that the evidence that has been provided through this work has the potential to do just that.

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Appendix A Personal reflection – Ethics of secondary data use

Although access to this data does not require an institutional ethics approval, it was important to consider the implications of analysing secondary data for the study population of the APS. This project was purely quantitative and the techniques that were used to analyze and draw conclusions are not easily understood for those not educated in the field. For that reason the results from this study will be prepared in a lay summary in order to ensure comprehension by all, especially those for whom it applies to directly. This research was a secondary use of the APS data and may be subject to more criticism for that reason. There are several opinions on this type of data use with some viewing it as exploitative without the engagement of the population of interest from the beginning (84). Others may see it as a necessary way to document the health of this population so long as there is engagement and transparency during and after completion of the research (84). Although I am new to this area of research, my opinion is that the data should be useable for secondary studies, when the researcher has committed to making efforts to engage with and explain the research to the population. In order to fulfill this commitment I have been in contact with the Thunderbird Partnership Foundation (TPF), a national First Nations organization dedicated to providing an Indigenous voice and perspective on health in this country. Although this group has specific goals in many areas of work, part of their mandate involves supporting effective research on "identifying individual, family and community need and improving programs and services (for First Nations populations)" (89). My research has been communicated to this organization and they have continued to be an active partner throughout the research process. The TPF will continue to provide guidance and approval on any publication that results from this thesis. Additionally, the thesis itself will not be made public unless approved by this organization. The purpose of this action is to ensure that I can provide as much transparency as possible in order to justify doing this research "with" and not "on" Indigenous people.

Appendix B Need-standardization

When performing need-standardization, there are two methods used in the literature: indirect and direct need-standardization.

Indirect Need-Standardization:

The indirect method is much more common and is described in the methods section of this thesis as the method of standardization used here. The regression equation employed here is as follows (section 3.3.3).

$$y_i = \alpha + \beta(inc_i) + \sum_j \beta_j^m x_{ji} + \sum_k r_k^n z_{ki} + \varepsilon_i \quad (5)$$

Ordinary least squares regression estimates ($\hat{\alpha}$, $\hat{\beta}$, $\hat{r}$) are then used along with the remaining parameter estimates to generate predicted values for health care utilization by individual i. This is given as the following:

$$\hat{y}_i{}^X = \hat{\alpha} + \hat{\beta}(inc_i) + \sum_j \hat{\beta}_j^m x_{ji} + \sum_k \hat{r}_k^n \bar{z}_{ki} \quad (6)$$

Estimates of health care utilization (using indirect standardization method) are then given as:

$$\hat{y}_i{}^{IS} = y_i - \hat{y}_i{}^X + \bar{y} \quad (7)$$

This can be interpreted as the distribution of health care utilization that would be expected when adjusting for need, across income.

Direct Need-Standardization:

This approach uses similar regression techniques, but groups the population based on SES, thus creating group-specific ordinary least squares coefficient and parameter means. These are then used to directly determine the need-standardized utilization for that group.

The major differences between these methods is that the indirect method limits the need for grouping and is feasible with individual values. Additionally, grouping in direct need-standardization will affect the value of the index differently based on the number of groups chosen.

Appendix C Variable Description

Variables	Type	Description
Outcome variables		
Primary care	Binary	Respondent's use of either a GP or nurse in the past 12 months
Specialist care	Binary	Respondent's use of a specialist (any other medical doctor or specialist such as a surgeon, allergist, orthopedist, [urologist/gynecologist] or psychiatrist) services in the past 12 months
Dental care	Binary	Respondent's use of a dental care professional in the past 3 years
Mental health care	Binary	Respondent's use of primary care services in the past 12 months for a subset of the population with increased need for mental health care.
Need variables		
Sex	Binary	Sex of the respondent (male/female)
Age	Categorical	Respondent's age, categories include: 19-24, 25-34, 35-44, 45-54, 55+.
Number of chronic conditions	Categorical	The amount of chronic conditions reported by each respondent (collapsed for those with ≥4 conditions).
Self-rated health	Categorical	The health status of the respondent (self-reported) on a 5-point scale: Excellent, Good, Very good, Fair, Poor.
Self-rated mental health	Categorical	The mental health status of the respondent (self-reported) on a 5-point scale: Excellent, Good, Very good, Fair, Poor.
K10 psychological distress	Continuous	Psychological distress score for each individual based on their response to 10 questions. The scale ranges from 10-50.
Non-need variables		
Individual income	Categorical	Respondent's annual income from any of the following sources: Employment or self-employment, Government income, Pensions & annuities, Other sources such as child support, spousal support, scholarships, etc., categories include: <$5,000, $5,000 – $9,999, $10,000 – $19,999, $20,000 – $29,999, $30,000 – $39,999, $40,000 – $49,999, ≥$50,000.
Education Level	Categorical	Level of educational attainment of the respondent, categories include: Grade 8 and less, Some secondary (respondent has completed some school after grade 8 but

		has not graduated high school), Secondary diploma/Equivalent (equivalency certificate includes academic or vocational high school diplomas or certificates as may be obtained by graduating from secondary school. It also includes successfully completing a high school equivalency test such as the General Educational Development (GED) test, or obtaining an Adult Basic Education (ABE) certificate), Post-secondary diploma (less than bachelor's degree), Bachelor's degree or above.
Employment status	Categorical	The respondent's employment status in the reference week (the most recently completed seven-day period beginning on a Sunday and ending on the following Saturday) categories include: Employed, Unemployed, Not in the labour force.
Household size	Categorical	Total number of persons (grouped for numbers above four) who are living in the household at the time of the interview.
Marital status	Categorical	Marital status of the respondent, categories include: Married, Common-law, Separated/divorced/widowed, Single, never married.
Rurality	Categorical	The size of the population centre where the respondent lives, categories include: Census metropolitan area (A CMA must have a total population of at least 100,000 of which 50,000 or more must live in the core), Other population centre (an area with a population of at least 1,000 and a density of 400 or more people per square kilometre), Other – rural (all areas outside population centres, which are collectively defined as rural area.
Indigenous status	Binary	Whether the respondent is a "Status-Indian". "Status Indians" include Registered and Treaty Indians. Registered Indians are persons who are registered under the *Indian Act* of Canada. Treaty Indians are persons who belong to a First Nation or Indian band that signed a treaty with the Crown.

Appendix D Interaction effects logistic regression models

Table 12: The interaction terms that are present in each of the complete logistic regression models (Chapter 4**)**

	Primary Care (non-status)	**Primary Care (status)**	**Primary Care (total)**	**Specialist Care (non-status)**	**Specialist Care (status)**	**Specialist Care (total)**
Interaction terms	**aOR**	**aOR**	**aOR**	**aOR**	**aOR**	**aOR**
Age # Sex (male-19-24: ref.)						
Female 25-34	0.798	0.897	0.786	1.083	0.700	0.878
Female 35-44	0.480	1.020	0.677	0.636	0.412*	0.513*
Female 45-54	0.532	0.538	0.444*	0.733	0.241***	0.338**
Female 55+	0.248	0.445	0.297**	0.285	0.418*	0.357**
Employment status # Age (unemployed-19-24: ref.)						
Employed 25-34	0.285	1.083	0.7	1.093	0.884	0.977
Employed 35-44	0.829	0.881	0.811	1.223	1.291	1.424
Employed 45-54	0.199	0.181*	0.185**	28.608**	0.607	1.743
Employed 55+	0.298	2.151	1.034	2.531	0.613	0.962
Not in labour force 25-34	0.509	1.352	1.042	0.281	1.449	0.879
Not in labour force 35-44	0.896	1.032	1.021	0.203	2.306	1.259
Not in labour force 45-54	0.434	0.589	0.524	13.376	1.058	1.836
Not in labour force 55+	0.301	2.401	1.176	0.789	0.771	0.797
Marital status # Sex (Single, never married-male: ref.)						
Married female	1.897	1.692	1.889*	0.954	1.563	1.380
Common-law female	1.270	2.964**	2.199**	0.581	2.054*	1.289
Separated/divorced/widowed female	1.565	1.634	1.651	1.836	1.467	1.842

Sample size (n)	**1,730**	**4,022**	**5,752**	**1,730**	**4,022**	**5,752**

Note: * p<0.05, ** p<0.01, *** p<0.001

Table 12 (cont.)

Interaction terms	Dental Care (non-status) aOR	Dental Care (status) aOR	Dental Care (total) aOR
Age # Sex (male-19-24: ref.)			
Female 25-34	2.048	4.241**	2.804*
Female 35-44	1.808	1.184	1.261
Female 45-54	2.840	1.965	2.113
Female 55+	0.794	0.813	0.753
Employment status # Age (unemployed-19-24: ref.)			
Employed 25-34	0.121*	0.355	0.179**
Employed 35-44	0.205	0.935	0.410
Employed 45-54	0.474	1.242	0.722
Employed 55+	0.355	1.285	0.672
Not in labour force 25-34	0.081*	0.532	0.200*
Not in labour force 35-44	0.216	0.794	0.410
Not in labour force 45-54	0.351	0.805	0.465
Not in labour force 55+	0.300	0.733	0.492
Sample size (n)	**1,749**	**4,082**	**5,831**

Note: * p<0.05, ** p<0.01, *** p<0.001

Table 12 (cont.)

Interaction terms	Mental Health Care (total) aOR
Age # Sex (male-19-24: ref.)	
Female 25-34	1.892
Female 35+	0.493
Employment status # Age (unemployed-19-24: ref.)	
Employed 25-34	0.702
Employed 35+	0.263
Not in labour force 25-34	1.500
Not in labour force 35+	2.163
Sample size (n)	**905**

* p<0.05, ** p<0.01, *** p<0.001

Appendix E Missing data analysis

Primary/specialist health care

It is important to understand the data that was excluded from the analysis. We must consider the 832 respondents (weighted: 47,159) who are excluded as they represent 13.2% of the weighted population. Table 13 displays all Chi-square values based on strata for those included in the analysis and separately for those excluded from the analysis. The final column shows the Chi-square value for each variable based on the total included and excluded populations (not stratified).

Table 13: Differences between strata and based on inclusion in the final analysis.

	Included in analysis	**Excluded from analysis**	*** Total**
Variables	**Pearson Chi2 value**	**Pearson Chi2 value**	**Pearson Chi2 value**
Outcome variables			
Primary care use	0.706	0.593	0.215
Specialist care use	<0.001	0.915	0.001
Need variables			
Sociodemographic variables			
Sex	0.024	0.069	0.955
Age	0.602	0.290	<0.001
Health Variables			
Number of chronic conditions	0.001	0.452	0.039
Self-rated health	0.604	0.308	<0.001
Non-need variables			
Socioeconomic variables			
Income	0.011	0.377	<0.001
Education Level	0.002	0.103	<0.001
Employment status	<0.001	0.008	<0.001
Other non-need variables			
Indigenous status	---	---	0.003
Household size	<0.001	0.055	0.014
Marital status	0.009	0.232	<0.001
Rurality	<0.001	<0.001	<0.001
Sample size (n)	**5,752**	**832**	**6,584**

***** The total column shows the unstratified difference between those included and excluded from the analysis.

It is important to note here the sample sizes being used for this calculation are dramatically different making statistical significance relative.

Dental health care

Again, it is important to note that this is not the entire eligible population, we will also look at descriptive information for the additional respondents representing 42,950 First Nations individuals. Table 14 shows the same Pearson Chi-square values based on differences between strata for each group (those included in the analysis, those excluded) and also shows unstratified difference between these two populations.

Table 14: Differences between strata and based on inclusion in the final analysis.

	Included in analysis	**Excluded from analysis**	**Total**
Variables	**Pearson Chi$_2$ value**	**Pearson Chi$_2$ value**	**Pearson Chi$_2$ value**
Outcome variables			
Dental care use	<0.001	0.136	0.189
Explanatory variables			
Sociodemographic variables			
Sex	0.033	0.028	0.660
Age	0.646	0.147	<0.001
Socioeconomic variables			
Income	0.007	0.033	<0.001
Education Level	0.002	0.017	<0.001
Employment status	<0.001	0.004	<0.001
Other explanatory variables			
Indigenous status	---	---	0.007
Household size	<0.001	0.232	0.043
Rurality	<0.001	<0.001	<0.001
Sample size (n)	**5,831**	**753**	**6,584**

The third column in particular is of interest. Here we can see whether there are differences between the population who is set to be included in the analysis when compared to those who are being left out. An ideal result here would show no statistical difference

between the two groups (i.e. no p-values below 0.050). This is not the case and is explored in more detail in the discussion (Chapter 5 above).

Mental health care

For this analysis the excluded group is, by design, fundamentally different from the included group. When analyzing missingness in this population, we first leave out all those who do not meet the inclusion criteria. The we look at people who have been included and excluded because of missing data. To understand these groups, Table 15 was created and shows the Pearson Chi-square values (stratum-based) for those included in the analysis and for the total population (based on inclusion or exclusion from the analysis). The stratum-based Chi-square values for those excluded are not in the table as some of the cell sizes were zero (in stratum-based analysis) making the values virtually meaningless.

Table 15: Differences between strata and based on inclusion in the final analysis.

	Included in analysis	**Total**
Variables	**Pearson Chi2 value**	**Pearson Chi2 value**
Outcome variables		
Primary care use	0.481	0.628
Need variables		
Self-rated mental health	0.696	0.549
Explanatory variables		
Sociodemographic variables		
Sex	0.760	0.917
Age	0.923	0.003
Socioeconomic variables		
Income	0.198	0.814
Education Level	0.980	0.429
Employment status	0.020	0.043
Other explanatory variables		
Indigenous status	---	0.584
Rurality	0.001	0.275
Food Security	0.513	0.056
Sample size (n)	**905**	**985**

Income missingness (regression results)

It is important to note that although there are additional individuals added in these regression models (those who are missing income) the trends that are present in the previous regressions hold true. This is an important result that mediates the concern of removing these individuals in the original analyses.

Table 16: Univariate and multivariable logistic regression models (stratified and total) for use of primary care.

Primary Care	**Non-status**		**Status**		**Total**	
	Univariate	**Multivariable**	**Univariate**	**Multivariable**	**Univariate**	**Multivariable**
Variables	**OR**	**aOR**	**OR**	**aOR**	**OR**	**aOR**
Sex (male: ref.)						
Female	2.361***	2.870*	2.214***	2.044**	2.263***	2.453***
Age (19-24: ref.)						
25-34	1.150	1.565	1.146	0.678	1.148	0.984
35-44	2.067*	1.169	2.128***	1.194	2.104***	1.399
45-54	2.293*	2.803	1.810**	3.476*	1.959***	3.945*
55+	2.254*	2.965	2.802***	0.836	2.544***	1.487
Number of chronic conditions (0 conditions: ref)						
1 condition	2.751***	2.875***	2.297***	2.309***	2.454***	2.522***
2 conditions	3.422***	2.569**	3.280***	3.275***	3.322***	2.997***
3 conditions	11.618**	9.158*	7.574***	7.001***	8.742***	7.623***
≥4 conditions	11.283**	8.899*	7.432***	8.110***	8.802***	8.100***
Self-rated health (excellent: ref.)						
Very good	1.971**	1.886*	1.124	0.926	1.381*	1.191
Good	1.738*	1.458	1.437*	1.091	1.547**	1.208
Fair	3.183***	1.985	3.511***	2.044**	3.369***	1.996**

Poor	14.608***	6.965**	2.877*	0.944	4.418***	1.562
Individual income (<$5,000: ref.)						
$5,000 – $9,999	0.762	0.979	1.596	2.114**	1.26	1.663*
$10,000 – $19,999	1.572	1.408	2.015**	2.030**	1.878***	1.895**
$20,000 – $29,999	1.003	1.107	1.396	1.344	1.257	1.283
$30,000 – $39,999	1.078	1.211	1.552	1.999*	1.387	1.769*
$40,000 – $49,999	1.461	1.693	1.644	1.868*	1.588*	1.854*
≥$50,000	0.947	1.107	1.670*	2.052**	1.376	1.716*
Missing	0.669	0.676	1.850	1.583	1.275	1.247
Education Level (Grade 8 and less: ref.)						
Some secondary	0.55	0.778	0.590*	1.145	0.567**	0.966
Secondary diploma/Equivalent	0.518	0.882	0.896	1.849*	0.742	1.426
PS diploma (less than bachelors)	0.733	1.193	1.298	2.290**	1.063	1.765*
Bachelor's degree or above	0.739	1.427	1.744	2.638**	1.260	2.077*
Employment status (Unemployed: ref.)						
Employed	2.244*	2.994	1.415	1.188	1.640**	1.689
Not in the labour force	3.091**	2.281	1.558*	0.806	1.944***	1.157
Household size (1 person: ref.)						
2 people	0.970	1.251	1.094	1.147	1.036	1.16
3 people	1.175	1.571	0.840	1.051	0.947	1.199
4 people	0.919	1.329	0.635*	0.756	0.731	0.926
≥5 people	0.745	1.087	0.691	0.853	0.714	0.911
Marital status (Single, never married: ref.)						
Married	2.104**	1.63	1.577**	1.203	1.759***	1.294
Common-law	0.845	0.753	1.051	0.718	0.968	0.724

Separated/divorced/widowed	1.810	1.119	1.912**	0.768	1.866***	0.869
Rurality (Census metropolitan area: ref.)						
Other population centre	0.809	0.772	0.927	0.879	0.881	0.842
Other – rural	0.726	0.727	0.844	0.836	0.796	0.774
Indigenous status (non-status: ref.)						
Status	---	---	---	---	0.962	1.126
CONSTANT	---	0.322		0.603	---	0.411
Sample size (n)	**1,808**	**1,808**	**4,252**	**4,252**	**6,060**	**6,060**

Note: * p<0.05, ** p<0.01, *** p<0.001

Table 17: Univariate and multivariable logistic regression models (stratified and total) for use of specialist care.

Specialist Care	**Non-status**		**Status**		**Total**	
	Univariate	**Multivariable**	**Univariate**	**Multivariable**	**Univariate**	**Multivariable**
Variables	**OR**	**aOR**	**OR**	**aOR**	**OR**	**aOR**
Sex (male: ref.)						
Female	2.057***	2.982**	1.575***	2.124**	1.733***	2.248***
Age (19-24: ref.)						
25-34	1.483	1.150	1.257	1.149	1.326*	1.15
35-44	1.549	1.523	1.679**	1.187	1.634***	1.139
45-54	2.167**	0.056*	1.637**	2.264	1.809***	0.956
55+	1.835*	0.708	1.900***	2.018	1.889***	1.524
Number of chronic conditions (0 conditions: ref)						
1 condition	1.516*	1.508*	1.747***	1.879***	1.666***	1.702***
2 conditions	3.510***	2.616***	2.695***	2.958***	2.979***	2.706***
3 conditions	6.605***	4.708***	4.771***	5.031***	5.340***	4.711***

≥4 conditions	4.544***	3.375**	8.966***	9.472***	6.610***	5.970***
Self-rated health (excellent: ref.)						
Very good	1.059	0.977	1.256	1.045	1.177	1.012
Good	1.774*	1.467	1.704**	1.292	1.727***	1.322
Fair	3.107***	2.478**	2.409***	1.345	2.634***	1.585*
Poor	7.182***	4.611***	4.411***	1.647	5.165***	2.122**
Individual income (<$5,000: ref.)						
$5,000 – $9,999	1.037	1.097	1.185	1.272	1.126	1.251
$10,000 – $19,999	1.258	1.389	1.141	0.975	1.196	1.054
$20,000 – $29,999	1.061	1.519	0.828	0.793	0.905	0.943
$30,000 – $39,999	0.881	1.301	0.608*	0.713	0.726	0.909
$40,000 – $49,999	0.660	1.054	0.979	1.091	0.853	1.044
≥$50,000	0.795	1.482	0.851	0.809	0.837	0.992
Missing	0.296*	0.301*	0.918	0.710	0.639	0.571
Education Level (Grade 8 and less: ref.)						
Some secondary	0.521	0.733	0.717	1.001	0.624*	0.851
Secondary diploma/Equivalent	0.544	0.97	0.959	1.614*	0.771	1.311
PS diploma (less than bachelors)	0.711	1.289	1.022	1.645*	0.891	1.49
Bachelor's degree or above	0.728	1.621	1.705*	3.302***	1.228	2.343***
Employment status (Unemployed: ref.)						
Employed	1.444	0.650	1.411	1.502	1.435*	1.095
Not in the labour force	2.876***	3.197	2.008***	1.168	2.289***	1.628
Household size (1 person: ref.)						
2 people	1.086	1.111	1. 023	1.186	1.051	1.157
3 people	1.062	1.005	0.842	1.163	0.914	1.067
4 people	0.858	0.925	0.820	1.012	0.836	0.962

≥5 people	0.618	0.707	0.791	1.027	0.728	0.873
Marital status (Single, never married: ref.)						
Married	1.307	1.287	1.225	0.887	1.276*	1.026
Common-law	1.106	1.462	1.212	0.826	1.177	1.061
Separated/divorced/widowed	1.624*	0.570	1.702**	0.947	1.689***	0.704
Rurality (Census metropolitan area: ref.)						
Other population centre	0.900	0.825	0.833	0.824	0.840	0.816
Other – rural	0.763	0.771	0.796	0.867	0.778*	0.806
Indigenous status (non-status: ref.)						
Status	---	---	---	---	0.813*	0.859
CONSTANT	---	0.141*	---	0.094***	---	0.131***
Sample size (n)	**1,808**	**1,808**	**4,252**	**4,252**	**6,060**	**6,060**

Note: * p<0.05, ** p<0.01, *** p<0.001

Table 18: Univariate and multivariable logistic regression models (stratified and total) for use of dental care.

Dental Care	**Non-status**		**Status**		**Total**	
	Univariate	**Multivariable**	**Univariate**	**Multivariable**	**Univariate**	**Multivariable**
Variables	**OR**	**aOR**	**OR**	**aOR**	**OR**	**aOR**
Sex (male: ref.)						
Female	1.546*	1.277	1.537**	1.340	1.555***	1.388
Age (19-24: ref.)						
25-34	0.683	1.944	0.593	0.696	0.646	1.390
35-44	0.684	1.139	0.634	0.519	0.646	0.894
45-54	0.542	0.369	0.340***	0.218	0.418***	0.326
55+	0.295***	0.512	0.199***	0.295	0.233***	0.450

Individual income (<$5,000: ref.)						
$5,000 – $9,999	0.681	0.704	1.179	1.317	0.977	1.005
$10,000 – $19,999	0.857	0.967	0.796	0.930	0.805	0.891
$20,000 – $29,999	0.819	0.946	0.648	0.565*	0.717	0.704
$30,000 – $39,999	0.587	0.639	0.860	0.901	0.684	0.744
$40,000 – $49,999	1.215	1.684	1.918*	1.916	1.514	1.684
≥$50,000	3.717**	5.234***	1.129	1.048	1.741*	1.930*
Missing	1.020	1.239	0.789	1.075	0.872	1.134
Education Level (Grade 8 and less: ref.)						
Some secondary	1.833	1.477	2.299***	1.401	2.134***	1.405
Secondary diploma/Equivalent	2.845**	1.643	3.489***	1.922**	3.139***	1.736*
PS diploma (less than bachelors)	4.761***	3.290**	3.783***	2.056**	4.096***	2.456***
Bachelor's degree or above	6.180**	2.751	8.365***	3.982***	6.969***	3.146**
Employment status (Unemployed: ref.)						
Employed	1.829	4.126*	1.239	1.554	1.367	2.540
Not in the labour force	1.141	7.912**	0.644	1.411	0.788	3.051
Household size (1 person: ref.)						
2 people	1.573	1.696	1.725**	1.555*	1.640**	1.542*
3 people	2.036*	1.440	1.825*	1.193	1.929**	1.304
4 people	1.87	1.157	3.130***	2.032**	2.412***	1.544
≥5 people	2.024	1.392	2.282**	1.454	2.289***	1.373
Rurality (Census metropolitan area: ref.)						
Other population centre	0.623*	0.714	0.987	1.107	0.852	0.898
Other – rural	0.516*	0.813	0.574**	0.683	0.560***	0.665*

Indigenous status (non-status: ref.)						
Status	---	---	---	---	1.597***	1.660***
CONSTANT	---	0.790	---	3.624	---	1.346
Sample size (n)	**1,834**	**1,834**	**4,326**	**4,326**	**6,160**	**6,160**

Note: * p<0.05, ** p<0.01, *** p<0.001

Table 19: Univariate and multivariable logistic regression models for use of mental health care.

Mental Health Care	**Total**	
	Univariate	**Multivariable**
Variables	**OR**	**aOR**
Sex (male: ref.)		
Female	1.490	1.705
Age (19-24: ref.)		
25-34	1.221	0.602
35+	2.770*	3.964
Individual income (<$5,000: ref.)		
$5,000 – $9,999	1.461	2.217
$10,000 – $19,999	2.236	2.895*
$20,000 – $29,999	2.281	2.772
$30,000 – $39,999	1.717	2.486
≥$40,000	2.877*	3.864*
Missing	8.432**	9.932**
Education Level (Grade 8 and less: ref.)		
Some secondary	0.981	1.688
Secondary diploma/Equivalent	1.491	2.482
PS diploma or above	1.730	2.842
Employment status (Unemployed: ref.)		
Employed	2.488*	3.644
Not in the labour force	4.357***	2.827
Rurality (Census metropolitan area: ref.)		
Other population centre	1.630	1.841
Other – rural	2.196	1.903
Food security (often not secure: ref.)		
Sometimes not secure	0.730	0.737
Never not secure	1.472	1.298
Indigenous status (non-status: ref.)		
Status	0.483*	0.552
CONSTANT	---	0.419
Sample size (n)	**954**	**954**

Note: * p<0.05, ** p<0.01, *** p<0.001

Missingness Summary

There are a large number of respondents who had to be excluded from the analytical samples for reasons of missing data. The missing data represents 13.2%, 12.0% and 9.8% of the total eligible population for primary and specialist care, dental care and mental health care respectively. There are some significant differences between these populations that should be considered. In all cases, those with missing data are less likely to have been to various types of care in the specified time frames. Additionally, they have more chronic conditions and worse self-rated health. We also see significantly lower levels of income, education, employment. These differences are important to consider when making conclusions about this analysis. Based on the differences in descriptive statistics, these missing individuals tend to be of lower SES and using less care. This would imply that the inclusion of these individuals would likely increase the inequity measures favouring the rich. The estimates provided in Chapter 4 above are likely underestimates of inequity when pro-rich (biased toward the null) and overestimates of inequity when pro-poor (biased away from the null).

The regression analyses that include those missing income show similar trends to the ones described in the original regressions. This indicates that the removal of these individuals does not negatively impact the results that have been discussed above. There are some results from the above tables that warrant discussion. For primary care analysis we see that those who have missing income data tend to have lower odds of using care in the non-status group, but higher odds in the population with Indigenous status. The same trend can be seen in the mental health care analysis. This may be due to relatively small cell sizes in these analyses, but would suggest that there is a fundamental difference in use between those who do not report income across status groups.