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## The Association Between Ethnicity and Caregiver Health

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### **Abstract**

Existing research shows that caregiving is associated with several adverse health outcomes. Despite the growing number of caregivers in Canada, little research has been conducted on the potentially unique experiences and outcomes of caregivers based on their ethnicity. The main objective of this study was to investigate whether ethnicity was associated with caregiver's health using three measures – self-reported overall health, self-reported mental health, and health utility index to measure health related quality of life. To address these research gaps, we used data from the 2012 Canadian General Social Survey (GSS) Caregiving and Care Receiving. Focusing on caregivers (n=9,552), we examined the association using three measures of health – self-reported overall health, self-reported mental health, and the Health Utility Index<sup>3</sup> (HUI3), a measure of health-related quality of life. We used the logistic regression model and the Tobit regression model and incorporated survey sample weights. We found that ethnicity was significantly associated with overall health, mental health, and health-related quality of life. Indigenous caregivers had increased odds of poor overall health compared to caregivers of Canadian ancestry. Caregivers of European ancestry, Indigenous, Mixed and other ancestry had increased odds of good mental health compared to caregivers of Canadian ancestry. Furthermore, caregivers of all three ethnicities each had small but significantly better health-related quality of life compared to caregivers of Canadian ancestry. Our results highlight that there is an association between ethnicity and caregiver's health. However, it is important to note that this association differs from one ethnocultural group to another. Therefore, future studies need to understand these differences. Policy solutions to provide financial and social support to caregivers need to account for ethnocultural differences, to improve overall health, mental health, and quality of life.

## **Keywords**

Caregiver, ethnicity, overall health, mental health, health-related quality of life, HRQOL.

## **Summary for Lay Audience**

The association between ethnicity and caregiver health was measured using self-reported overall health, mental health, and health-related quality of life. Caregiver ethnicity was significantly associated with overall health, mental health, and health-related quality of life. The different ethnocultural groups had different health outcomes. Caregivers of Indigenous ancestry had significantly worse overall health than caregivers of Canadian ancestry. Caregivers of all three ethnicities had significantly better overall health than caregivers of Canadian ancestry. Caregivers of all three ethnicities each had a small but significantly better health-related quality of life than caregivers of Canadian ancestry.

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# CHAPTER 1

## 1 Introduction

Caregiving is the act of regularly providing care for the physical and emotional needs of a family member or a friend. Caregiving can be exhausting, anxiety-provoking, nerve-wracking, and frustrating. It may also present the caregiver with financial challenges. Despite all this, caregiving is often a rewarding, bonding, cherished, and important experience between loved ones that only a few would choose not to do again. Caregiving gives the opportunity to connect, love, show affection, dote upon, reminisce, and be compassionate and empathetic towards a care partner. Caregiving responsibility may involve assisting with meals, personal care, and transportation, helping with medical procedures and therapy, devoting a few hours weekly or many hours each day.

In Canada, approximately one in four Canadian aged 15 and older provides care to a family member or friend with a long-term health condition, physical or mental disability, or problems related to aging (Sinha M, 2013). Unpaid or informal caregiving provided by family and friends has become increasingly recognized as an important role in society (Broese van Groenou & De Boer, 2016). However, caregiving responsibilities differ and may have different health effects for individuals of different ethnocultural groups (Janevic & Connell, 2001).

### 1.1 Research Aims

The research aims of this thesis are as follows:

- We will examine the association of ethnicity and physical health of caregivers using self-reported overall health. We will examine the association of ethnicity and health-related quality of life of caregivers using the Health Utility Index<sup>3</sup>.
- We will examine the association of ethnicity and the mental health of caregivers using self-reported mental health.

## **1.2 Thesis Layout**

The chapters are laid out as follows: chapter two provides background information on what is caregiving, who care is provided to, the caregiver's health, ethnicity, and social-economic statuses such as age, sex, marital status, education, income, and employment. Additionally, this chapter provides information on measures of health including what is health-related quality of life, how it is measured, and Health Utility Index<sup>3</sup>; chapter 3 describes the General Social Survey (GSS), the survey from which the data were obtained, and the study methods; chapter four describes the study results; and chapter five concludes with a discussion of the research findings.

## CHAPTER 2

### 2 Literature Review

A literature review was conducted for several reasons. First, a review was done to develop a better understanding of the caregiving literature and to explore the predictors of health. Second, the literature review also highlighted how different ethnocultural groups approach caregiving. The literature review helped motivate and refine the research question. Findings from the literature review were used to help decide which variables were included in the statistical models.

This chapter features a review of caregiving, physical health, mental health, ethnicity, gender, marital status, age, education, income, employment. This will be followed by a section that outlines the gaps in the literature and the objectives of this thesis.

#### 2.1 Caregiving

Caregiving is defined as providing care to a family, friend, neighbor, elderly person, chronically ill or disabled person. Furthermore, caregiving is defined by (Drentea, 2007) “as the act of providing unpaid assistance and support to family members or acquaintances who have physical, psychological or developmental needs”. Caregiving can be formal or informal. Formal caregivers are paid to provide care, informal caregivers are not paid to provide care. For example, a nurse is a formal caregiver, and a family member is an informal caregiver. Almost everyone acts as an unpaid caregiver at some point in life and some individuals assume this role over an extended period. Caregivers provide help to individuals who are aging, ill, or suffering from a functional disability. Caregiving responsibility impacts the psychological, social, financial, and overall health of the caregiver (Aoun et al., 2005)(Haug et al., 1999) (Miller et al., 1995) (R. Schulz et al., 1990) (Solomon & George, 1996) (Smith et al., 2014) (William E. Haley et al., 1995) . The Pearlin conceptual framework on caregiver stress has four domains each comprising multiple components. The domains include: the background and context of stress, the stressors, the mediators of stress

and the outcomes of stress (Pearlin et al., 1990). The background and context of stress domain is potentially influenced by the socio-economic statuses of the caregiver such as age, gender, ethnicity, educational, occupational, and economic attainments. These characteristics signify where people stand within stratified orders having unequal distributions of rewards, privileges, opportunities, and responsibilities. The kinds and intensities of stressors to which people are exposed, the personal and social resources available to deal with the stressors, and the ways stress is expressed are all subject to the effects of these statuses. Stress can impair physical and mental health.

### **2.1.1 Aging**

Caregivers provide care to aging individuals. In a recent report, aging needs were indicated as the most common problem requiring help from caregivers (Sinha, 2013). Aging can be defined in many ways. Aging can be thought of as the process of becoming old. An evolutionary biologist defined aging to be “a persistent decline in the age-specific fitness components of an organism due to internal physiological deteriorations” (Rose et al., 2012). Furthermore, another evolutionary biologist described aging as an “inevitable age-progressive deterioration in intrinsic physiological function, increasing mortality rate and a decrease in survival rate” (López-otín et al., 2013) (Flatt & Schmidt, 2010). Aging is a life process. Social scientists indicate aging can be defined as “time-dysfunctionality” (Kyriazis, 2020) due to the passage of time and heterogeneity of causative factors which are subjected to changes that are detrimental such as increased falls, high risk of chronic conditions, and a decrease in physical activities. Many disciplines define aging in slightly different ways.

Globally, government and non-governmental organizations monitor aging. Due to the decrease in fertility rates and the advancement in technology, people tend to live longer. The aging of the population will continue to accelerate. According to a report by the United Nations in 2017, the

global population aged 60 years or over was 962 million in 2017 which is more than double the population of 382 million in 1980 (*World Population Ageing [highlights]*, n.d.). A report by the World Health Organization (WHO) in 2018 projected an increase in the population of people aged 65 or older from an estimated 524 million in 2010 to approximately 2 billion in 2050. This projected growth rate is triple the initial growth rate of 2010 with most of the increase in high-income countries – Europe and North America (WHO, 2011). Around the globe, populations are growing older, and this is a significant concern for governments and other organizations because of the need for increase human, social and financial resources to provide formal supports and increase informal caregiving.

The Canadian population is also aging. Canada is a high-income country with a total population of approximately 38 million which is projected to increase by 20% by 2036 (Sheets & Gallagher, 2013). The life expectancy at birth of an average Caucasian Canadian is 81 years, the fourth highest in the world. On average, a 65-year-old man can be expected to live an extra 17.4 years and a 65-year-old woman can be expected to live an extra 20.8 years (“The Future is AGING Institute of Aging,” 2012). In 2015, Statistics Canada data showed that there were more adults aged 65 and older than youth aged 15 and younger for the first time in history (“The Future is AGING Institute of Aging,” 2012). Forecast estimates suggest that by 2031, about one of every four Canadians will be 65 years or older (“The Future is AGING Institute of Aging,” 2012). Aging is not equal to disability however some aging individuals become disabled and need attention from caregivers. Thus, aging and its impacts pose challenges to Canadian society.

The effects of aging impact many aspects of society, including politics and economics. The burden of aging will become an increasingly salient political issue because of the economic impacts including increased health care cost, decreased workforce participation, and increase in caregiver

burden (Uhlenberg, 1996). Aging places a burden on some caregivers that impact their lives significantly.

### 2.1.2 Multimorbidity and chronic conditions

Health problems lasting 12 months or more that require long-term ongoing management are known as chronic conditions (Fortin et al., 2017). Multimorbidity refers to the simultaneous presence of two or more concurrent chronic health conditions in an individual (Roberts et al., 2015). The presence of these chronic conditions can lead to adverse health outcomes and these outcomes can be exacerbated when multiple conditions are present (Fortin et al., 2017). Multimorbidity, as a global health phenomenon is known to increase with age and is associated with polypharmacy, mortality, and reduced quality of life. In Canada, the prevalence of two or more and three or more chronic conditions was 26.5% and 10.2% respectively among individuals aged 40 years and older in the 2011/ 2012 fiscal year as reported by the Canadian Chronic Disease Surveillance System (CCDSS) (Feely et al., 2017). Multimorbidity is associated with increased dependency and complexity of care needs, higher health care utilization and costs, and poorer quality of life and mortality outcomes. Providing care to people with a chronic condition may be particularly burdensome due to the high use of health care services, high risk for adverse events and outcomes, and reduced ability to adhere to complex treatment regimens (Vogeli et al., 2007). People with multimorbidity tend to have greater health care needs than those with one chronic illness and face unique barriers to self-care, including challenges associated with multiple medications, and one condition may be aggravated by the symptoms or treatment of another, thus increasing the need for a caregiver. Caregivers of people with a chronic condition may be at risk of adverse consequences to their health and wellbeing and be struggling to cope with caregiving.

### 2.1.3 Functional disability

A disability is any condition that makes an individual significantly impaired to do certain activities and interact with the world around them. These disabilities sometimes affect an individual's vision, movement, thinking, memory, learning, communicating, hearing, mental health, and social relationship. An article by the World Health Organization reports that disability has three dimensions: impairment, activity limitation, and participation restrictions ("WHO | International Classification of Functioning, Disability and Health (ICF)," 2019). Functional disability is rampant among aging individuals, it leads to loss of autonomy, isolation, pain, increased burden on social networks, and the development of depression. Functional disability has numerous implications for public health, including increased demand for health care and increased demand for the caregiver (Chan et al., 2002). Over 40% of Canadians 65 years and older reported having at least one disability, with approximately one-quarter of this population categorized as severely disabled (Raina et al., 1998). The most important determinants of disability among the aging population have been attributed to chronic conditions. Musculoskeletal diseases such as arthritis, coronary heart disease, vision problems, cognitive deficits, stroke are individual causes of functional disability among the elderly. Often individuals with functional disabilities need assistance with transportation, banking, cooking, and personal care due to a lack of autonomy. These individuals make use of nursing homes, personal formal caregivers, or informal care, provided by a member of their immediate circle. The use of informal care by individuals with functional disabilities generally increases the caregiver's burden.

#### **2.1.1.1 Effects of caregiving on health**

Providing care to an individual with a chronic disease or multimorbidity, mental health, functional disability, or an aging individual is generally viewed as a major life stressor, and its effects on the physical and mental health of the caregiver have been intensively studied over the years (Pottie et

al., 2014) (Pinquart & Sörensen, 2007). Existing studies document how caring for chronically ill family members or significant others at home influences multiple aspects of caregivers' lives. These effects are physical, psychological, and social and may include worsened physical health, impaired social and family life, and increased stress, anxiety, and depression. The psychological, social, and health consequences experienced by family members providing care to an aging individual and chronically ill individual have been well documented (“Family caregiving in chronic illness: Alzheimer’s disease, cancer, heart disease, mental illness, and stroke,” 1991) (Cattanach & Tebes, 1991) (R. Schulz et al., 1990). A meta-analysis by Pinquart & Sörensen (2003) of 84 articles concluded that caregivers have poorer physical health than non-caregivers. A study comparing primary caregivers of aging adults with non-caregivers of aging adults discovered that caregivers were likely to report more visits to the doctor and had a higher risk of reporting poor health than non-caregivers (Ho et al., 2009)

#### 2.1.1.2 Physical effects of caregiving

The physical consequences of caregiving have received less attention than psychological outcomes. One study indicated that caregivers often experience several physical problems, including arthritis, high blood pressure, back injuries, and headaches (Sawatzky & Fowler-Kerry, 2003). Although caregivers may have existing physical problems that are not directly caused by caregiving responsibilities, they are often aggravated by these caregiving responsibilities. A different study found that the physical health of caregivers of long-term patients declined after the patients were discharged from the hospital (Douglas & Daly, 2003). Caregiver physical health are likely to be affected due to the care recipient’s behavior problems, cognitive impairment, functional disabilities, the amount of care provided, vigilance demands and caregiver and patient co-residence (Vitaliano et al., 2003). Distress and depression are associated with caregiving, they are factors that negatively affect the physical health of a caregiver. All these factors have been

linked to negative caregiver outcomes (Pinquart & Sörensen, 2007). These negative outcomes include muscle strain, physical discomfort, and pain, negative changes in health-related activities such as diet and exercise.

### **2.1.1.3 Psychological effects of caregiving**

In the caregiving literature aspects of psychological well-being such as depression and stress have been the most frequently studied consequences of caregiving (Pinquart & Sörensen, 2003) (Vitaliano et al., 2003). In one review (Pinquart & Sörensen, 2003), the difference between caregivers and non-caregivers effect sizes for all studies was 0.58 Standard Deviation Units (SDUs) for measures of depression and 0.18 SDUs for measures of physical health. Caregivers reported higher depression and worse health. A greater degree of depression and stress and low ratings of subjective well-being in caregivers are consistently associated with the care recipient's behavior problems, cognitive impairment and functional disabilities. The amount of care provided, age of the caregiver, the relationship between caregiver and care recipient and the caregiver's sex also influences psychological well-being.

## **2.2 Multiculturalism in Canada**

Although multiculturalism in Canada was not stated in the objective of this thesis, it is important to include this concept to have a background understanding of the different ethnocultural groups in Canada. The concept of multiculturalism has been significant in the past 40 years and a widely accepted definition has been put forward by Berry & Kalin (1995), "who describes multiculturalism as having three dimensions: (1) a reflection of a country's ethnocultural demographic diversity, (2) a political philosophy aimed at recognizing and accommodating the differences that result from demographic diversity, (3) public policy instrument to help achieve objectives based on the above political philosophy". The psychological meaning of multiculturalism is described as individuals sharing and having a collective identity such as being

a Canadian as well as having particular identities as members of various ethnocultural communities (Cameron & Berry, 2008). Canada recognizes diversity and seek to manage this diversity.

Canada's history of settlement and colonization has resulted in a multicultural society made up of three founding people, these founding people are Indigenous, French, and British. In addition to these three founding peoples there is a wide range of ethnic groups represented in the Canadian population, including large numbers of German, Italian, Dutch, Ukrainian, Chinese, African American and Indo-Pakistani, and many other racial and ethnic groups (*Canadian Multiculturalism*, n.d.). Canada is one of the most diverse countries in the world. It is a multicultural society whose ethnocultural makeup has been shaped over time by immigrants and their descendants. Immigration has added to Canada's ethnic and cultural constellation. Historically, Canada relied solely on Europe, in particular Great Britain, as the major repertoire of immigrants to Canada. After the end of the second world war, Canada maintained its policy of preference to immigrants from the United States, United Kingdom, and other European countries. However, in the 1960s, there was a major change in the Canadian immigration policy which placed more emphasis on educational and occupational skills as criteria (*Canadian Multiculturalism*, n.d.). The changes in immigration regulations in 1967 resulted in the adoption of a universal point system in assessing prospective immigrants, irrespective of country of origin or racial background (Li, 1999). This policy change resulted in increased ethnic diversity in Canada.

Immigration statistics show that the largest group of immigrants in recent times has come from Asia and the middle east and Africa (Statistics Canada, 2013). Given this shift in source countries, the visible minority population of Canada is increasing. According to the 2016 Statistics Canada census, 21.9% of the Canadian population are immigrants, the highest in 85 years. Statistics show people tend to migrate when they are relatively young. In 2011, 58.6% of people who came to

Canada since 2006 were in the core working-age group between 25 and 64. Different ethnocultural groups have different customs of caregiving, different expectations of familial relationships and the implications for caregiving have not been well investigated in these ethnocultural groups.

### **2.2.1 Indigenous people of Canada**

In Canada, the term Aboriginal people or Indigenous people are used interchangeably, it refers to First Nations, Métis, and Inuit people. They were the original inhabitants of the land that is now Canada (*Indigenous Peoples in Canada | The Canadian Encyclopedia*, n.d.). The Indigenous people of Canada pre-date the arrival of European settlers and waves of immigration to Canada. In the 2016 census by Statistics Canada, over 1.6 million of Canada identified as Indigenous (*Indigenous Peoples in Canada | The Canadian Encyclopedia*, n.d.), making up 4.9% of the total population (*Statistics on Indigenous peoples*, n.d.). The Indigenous population in Canada is growing steadily. Since 2006, it has grown by 42.5% (*Indigenous Peoples in Canada | The Canadian Encyclopedia*, n.d.), which is four times the growth rate of the non-Indigenous population. Statistic Canada has projected that in the next 20 years, the Indigenous population will likely grow to more than 2.5 million people. The population changes reflect increased life expectancy, high birth rates, and more people identifying as Indigenous in the 2016 census.

The Indigenous population is younger than the non-Indigenous population (*Portrait of Seniors in Canada: Chapter 6. Aboriginal seniors in Canada*, n.d.). The average age of the Indigenous population was 32.1 years in 2016 while the average age of the non-Indigenous population is 40.9 years. In the 2016 census, for the first time in Canada seniors outnumbered children. However, this was not the case among Indigenous people. Although, the Indigenous population is younger than the rest of the population in Canada, it is also aging. In 2006, 4.8% of the Indigenous population was 65 years of age and older, this proportion had risen to 7.3% in 2016. According to population projections, the proportion of the Indigenous population 65 years of age and older could

more than double by 2036 (*The Daily — Aboriginal peoples in Canada: Key results from the 2016 Census*, n.d.). There is a trend toward aging in the Indigenous population, albeit slower than in the non-Indigenous population. Nonetheless, fertility rates remain higher among the Indigenous population than those of the non-Indigenous population, and life expectancies remain lower (*The Daily — Aboriginal peoples in Canada: Key results from the 2016 Census*, n.d.). The increase of aging individuals in the Indigenous community has increased the number of informal caregivers amongst Indigenous people (Buchignani & Armstrong-Esther, 1999).

### **2.3 Caregiving in different ethnocultural group**

Ethnicity is a word derived from the Greek word “ethnos” meaning people or tribe. Ethnic or ethnocultural groups are distinguished based on a common history, a unique language or communication system, the same values, and beliefs as well as normative expectations and attendant customs (Brislin, 1993).

The demographic shifts resulting in an increase in the population of older adults in Canada, along with increased ethnic diversity, mean it is important to understand ethnic differences in caregiving and psychological responses to the caregiving experience. However, the literature on ethnic differences in caregiving is incomplete and very sparse. The relationship between ethnicity and caregiving is not well understood. A systematic review by (Dilworth-Anderson et al., 2002) investigating what is known about caregiving among diverse groups from 1980-2000, focused on conceptual and theoretical approaches. In this study 59 articles were identified; all these articles used qualitative research method. The author of this study found that caregiving experiences and outcomes varied across racial and ethnic groups. However, the use of non-theoretical approaches, non-probability samples, and inconsistent measures among these studies limited their understanding of caregiving among a diverse population.

A few studies analyzed ethnic differences in structure and size of caregiving networks (Lum, 2005) (Burton et al., 1995) (Kristen Peek et al., 2000). The structure and size of a caregiving network are sometimes viewed as an indication of the range and depth of resources that an aging adult can tap for assistance (Burton et al., 1995). One study (Burton et al., 1995) found no differences by race in the size of caregiving networks. However, both White and African American individuals in this study had a family member providing care to them. The difference in tradition and culture of different ethnocultural groups suggests that the racial and ethnic differences in caregiving networks reflect differences in filial responsibility and cultural values, lifestyle, and help-seeking behaviors (Kristen Peek et al., 2000). This cross-sectional study investigated racial differences between Whites (n = 340) and African Americans (n = 402) exploring variation between racial groups in sociodemographic characteristics or family and household structure (Kristen Peek et al., 2000). The result of the study found that aging adults living with a child are approximately eight times more likely to receive help from that child than an aging adult who does not live with a child (OR = 7.52,  $p < 0.01$ ). In the study, African American aging adults are more likely to receive care from an adult child at home than their White counterparts. Previous research on ethnocultural differences in social support, showed negative effects of caregiving, including caregiver burden, stress, caregiver burnout, and depression. A study on caregiver depression among White and African American caregivers suggests that African American caregivers are more resilient to negative psychological effects of the stress of caregiving than White families, this is partly due to larger family and social support among African American caregivers (Haley et al., 1995).

In some caregiving research, authors have compared different ethnocultural groups, and many of these studies have been done in the United States. These studies have compared African American, Hispanic, Non-Hispanic, Whites, or some other ethnocultural groups. In one cross-sectional study

(Lum, 2005) the authors investigated the importance of family household or structure and the association with racial and ethnic characteristics. The study used data from the first wave of the Asset and Health Dynamic study (AHEAD) funded by the National Institute on Aging. The sample size included 3,264 respondents. The study compared White, African Americans, and Hispanics. 82% of the total sample were White, 13% African American, and 5% Hispanic. They used a logistic regression model and they adjusted for socioeconomic status and household structure. This study found that Hispanic aging adults were more likely to receive care from their spouses, family members, and from multiple types of caregivers when compared to their African American or White counterparts. Out of the three groups, White aging adults were more likely to receive formal care than African American or Hispanic aging adults (Lum, 2005). Although there is research on the impact of ethnicity on caregiver's health, many of these studies were done in the United States. The literature on ethnocultural comparison of caregiving is sparse in Canada.

In a study conducted in the United States comparing Whites to African Americans, the authors found that African Americans were more likely to report using informal long-term care and these differences were consistent even after adjusting for predisposing need and enabling factors (Bradley et al., 2004). The predisposing and enabling factors in this study were based on the conceptual framework for long-term care which expands on the behavioral model of health services use, which is commonly used in geriatric health services literature (Bradley et al., 2004). This same study also found that minorities are less likely to use formal services even after controlling for enabling and predisposing factors. In this study, the predisposing factors include sex, age, race or ethnicity, and the highest level of education obtained. The enabling factors include marital status, household income, number of children, co-residence with others, financial well-being, use of long-term care.

## 2.4 Sex

Worldwide, 70% to 80% of individuals living with mental or physical co-morbidities or living with health conditions are cared for at home by their family members. Across different countries, approximately 57% to 81% of all caregivers of aging adults are women (del-Pino-Casado et al., 2012). Some studies in the 1980s in the United States suggested that although women were the predominant caregivers, about 20% and 33% of the caregivers of the elderly were men (Stone et al., 1987). In the caregiving literature, it is well documented that females report a greater burden of caregiving for aging adults than males do. Caring for an aging adult or a child is associated with nurturing qualities of the female role (Montgomery, 1992) and in most cases has been institutionalized as a woman's work. The caregiver for an aging man is usually his wife. When the spouse is not available, daughters are the predominant caregivers (Stone et al., 1987). Wives and daughters are more likely to be caregivers of aging adults, chronically ill adults, and disabled children with higher levels of dependence than husbands and sons (Miller & Montgomery, 1990). A quantitative study of caregiving contributions of adult daughters and sons (Matthews & Rosner, 1988) reported that daughters provide more of the routine and backup care, they tend to spend time providing personal care and domestic chores, whereas sons assist with specific tasks such as running errands, transportation, and shopping. Even though the predominance of women caregivers is well-established, recent studies have shown that with more women working outside of the home and with smaller families, there has been an increased pressure on men to assume roles as caregivers of aging adults. There has been a steady increase in the proportion of men providing care to aging adults such that men may constitute nearly half of the primary caregivers of aging adults (Baker & Robertson, 2008) soon. Although there is an increase in men taking on roles as caregivers, caregiving research generally maintains its focus on female caregivers. The literature suggests men and women approach caregiving responsibilities in different ways.

Husbands and sons tend to use formal care services to help with caregiving more often and more quickly than daughters and wives do (Abel, 1990). Additionally, caregiving responsibilities are not equally shared between wives and husbands (Henz, 2009). Daughters-in-law are more likely to provide care to their in-laws than sons-in-law (Henz, 2009). A study found that female caregivers are likely to report higher levels of relational deprivation, loneliness, and depression than male caregivers (Bookwala & Schulz, 2000), and men reported less negative and more self-efficacious attitudes than women (Adams et al., 2002)

## **2.5 Marital Status**

Marital status may produce offsetting effects on the overall likelihood of being a carer. For example, single people or never married individuals are less likely than the married to have responsibilities for providing care to a spouse or a parent-in-law but may be more likely to be involved in parent care. There is evidence that spousal caregiving places a significant burden on the quality of marital relationships (Ascher et al., 2010) (Zhou et al., 2011). However, most caregiving research assumes that the care recipient's health status is a major stressor that affects the caregiver's overall well-being health. There is not enough literature on the similarities and differences of caregiving amongst ethnocultural groups and the use of informal care (spouse, relative, and non-relatives). A few studies have addressed these variations concerning formal caregiving, that is paid caregiving (White-Means & Thornton, 1990) (Miller et al., 1996). However, studies on this variation in informal caregiving are sparse. Typically, spouses are not distinguished from other informal caregivers in studies relating to caregiving. As earlier stated, in studies of caregiving outcomes, ethnic differences in burden and depression may be confounded by differences in the background characteristics of the caregivers such as gender, the relationship between the caregiver and recipient, the amount of care provided, and income. For example, in

studies of caregivers of aging individuals, minority ethnic groups are less likely to be spousal caregivers than Whites (Kosloski et al., 1999) (Kramer, 1997). The differences in family structure and household size of caregiving networks reflect differences in family and household structure and living arrangement across ethnocultural groups. For instance, African American individuals are less likely to live with a spouse, instead, they often live in an extended family household (Kristen Peek et al., 2000). Therefore, they are more likely to receive informal care from family and household members and less likely to receive care from spouses. Spousal caregivers are more likely to have age-associated health challenges and disabilities (Schneider et al., 1999); they provide approximately four times the hours of care provided by non-spousal caregivers and they have fewer social activities outside their role as a caregiver (Tennstedt et al., 1989). All these characteristics of a spousal caregiver are likely to impact the caregiver's overall health. Additionally, a study by Larsson and Silverstein (Larsson & Silverstein, 2004) found that married individuals tend to receive informal care at home, while unmarried individuals tend to receive formal care in living institutions.

## **2.6 Age**

Age is significantly associated with health. In the GSS data collected in 2012 amongst Canadians, caregivers are mostly between the ages of 45 to 54 years (24%) and 55 to 64 years (20%) (Sinha M, 2013). In the GSS 2012 survey, 28% of caregivers were considered sandwiched between caregiving and child-rearing, having at least one child under 18 years living at home. A general description of the sandwich generation was defined by Chisholm (1999) "as an individual who, by dint of circumstances, find themselves in the position of being caregivers for their young children and/or adult children as well as one or both of aging parents. The individuals of the sandwich generation tend to be in the 40 to 65 years of age group". Previous research focused on middle-

aged adults as the primary demographic group of the sandwich generation. However, because of recent demographic trends, which include delay in marriage and childbearing, increasing numbers of younger adults in their twenties and thirties are often saddled with the responsibility of providing care to an aging adult. Therefore, it is imperative to investigate age in caregiving studies. In caregiving research, age is a significant variable to understand caregiver burden or strain. Age-associated impairments in physical competence make the provision of care more difficult for older caregivers because of the decline in physical health irrespective of the caregiving role (Turcotte, 2013). Sometimes caregiving-related stressors may have stronger negative effects on the physical health of older caregivers with pre-existing health problems (Richard Schulz & Sherwood, 2008). Middle age is a time for multiple social roles and the demands that come with these roles, including caregiving. Using a framework of developmental life course theory, middle-aged individuals are in the later stage of raising a family, and many have achieved or are working towards achieving a sense of self-confidence at work (Harden, 2005). Middle-aged caregivers have more financial stability but may also experience a period of financial strain due to children entering college. However, the literature has been inconsistent about age differences in the health of caregivers of the different ethnocultural groups (Lawton et al., 1992) (Cox, 1995). A study by Lawton (Lawton et al., 1992) found a positive association of age and caregiver burden in Whites but a negative association for African Americans, suggesting that older African Americans are less likely to experience caregiving as burdensome. However, a study found a negative association of age and burden in African American caregivers but no significant difference in Whites (Cox, 1995). Although there is inconsistency in the literature about the impact of age on the health of caregivers of different ethnocultural groups, it is, however, clear that age is highly correlated with health, it is also correlated to differences in ethnocultural groups.

## **2.7 Education**

Education has been shown to be associated with whether an individual provides care or not. In most cases, individuals with higher education are more likely to experience better health than individuals with lower educational attainment. Educational attainment, especially post-secondary education, can affect whether individuals provide informal care. Highly educated individuals are more likely to utilize organized, formal home-help services (Larsson & Silverstein, 2004). Educational attainment is correlated with health status as noted by Roberge (Roberge et al., 1995) who found that of all the socio-economic variables, education was the strongest marker of individual health status. The level of caregiver education can impact caregiving, a study on caregivers of people with dementia found that individuals with a lower level of education are more likely to experience symptoms of depression than caregivers with higher education levels (Gallagher et al., 2011). Highly educated caregivers of individuals with dementia or stroke are more likely to experience a better quality of life and satisfaction and better physical and mental health (Rosdinom et al., 2013). A study found that caregivers of stroke patients with lower educational attainment are more likely to experience feelings of fear and isolation. This might be partly due to the lack of information on caregiving health literacy (Adelman et al., 2014). In the literature, the differences in caregiving and educational attainment are further separated by ethnicity.

In a quantitative study by Sander (Sander et al., 2007), the authors investigated the relationship between ethnicity and distress amongst caregivers providing care for traumatic brain injury. In this study, a higher percentage of White caregivers obtained education beyond high school, while African Americans and Hispanic caregivers were more likely to have less than high school education. These differences are consistent with the literature on the association between education and ethnicity and these differences can be partly because minority ethnic groups are more likely

to be financially unstable than their White counterparts, and sometimes minority ethnic groups are more likely to be immigrants who are trying to adjust to the economic situations of their environment. The relationship between education, ethnicity and caregiver health are important aspects of this thesis topic.

## **2.8 Income and employment**

In caregiving research, income and employment are significant variables used to understand caregiver burden or strain. In the caregiving literature, it has been noted that caregiving responsibilities can lead to loss or reduction in employment. When caregivers are of working age, the time used for informal care competes with that of paid work, meaning that the opportunity costs of informal care are often associated with paid employment. Research into the issue of employment and income and the impact on caregiving and health has been greatly studied due to the growing availability of longitudinal data. From a casual standpoint, any negative care-work association can be explained in two ways. Firstly, care is time-consuming, and combining it with regular employment is difficult, most caregivers either reduce the number of hours or quit their jobs entirely to provide care. Over half of aging adults who meet the eligibility criteria for nursing home care live at home, which is partly possible because these aging adults have unpaid care provided by informal caregivers. Arno (Arno et al., 1999) estimated that the national economic value of informal caregiving was US\$196 billion in 1997. These figures dwarf the national spending for formal home health care (US\$32 billion) and nursing home care (US\$83 billion) and if this amount is accounted for as part of national health care spending, it would increase the estimated total spending by 20%. According to a United States article, caregivers miss an average of 6.6 days of work annually due to their caregiving responsibility (*The Cost of Caregiving to the U.S. Economy*, n.d.). One-third of caregivers providing care to aging adults often reduce work

hours or leave the workforce entirely. Furthermore, women are more likely to leave their jobs once they are providing care. Both options have lasting financial effects for caregivers, including an immediate loss of income, loss of employment, and savings. Many caregivers have reported spending over 40 hours per week providing care (Lily, 2011).

The role of income and employment on caregiver health varies by ethnicity. A study investigating the association between informal caregiving in the sandwich generation and the socioeconomic and demographic factors found that as income increases, the magnitude of the association between caregiving and health increases (Do et al., 2014a). The authors used data from the Behavioral Risk Factor Surveillance System, a cross-sectional study design with a total sample size of 292,813 to determine how the association between caregiving and health varies by socioeconomic factors using ordinal logistic regression. Of those, 74,135 identified as caregivers, and 216,652 identified as non-caregivers. The authors found that the association between informal caregiving and health varied by membership in the “sandwich generation”, income and ethnicity. When the authors of the study stratified by ethnicity, the positive trend indicating an increasing association of caregiving and health as income increased was present in Hispanics ( $p < 0.001$ ) and also in African American ( $p = 0.064$ ) though not significant, but for White individuals, there was a significant negative linear trend in income as a modifier of the association between caregiving and health ( $p < 0.001$ ). This result for the White population indicates that as income increases, the association between caregiving and health decreases. In this study, the observed trend was small, but it was statistically significant. The results of this particular study are consistent with the literature that says individuals of ethnic minority are more likely to be represented in unskilled and services jobs (Aranda, 1997) leading them to have lower average income and higher poverty rates than their

White counterparts. The accumulation of financial stress may be a greater source of elevated levels of depression for minority ethnic groups due to their limited access to resources.

## **2.9 HEALTH-RELATED QUALITY OF LIFE**

Health-related quality of life (HRQL) (Patrick & Erickson, 1993)“is defined as the value assigned to the duration of life as modified by the impairments, functional states, perceptions, and social opportunities that are influenced by disease, injury, treatment or policy”. HRQL is viewed by patients, clinicians, and society as an important outcome of medical technology and disease control. The range of quality of life values incorporates negatively valued aspects of life, including death, to more positively valued aspects such as role function or happiness. The HRQL is important for measuring the impact of chronic disease (D. Patrick & Erickson, 1993). It is also important because of the commonly observed phenomena that two patients with the same clinical criteria may have extremely different responses. For example, three patients with the same range of health problems and similar ratings of discomfort may have different functional roles and emotional well-being. Two main approaches are used to evaluate generic health status outcomes, psychometric measures, and utility/preference measures.

### **2.9.1 Psychometric Measures**

Although psychometric measures of health were not included in this thesis, it is important to understand psychometric measures to distinguish them from the utility-based measures that were included in this thesis. The psychometric approach to measuring HRQOL requires the respondent to indicate the presence, frequency, or intensity of symptoms, behaviors, capabilities, or feelings. Responses to individual questions are aggregated to create individual homogeneous scales (Revicki & Kaplan, 1993). This homogeneous scale can include physical function, social function, mental health, role function, vitality/energy, bodily pain, general health, reported change in health. The frequency scales are used to convert the scores to a percentage of the maximum possible score

(Stewart & Ware, 2017). Psychometrically sound health status scales have been successfully used to assess the outcomes of medical and surgical treatment and to compare individual patient group outcomes under a different system of care (D. L. Patrick & Deyo, 1989).

### **2.9.2 Utility-based Measures**

Utility measures of quality of life are derived from economic and decision theory. Utility measures were developed as a normative model for individual decision-making under conditions of uncertainty. Utilities are numbers that represent the strength of an individual's preference for different health outcomes under conditions of uncertainty (D. H. Feeny & Torrance, 1989). These numbers reflect a person's level of subjective satisfaction, distress, or desirability associated with a different health condition (Froberg & Kane, 1989). They reflect the preference of patients for treatment process and outcome. The key elements of utility measures are that they incorporate preference measurements and relate health states to death. A health utility is a measure of the strengths of preference for a health state that typically ranges from 0 to 1. The health utility scoring system provides utility scores on this scale. However, the utility values can be less than 0, signifying a health state worse than death, 0 which indicates a health state equivalent to death, and a maximal value of 1, which indicates perfect health. Health utilities measures are used to measure the health-related quality of life of individuals and reflect the societal preference for the health states. Decomposed or holistic approaches can be used to elicit health utilities. In the decomposed approach, individuals are asked a series of questions about their functioning in specific health domains. Based on their responses, individuals are assigned to one of several health states, each of these health states has an associated utility score (Revicki & Kaplan, 1993). The Health Utility Index<sup>3</sup> uses a decomposed approach to generate preferences.

### **2.9.3 Health Utility Index<sup>3</sup>**

Self-reported health status is often measured using psychometric or utility indices that provide a score intended to reflect a person's health. The Health Utilities Index (HUI) is a preference-weighted instrument for measuring the overall health status and health-related quality of life (HRQL) of individuals, clinical groups, and general populations. The development of the HUI is based on economic and decision theory. The HUI describes an individual's overall functional health based on eight attributes, mobility, emotion, vision, speech, pain, hearing, ambulation, and dexterity. Attribute levels were defined to cover the full range of possible abilities/disabilities and to be distinguishable from one another. The HRQOL utility score for each health state is calculated using a mathematical formula developed using a population-based study. The HUI uses multiplicative and multi-attribute utility functions. The multiplicative function accounts for the interaction among health states and, it predicts the mean utility scores using an algorithm developed from a utility-elicitation study (D. Feeny et al., 2002). The HUI3 attributes are functionally independent.

## **2.10 Objective for Thesis**

Although there is a growing body of literature that focuses on understanding the association between ethnicity and the health of caregivers, how differences in ethnicity are measured is problematic. The study aims to fill a research gap, as studies of caregiving related to different ethnic groups have tended to focus on one cultural group or to ignore differences amongst groups so there are few caregiving comparisons among several ethnic groups. However, when authors do aim to analyze differences between ethnic or racial groups the comparison is often done between African Americans, Hispanics, non-Hispanic Whites, or some combination of two of the three

groups. This simply reflects the preponderance of studies relevant to the United States. There seems to be value in exploring differences among ethnocultural caregiver groups in the Canadian setting. This thesis aims to understand the relationship between ethnicity and caregiver health in a Canadian context. The study will focus on whether ethnicity is associated with self-reported overall health, self-reported mental health and, health-related quality of life using the Health Utility Index 3. We will also analyze a range of other factors that could influence informal caregiver's health including, age, marital status, household income, caregiving intensity, children, education, employment, region of residence, and education. It is important to control for these variables because they may be confounders.

The data will be taken from the General Social Survey 2012 Cycle 26, Caregiving and Care Receiving. Using these data, the association between ethnicity and caregivers' overall health and mental health will be modeled using logistic regression and the association between ethnicity and caregivers' health-related quality of life measured using the Health Utility Index 3 will be modeled using Tobit regression. This study aims to understand if there is an association between caregiver ethnicity and health.

## **Chapter 3**

### **3.1 Study Objectives**

This thesis aims to understand the relationship between ethnicity and caregiver health in a Canadian context. The study will focus on whether ethnicity is associated with self-reported overall health, self-reported mental health, and, health-related quality of life using Health Utility Index<sup>3</sup> – based measures of health amongst informal caregivers. We will also analyze a range of other factors that could influence the health of informal caregivers including age, marital status, household income, caregiving intensity, children, education, employment, region of residence, and education.

### **3.2 Data & Methods**

The study data were taken from General Social Survey (GSS) 2012, Cycle 26. The GSS is a cross-sectional survey, designed to gather data on social trends to monitor changes in the living conditions and the well-being of Canadians. The GSS provides information on specific policy issues of current or emerging interest (Canada, 2005).

Cycle 26 of the GSS was chosen to address the research questions because the survey provides information about the situation of Canadians who are care recipients or caregivers. The objective of this cycle was to better understand the needs and experiences of Canadians, by examining issues related to caregiving and care receipt, employment, retirement, and socio-demographic characteristics allowing policymakers to design programs that meet the needs of Canadians. Individuals responding to this survey provided care or received care due to a long-term health condition, disability, or problems related to aging. Due to the objectives of this study, the focus was on responses provided by caregivers. The survey covers the types and amount of care family caregivers provide and the impact of caregiving on various aspects of the caregiver's lives. The

GSS file was accessed through the Western University Libraries Statistics Canada Data Centre that provides the public use microdata file (PUMF).

### **3.2.1 Content of Data Source**

The GSS included questions from which we derived the key variables on ethnocultural groups. The question asked the respondents of the survey about their ethnic background. The GSS provided question to help understand the different ways of providing informal care, including the types of informal care being provided (age-related, mental, or physical disability, long-term health conditions) the number of hours of care provided, number of people cared for by respondent and who was providing the care. To differentiate between informal and formal care, the GSS included questions indicating whether the care recipients received formal care.

### **3.2.2 Sampling**

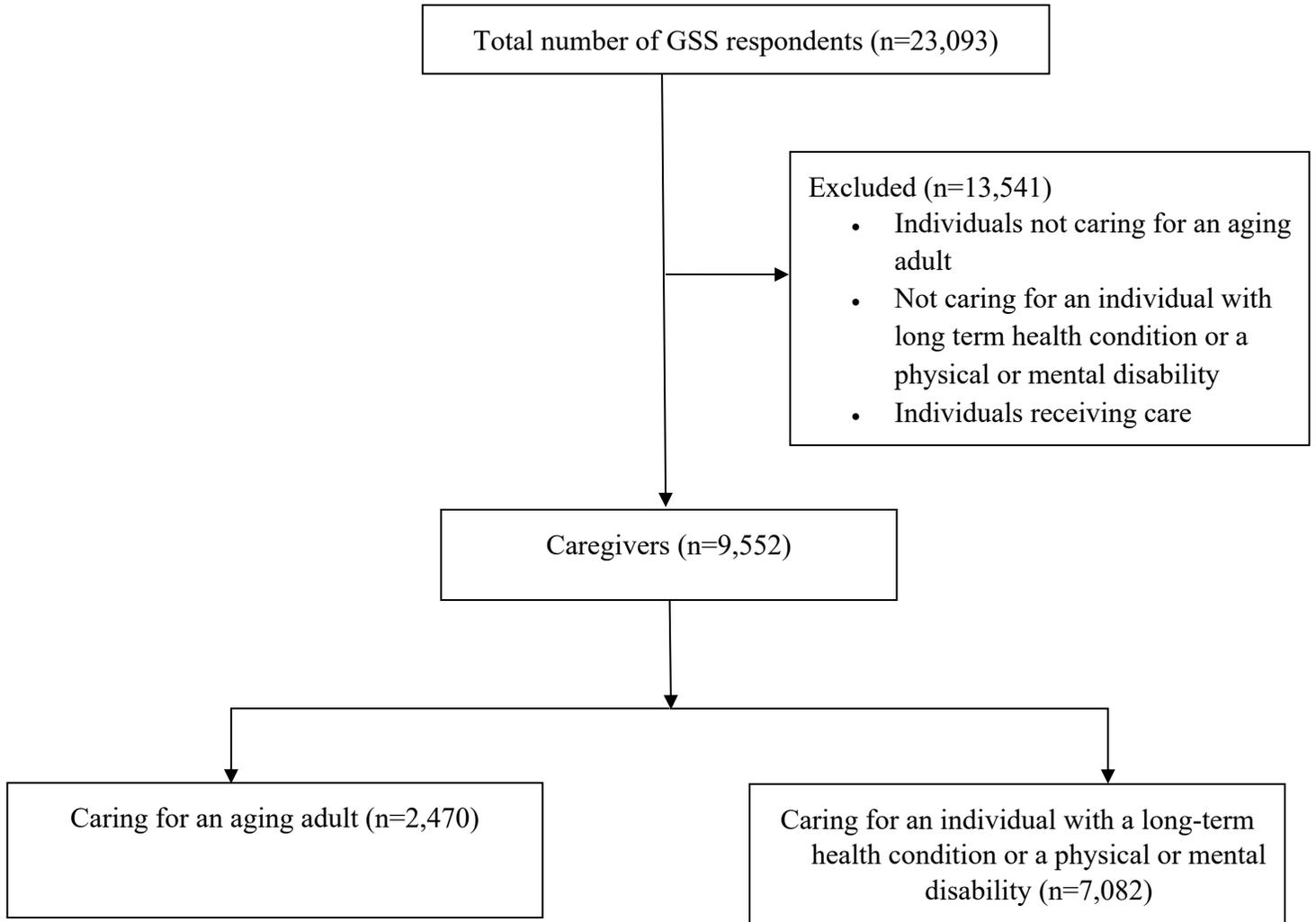
The target population for the main GSS is all non-institutionalized individuals 15 years of age or older, living in the ten provinces of Canada. All respondents were contacted and interviewed by telephone, thus individuals in households without telephones were not interviewed. Individuals in households without telephones represent less than 2% of the target population (Canada, 2005). An additional 5% of the target population was omitted because they only had cellular telephones (Canada, 2005). To carry out sampling, ten provinces of the target population were divided into strata. Many of the Census Metropolitan Areas (CMAs) were each considered separate strata. The phone numbers used to contact respondent households for the survey were randomly selected through a technique called “Random Digit Dialling” (RDD). This method randomly generated a list of phone numbers correlating to households in the 10 study provinces. All sample telephone numbers were listed “in service for residential use” based on Statistics Canada’s administrative sources. Survey respondents were identified once they had been contacted by Statistics Canada (Canada, 2005). In total, there were 23,093 respondents for the 2012 GSS (Canada, 2005)

For Cycle 26, a technique called “rejective sampling” was used to include respondents in hard to reach or small populations. Rejective sampling is a sampling method that is used to reject samples from easy to reach populations to ensure that there are enough samples from hard to reach populations (e.g. rural areas) (Hajek, 1964). A respondent was classified as a caregiver or care receiver, both or neither. All respondents who were care receivers or caregivers proceeded to complete the entire survey. The overall response rate of the GSS cycle 26 was 65.7%. Computer Assisted telephone interview (CATI) methods were used to collect data for GSS. Respondents were interviewed in the official language of their choice.

### 3.2.3 Population

Observations were included in the study dataset if the following criteria were met (see Fig 3.1).

- Respondents indicated that they provide care to someone who has problems related to aging,
- Respondents indicated that they provide care to someone who has long-term health conditions or a physical or mental disability.



Once all the inclusion criteria were met, the working sample for our study contained 9,552 observations.

### 3.3 Variables

The following section describes each dependent and independent variable in the regression analyses. For each, we describe the original GSS variable, explain how it was categorized and outline the reason for the inclusion of the variable in the regression model. Please refer to the appendices to find the GSS survey questions used to construct both the dependent and independent variables.

#### 3.3.1 Dependent Variables

**Equation 1: Self-reported overall health:** Respondents to the GSS were asked “In general, would you say your health is: excellent, very good, good, fair, poor”. In the GSS file, this variable was coded as a categorical variable with the response excellent, very good, good, fair, or poor. We categorized the response into two groups and dummy coded as 0 and 1 where, 0 = excellent, very good, good, and 1 = fair or poor (Appendix 1).

**Equation 2: Self-reported mental health:** Respondents to the GSS were asked, “In general, would you say your mental health is: excellent, very good, good, fair, or poor. In the GSS file, this variable was coded as a categorical variable with the responses excellent, very good, good, fair, or poor health. We categorized the response into two groups and dummy coded as 0 and 1 was, 0 = excellent, very good, good, and 1 = fair or poor (Appendix 1).

**Equation 3: Health Utility Index3 (HUI):** Respondents to the GSS completed the Health Utility Index3 (HUI) questionnaire. Thus, respondents provided a health state description that included the HUI dimensions of vision trouble, hearing trouble, speech trouble, mobility trouble, dexterity trouble, emotional trouble, cognitive trouble, pain, and discomfort. Each dimension was categorized into the number of levels defined by the HUI health state classification system (Appendix 1). We calculated the Health Utility Index3 using the HUI formula stated below:

$$U^* = 1.371(HUI\_SPE1 \times HUI\_HER1 \times HUI\_EMO1 \times HUI\_COG1 \times HUI\_DEX1 \times HUI\_PAD1 \times HUI\_VIS1 \times HUI\_MOB1) - 0.371 \text{ (Drummond et al., 2015)}$$

In this study, the HUI is defined as a continuous variable that measured the health utility of the caregiver.

### 3.3.2 Independent Variables

**Ethnocultural groups (ethnicity):** This is our exposure variable. In the GSS file, ethnocultural groups (ethnicity) were measured as a categorical variable with 25 categories. The GSS asked the respondent about their ethnic background (the question and responses are attached in Appendix 2&3). Statistics Canada grouped respondents who are First Nations, Métis, and Inuit as Aboriginal. However, throughout this study, we defined First Nations, Métis, and Inuit as Indigenous. We grouped the 25 responses into four categories as follows:

- Indigenous ancestry only
- European ancestry only
- Mixed or other ancestry
- Canadian ancestry only

In the analysis, the categorized variable was dummy coded so that the reference category would be the Canadian ancestry only group.

**Age:** In the GSS data, age groups were categorized as follows: 15 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 74, and 75 years and older. We used the same categories as the GSS. Age was included because the literature indicates that middle-aged (45 to 64) individuals were more likely to provide informal care than younger individuals. Age is strongly associated with health (Appendix 2).

**Sex:** According to the literature females are more likely to be caregivers in comparison to men. Sex is also a strong predictor of differences in health.

**Marital status:** In the GSS data, marital status is categorized as married, living common-law, widowed, separated, divorced, single, never married. For this study married and living common-law were considered married while individuals who had never been married, divorced, separated, widowed, or single were considered single. Marital status was included because it is a strong predictor of whether an individual of an ethnocultural group provides informal care, especially to a spouse. Marital status is also strongly associated with health.

**Education:** Respondents were asked, “What is the highest level of education that you have completed?”. The response was categorized into less than high school, high school diploma, trade certificate, college, CEGEP, university certificate or diploma below bachelor’s level, bachelor’s degree, university degree above bachelors. We recategorized the responses as: some high school; high school; trade/ college/ CEGEP/ certificate; university/ postgraduate. We included education in the model because past research has shown that education is a factor in determining if an individual provides care. It is a variable that is strongly correlated with an individual’s overall health. This is consistent with a study by (Winkleby et al., 1992) that found that amongst all the socio-economic variables listed in this study, education was the strongest risk factor for cardiovascular disease.

**Household Income:** Household income is another indicator of socio-economic status that has been found in previous research to be related to health (Lily, 2011) (Hosseinpoor et al., 2013) (Do et al., 2014a) (Sander et al., 2007). Responses from the household income in the GSS data were recorded as a categorical variable with a \$5,000 range. We categorized the household income

variable into six groups: 0 to 19,999; 20,000 to 39,999; 40,000 to 59,999; 60,000 to 99,999; 100,000 to 149,999; 150,000 or more.

**Employment:** We grouped the employment status of the respondent into three groups. Employment was defined as employed, retired, and unemployed. The variable was included because the theoretical model has suggested that the employment status of the caregiver can affect the opportunity cost of informal care on the household. Employment status among people of different ethnicities differs and is strongly associated with overall health.

**Children:** Having a dependent child is a stressor in the caregiving literature. We used a binary variable to capture whether the respondent had a dependent child (1) or no dependent child (0). We included this variable in the model to investigate if having a dependent child has some impact on caregivers of different ethnocultural groups. The reference category is no dependent child.

**Caregiving intensity:** This variable was included in the model to investigate if the number of hours of caregiving differs among ethnocultural groups and if it was associated with caregiver health. In the GSS survey, this variable was continuous. However, for our study, this variable was modeled after the report done by Lily (Lily, 2011) and categorized into three groups. Caregiving intensity refers to the hours of care provided per week.

**Province:** The provinces were categorized by grouping together the Maritime provinces, the Atlantic region provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick). Alberta, Saskatchewan, and Manitoba were grouped as the Prairie provinces. In total, we had five categories for this variable stated below:

- Ontario
- Atlantic region
- Prairie region

- Quebec
- British Columbia

### **3.4 Model Specifications**

This study utilized a multivariate logistic regression model and a Tobit regression model. The first two models estimated the probability of having poor overall health and mental health, while the third modeled the Health Utility Index<sup>3</sup>.

#### **3.4.1 Tobit Regression Model**

An important issue in using the health utility index is accounting for ceiling effects. In a population survey in which the HUI is measured a substantial number of the respondents obtain a perfect score. The result can be interpreted in one of two ways; either the index is accurate, and a large proportion of the population is perfectly healthy, or the index has a ceiling effect. The term **ceiling effect** is a situation that occurs when the highest upper limit or near to the highest possible upper limit of a scale or measurement instrument is reached, indicating a decrease in the likelihood that the testing instrument has accurately measured the intended domain (Salkind, 2012). In the latter scenario, many individuals silently exceed the threshold. In this case, the upper end of the population distribution of health status is collapsed to a ceiling value. In studying the relationships between health status and health determinants such as age, gender, or socio-economic status, one frequently wants to construct regression models to quantify how the mean value of the health index varies with changes in the determinants of health. When a ceiling effect is present, standard regression models ignore the censoring that has occurred amongst those individuals with a health status that lies above the threshold for perfect health or health status below the threshold for death (Austin et al., 2000).

The Tobit model was devised in 1958 by Tobin. It assumes that the dependent variable has several of its values clustered at a limiting value usually zero. For example, data on demand for

consumption goods often have values clustering at a value in the data set. Data on hours have the same clustering. The Tobit regression model is an analytic tool used for modeling censored variables (Austin et al., 2000) and it is a preferred regression model, over alternative techniques (McDonald & Moffitt, 1980).

## **3.5 Statistical Analysis**

### **3.5.1 Descriptive Analysis**

Univariate analysis was conducted to determine descriptive statistics for both the independent and dependent variables. The percent and frequency were calculated for ethnicity, sex, age, marital status, household income, caregiving intensity, employment status, education, children, province of residence, self-reported overall health, and self-reported mental health. We reported the HUI sample size, mean, standard deviation by ethnicity (See Table 3). The bivariate analysis used were chi-square and ANOVA tests. The objective of the chi-square test was to investigate the association between ethnicity and all the other variables including sex, age, marital status, employment, household income, education, dependent child, caregiving intensity, region of residence, overall health and mental health. The objective of the ANOVA test was to investigate the difference among the ethnocultural groups on the HUI. All analyses were performed using GSS sampling weights.

### **3.5.2 Multivariate Analysis**

The logistic regression was used to calculate the odds ratio (OR) and associated 95% confidence intervals. ORs above 1 indicate increased odds of reporting excellent overall and mental health and ORs below 1 indicate decreased odds of reporting excellent overall and mental health (increased odds of reporting poor overall and mental health). We used the Tobit regression model because the HUI index represents censored data that ranges from -0.3 to 1.

### **3.5.3 Software**

All analysis was performed using SAS version 9.

## **Chapter 4**

### **Results**

In this chapter, I present the results of bivariate analyses and multivariate analyses to determine if there was an association between caregiver ethnicity and overall health, mental health and health-related quality of life as measured by the Health Utility Index<sup>3</sup>.

#### **4.1 Descriptive Analysis**

Table 1 shows the characteristics of the study population, incorporating the population weights. Among the entire sample approximately 8% was of Canadian only ancestry, approximately 50% was of European ancestry only, approximately 2% was of Indigenous ancestry and approximately 40% of our sample indicated mixed or other ancestry. Approximately 54% of our entire sample were women providing care while 46% were men providing care. Individuals ages 45 to 54 represent the largest proportion of caregivers at approximately 24%, followed by individuals age 55 to 64 at approximately 20%. Most of the respondents were married or in a common-law relationship (65%) and the highest level of education obtained by most respondents was (trade, college, and diploma) at 32%. The greatest proportion of respondents lived in households where their income ranged from \$60,000 to \$99,999 (28%). Approximately 54% of the sample spent at most 5 hours per week providing care. Approximately 30% of the sample had a dependent child. The highest proportion of respondent resides in Ontario (41%).

Table 1: Descriptive Statistics

	<b>Characteristics</b>	<b>Weighted %</b>	<b>St. Error</b>
<b>Sex</b>	Male	45.80	0.72
	Female	54.20	0.72
<b>Age group</b>	15 to 24	15.40	0.66
	25 to 34	14.33	0.61
	35 to 44	14.06	0.47
	45 to 54	23.88	0.59
	55 to 64	20.09	0.49
	65 to 74	8.54	0.29
	75 years and over	3.70	0.20
<b>Marital Status</b>	Married or common law	65.25	0.73
	Divorced/Separated/Widowed/Single/Never Married	34.75	0.73
<b>Education</b>	Under high school	13.83	0.50
	High school or equivalent	28.70	0.66
	Trade/College/CEGEP/ Diploma	32.36	0.67
	University/Postgraduate	25.11	0.62
<b>Household Income</b>	\$0 to \$19,999	4.87	0.29
	\$20,000 to \$39,999	12.70	0.48
	\$40,000 to \$59,999	15.01	0.53
	\$60,000 to \$99,999	27.63	0.71
	\$100,000 to \$149,000	23.09	0.71
	\$150,000 or more	16.70	0.64
<b>Employment</b>	Employed	59.14	0.71
	Unemployed	25.09	0.68
	Retired	15.77	0.41
<b>Caregiving Intensity</b>	Less than 5	53.55	0.72
	≥ 5 and <15	23.30	0.62
	≥15	23.15	0.59
<b>Dependent child</b>	Yes	29.43	0.66
	No	70.57	0.68
<b>Region</b>	Atlantic Region	6.99	0.19
	Quebec	20.78	0.61
	Ontario	40.53	0.73
	Prairie Region	18.62	0.49
	British Columbia	13.08	0.47
<b>Ethno-cultural groups</b>	Canadian only	8.03	0.40
	European only	49.53	0.74
	Indigenous	1.97	0.20
	Mixed or other	40.47	0.74
<b>Overall Health</b>	Excellent	22.75	0.62
	Very good	34.41	0.70
	Good	30.69	0.70
	Fair	9.47	0.39
	Poor	2.68	0.20
<b>Mental Health</b>	Excellent	30.68	0.68
	Very good	33.38	0.68
	Good	27.62	0.64
	Fair	7.03	0.37
	Poor	1.29	0.15

Table 2 shows an ANOVA test of the Health Utility Index<sup>3</sup> of the ethnocultural groups. The results demonstrate that the mean HUI3 are not equal across ethnocultural groups ( $p=0.0225$ ). Furthermore, in a post hoc analysis to investigate which two ethnic group had different means. We found that caregivers of European ancestry and Indigenous ancestry had different means ( $p<0.001$ ).

Table 2: ANOVA, Sample size, mean, standard deviation, minimum and maximum value of the HUI by ethnicity

	N	Mean	S. D	Minimum	Maximum	F-value	P-value
<b>Ethnocultural groups</b>						3.19	0.0225
Canadian only	652	0.8523	6.2074	-0.2282	1.0000		
European only	4672	0.8655	5.3065	-0.2419	1.0000		
Indigenous	186	0.8249	6.0922	0.0502	1.0000		
Mixed/others	3122	0.8601	6.0410	-0.2367	1.0000		

## 4.2 Bivariate Analysis

Table 3 shows the respondent characteristics stratified by ethnocultural group, using a chi-square test to compare differences amongst groups. As earlier stated, a higher percentage of caregivers was female, this was consistent across the ethnocultural groups, however there were significant differences in the percentage of female across the ethnocultural groups ( $p<0.0001$ ). However, we observed other notable differences in several characteristics based on the ethnicity of the caregiver. There were significant differences in the age distribution of caregivers in each ethnocultural group. In each ethnocultural group, the largest proportion of caregivers were in the age groups 45-54 and 55-64. However, a greater proportion of Indigenous caregivers were young (15-24). There were significant differences amongst ethnic groups in the percent of caregivers who were married or in common-law relationships. Notably, caregivers of Canadian and European ancestry had a larger

percentage of married and common law caregivers. There were significant differences amongst ethnic groups in the percentage of caregivers who were employed. Notably, caregivers of Indigenous ancestry had a lower percentage of retired caregivers. Indigenous caregivers had a higher percentage of individuals reporting low household incomes (\$20,000 to \$39,999) in comparison to other ethnic groups. The differences amongst ethnic groups in the income distribution were statistically significant. There were significant differences amongst ethnocultural groups in caregiver's educational attainment. A high proportion of the sample was likely to have completed post-secondary education and this was consistent across the ethnocultural groups. However, Indigenous caregivers had a higher percentage of individuals with less than a high school diploma.

Table 3: Bivariate association of ethnicity and caregiver characteristics

Characteristics	ETHNO-CULTURAL GROUP					Chi-square	P-value
	Canadian %	European %	Indigenous %	Mixed or other %			
<b>Sex</b>						10,858.54	<0.0001
Male	40.58	47.28	47.17	45.21			
Female	59.42	52.72	52.83	54.79			
<b>Age</b>						22,7016	<0.0001
15-24	17.57	11.16	21.77	18.24			
25-34	14.88	11.49	16.02	17.11			
35-44	14.13	13.06	14.08	14.70			
45-54	23.90	24.86	26.35	23.16			
55-64	20.54	23.32	17.26	17.39			
65-74	6.60	10.90	3.17	6.89			
75+	2.38	5.21	1.35	2.51			
<b>Marital Status</b>						60,697.23	<0.0001
Married or common law	68.19	69.42	60.75	60.82			
Divorced/Separated/Widowed/Single/Never Married	31.81	30.58	39.25	39.18			
<b>Employment</b>						84,834.19	<0.0001
Employed	58.42	58.27	60.64	60.61			
Unemployed	26.38	22.02	31.69	26.80			
Retired	15.20	19.71	7.67	12.59			
<b>Household Income</b>						36,254.81	<0.0001
\$0 to \$19,999	5.14	4.27	7.01	5.15			

\$20,000 to \$39,999	13.92	12.18	22.50	12.34		
\$40,000 to \$59,999	18.28	14.91	12.94	14.30		
\$60,000 to \$99,999	30.73	28.35	22.92	26.75		
\$100,000 to \$149,000	20.00	22.55	22.56	24.24		
\$150,000 or more	11.93	17.74	12.07	17.22		
<b>Education</b>					97,832	<0.0001
Under high school	18.69	12.57	26.07	11.79		
High school	32.87	28.28	35.92	27.71		
Trade/ College/ CEGEP/ certificate	33.95	32.71	26.74	32.88		
University/ Postgraduate	14.49	26.44	11.27	27.62		
<b>Dependent Child</b>					24,118.82	<0.0001
No	68.83	73.03	61.53	68.63		
Yes	31.17	26.97	38.47	31.37		
<b>Caregiving Intensity</b>					16,130.84	<0.0001
Less than 5	57.40	52.57	43.11	54.30		
≥ 5 and <15	22.62	23.10	28.80	23.52		
≥15	19.98	24.33	28.09	22.18		
<b>Region</b>					643,786	<0.0001
Atlantic Region	9.50	8.04	11.04	4.45		
Quebec	53.15	16.06	17.65	18.72		
Ontario	20.69	45.12	15.71	40.55		
Prairie Region	8.69	17.28	42.67	21.90		
British Columbia	7.97	13.50	12.93	14.38		
<b>Overall Health</b>					28,344.25	<.0001
Excellent	20.30	23.10	18.27	22.76		
Very good	32.93	35.63	25.27	33.94		
Good	33.92	28.94	41.05	31.50		
Fair	11.20	9.46	11.21	9.17		
Poor	1.65	2.87	4.20	2.63		
<b>Overall Health (Binary)</b>					2,253.25	<0.0001
Excellent/Very good/Good	87.15	87.67	84.59	88.20		
Fair/Poor	12.85	12.33	15.41	11.80		
<b>Mental Health</b>					28,629.93	<0.0001
Excellent	26.96	31.08	26.45	30.70		
Very good	36.36	33.66	26.59	32.97		
Good	25.31	27.37	32.81	28.24		
Fair	10.24	6.58	11.26	6.81		
Poor	1.13	1.31	2.89	1.28		
<b>Mental Health (Binary)</b>					15,547.30	<0.0001
Excellent/Very good/Good	88.63	92.11	85.85	91.91		
Fair/Poor	11.37	7.89	14.15	8.09		

## **4.3 Regression Analysis**

### **4.3.1 Overall health**

#### **Univariate Analysis**

Table 4 shows the association of caregiver ethnicity with overall health in the logistic regression model. Notably, caregivers of European, Mixed, or other ancestry had statistically significantly increased odds of good overall health (Excellent/Very Good/Good) compared to caregivers of Canadian ancestry. Indigenous caregivers had statistically significantly decreased odds of good overall health compared to caregivers of Canadian ancestry.

#### **Multivariate Analysis**

In the multivariate analysis, after adjusting for sex, age, marital status, household income, dependent children, caregiving intensity, education, employment status and region, caregivers of European, Mixed, or other ancestry had increased odds of good overall health compared to caregivers of Canadian ancestry ( $p < 0.0001$ ). Indigenous caregivers had decreased odds of good health compared to caregivers of Canadian ancestry ( $p < 0.0001$ ). In both the univariate and multivariate analyses caregiver ethnicity was significantly associated with overall health.

Table 4: Association between caregiver ethnicity and overall health using the Logistic Regression Model

	Univariate Model		Multivariate Model	
	OR (95% CI)	P-value	OR (95% CI)	P-value
<b>Ethnicity (reference: Canadian)</b>				
European	1.05 (1.04,1.06)	<0.0001	1.24 (1.23,1.25)	<0.0001
Indigenous	0.81 (0.80,0.82)	<0.0001	0.85 (0.84,0.86)	<0.0001
Mixed or other	1.10 (1.09,1.11)	<0.0001	1.16 (1.15,1.17)	<0.0001
<b>Sex (reference: Male)</b>				
Female			0.94 (0.93,0.95)	<0.0001
<b>Age (reference: 15-24)</b>				
25-34			0.58 (0.57,0.59)	<0.0001
35-44			0.25 (0.24,0.26)	<0.0001
45-54			0.23 (0.22,0.24)	<0.0001
55-64			0.24 (0.23,0.25)	<0.0001
65-74			0.30 (0.29,0.31)	<0.0001
75+			0.25 (0.24,0.26)	<0.0001
<b>Marital Status (reference: Married)</b>				
Divorced/Separated/Widowed/ Single/Never Married			0.98 (0.97,0.99)	<0.0001
<b>Household Income (reference: \$0 to \$19,999)</b>				
\$20,000 to \$39,999			1.43 (1.42,1.44)	<0.0001
\$40,000 to \$59,999			2.32 (2.29,2.34)	<0.0001
\$60,000 to \$99,999			2.88 (2.85,2.91)	<0.0001
\$100,000 to \$149,000			3.79 (3.75,3.84)	<0.0001
\$150,000 or more			6.27 (6.18,6.35)	<0.0001
<b>Children (reference: No Dependent child)</b>				
Dependent child			1.30 (1.29,1.31)	<0.0001
<b>Caregiving Intensity (reference: &lt;5)</b>				
≥ 5 and <15			0.98 (0.97,0.99)	<0.0001
≥15			1.00 (0.93,1.09)	0.3903
<b>Education (reference: under high school)</b>				
High school			1.09 (1.08,1.10)	<0.0001
Trade/ College/ CEGEP/ certificate			1.11 (1.10,1.12)	<0.0001
University/ Postgraduate			1.41 (1.40,1.42)	<0.0001
<b>Employment status (reference: employed)</b>				
Unemployed			0.43 (0.42,0.44)	<0.0001
Retired			0.75 (0.74,0.76)	<0.0001
<b>Region (reference: Ontario)</b>				
Atlantic Region			1.36 (1.35,1.37)	<0.0001
Quebec			2.04 (2.02,2.06)	<0.0001
Prairie Region			1.46 (1.45,1.47)	<0.0001
British Columbia			1.23 (1.22,1.24)	<0.0001

### **4.3.2 Mental health Univariate Analysis**

Table 5 shows the association of caregiver ethnicity with mental health in the logistic regression model. Caregivers of European, Mixed, or other ancestry had statistically significantly increased odds of good mental health (Excellent/Very Good/Good) compared to caregivers of Canadian ancestry. However, Indigenous caregivers had decreased odds of good mental health compared to caregivers of Canadian ancestry and this was statistically significant.

### **Multivariate Analysis**

In the multivariate analysis, after adjusting for sex, age, marital status, household income, dependent children, caregiving intensity, education, employment status and region caregivers of European, Indigenous, Mixed, or other ancestry had increased odds of good mental health compared to caregivers of Canadian ancestry, and this was statistically significant. This result was notable amongst the Indigenous caregivers. In both the univariate and multivariate analyses caregiver ethnicity was significantly associated with mental health, however after adjusting for other variables, Indigenous caregivers had statistically significantly greater odds of good mental health.

Table 5: Association between caregiver ethnicity and mental health using the Logistic Regression Model

	Univariate Model		Multivariate Model	
	OR (95% CI)	P-value	OR (95% CI)	P-value
<b>Ethnicity (reference: Canadian)</b>				
European	1.50(1.49,1.51)	<0.0001	1.85 (1.83,1.87)	<0.0001
Indigenous	0.78 (0.77,0.79)	<0.0001	1.66 (1.62,1.70)	<0.0001
Mixed or other	1.46 (1.44,1.47)	<0.0001	1.79 (1.77,1.81)	<0.0001
<b>Sex (reference: Male)</b>				
Female			0.85 (0.84,0.86)	<0.0001
<b>Age (reference: 15-24)</b>				
25-34			0.79 (0.78,0.80)	<0.0001
35-44			0.43 (0.42,0.44)	<0.0001
45-54			0.48 (0.47,0.49)	<0.0001
55-64			0.69 (0.68,0.70)	<0.0001
65-74			1.03 (1.01,1.05)	0.0010
75+			0.96 (0.94,0.98)	0.0003
<b>Marital Status (reference: Married)</b>				
Divorced/Separated/Widowed/ Single/Never Married			0.68 (0.67,0.69)	<0.0001
<b>Household Income (reference: \$0 to \$19,999)</b>				
\$20,000 to \$39,999			1.25 (1.23,1.27)	<0.0001
\$40,000 to \$59,999			1.29 (1.27,1.31)	<0.0001
\$60,000 to \$99,999			1.80 (1.78,1.82)	<0.0001
\$100,000 to \$149,000			2.40 (2.37,2.43)	<0.0001
\$150,000 or more			3.38 (3.33,3.43)	<0.0001
<b>Children (reference: No Dependent child)</b>				
Dependent child			1.01 (0.99,1.02)	0.0977
<b>Caregiving Intensity (reference: &lt;5)</b>				
≥ 5 and <15			0.95 (0.94,0.96)	<0.0001
≥15			0.76 (0.75,0.77)	<0.0001
<b>Education (reference: under high school)</b>				
High school			0.75 (0.74,0.76)	<0.0001
Trade/ College/ CEGEP/ certificate			0.79 (0.78,0.80)	<0.0001
University/ Postgraduate			1.09 (1.07,1.10)	<0.0001
<b>Employment status (reference: employed)</b>				
Unemployed			0.40 (0.39,0.41)	<0.0001
Retired			0.71 (0.70,0.72)	<0.0001
<b>Region (reference: Ontario)</b>				
Atlantic Region			1.24 (1.23,1.26)	<0.0001
Quebec			1.66 (1.65,1.68)	<0.0001
Prairie Region			0.91 (0.90,0.92)	<0.0001
British Columbia			0.86 (0.85,0.87)	<0.0001

### **4.3.3 Health Related Quality of Life Univariate Analysis**

Table 6 shows the association of caregiver ethnicity with health-related quality of life using the Tobit regression model. Caregivers of European, Mixed, or other ancestry each had a 0.01 higher mean health utility score in comparison to Canadians, and these differences were statistically significant ( $p < 0.0001$ ). However, Indigenous caregivers had 0.02 lower HUI3 score in comparison to Canadians and this was statistically significant ( $p < 0.0001$ ).

### **Multivariate Analysis**

In the multivariate analysis, after adjusting for sex, age, marital status, household income, dependent children, caregiving intensity, education, employment status and region. Caregivers of European, Indigenous, Mixed, or other ancestry had a significantly higher Health Utility Index3 score in comparison to Canadians and this was statistically significant. After adjusting for the other variables, Indigenous caregivers had a mean HUI3 utility that was 0.01 greater than that of Canadians ( $p < 0.0001$ ), whereas in univariate analysis Indigenous caregivers had significantly lower HUI3 scores.

Table 6: Association between caregiver ethnicity and health-related quality of life using the Tobit Regression Model

	Univariate Model		Multivariate Model	
	Coeff	P-value	Coeff	P-value
<b>Ethnicity (reference: Canadian)</b>				
European	0.01 (0.00,0.02)	<0.0001	0.03 (0.02,0.04)	<0.0001
Indigenous	-0.02 (-0.01, -0.03)	<0.0001	0.01 (0.00,0.02)	<0.0001
Mixed or other	0.01 (0.00,0.02)	<0.0001	0.02 (0.01,0.03)	<0.0001
<b>Sex (reference: Male)</b>				
Female			-0.01(-0.00,0.02)	<0.0001
<b>Age (reference: 15-24)</b>				
25-34			-0.07 (-0.06, -0.08)	<0.0001
35-44			-0.11 (-0.10, -0.012)	<0.0001
45-54			-0.15 (-0.14, -0.16)	<0.0001
55-64			-0.15 (-0.14, -0.16)	<0.0001
65-74			-0.11 (-0.10, -0.12)	<0.0001
75+			-0.17 (-0.16, -0.18)	<0.0001
<b>Marital Status (reference: Married)</b>				
Divorced/Separated/Widowed/ Single/Never Married			-0.02 (-0.01, -0.03)	<0.0001
<b>Household Income (reference: \$0 to \$19,999)</b>				
\$20,000 to \$39,999			0.07 (0.06,0.08)	<0.0001
\$40,000 to \$59,999			0.09 (0.08,0.10)	<0.0001
\$60,000 to \$99,999			0.12 (0.11,0.13)	<0.0001
\$100,000 to \$149,000			0.13 (0.11,0.15)	<0.0001
\$150,000 or more			0.17 (0.15,0.19)	<0.0001
<b>Children (reference: No dependent child)</b>				
Dependent child			0.02 (0.01,0.03)	<0.0001
<b>Caregiving Intensity (reference: &lt;5)</b>				
≥ 5 and <15			-0.02 (-0.01, -0.03)	<0.0001
≥15			-0.01 (-0.00, -0.01)	<0.0001
<b>Education (reference: under high school)</b>				
High school			0.01 (0.00,0.03)	<0.0001
Trade/ College/ CEGEP/ certificate			0.02 (0.01,0.03)	<0.0001
University/ Postgraduate			0.05 (0.04,0.06)	<0.0001
<b>Employment status (reference: employed)</b>				
Unemployed			-0.08 (-0.07, -0.09)	<0.0001
Retired			-0.01 (-0.00, -0.02)	<0.0001
<b>Region (reference: Ontario)</b>				
Atlantic Region			0.01 (0.00,0.02)	<0.0001
Quebec			0.04 (0.03,0.05)	<0.0001
Prairie Region			0.01 (0.00,0.02)	<0.0001
British Columbia			-0.0002 (-0.0008,0.0003)	0.4004

## **Chapter 5**

### **Discussion**

This chapter summarizes the results and implications of the study, discusses the broader strengths and limitations of the work, and provides future research directions.

#### **5.1 Summary of Study Findings**

For this study, we used data from the GSS, 2012 (Canada) cycle 26, caregiving and care receiving.

We only used the caregiving section of the data set. It is a cross-sectional population health survey that includes Canadians aged 15 years and older. In this study, we identified caregivers as individuals providing care to someone who has problems related to aging or individuals providing care to someone who has a long-term health condition or mental disability. The purpose of this study was to investigate whether caregiver ethnicity was associated with health using three measures – self-reported physical health, self-reported mental health, and the Health Utility Index<sup>3</sup>. Ethnicity, which was our main exposure was categorized into Canadian ancestry, European ancestry, Indigenous, and Mixed or other ancestry. We used the logistic and the Tobit regression models.

The GSS survey showed that of all caregivers responding to the survey, 8% were of Canadian ancestry, 50% were of European ancestry, 2% were of Indigenous ancestry and 40% were of Mixed or other ancestry. In the regression analysis, caregiver ethnicity was associated with overall health, with caregivers of Indigenous ancestry having worse health than caregivers of Canadian ancestry. In the regression analysis, caregivers of Indigenous ancestry had better mental health than caregivers of Canadian ancestry. Caregiver ethnicity was significantly associated with health-related quality of life, with small significant differences amongst the groups.

It is difficult to compare our study to the literature on ethnicity and caregiving. Our study used ancestry and limited information on ethnicity, whereas the literature reflects clearer measures of ethnicity (e.g. White, African American, Hispanic etc.). However, the literature may be useful for comparison nonetheless as Indigenous respondents to the GSS represent a clear, well-defined, ethnic group. Other studies have examined the association between ethnocultural groups and caregiver health. In a particular cross-sectional study, African American caregivers of foreign-born care recipients had better psychological and self-rated health than non-Hispanic White caregivers, controlling for age, education, relationship to the care recipient, nativity status, caregiver disability and caregiver secondary stressors (Rote et al., 2019). A cross-sectional study on caregiver ethnicity and mental and physical health found that there was a statistically significant difference in mental health but no statistically significant difference in physical health (William E. Haley et al., 2004). This study reported that White caregivers reported higher anxiety than African American caregivers (William E. Haley et al., 2004), controlling for age, sex, marital status, education, employment, and household income. A longitudinal study conducted among New Zealand caregivers found that Indigenous caregivers reported worse mental health than non-Indigenous caregivers (Alpass et al., 2013), controlling for age, sex, education, employment, wealth, care level and care-level changes.

The findings in these studies, although focused on different ethnic groups, were somewhat like our own, in that caregivers from minority ethnic groups had better mental health. Notably, in our study, Indigenous caregivers had significantly decreased odds of good mental health but after adjusting for sex, age, marital status, household income, dependent children, caregiving intensity, education, employment status, and region, the Indigenous caregivers had significantly increased odds of good mental health. It is unclear why Indigenous caregivers had better mental health than caregivers of

Canadian ancestry after adjusting for other factors. It is possible that the value that Indigenous communities place on elders could play a role (*Indigenous Elders in Canada | The Canadian Encyclopedia*, n.d.). In the bivariate analysis, the Indigenous caregivers had a higher proportion of individuals with low household income (\$20,000 – less than \$40,000). We conducted a post hoc analysis and found that high household income was a strong predictor of better mental health outcomes for all the ethnocultural groups. In existing literature increased income is associated with better health outcomes (Do et al., 2014b). It appears that household income was a confounder of the relationship between caregiver ethnicity and mental health because after adjusting for household income, caregivers of Indigenous ethnicity had better mental health than caregivers of Canadian ancestry.

Similarly, Indigenous caregivers had significantly increased health-related quality of life compared to caregivers of Canadian ancestry after adjusting for sex, age, marital status, household income, dependent children, caregiving intensity, education, employment status, and region. This change in the quality-of-life outcome, when compared to the univariate analysis, was also associated with household income.

Interestingly, after adjusting for sex, age, marital status, household income, dependent children, caregiving intensity, education, employment status, and region, Indigenous caregivers had decreased odds of good overall health compared to caregivers of Canadian ancestry in both univariate and multivariate analysis. In the post hoc analysis, none of the variables were strong confounders of the association between Indigenous ethnicity and overall health.

## **5.2 Study Strengths**

There are several important strengths of our study that should be noted. One of the strengths of our study is that the GSS sampling scheme was designed to provide estimates that were representative

of the Canadian population. The GSS collected extensive information on a series of socio-demographic characteristics including ethnicity, by which we were able to stratify and perform analysis to answer our research question. A strength of the GSS is that it collected extensive information on health utilities and calculated the Health Utility Index<sup>3</sup> (HUI) of each respondent. A strength of our study was the measurement of the self-reported overall and mental health. Studies have shown that self-reported health with the options of excellent, very good, good, fair, and poor is a valid measure of health (Chandola, 2000) (Haddock, 2016) (Schnittker, 2014).

A strength of our study is that to the best of our knowledge, it is one of the first to investigate associations of caregiver ethnicity – comparing amongst four different ethnic categories and health outcomes in Canada.

### **5.3 Limitations**

Though this study had several strengths it is worth noting key limitations. As our data comes from the GSS, a cross-sectional survey, it is subject to the limitation of all cross-sectional survey data, including that the temporality of effects is uncertain and casual relationships can not be drawn from data at hand. Thus, the significant associations we identified may not be causal. Additionally, our data is subject to biases inherent to survey data, including social desirability bias and interview bias, where individuals may not fully report all information about them due to pre-existing stigma that may be attached to certain ethnocultural group or interviewers not correctly reporting responses provided by the participants, respectively.

The GSS as earlier stated is a representative sample of the Canadian population. Some of the presented findings may be biased due to participation rates. For the data collection, respondents were only contacted if they had a telephone in their household. Respondents with only a cellphone in their households were excluded. Participation in telephone surveys is typically influenced by

socio-demographic and lifestyle factors, it is not straightforward to generalize our study findings to the Canadian population. This makes the GSS less representative of the households without telephones leading to potential loss of information from those individuals. The survey was only conducted with individuals fluent in French or English. Some people may have been left out of the survey, such as recent immigrants or Indigenous individuals who are only fluent in their native language. This could lead to the potential loss of information from this category of people.

A key limitation to this study was the way the ethnicity question was posed in the GSS survey and the response options provided (Appendix 3). The way the ethnicity question was worded was quite unclear. There were many response options for European ancestry, but there was no information on African groups. According to recent immigration statistics, the largest group of immigrants to Canada in recent times have come from Asia, the Middle East, and Africa (*Immigr. Ethnocult. Divers. Canada*, n.d.). Although there was a category of Asia and the middle east in the GSS, the sample size was relatively small. There was no information on African respondents at all.

The ethnicity variable was grouped based on ancestry and provided limited information about racial categories. Apart from Indigenous ancestry, the GSS data provide no information to distinguish White and non-White respondents. Studies have shown that racialized groups have significantly lower physical and mental health (Pinquart & Sørensen, 2005) (William E. Haley et al., 2004) (Chen et al., 2020) (Rote et al., 2019). Furthermore, people self-identify with many dimensions such as religion, nationality and, cultural heritage in addition to ethnicity. We do not have information on these dimensions and thus cannot generalize our study findings to these groups.

## **5.4 Recommendations for Future Research**

The current study categorizes ethnicity as Canadian ancestry, European ancestry, Indigenous, and mixed or other ancestry. Future studies of caregiver ethnicity should include more comprehensive ethnic categories including African ancestry that will better reflect Canada and help policymakers make better informed decisions. More detailed response options should be provided on future GSS Caregiver and Care-Receiver Surveys. This would allow for a more meaningful categorization of ethnic groups. More comparative studies of caregiver ethnicity are needed in the Canadian literature.

## **5.5 Conclusion**

We found that caregiver ethnicity is associated with health. However, our findings should be interpreted cautiously due to the uncertainties surrounding ethnic categories, use of cross-sectional data, and selection bias. Nonetheless, the findings of our study are consistent with previous epidemiological investigations and guide future research on caregiving particularly regarding the health impacts of caregiving amongst different ethnic groups.

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## Appendices

### Appendix 1: List of Dependent Variables and Definitions

Dependent Variable	GSS Variable Name	GSS Survey Question
Overall Health	SHP_Q10	In general, would you say your health is: Excellent, very good, good, fair, poor.
Mental Health	SHM_Q10	In general, would you say your mental health is: Excellent, very good, good, fair, poor.
HUI Index	Health Utilities	Derived from the eight HUI variables listed below
HUI 1	HUI_SPE1	Speech trouble
HUI 2	HUI_VIS1	Vision trouble
HUI 3	HUI_HER1	Hearing trouble
HUI 4	HUI_MOB1	Mobility trouble
HUI 5	HUI_EMO1	Emotional trouble
HUI 6	HUI_PAD1	Pain and discomfort
HUI 7	HUI_DEX1	Dexterity trouble
HUI 8	HUI_COG1	Cognitive capacity

Reference: (Canada, 2005)

### Appendix 2: List of Independent Variables and Definitions

Independent Variable	GSS Variable Name	GSS Survey Question
Age	AGEGR10	Age group of the respondent
Sex	SEX	Sex of the respondent
Marital Status	MARSTAT	Marital status of the respondent
Employment	MAR_Q110	During the past 12 months, was your main activity working at a paid job or business, looking for paid work, going to school, caring for children, household, work, retired or something else?
Household Income	INCMHSD	Total household Income
Education	EOR_Q04	What is the highest level of education that you have completed?
Region of residence	REGION	Region of residence of the respondent
Children	CHRTIME6	Age group of respondent's single child(ren) living in the household

Caregiving Intensity	HAP_Q10C	In an average week, number of hours of care or help provided by the respondent with these activities
Ethnicity	ETHNIC25	Ethnic background of the respondent (25 categories)

Reference: (Canada, 2005)

**Appendix 3: List of Ethnicity Categories**

<b>Ethnicity</b>	<b>What were the ethnic or cultural origins of your ancestors?</b>
Indigenous	1. Aboriginal only (North American Indian, Metis or Inuit)
European ancestry only	2. English only 3. French only 4. Scottish only 5. Irish only 6. German only 7. Italian only 8. Dutch only 9. Polish only 10. Other European
Mixed or other ancestry	11. South Asian, 12. Single origins 13. British Isles (multiples with English, Scottish or Irish) 14. British Isles and Canadian, British Isles and French 15. British Isles and other 16. British Isles 17. French and other 18. Canadian and French 19. French and other 20. Canadian and other 21. All other multiples with Canadian 22. British Isles or French 23. All other multiple origins excluding Canadian 24. British Isles
Canadian ancestry only	25. Canadian only

Reference: (Canada, 2005)

#### Appendix 4: Descriptive Statistics (unweighted)

	Characteristics	Population N=9552	%
<b>Sex</b>	Male	3837	40.17
	Female	5715	59.83
<b>Age group</b>	15 to 24	655	6.86
	25 to 34	821	8.60
	35 to 44	1296	13.57
	45 to 54	2290	23.97
	55 to 64	2572	26.93
	65 to 74	1316	13.78
	75 years and over	602	6.30
	<b>Marital Status</b>	Married or common law	6064
Divorced/Separated/Widowed/Single/Never Married		3472	36.35
<b>Employment</b>	Missing	16	0.17
	Employed	5347	55.98
	Unemployed	1862	19.49
	Retired	2327	24.36
	Missing	16	0.17
<b>Household income</b>	0 to 19,999	598	6.26
	20,000 to 39999	1308	13.69
	40000 to 59999	1382	14.47
	60000 to 99999	2052	21.48
	100000 to 149000	1378	14.43
	150000 or more	968	10.13
	Missing	1866	19.54
	<b>Education</b>	Under high school	1385
High school or equivalent		2636	27.60
Trade/College/CEGEP/ Diploma		3062	32.06
University/Postgraduate		2396	25.08
Missing		73	0.76
<b>Mental Health</b>	Excellent	2687	28.13
	Very good	3182	33.31
	Good	2752	28.80
	Fair	684	7.116
	Poor	136	1.42
	Missing	112	1.17
	<b>Overall Health</b>	Excellent	1980
Very good		3201	33.51
Good		2907	30.43
Fair		1025	10.73
Poor		325	3.40
Missing		114	1.19
<b>Caregiving Intensity</b>	Less than 5	4938	51.70
	≥ 5 and <15	2170	22.72
	≥15	2444	25.59
<b>Region</b>	Atlantic Region	2505	26.22
	Quebec	1216	12.73
	Ontario	2272	23.79
	Prairie Region	2441	25.55
	British Columbia	1118	11.70

<b>Dependent child</b>	Yes	2265	23.71
	No	7287	76.29
<b>Ethno-cultural groups</b>	Canadian only	679	7.11
	European only	4942	51.74
	Indigenous/First Nations	196	2.05
	Mixed or other	3260	34.13
	Missing	475	4.97

## Appendix 5: Univariate analysis of overall health and other variables using Logistic Regression Model

	Univariate Model	
	OR (95% CI)	P-value
<b>Sex (reference: Male)</b>		
Female	0.82 (0.81,0.83)	<0.0001
<b>Age (reference: 15-24)</b>		
25-34	0.81 (0.80,0.82)	<0.0001
35-44	0.50 (0.49,0.51)	<0.0001
45-54	0.41 (0.40,0.42)	<0.0001
55-64	0.33 (0.32,0.34)	<0.0001
65-74	0.32 (0.31,0.33)	<0.0001
75+	0.21 (0.20,0.22)	<0.0001
<b>Marital Status (reference: Married)</b>		
Divorced/Separated/Widowed/ Single/Never Married	0.96 (0.94,0.96)	<0.0001
<b>Household Income (reference: \$0 to \$19,999)</b>		
\$20,000 to \$39,999	1.74 (1.72,1.75)	<0.0001
\$40,000 to \$59,999	2.91 (2.88,2.93)	<0.0001
\$60,000 to \$99,999	4.01 (3.97,4.05)	<0.0001
\$100,000 to \$149,000	5.85 (5.79,5.91)	<0.0001
\$150,000 or more	9.38 (9.28,9.49)	<0.0001
<b>Children (reference: No Dependent child)</b>		
Dependent child	0.69 (0.68,0.70)	<0.0001
<b>Caregiving Intensity (reference: &lt;5)</b>		
≥ 5 and <15	0.82 (0.81,0.83)	<0.0001
≥15	0.57 (0.56,0.58)	<0.0001
<b>Education (reference: under high school)</b>		
High school	1.34(1.33, 1.35)	<0.0001
Trade/ College/ CEGEP/ certificate	1.50(1.49,1.51)	<0.0001
University/ Postgraduate	2.13 (2.12,2.14)	<0.0001
<b>Employment status (reference: employed)</b>		
Unemployed	0.49(0.48,0.50)	<0.0001
Retired	0.45 (0.45,0.46)	<0.0001
<b>Region (reference: Ontario)</b>		
Atlantic Region	1.38 (1.36,1.39)	0.0001
Quebec	1.01 (1.00,1.02)	<0.0001
Prairie Region	1.27 (1.26,1.29)	<0.0001
British Columbia	1.07 (1.06,1.08)	<0.0001

**Appendix 6: Univariate analysis of mental health and other variables using Logistic Regression Model**

	Univariate Model	
	OR (95% CI)	P-value
<b>Sex (reference: Male)</b>		
Female	0.73 (0.72,0.74)	<0.0001
<b>Age (reference: 15-24)</b>		
25-34	1.10 (1.09,1.11)	<0.0001
35-44	0.77 (0.76,0.78)	<0.0001
45-54	0.94 (0.93,0.95)	<0.0001
55-64	1.06 (1.05,1.07)	<0.0001
65-74	1.23 (1.22,1.24)	<0.0001
75+	0.81 (0.79,0.82)	<0.0001
<b>Marital Status (reference: Married)</b>		
Divorced/Separated/Widowed/ Single/Never Married	0.65 (0.64,0.66)	<0.0001
<b>Household Income (reference: \$0 to \$19,999)</b>		
\$20,000 to \$39,999	1.77 (1.76,1.78)	<0.0001
\$40,000 to \$59,999	2.02 (2.00,2.04)	<0.0001
\$60,000 to \$99,999	2.86 (2.83,2.89)	<0.0001
\$100,000 to \$149,000	4.10 (4.05,4.15)	<0.0001
\$150,000 or more	6.08 (6.00,6.16)	<0.0001
<b>Children (reference: No Dependent child)</b>		
Dependent child	0.97 (0.96,0.98)	<0.0001
<b>Caregiving Intensity (reference: &lt;5)</b>		
≥ 5 and <15	0.89 (0.88,0.90)	<0.0001
≥15	0.62 (0.61,0.63)	<0.0001
<b>Education (reference: under high school)</b>		
High school	1.01 (1.00, 1.02)	<0.0001
Trade/ College/ CEGEP/ certificate	1.09 (1.08,1.10)	<0.0001
University/ Postgraduate	1.75 (1.74,1.76)	<0.0001
<b>Employment status (reference: employed)</b>		
Unemployed	0.42 (0.41,0.43)	<0.0001
Retired	0.78 (0.77,0.79)	<0.0001
<b>Region (reference: Ontario)</b>		
Atlantic Region	1.29 (1.28,1.30)	0.0001
Quebec	1.04 (1.03,1.06)	<0.0001
Prairie Region	0.96 (0.95,0.97)	<0.0001
British Columbia	0.77 (0.76,0.78)	<0.0001

**Appendix 7: Univariate analysis of the health-related quality of life and other variables using the Tobit Model.**

	Univariate Model	
	Coeff	P-value
<b>Sex (reference: Male)</b>		
Female	-0.03 (-0.02, -0.04)	<0.0001
<b>Age (reference: 15-24)</b>		
25-34	0.00 (-0.01,0.01)	0.9381
35-44	-0.01 (-0.00, -0.02)	<0.0001
45-54	-0.06 (-0.05, -0.07)	<0.0001
55-64	-0.09 (-0.08, -0.10)	<0.0001
65-74	-0.07 (-0.06, -0.08)	<0.0001
75+	-0.15 (-0.14, -0.16)	<0.0001
<b>Marital Status (reference: Married)</b>		
Divorced/Separated/Widowed/ Single/Never Married	-0.02 (-0.01, -0.03)	<0.0001
<b>Household Income (reference: \$0 to \$19,999)</b>		
\$20,000 to \$39,999	0.09 (0.08,0.10)	<0.0001
\$40,000 to \$59,999	0.11 (0.10,0.12)	<0.0001
\$60,000 to \$99,999	0.15 (0.14,0.16)	<0.0001
\$100,000 to \$149,000	0.18(0.16,0.20)	<0.0001
\$150,000 or more	0.23 (0.21,0.25)	<0.0001
<b>Children (reference: No dependent child)</b>		
Dependent child	0.05 (0.04,0.06)	<0.0001
<b>Caregiving Intensity (reference: &lt;5)</b>		
≥ 5 and <15	-0.03 (-0.02, -0.04)	<0.0001
≥15	-0.06 (-0.05, -0.07)	<0.0001
<b>Education (reference: under high school)</b>		
High school	0.04 (0.03,0.05)	<0.0001
Trade/ College/ CEGEP/ certificate	0.05 (0.04,0.06)	<0.0001
University/ Postgraduate	0.10 (0.09,0.11)	<0.0001
<b>Employment status (reference: employed)</b>		
Unemployed	-0.06 (-0.05, -0.07)	<0.0001
Retired	-0.08 (-0.07, -0.09)	<0.0001
<b>Region (reference: Ontario)</b>		
Atlantic Region	-0.01 (-0.00, -0.02)	<0.0001
Quebec	0.01 (0.00,0.02)	<0.0001
Prairie Region	0.0012 (0.0007,0.0017)	<0.0001
British Columbia	-0.02 (-0.01, -0.03)	<0.0001

## Summary of Qualification

- Extensive knowledge of statistical research and data analytics
- Graduate research coursework and experience focused on the study of longitudinal and cross-sectional data from epidemiological surveys and population health
- Experience with health economic research and psychometric assessment of frailty measures
- Experience in using medical terminology and hands-on experience with ICD-9/10 codes
- Experience in conducting literature reviews, systematic reviews, and meta-analysis
- Experience with statistical models, including generalized linear model and mixed model
- Experience with decision-making regarding study protocols, designs, objectives, and the selection of appropriate study methodology
- Experience presenting and summarizing complex and straightforward statistical results
- Effective multi-tasker developed over years of engaging in multiple research endeavors simultaneously
- Strong oral and written communication created through various presentations and correspondences
- Ability to work effectively independently and as part of a team.

## Education

### **Western University | Master of Science: Epidemiology & Biostatistics | 2018-2021**

- Western Graduate Research Scholarship (\$10,800/year)
- Ontario Student Opportunity Trust Fund Bursary Award (\$6,000)
- CADTH Symposium travel award 2020 (\$2,000)

### **Bowen University | Bachelor of Science (Honors): Statistics | 2010-2014**

## Skills

SAS | STATA | SPSS | Literature Review | Systematic Review | Meta-analysis | Quantitative and Qualitative Analyses | Interpretation of data | Inference from data | Microsoft Office (Word, Excel, PowerPoint, Access) | Detail oriented | Excellent oral and communication | Independent | Teamwork

## Worker Health and Safety Training & Certificates

- **Awareness in 4 Steps Training**  
Ontario Ministry of Labor
- **Good Clinical Practice (GCP) Training**  
NIDA Clinical Trials Network
- **Tri-Council Policy Statement (TCPS2) Training**  
Government of Canada TCPS2: CORE
- **Standard Operating Procedures for Clinical Research eLearning Training**  
Lawson Health Research Institute

