

**PROVINCIAL INEQUITIES OF INCOME-RELATED HOME
CARE**

**PROVINCIAL INEQUITIES OF INCOME-RELATED HOME
CARE: RECEIPT OF FORMAL AND INFORMAL CARE**

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TITLE: Provincial inequities of income-related home care: receipt of formal and informal care

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Abstract

Background: Although physician and hospital services are universally accessible without user charges through the stipulations of the Canada Health Act (CHA), formal home care is not included in the CHA and may be subject to user charges, which vary across provinces. The user charges may result in differential substitutability with informal care across provinces according to an individual's income.

Objectives: The objective of this research is to understand if income is related to the probability of receipt of caregiving, formal or informal, in the community (excluding institutional care). It will also be investigated if and in what measure income-related horizontal inequity exists for the receipt of formal and informal care and if this relationship varies across provinces.

Methods: This secondary analysis first specified a logic regression model for predicting the use of informal care and home care. After standardizing for need, a concentration index was computed to measure horizontal inequity, which was then decomposed to understand the contributing factors to the unequal distribution in the receipt of formal home care and informal care.

Results: After controlling for need, pro-poor income-related horizontal inequity exists for the receipt of formal home care and informal care.

Conclusions: Income-tested provincial user charges for home care may contribute to a greater utilization of home care among the poor, but it should be further investigated if there is an unequal distribution of informal caregiver burden that results from the substitution with informal care due to these user charges.

List of Abbreviations

CHA	Canada Health Act
ADL	Basic activities of daily living
IADL	Instrumental activities of daily living
CI	Concentration index
HI	Horizontal inequity index
SE	Standard Error
Atl	Atlantic
Nfld. Lab.	Newfoundland and Labrador
PEI	Prince Edward Island
Que	Quebec
Ont	Ontario
LICO	Low-income-cut-off
HHldInc	Household Income ratio to LICO
CMA	Canadian Metropolitan Area
CCHS-HA	Canadian Community Health Survey-Healthy Aging
OR	Odds Ratio
BIC	Bayesian Information Criterion

Introduction	2
Background and Literature Review	3
Magnitude	3
Landscape and Public Generosity	4
Complements or Substitutes	6
Benefit or Burden	8
Labour Force Participation	10
Determinants of the Receipt of Care	12
Living Arrangement	12
Urban-Rural.....	12
Income	12
Education.....	15
Gender.....	15
Immigrant Status.....	15
Objective and Research Question	16
Methods:	16
Data	16
Variables	17
Statistical Analysis	21
Descriptive Statistics	21
Logistic Regression and Marginal Analysis.....	21
Need Standardization and Horizontal Inequity	22
Concentration Curve.....	23
Concentration Index	24
Decomposition	25
Results	26
Descriptive Statistics	26
Logistic Regression and Marginal Analysis	29
Logistic Regression and Marginal Analysis – Informal Care	29
Logistic Regression and Marginal analysis – Home Care.....	32
Concentration Index and Curve	36
Concentration Index and Curve – Informal care	36
Concentration Index and Curve – Home care	38
Decomposition of Inequality	41
Decomposition of Inequality – Informal Care.....	41
Decomposition of Inequality – Home care	42
Discussion	44
Descriptive Statistics	44
Logistic Regression	45
Concentration Curves and Indices	48
Concentration Curves and Indices – Informal Care.....	48
Decomposition – Informal care	50
Concentration Curves and Indices – Home care	50
Decomposition – Home care	51
Strengths and Limitations	52
Conclusion	53

Introduction

For the first time, in 2017 Statistics Canada reported that there are now more individuals living in Canada who are 65 years of age or older (16.9%) than there are individuals who are below the age of 15 years old (16.6%) (Statistics Canada, 2017). Although medically necessary physician and hospital services are included in the provisions of the Canada Health Act that provide publicly administered and universal access to care, care for dependent seniors through formal home care is not included and is potentially subject to user co-payments. These statistics of the changing demographic provide an indicator of the magnitude of the population that may be affected by the potential income-related inequities in the receipt of care from the different cost-sharing arrangements for formal home care that have developed across provinces. The present thesis studies the distribution of utilization of home care and informal care in Canada, and, more specifically, the relationship of income with differences in utilization for individuals with the same level of need (horizontal inequity).

Care for dependent seniors may be provided through various mechanisms. First, at the highest levels of impairment and loss of independence, seniors may enter an institutional long-term care facility, which is typically heavily subsidized by the provincial government, but still rely on a cost-sharing mechanism with the user. Second, seniors may be cared for through publicly provided formal home care services by professionals in the community and home setting, which are also subsidized by the government, and often require some type of cost-sharing. Third, and typically at lower levels of impairment, dependent seniors may utilize informal home care services which are characterized by unpaid, non-professional care provided in a home setting typically by spouses, other relatives, friends, or neighbours. Informal care can be used (and is used) at higher levels of impairment as well, but cannot be used alone at those levels and needs to be complemented by formal care. For the purpose of this paper, paid professional formal home care will simply be referred to as home care, while unpaid, non-professional care will be referred to as informal care. Because of the constraints of the sample population in the data, individuals in institutional long-term care residential facilities will not be considered.

While equality dictates an equal distribution of resources, equity demands that resources be distributed according to need. Vertical equity stipulates that people of different levels of need receive different levels of care, while horizontal equity stipulates that people of the same level of need receive the same level of care. Thus, because of the association between low income and poor health, it is likely that home care and informal care are more concentrated in lower income households, but, if after

controlling for “need”, receipt of home care and informal care are still concentrated in lower income households and income was a determinant in the receipt of care, then this would demonstrate income-related inequity. While it is reasonable that access to home care services is beneficial for the dependent senior, the use of informal care is more difficult to evaluate because of the competing consequences. The caregiver burden and decreased labour force participation among care givers associated with informal care should be taken into consideration for equitable policy development, along with the differential sensitivity in the probability to receive care across income groups.

This thesis will proceed as follows: first, a literature review of what we know about the determinants of the probability to use informal care and home care as well as the implications of the decision to use these types of care will be addressed; second, the methodology used in this thesis will be presented, including logistic regression, concentration curves and indices, and decomposition of the concentration index; third, the results will be presented; and fourth, a discussion of the results.

Background and Literature Review

Magnitude

Between 1994 and 2011, an average of 10.7% of Canadians per year reported using home care services in the previous 12 months (Mery, Wodchis et al. 2016) and more than one-third (35%) of Canadians aged 45 or older reported caring for a senior with a short- or long-term health condition or limitation in 2011 (Turner and Findlay 2012). Of informal care recipients, 21.1% were receiving care on a daily basis, and 35.5% were receiving it regularly but less than daily (Turner and Findlay 2012). For all the care provided at home, informal caregivers provide an estimated 80% of it (Stone, Cafferata et al. 1987). Quantifying the cost or benefit to the government from informal care is an intricate and near futile exercise because of the sensitivity of the analysis to the various assumptions and values of the parameters, but some estimates put the value of the benefit to the government (in costs saved) of informal care giving to \$4.4 billion at the lowest intensities of caregiving (< 5 hrs of care/week) which results from the reduced paid care expenditures that would have been provided through home care, but at the highest intensity of caregiving, there was a net cost to government of \$641 million (Jacobs, Lilly et al. 2013), which results from the lost tax revenues from informal care givers reducing labour force participation. It could be argued that this amount of care ought to have been provided by the government through home care services, but was instead provided by informal caregivers. The pressure on formal home care services will likely increase as the baby boomers gradually join the oldest old, which will be accompanied by the proportion of females without any surviving children – an

important source of informal care - increasing from 16% in 2001 to a high of 24% in 2031 (Keefe, Legare et al. 2005). However, the consequences on sources of informal care from the increased proportion of older women without any surviving children may be attenuated by the narrowing gender gap in longevity – males are living longer and will be able provide informal care. Because of the magnitude of care provided to dependent seniors now and in the near future, careful consideration should be taken to ensure a similar level of equity is achieved as that of physician and hospital services provided in Canada.

While the reasons for receiving informal care are diverse, they are often associated with a loss of independence in basic activities of daily living (ADL). A systematic review found that the median weekly hours of informal care were greatest for dementia (26 hrs), followed by stroke (25 hrs), multiple sclerosis (24 hrs), and cancer (15 hrs) (Oliva-Moreno, Trapero-Bertran et al. 2016). Similarly, the average weight attributed to the societal level costs of informal care was 50% for dementia, 28% for stroke, 28% for mental illnesses, 24% for cancer, 23% for multiple sclerosis and 9% for arthritis or osteoarthritis (Oliva-Moreno, Trapero-Bertran et al. 2016). In 2011, of the 340,000 people living with dementia in Canada - a number which was projected to approximately double to 674,000 people by 2031 - 77 % were estimated to be receiving informal care (Manuel, Garner et al. 2016). As these conditions become more prevalent and there is a progressive loss of functional ability, it appears that home care services will become more important as the professional nature of the care required exceeds that capable of informal caregivers.

The financial contributions of informal care, using annual costs at hourly market rate for homemakers in Canada, was estimated to be between \$25-26 billion in 2009 (Hollander, Liu et al. 2009). Although this unpaid care may seem beneficial to the economy and government, there are costs associated with providing informal care that need to be taken into consideration, such informal caregiver burden and reduced labour force participation, for both the decision to pursue care and for an analysis of inequity.

Landscape and Public Generosity

The 1984 Canada Health Act (CHA) established the principle of equitable access to health care services through the criteria of universality and accessibility, by which it means that access should be determined by need, not ability to pay: user charges, including extra-billing, were banned for physician and hospital services. However, home care services were not covered by the CHA and provinces can still implement user charges on these services. This has resulted in a patchwork of funding arrangements across provinces for home care, most of which require some sort of private contribution. After assessment for need, individuals in some provinces are fully

covered for home care services, while in other provinces there is an income- or means-tested co-payment, and in others there is a maximum monthly payment by patients, while in others the needs assessment takes into account the number of individuals in the household. The variation in generosity of home care provisions across provinces has the potential to affect utilization of these services, which may also contribute to a differential relationship between income and the probability to receive home care.

Using the natural variation of home care funding over time and across provinces in Canada, Stabile and colleagues found that the generosity of the public program (i.e., spending per capita) was positively and significantly correlated with the probability of using home care: a \$100 increase in spending per individual 65 plus was associated with a 1.3% point increase in the probability of using home care, or a relative increase of 15%; and a 1.9% point decrease in the probability of receiving informal care, or a relative decrease of 12.7% (Stabile, Laporte et al. 2006). The same study also shows that increases in the generosity of public home care programs were positively correlated with increases in the probability of reporting good self-assessed health or better: a \$100 increase in spending per elderly individual is correlated with a 2.1% point increase in the probability of reporting good health among home care recipients (Stabile, Laporte et al. 2006). Furthermore, it was found that a 10% increase in public expenditures of home care was associated with a 6% increase in private expenditures for home care services, suggesting the benefits of increasing generosity of publicly funded home care go beyond health improvements and use of public services to include increased private expenditures on home care (Guerriere, Wong et al. 2008).

In the US, a natural experiment which saw substantially expanded public coverage for home care compared to less generous home care coverage in five communities from 1982 - 1985 found that the more generous home care provisions for the unmarried sample resulted in a 2.4% and 4.7% reduction in the probability of living with others and in a nursing or personal care home, respectively (Pezzin, Kemper et al. 1996). Additionally, Medicare managed-care enrollees in the lowest tertile for non-housing assets, who are subject to lower copays than other income tertiles, had 50% greater odds than those in the highest tertile of having one or more home care visits after controlling for need— further suggesting that increasing the government contribution for the cost home care through a reduction in co-payment results in increased utilization and may lessen the burden of informal caregiving (Freedman, Rogowski et al. 2004).

In a comparative analysis between Denmark, France, Germany, and Italy, more generous programs found in Denmark and France ensured that access to care is more equally distributed across income, compared to less generous programs in Germany and Italy (Albertini and Pavolini 2017). The finding that home care was less accessible

to the poor because of out-of-pocket cost was corroborated by Bakx, Meijer and colleagues in a comparison of the Netherlands and German home care services, noting that the higher co-payments in Germany deters use by lower income groups (Bakx, Meijer et al. 2015).

In North America, and across Europe, it seems clear that increasing government contributions to home care services results in increased utilization of these services, and that consumption of home care services will increase when the price faced by the individual decreases, even after accounting for need. However, there is a possibility that dependent seniors, when faced with more restrictive home care provisions, may instead substitute informal care for home care services, or the result could be decreased informal caregiving if home care and informal care are complements. The caregiver burden and decreased labor force participation associated with informal caregiving that may result from this government generosity should be taken into consideration for policy development.

Complements or Substitutes

Dependent individuals use more home care when it is financially affordable, but what happens when they don't use it? As with other economic commodities, there is a possibility that informal care may act as a substitute for home care services if it provides a similar level of utility to the recipient for a given volume of care received. If that is the case, then increasing the private cost of home care services will result in decreased consumption, and an increase in the use of informal care. This relationship may be particularly more pronounced among lower income households facing more restrictive budget constraints – exacerbating inequities related to informal caregiver burden and reduced labour force participation discussed below. The substitutability of informal care and home care won't be analyzed in this thesis, but it is worth drawing on some of the literature to understand its impact on equity. If home care is the preferred type of care and a substitute to informal care, then increased subsidization of home care may promote horizontal equity. To the extent that care for more impaired dependent seniors may require increasing professional services and at greater intensity, there is likely to be some substitution between informal and home care.

Using the natural experiment in the US discussed earlier which saw substantially expanded public coverage for home care compared to less generous home care coverage, the research demonstrated that increased generosity of public home care provisions resulted in only small reductions in the overall amount of care provided by informal caregivers to unmarried persons and in no reductions for married persons, suggesting they may be unrelated (Pezzin, Kemper et al. 1996). However, Golberstein and Gabrowski et al. (2009) found that lower-income individuals exposed to more

restrictive payment caps offset reductions in Medicare home health care with increased informal care - the effect of going from low restrictive payment systems to high restrictive payment systems for the low-income subsample was a 15% increase in the probability of using any informal care and an increase of 5.87 informal care hours per week suggesting that when faced with budget constraints, lower income individuals may substitute formal home care services with informal care (Golberstein, Grabowski et al. 2009). Additionally, the Medicaid home care subsidy increased the use of formal home care and led to substitution of informal with formal home care for services that were non-medical in nature – suggesting substitution for such services (Ettner 1994). In Ireland and France, authors determined that informal care is negatively and significantly associated with the use of home care and conclude that they are substitutes (Gannon and Davin 2010). The evidence suggests that when faced with increased private costs for home care, there may be substitution for informal care for services that are less professional in nature, and this may be more prevalent for low-income households.

But substitutes and complements need not be mutually exclusive across different contexts. For example, the substitutability of home care and informal care might vary across the income distribution, or across the range of services encompassed by home care. Indeed, those who receive home care often complement these services with informal care giving – demonstrated with Canadian data in 2007 by an increased probability to access home care with increasing number of informal care hours provided (Jacobs, Lilly et al. 2013). In contending that increasing generosity of home care services in the US would not erode the amount of informal care provided, Hanley, Wiener et al (1991) concluded that receipt of home care is actually significantly and positively associated with the receipt and intensity of informal care for the most severely disable subgroup (Hanley, Wiener et al. 1991). Similarly, in Spain, it was found that formal home care complements informal caregiving (Pena-Longobardo and Oliva-Moreno 2015). In Finland, where there is universal access to formal help, the more frequently the children helped, the larger were the odds of receiving home care, suggesting that these services are complementary (Blomgren, Martikainen et al. 2008). In France, Germany, Italy, and Denmark, use of informal care services was positively related to the likelihood of receiving home care services (Albertini and Pavolini 2017). These international examples of developed countries who provided similar cost sharing arrangements for home care indicate that home care services and informal care services are utilized along side one another – that is, the use of home care will promote informal care giving as well. In that informal care giving is associated with caregiver burden and reduced labour force participation as outlined below, the complementary nature of these services suggests that increased generosity of public home care through lower co-payments may increase home care use as well as informal care use, and this relationship

will be more pronounced in lower income households. Compared to substitution, this effect of increasing government generosity for home care may actually increase inequities related to informal caregiver burden and reduced labour force participation.

The inconclusive literature concerning the substitutability between home care and informal care provides some evidence that there may be substitution that occurs for services that are less medical in nature, and this effect may be more pronounced in low income households. However, there is also evidence that informal care may play a complementary role for home care. The importance of understanding the substitutability between informal care and home care is the resulting consequences from the differing provincial government contributions to home care that could lead to varying levels of substitution between informal care and home care across provinces—transpiring as income-related provincial inequities associated with the burden from informal care.

Benefit or Burden

The consequences of informal care are fundamental for an analysis of income-related equity. After determining whether informal care is more concentrated in higher or lower income households, value judgements must be made to determine whether or not this observation is “good” or “bad”, and these value judgements will be guided by the consequences related to informal care, including care giver burden. The health implications of informal care should be considered from both the care recipient and caregiver perspective. Although there is a vast literature on the burden associated with caregiving responsibilities, there are presumably benefits to the care recipient, and perhaps the caregiver.

Research in France found that after controlling for relevant covariates, compared to not receiving informal care, receiving informal care was associated with a 42% reduced risk of depression and that an additional hour of care received was associated with a 1.8% increase in self-reported mental health for the care recipient (Barnay and Juin 2016). Additionally, in the US, it was found caregivers rate their health better than non-caregivers and do not report more depressive symptoms or social isolation than non-care-givers, suggesting that there can be some self-fulfillment in providing care, however this could be due to a selection bias of only healthy individuals choosing to be informal caregivers (Robison, Fortinsky et al. 2009). In Europe, factors associated with psychological well being among caregivers for persons living with dementia were low caregiver burden, and few neuropsychiatric and depressive symptoms for the care recipient (Lethin, Renom-Guiteras et al. 2016). In Belgium and Great Britain, non-intensive caregiving (less than 20 hours a week) was associated with a 14% reduction in risk of reporting poor health, while providing intensive care was associated with a 12%

increased risk, compared to non-caregivers (Dujardin, Farfan-Portet et al. 2011). The evidence suggests that there may be health benefits to the informal care recipient, and low intensities of informal care may provide some benefits to the informal caregiver, however this results may be due to a selection bias in only healthy individual taking on the role of caregiver.

Despite the potential benefits to the caregiver and care recipient of informal care, caring for a dependent seniors will contribute to a number of health-related adverse outcomes. A meta-analysis indicated that after controlling for other factors, worse physical health among the caregiver was associated with older age, not being a spouse, co-residence, higher levels of behavior problems and cognitive impairments of the care recipients, fewer caregiving tasks, more months in the caregiver role, lower educational attainment, receipt of less informal support, higher levels of burden and depression, and most notably, lower income (Pinquart and Sorensen 2007). A longitudinal study from the Netherlands found that spousal caregivers experienced a higher overall subjective burden, reported more mental health problems, physical health problems, and problems with daily activities, compared to adult-child caregivers (Oldenkamp, Hagedoorn et al. 2016). Caregivers were also found to have significantly greater odds of reporting household food insecurity (OR = 2.10) and personal hunger (OR = 2.89) (Horner-Johnson, Dobbartin et al. 2015). Higher caregiver strain was significantly associated with greater patient symptoms and lower patient quality of life for heart failure patients (Bidwell, Lyons et al. 2016). Other studies revealed that providing informal care contributed to poor mental health (Hajek and Konig 2016), increased stress and burden (Dwyer and Miller 1990), higher rates of affective and anxiety disorders (Cochrane, Goering et al. 1997), and worsened self-reported health (Danilovich, Xiang et al. 2016). The functioning level of the patients, proximity to the recipient's home, prolonged caregiving, and limited availability of accessible and affordable care services have also been documented as determinants of the burden of informal care (Flyckt, Fatouros-Bergman et al. 2015).

Caregiver burden may also affect men and women differently. A systematic review on the burden from informal palliative care found that women caregivers experienced a greater degree of mental and physical strain compared men (Morgan, Ann Williams et al. 2016). In Spain, women of lower SES were more likely to develop impaired health, feel depressed, have professional, economic, and personal problems, but in men, there were only associations with depressed problems (Abajo, Rodriguez-Sanz et al. 2016). In Australia, deterioration in both physical functioning and mental health was worse for females after only two years and deterioration in only mental health was worse for males after 4 years (Kenny, King et al. 2014). The negative consequences associated with informal care seem to affect females more so than males.

In considering income-related equity implications for informal caregiver burden, there is also a possibility that lower income households could feel greater degrees of burden. In the US, there was a negative association between informal caregiver burden and income – as income increased, the magnitude of the association between caregiving and burden decreased (Do, Cohen et al. 2014). Research in Spain has also demonstrated SES inequalities of informal caregiver burden, with a greater burden of care falling on individuals of lower SES (Abajo, Rodriguez-Sanz et al. 2016).

A dose-response relationship between the intensity of care provided and the degree of burden felt by the caregiver also warrants a further understanding for the discussion of income-related equity in the receipt of informal care. A meta-analysis indicated that worse physical health was associated with more months in the caregiver role, receipt of less informal support, and higher levels of burden and depression (Pinquart and Sorensen 2007). In British Columbia, well-being and self-reported burden were directly related to the number of hours of informal care provided (Chappell and Reid 2002). In Ontario, the probability of reporting poorer health increased with the amount of care provided for men (Dujardin, Farfan-Portet et al. 2011). Similarly, there was a dose-response relationship found between intensity of informal care provided and self-reported caregiving problems in Spain (Abajo, Rodriguez-Sanz et al. 2016). Among the nonworking caregivers, quitting or retiring early because of caregiving was associated with higher stress levels, and as the number of caregiving hours needed went up, so did the reported stress (Longacre, Valdmanis et al. 2016). In addressing the burden associated with informal caregiving that might be unequally distributed across income, the evidence suggests that there is a dose-response relationship between the intensity of care provided, and the burden that is experienced.

Although there may be some benefits to both the recipient and caregiver, the ubiquitous burden associated with informal caregiving responsibilities, and its unequal affect across sex and income groups, suggests that informal caregiver burden creates substantial adverse health outcomes that will be incorporated in the decision to provide care, and that are important for an analysis of equity.

Labour Force Participation

Depending on the severity of the condition of the individual receiving care, informal caregivers may reduce their participation in the labour force to provide care for the dependent senior - further disadvantaging individuals of lower income as they forego wages to provide care.

A meta-analysis on the relationship between informal care and labour force participation in England indicated that among women in the labour force, informal caregiving was associated with a 13% higher risk of absence from work due to sickness and women exposed to both high job strain and informal caregiving showed a 20% higher risk of sickness absence, but this association was not significant for men (Mortensen, Dich et al. 2017).

In Canada, high intensity caregiving was associated with being fully retired for men and women, but for women only, high intensity caregiving was also associated with working part-time and being a labour force non-participant (Jacobs, Laporte et al. 2014), which was supported by similar research (Lilly, Laporte et al. 2007). Considering the number of hours worked and potential opportunity cost, other Canadian-based research has suggested that caregiving is negatively associated with the number of hours worked for females only (Latif 2006), but Lilly, Laporte et al. (2007) found that this was true for both men and women. These relationships might be important for primary caregivers only - both primary caregiving men and women were significantly less likely to be employed compared to either secondary caregivers, or non-caregivers (Lilly, Laporte et al. 2010).

In the US, compared with non-caregivers, helping a spouse with basic activities of daily living (ADLs) or instrumental activities of daily living (IADLs) reduced the odds of returning-to-work in the subsequent wave by 78% and 55%, respectively (Gonzales, Lee et al. 2015).

In Australia, providing care as the main caregiver reduced the probability of reporting active employment status by approximately 12% for both males and females (Nguyen and Connelly 2014). However, women who provided informal care were more likely to decrease working hours compared to non-care givers, but this association was not observed for men. Concerning the greater relative opportunity cost of providing informal care for lower income individuals, women who reported difficulty managing on their available income were less likely to decrease paid work (Berecki-Gisolf, Lucke et al. 2008).

The evidence suggests that informal care giving is associated with reduced labour force participation, and there is a dose-response relationship observed. As well, this association may be more pronounced for females and low-income households – important implications in the consideration of an equitable distribution of care received.

Determinants of the Receipt of Care

Factors that affect the probability of receiving home care or informal care that might also be correlated with the income variable should be included in the analysis to limit omitted variable bias, and to control for other factors that might result in a biased estimate. Similarly, it is worth investigating illegitimate determinants in the receipt of care. The literature provided below outlines evidence supporting the inclusion of these socioeconomic and demographic variables in the model, and supports the interpretation of the results in the discussion section.

Living Arrangement

Access to informal care will largely be driven by social networks, and predominantly from those living within the household. Thus, individuals whose spouse is still living will have a greater likelihood of accessing informal care. However, someone not residing within the household may also provide informal care. Living arrangements are also taken in to consideration for the assessment for home care need. Individuals without a child, and those living without a co-residing resident were more likely to access formal home care services in France, Denmark, Germany, and Italy, and elders living with a child were less likely to use formal services compared to elders who didn't have parents living with them (Albertini and Pavolini 2017). In France, having a partner has a positive effect on the probability of receiving informal care and a negative effect on formal care hours (Barnay and Juin 2016). After adjusting for need factors in Finland, receiving help from a spouse or living with someone else other than the spouse decreased the odds of receiving formal help (Blomgren, Martikainen et al. 2008). Finally, people who are single or unattached were higher users of formal home care in France and Ireland compared to those who were not single (Gannon and Davin 2010).

Urban-Rural

The distance to health centres generally limit access to health services, which provides or coordinate such services. Dependent seniors living in rural settings may face a lower probability of accessing home care services than would individuals living in urban, well-served areas. In Canada, those with dementia were more likely than those without dementia to live in rural areas, suggesting a greater need for care associated with dementia in rural settings (Forbes, Morgan et al. 2006). In Ontario, a study found that rural residents were more likely than their urban counterparts to receive home care, but were more reliant on informal care (Kitchen, Williams et al. 2011). However, other research has shown that short-term service intensity for home care decreased with increasing rurality (Laporte, Coyte et al. 2002).

Income

As the principal variable under consideration, income has often been studied as a determinant in the receipt of both home care and informal care. As outlined earlier, the

values of horizontal equity implicitly preserved in the CHA suggest a system where income should not be a determinant in the receipt of care. The evidence below outlines some of the main research concerning income as a determinant in the probability to receive both home care and informal care

Considering home care, a scoping review found that there was general agreement that utilization of home health services favored persons with lower SES (Goodridge, Hawranik et al. 2012). In British Columbia, income quintiles one through three were more likely to receive home care in the last six months before death, which is consistent with the income tested co-payment; however, lower income quintiles received fewer hours of care compared to higher income quintiles –suggesting inequity that favors the rich (Brackley and Penning 2009). People in the lowest income tertile were nearly twice as likely to receive home care than those in the highest income tertile (Kitchen, Williams et al. 2011). Furthermore, SES had a larger effect on the probability of long-term home care than it did on the probability of short-term care in Ontario in 1998 (Laporte, Coyte et al. 2002). In Saskatchewan, measuring SES by material deprivation, it was found that the second income quintile was significantly more likely than the richest quintile to receive home care services during the last year of life (Goodridge, Buckley et al. 2011). In Ontario, both the propensity and intensity of home care receipt increased with lower SES (Laporte, Croxford et al. 2007). Using a nationally representative data set for Canada, authors controlled for need through a combination of self-reported health status, and self-reported claims of need for care and found that higher income individuals were less likely to receive home care conditional on needing it (Stabile, Laporte et al. 2006). There is strong evidence to support the notion that lower income households in Canada are more likely to receive home care. This paper extends on the Canadian literature by controlling for need through age, sex, and self-reported functional impairment (based on seven questions regarding ADL and seven questions based on IADL) to determine if income is a predictor of receipt for home care and informal care, or income-related horizontal inequity. Further, this research quantifies the degree of inequity that exists, which is then decomposed by its contributing factors - the decomposition takes into account both the coefficient on each contributing factor, as well as the sensitivity of the respective inequality to this coefficient.

In the US, considering home health care referral after hospital discharge, individuals of lower income were more likely to receive a home health care referral than the highest quintile (15% reduction in probability for high income people) (Jones, Wald et al. 2017), perhaps due to the lower co-payments required by Medicare managed care patients. But, other research based on US data from 1994 demonstrated that this was true only up to a household income of US \$49,500 – after which increases in income actually increases the probability of using home care (White-Means and Rubin 2004). Other results in the US

demonstrated that as retirement income increases, elderly individuals increase their use of formal home care and become less likely to rely on informal care provided to them by their children (Tsai 2015).

In Ireland and France research demonstrated that lower SES is associated with unmet need for care, as well as informal care, but not home care (Gannon, Davin 2010). In Italy and Germany, who had weaker coverage of home care, a positive association was found between income and the probability of accessing home care services, but this was less so in Denmark and France who have better coverage of those services (Albertini and Pavolini 2017). In the Netherlands, after controlling for other covariates, increasing income is associated with a reduced probability of accessing home care, which is in line with the income-tested copayment (Plaisier, Verbeek-Oudijk et al. 2017). When comparing the Netherlands' more generous program to that of Germany that relies on higher co-payments for formal home care, individuals of higher SES used more informal care in the Netherlands but home care was not determined by income, and high income respondents were more likely to use formal home care in Germany and less likely to use informal care services than are high income respondents in the Netherlands (Bakx, Meijer et al. 2015). In Spain, where home care is provided with no co-payments, lower levels of SES were associated with greater levels of home care use (Abajo, Rodriguez-Sanz et al. 2016); however, the opposite was true for private home care services (Garcia-Gomez, Hernandez-Quevedo et al. 2015). Finally, in an analysis of equity that similarly relied on concentration indices and curves across European countries, researchers found that, after controlling for need, home care was significantly more concentrated among the poor in only Denmark and Czech Republic (Rodrigues, Ilinca et al. 2014).

Considering informal care, people in Canada with lower incomes were also more likely to use informal services: compared to the highest income quartile, individuals in the lowest and second lowest quartile had 68% and 83% increased odds of receiving informal care compared to the highest income quartile (Kitchen, Williams et al. 2011). In Spain it was found that lower levels of SES, based on education, employment status, and social class, were associated with greater levels of intensity, frequency, and duration of informal care, as well as reduced access to private home care services, but received more public services than individuals of higher levels of SES (Abajo, Rodriguez-Sanz et al. 2016). In France, where home care co-payments are income-tested, the probability of receiving informal care increased with income, but income did not affect the intensity of care provided (Barnay and Juin 2016). Barnay and Juin attributed this finding to the motivation of the caregiver to protect the expected inheritance that he or she might receive that would otherwise be diminished by home care payments. The association between lower SES and informal care was also found by other research in

France (Paraponaris, Davin et al. 2012). Finally, research based on European data found that after controlling for need, informal care was more concentrated in the poor in Austria, Germany, Sweden, France, Denmark, Greece, and Belgium – concluding that horizontal inequity existed for both home care and informal care (Rodrigues, Ilinca et al. 2014).

Education

To control for the potential increased capacity of individuals to navigate the healthcare system, or as a separate dimension of SES, education is an important determinant to control for in the model. Stabile, Laporte et al. (2006) found that after controlling for need, individuals with more education were more likely to use home care and suggested this may be due to a greater awareness of the services available. In the Netherlands, lower education was associated with greater odds of receipt of home care even after controlling for household income (Plaisier, Verbeek-Oudijk et al. 2017). However, it was found that education was not a significant determinant in the probability to access home care in France, Denmark, Germany, and Italy (Barnay and Juin 2016).

Gender

In Canada, among older females, those with dementia were more likely to have higher education – this association suggests a different level of need that may be required by females, and thus should be controlled for in the model (Forbes, Morgan et al. 2006). In the US, women received fewer hours of informal care per week than men (15.7 hours vs. 21.2 hours) and children were the dominant caregivers for disabled women while wives were the dominant caregivers of disabled men (Katz, Kabeto et al. 2000). In Spain, women were found to provide more hours of informal care resulting in a greater opportunity cost taken on by women because women are more likely to reduce working hours than are men (Abajo, Rodriguez-Sanz et al. 2016). Not only is it important to control for gender in the model, but also there could be differences in income-related inequities across genders.

Immigrant Status

Cultural differences concerning the care for older persons will also affect the probability of receipt of care. Whereas western neoliberalism has tended to the ontological values of individualism, eastern norms have developed toward a more communal experience for caregiving. Research based on Canadian data found that immigrants were significantly less likely (OR=0.54) to access homemaking/personal support, but not home health care when compared to Canadian born residents (Mery, Wodchis et al. 2016). In the Netherlands, people of Western origin were more likely to use home care than were the Dutch, after controlling for other covariates (Plaisier, Verbeek-Oudijk et al. 2017).

When analysing health equity, necessary value judgements are unavoidable decisions that must be made for the analysis. Spouses, family members and friends may feel a moral obligation to assist relatives who require care with old age, often to prevent institutionalization as well as protect finances, and potential bequests. However, from the caregiver perspective, this might not be a beneficial arrangement because of the health and financial costs associated with providing necessary care. Because of the government cost-sharing policies for home-care services that may reduce access to home care services for those who are of lower income, and because of the substitutability of home care for informal care and the subsequent caregiver burden that may result, it is important to investigate to what extent horizontal inequities may exist for home care and informal care.

Objective and Research Question

The objective of this research is to understand if income is related to the probability of receiving home care and informal care after controlling for need. It will also be investigated if and in what measure this relationship between income and receipt of formal and informal care varies across geographical regions.

The research will seek to answer the following questions:

1. Is household income related to the probability of receiving informal care after controlling for need?
2. Is household income related to the probability of receiving home care after controlling for need?
3. What is the magnitude of horizontal inequity for the receipt of home care?
4. What is the magnitude of horizontal inequity for the receipt of informal care?

This research extends on previous literature, notably that of Mery, et al. (2016), Stabile, Laporte, et al (2006) and Kitchen, et al. (2011) - who quantified the association between income and the probability to receive home care and informal care after controlling for relevant covariates - to determine the degree of income-related inequity in the receipt of both types of care by constructing a concentration index using need-standardized values as well as decomposing the index into its contributing factors.

Methods:

Data

To conduct this research, a secondary analysis of the Canadian Community Health Survey – Healthy Aging, 2008/2009 (CCHS-HA) was conducted. The CCHS-HA is a cross sectional survey administered via telephone and a computer-assisted personal

interviewing method by Statistics Canada, designed to capture factors, influences and processes that contribute to healthy aging by addressing health, social and economic determinants. Respondents were 45 years of age or older, and after receipt of an invitation to participate and a brochure outlining the details, the response rate was 74.4%, representing 30,865 individuals. The data collection period started in 2008 and ended in 2009.

Where appropriate, sampling weights were applied to the analysis and indicated throughout the results. Sample weights were provided in the master file and developed by Statistics Canada to provide a representative sample of the general Canadian population 45 years of age and older. A sampling weight was assigned to each respondent as a probability weight and corresponds to the number of persons in the adult Canadian population that the respondent represents. In several instances, the sampling weight was multiplied by 10^k to obtain integer values that could be used as frequency weights for the construction of concentration index, where k represents the maximum number of integers after the decimal in the probability weights (O'Donnell, van Doorslaer et al., 2007).

The Statistics Canada Research Data Centre (RDC) at McMaster University facilitated access to the master data file of the CCHS-HA after proposal approval by Social Sciences Research Council. Stata 14.0 was used for all statistical analyses. Any missing, not reported, or refusal to respond was recoded as missing values in the models. For logistic regression, Stata recognizes missing values and does not include the respective observation in the analysis. However, for the generation of the rank variable that was used for the concentration curves, concentration indices and decomposition, Stata treats missing values as positive infinity and thus any missing values for the household income to LICO ratio variable were dropped entirely from the analysis for this portion. A total of 5,226 observations were dropped, leaving 25,639 observations for the construction of concentration indices and curves, and the decomposition.

Variables

The variables included in the analysis have been guided by the theory and literature concerning the determinants of the probability to receive care outlined in the previous section. To accurately quantify the magnitude of the parameters related to the probability in receipt of home care and informal care, control variables were included in the logistic model to limit omitted variable bias. If there were variables omitted from the model that will affect the probability to receive care, which were also related to the household income level, the respective variance would be constrained to the error term and would result in a bias of the estimates for the logistic regression, and, as a result, of the estimated concentration index. Most important in the determination of income-

related horizontal inequity is the standardization for need, which will be done using age, sex, and functional impairment, discussed below.

The primary outcome measures will be the binary response (yes/no) to whether or not the CCHS-HA respondent had received any home care (outcome variable number 1) or informal care (outcome variable number 2) in the past 12 months. These variables are derived by Statistics Canada as a flag for any receipt of care based on the following questions for informal care (home care):

“During the past 12 months, did you receive short-term or long-term (professional) assistance at home, because of a health condition or limitation that affects your daily life, for any of the following activities?

- Personal care such as assistance with eating, dressing, bathing, or toileting
- Medical care such as help taking medicine or help with nursing care
- Managing care such as making appointments
- Help with activities such as housework, home maintenance or outdoor work
- Transportation, including trips to the doctor or for shopping
- Meal preparation or delivery

The binary outcome variable used for the logistic regression does not distinguish between nursing care, or home management care. The question regarding home care also does not distinguish who paid for the care – the care provided may have been from publicly funded or subsidized sources, or it may have been paid for privately.

The analysis will include two types of independent variables to explain the probability to receive home care or informal care: “need” variables (legitimate sources of inequality) and “non-need” variables (illegitimate sources of inequality). To standardize for need, age, sex, and functional limitation classification will be included in the model. “Non-need” control variables will include demographic and socioeconomic variables including education, income, immigrant status, living arrangement, province of residence, and whether or not the individual resides in a Canadian Metropolitan Area (CMA). A description of these variables is provided below. All independent variable response categories are included in the model as dummy variables unless otherwise indicated. The reference group for each dummy variable is the lowest level, unless otherwise indicated (e.g. reference group for education is “less than secondary school”).

As the primary variable to control for need, an individual's functional impairment classification has been included in the model as a categorical variable derived by Statistics Canada based on seven questions concerning the help required for activities of daily living (ADL), as well as seven questions concerning the help required for

instrumental activities of daily living (IADL), all of which are self-reported. IADLs cover tasks that require a greater level of physical coordination than that of ADLs. Each of the 14 questions on activities of daily living asks the respondent to indicate whether or not he or she needs help completing the specified activity. For example one of the ADL questions asks whether the respondent is able to bath or shower without help (yes/no), and one of the IADL questions asks the respondent if he or she can get to places without help (yes/no). This derived variable creates a classification of functional assessment representing an indicator for self-care capacity based on a five-point scale: no impairment, mild impairment, moderate impairment, severe impairment, and total impairment. As another measure to control for need, a respondent's age was collected as a continuous variable, and then categorized into the following age ranges: 45-54, 55-64, 65-74, 75-84, 85+ years old. As the final variable used to control for need, gender was collected as a binary variable, and was included in the model as 1 if the respondent is a male, and 0 if the respondent is a female.

Education, an illegitimate source of inequality in the receipt of care, was included as a control variable and is reported as the respondents highest level of education attained and separated into four response categories ranging from "less than post secondary" to "graduated from post-secondary". It has been postulated that more years of education may facilitate a better ability of an individual to navigate the complexities of the health care system, particularly home care. There is also a possibility that a higher education may be reflective of a higher SES and capture a dimension of SES that the income variable is not.

Immigrant status will be included in the model to help control for cultural differences in the care for elders, particular for informal care, but may also provide insight into the potential reductions in use of formal home care services because of language barriers. In the CCH-HA, immigrant status is a derived binary variable and indicates whether or not an individual was born in Canada.

Based on an individual's postal code provided in the survey, an individual is categorized into their respective Canadian Metropolitan Area (CMA) or not within a CMA. The categorization of respondent's CMA was determined by Statistics Canada and is based on 2006 Census information. For the purpose of the analysis, individuals living within a CMA are assigned a value of 1, while those living outside a CMA are assigned a value of 0. The rurality of a respondent may be reflective of barriers to access home care because of the geographical distance to services, or it may also be reflective of different cultural practices exhibited by people who live rurally that are less reliant on public services and live more independently.

Province of residence will be included in the logistic regression model to control for

potential differences in formal home care funding generosity that may reduce the probability to access care. Other fixed unobservable differences that will be controlled for by including province as dummy variables might include the provincial basis for the determination of the home care co-payment, inclusion of household characteristics for determination of home care benefits, and provincial tax credits for informal care givers. Because of sample size, provinces will be categorized into the following regions for the concentration curve and indices: West (Alberta, British Columbia), Prairies (Saskatchewan, Manitoba), Ontario, Quebec, Atlantic (New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland).

Beyond marital status, health care providers may make an assessment for eligibility of home care services based on the number and relationship of individuals living in the household. To control for this source of potential inequity in the receipt of home care, living arrangement was included in the model as one of the following: unattached (single) and living alone, unattached (single) and living with others, living with spouse/partner only, parent living with spouse and children, single parent living with children, and child (adult) living with parents and/or other relatives.

The primary independent variable for this analysis will be an individual's household income. For the logistic regression, the variable that will be used is the national distribution of household income, derived as one of ten deciles. The ten deciles are adjusted household income to the low income cut off (LICO) cutoff. Household income deciles were chosen as the income variable for the logistic regression because they provide the opportunity for dummy variables to be used and for odds ratios to be computed to interpret the relationship between income and receipt of care along different ranges of the income distribution. Similarly, through the Statistics Canada assignment of the LICO, this derived variable also accounts for household size – an adjustment often made in the literature through the equivalency scale by dividing household income by the square root of the household size – as well as the size of the community the individual resides in which provides a relative measure of income. Using this derived variable will also allow for comparisons to other literature based on CCHS data that relied on this measure.

To derive the household income deciles, a respondent's annual household income was first collected by asking the respondent to report their best estimate of the total household income in the previous tax year as a continuous variable. If the respondent refused or did not answer this question, a follow-up question requested the respondent to indicate if the annual household income was above or below \$50,000, which was then followed-up by requesting the respondent indicate if their annual household income fell within specified \$5,000 intervals (e.g. lower than \$10,000; \$10,000 - \$15,000, \$15,000-

25,000, etc.). Once it was determined which \$5,000 income interval the respondent fell in to, they were assigned a random value in that interval.

Next, the ratio of household income to the LICO was derived by assigning a LICO to each respondent. The LICO was assigned by Statistic Canada based on the 2008 tax year and took into account the household size, as well as the community population the respondent resided in. The household income was then divided by this LICO value. The natural logarithm of this continuous measure of household income to the LICO ratio was used to calculate the concentration index and concentration curve.

The household income to the LICO ratio was divided into income deciles – the first 10% of the sample was assigned the 1st income decile, the next 10% of the sample was assigned the 2nd income decile, all the way up to 90-100% of the sample to arrive at the 10th income decile to produce 10 separate income categories. This categorical variable was used in the logistic regression.

Both the income deciles and ratio of the household income to the LICO value were used because of the robust methodological effort to capture an accurate reflection of an individual's economic standing within the socioeconomic gradient by the combination of census, tax, and survey information, along with the comprehensive host of questions employed to derive a value.

Statistical Analysis

Descriptive Statistics

Descriptive statistics were compiled as the proportion of individuals that fell into each of the independent variables response categories and across informal care, home care, no care, and total sample. All independent variable responses are mutually exclusive, however the receipt of each type of care is not mutually exclusive – individuals who receive home care may also receive informal care.

Logistic Regression and Marginal Analysis

Estimating the relationship between income and the probability to receive care was done by logistic regression. The logistic regression model uses the logistic cumulative distribution function along with the maximum likelihood estimator to estimate the different parameters on the probability to receive care. Specifically, the logistic regression model estimates predicted values for each observation as a probability to receive care while holding other variables constant. As a binary outcome variable, logistic regression is an appropriate method for analysis of this non-linear relationship. When doing robustness checks of the model specification by introducing different income variables, the pseudo-r-squared, the Bayesian Information Criterion, and the Wald chi-squared test are reported. The significance level is set at 0.05, but is indicated

if the significance level surpassed 0.01 or 0.001.

First, a logistic regression model was produced by entering the independent variables individually as dummy variables. Next, the household income to LICO ratio distribution (deciles) was replaced with the ratio itself, and then with the natural log of the ratio. The purpose of this step was to understand the sensitivity of the model in regards to income variables so that a continuous measure of income, rather than the categorical income decile measure, could be used in the construction of the concentration curves and indices. The natural logarithm of household income to LICO ratio was constructed in an attempt to normalize the frequency distribution and approach the required regression assumptions. A single model was then selected and the odds ratios were reported for analysis and interpretation.

To assist with the interpretation of the income variable in the logistic regression, marginal analysis of the predicted values for home care and informal care was conducted over the ten household income distribution deciles. Marginal analysis determines the probability of receipt of care for a given explanatory variable while holding constant the other variables in the model at their respective means. Whereas odds ratios provide data on the relative increased probability of use, predictive margins provide estimates on the absolute increased probability of use. Odds ratios indicate the effect of a unit increase of the independent variable on the odds of an event $[(\text{probability of receipt of care}) / (1 - \text{probability of receipt of care})]$, but margins report the effect of a unit increase in the independent variable on the probability of receipt of care. The predictive margins and their confidence intervals were then prepared in a graphical format.

Need Standardization and Horizontal Inequity

Income-related inequity in the probability to receive home care or informal care results from the combination of the income gradient (estimated by the logistic model detailed in 2.3.2) and the concentration of income. Controlling for other variables (need or non-need) it can be decomposed into a series of products of income-related concentration and gradient of the probability to receive care. For instance, the contribution of education to the inequity of probability to receive home care will be the product of the income concentration of education (the extent to which the more educated are richer) and the linear relationship between education and the probability to receive home care. While inequality of informal care and home care can be measured by quantifying the relationship between income and the probability to use each type of care, inequity requires that the relationship with income be standardized by “need”. Need-standardization is conducted because the need standardizing variables are correlated with income, and because they are also correlated with the probability to receive care.

After standardization of “need”, if income is still a significant predictor for the use of each type of care, then this demonstrates horizontal inequities – unequal treatment for the same level of need.

For the concentration curve and concentration index (discussed below), need-standardization was conducted using the indirect method as recommended by O'Donnell, van Doorslaer et al. (2007). First, “non-need” variables were held at their means, and predicted values were computed for both home care and informal care by regressing the receipt of home care and informal care on “need” variable using a logit model. “Need” variables can be considered confounding variables in predicting the relationship between income and the probability to receive care, whereas “non-need” variables are non-confounding variables that we simply want to control for and not standardize for. Standardized predicted values are then calculated by subtracting the “need” predicted values from the observed values (0,1), and adding the mean of the predicted values. The result is a distribution of receipt of care that would be expected to be observed irrespective of differences in the distribution of the “need” variables across income and other “non-need” variables. The need-standardized predicted values for the probability to receive both types of care were used in the construction of the concentration indices and concentration curves, allowing inequity, rather than mere inequality, to be quantified. “Need” variables, a legitimate source of inequality, included functional class, age, and sex, while “non-need” variables, illegitimate sources of inequality, included natural log of the household income to LICO ratio, education, living arrangement, immigrant status, province, and rurality.

Concentration Curve

Subsequently, a concentration index and curves were constructed for each region to understand if there are income-related horizontal inequities of home care and informal care and whether or not this observation varies across regions. A concentration curve provides the cumulative amount of care received by percentiles in ascending order of the distribution of SES. It is similar to a Lorenz curve in uni-dimensional descriptions of inequality. The concentration curve displays the share of care received by cumulative proportions of individuals in the population ranked from poorest to richest. The concentration curve can be used to assess inequalities in health as well as health service utilization. A line of perfect equality is represented by a straight forty-five degree line indicating that the health variable does is not unfairly distributed across SES. If the concentration curve lies below the line of perfect inequality, than the health outcome under consideration is more concentrated in the rich, and if the curve lies above the line of perfect equality, then the health variable is concentrated among the poor.

Concentration Index

A concentration index (CI) is the bi-dimensional equivalent of the Gini index of inequality: individuals are ranked in ascending order of income and the area between the concentration curve and the line of perfect equality is measured. Concentration indices have long been used to measure socioeconomic health inequalities (Wagstaff, Paci et al. 1991). If the concentration index is calculated for the distribution of care received standardized by need - based on age, sex, and functional class - across measures of SES then horizontal inequity rather than mere inequality in the receipt of care is measured. The calculations were run for formal and informal care and computed for each region. I decompose the concentration index to understand the role of Region in the income effect.

Because the CI is designed for a continuous outcome variable, the bounds of a CI will not be -1 and 1 when a binary variable is used, but will depend on the mean of the variable. Wagstaff (2005) demonstrated that for large samples that investigate a binary variable, the $1/n$ component approaches zero and the lower bound is $\mu - 1$ and the upper bound will be $1 - \mu$ resulting in the range of the CI to decrease as the mean increases, where μ is the mean of the dependent variable. As such, Wagstaff proposed a correction for this limitation by normalizing the CI by dividing it by the reciprocal of its mean.

The concentration index can be written as:

$$\text{Equation (1)} \quad C = \frac{2}{n\mu} \sum_{i=1}^n y_i R_i - 1 - \frac{1}{n}$$

Where R_i is the weighted fractional rank, and y_i is the observed values (0,1) for the unstandardized CI, and the predicted values for the need-standardized CI as discussed above. Equivalently, the CI can be computed as the covariance between the receipt of care and the fractional rank:

$$\text{Equation (2)} \quad C = \frac{2}{\mu} \text{cov}(y_i, R_i)$$

It can also be written using the convenient regression method:

$$\text{Equation (3)} \quad 2\sigma_r^2 \left(\frac{y_i}{\mu} \right) = \alpha + \beta R_i + \varepsilon_i$$

where σ_r^2 is the variance of the fractional rank and the β is a scalar value representing the CI. The weighted fractional rank is defined as follows:

$$\text{Equation (4)} \quad R_i = \sum_{j=0}^{i-1} w_j + \frac{w_i}{2}$$

where w_i is the sample weight, R_i is the rank.

The CI will be computed using the need-standardized predicted values to obtain an estimate of income-related horizontal inequity. Standard errors will be computed for each concentration index. The standard error for each concentration index is computed using the “delta method” by regressing the outcome variable on the rank variable, and then computing standard errors using the non-linear combination of parameter estimates. Heteroscedasticity robust standard errors were computed. The null hypothesis being tested for each concentration index is that the concentration index is zero, and the alternative hypothesis is that it is different than zero. Again, the significance level is set at 0.05.

Decomposition

The decomposition of the unstandardized concentration index quantifies the contributions of individual factors to income-related inequalities in the receipt of home care and informal care. Each “need” and “non-need” variable contribution is calculated as the product of each variable’s elasticity, or sensitivity, to receipt of care and the degree of income-related inequality for that variable, where the elasticity is computed as follows:

$$\text{Equation (7)} \quad \eta_j = \beta_j \frac{\bar{x}_j}{\mu}$$

The decomposition of receipt of both types of care relies a linear relationship between the determinants and the receipt of care. In the case of a non-linear model, a linear approximation to the non-linear model is required. The method proposed by van Doorslaer, Koolman, and Jones (2004) involves estimating the partial effects at sample means for each of the included determinants in the models. Although the linear approximation results in a linearly additive model that allows for decomposition, it also results in a model that is not unique, and produces a horizontal inequity index that will be different than that computed using the indirect need-standardized predicted values for the concentration index discussed above (O’Donnell, van Doorslaer et al. (2007).

$$\text{Equation (6)} \quad C = \sum_j (\beta_j^m \bar{x}_j / \mu) C_j + \sum_k (\gamma_k^m \bar{z}_k / \mu) C_k + G C_\varepsilon / \mu$$

In the case of the non-linear model, β_j^m and γ_k^m represent the partial effects of the “need” and “non-need” variables evaluated at their means, respectively. The horizontal inequity index is computed after the decomposition by subtracting the sum of the “need” contributions, determined by partial effects, from the unstandardized CI computed using the observed values from equation 3.

Results

Descriptive Statistics

Descriptive statistics as proportions for each independent variable are presented in Table 1 with sampling weights applied. Results are presented for those who received no care, received informal care, received home care, and for the total sample. Also included in the table is home care and informal care, which provides the proportions for those who received each type of care, as well as those who received both informal care and home care.

Of the entire sample, 11.7% received informal care and 5.2% received home care services within the past 12 months. Of all the individuals who received home care, 61.2% also received informal care. Of all the individuals who received informal care, 27.3% received home care.

While 3.2% of individuals who receive informal care had a functional classification of total impairment, 5.4% of individuals who received home care were classified as having total impairment, which contrast the 0.1% of those who received no-care for total impairment. For those who received informal care, 3.8% were classified as severe impairment, 12.9% as moderate impairment, 29.3% as mild impairment, and 50.9% as no impairment. For those who received home care, 5.6% were classified as having severe impairment, 16.0% as moderate impairment, 36.2% as mild impairment, and 36.8% as no impairment. The results suggest that those who received home care have more severe functional impairments, but also that a noteworthy number of individuals who received both home care and informal care were classified as having no impairment.

For those who received informal care, 24% were between the ages of 45-54, 22.5% were between 55-64, 19.6% were between the ages of 65-74, 23.1% were between 75-84, and 10.9% were older than 85. For recipients of home care, 14.5% were between the ages of 45-54, 17.0% were between the ages of 55-64, 20.9% between the ages of 65-74, 28.7% between 75-84, and 18.9% were older than 85. The results suggest that home care recipients tend to be of older age.

For those who received informal care, 66.6% were female and 33.4% male, while home care recipients were 65.2% female and 34.8% male.

For those who received informal care, 18.6% were within the first household income distribution decile, 16.5% in the second decile, 12.5% in the third decile, 10% in the fourth decile, 9.2% in the fifth decile, 10.3% in the sixth decile, 6.5% in the seventh

decile, 6.7% in the eighth decile, 4.7% in the ninth decile, and 5.0% in the tenth decile. For those who received home care, 22.7% were within the first household income distribution decile, 16.7% in the second decile, 12.2% in the third decile, 11.6% in the fourth decile, 8.4% in the fifth decile, 8.2% in the sixth decile, 4.8% in the seventh decile, 6.4% in the eighth decile, 3.7% in the ninth decile, and 5.2% in the tenth decile.

Among recipients of informal care, 42.1% lived in a rural setting, and 40.7% of home care recipients lived in a rural setting, which contrasts those who did not receive care (34.4%).

Among informal care recipients, 24.3% were of immigrant status, while 21.2% of home care recipients were of immigrant status.

Among informal care recipients, 8.7% lived in one of the Atlantic provinces, 22.2% lived in Quebec, 39.2% lived in Ontario, 7.2% lived in one of the Prairie provinces, and 24.3% lived in one of the Western provinces. Among home care recipients 8.2% lived in one of the Atlantic provinces, 24.4% lived in Quebec, 41.6% lived in Ontario, 6.9% lived in one of the Prairie provinces, and 18.9% lived in one of the Western provinces.

Among informal care recipients, 31.7% were unattached and living alone, 3.8% were unattached and living with others, 41.7% were living with their spouse or partner, 14.2% were living with their spouse and child, 6.2% were single and living with their child, and 2.4% were (adult) children living with their parents or other relatives. Among home care recipients, 42.7% were unattached and living alone, 4.6% were unattached and living with others, 39% were living with the spouse or partner, 7.4% were living with their spouse and child, 5.3% were single and living with their child, and 1% were (adult) children living with their parents.

Table. 1 Descriptive Statistics - Proportions of individuals by source of care				
Note: Weighted results				
	No care	Informal care	Homecare	Total
Informal Care	Col %	Col %	Col %	Col %
No	-	-	38.8	88.3
Yes	-	-	61.2	11.7
Homecare				
No	-	72.7	-	94.8
Yes	-	27.3	-	5.2
Functional Class				
No impairment	95.1	50.9	36.8	89.1
Mild impairment	4.3	29.3	36.2	7.9
Moderate impairment	0.4	12.9	16.0	2.0
Severe impairment	0.1	3.8	5.6	0.5
Total impairment	0.1	3.2	5.4	0.5
Age Category				
45-54	44.7	24.0	14.5	41.8
55-64	29.6	22.5	17.0	28.5
65-74	16.3	19.6	20.9	16.8
75-84	7.9	23.1	28.7	10.1
85+	1.4	10.9	18.9	2.8
Sex				
Female	49.9	66.6	65.2	51.9
Male	50.1	33.4	34.8	48.1
Household Income Distribution				
Decile 1	8.6	18.6	22.7	10.1
Decile 2	9.0	16.5	16.7	10.0
Decile 3	9.6	12.5	12.2	10.0
Decile 4	10.1	10.0	11.6	10.1
Decile 5	10.1	9.2	8.4	10.0
Decile 6	10.2	10.3	8.2	10.1
Decile 7	10.5	6.5	4.8	9.9
Decile 8	10.5	6.7	6.4	10.0
Decile 9	10.9	4.7	3.7	10.1
Decile 10	10.6	5.0	5.2	9.9
Urban-Rural				
Non-CMA	34.4	42.1	40.7	35.4
CMA	65.6	57.9	59.3	64.6
Immigrant Status				
Yes	24.9	24.3	21.2	24.8
No	75.1	75.7	78.8	75.2
Province				
Nfld. and Lab.	1.7	1.6	1.5	1.7
PEI	0.5	0.4	0.4	0.4
Nova Scotia	3.0	3.9	3.2	3.1
New Brunswick	2.4	2.8	3.1	2.4
Quebec	24.9	22.2	24.4	24.6
Ontario	38.1	39.2	41.6	38.3
Manitoba	3.3	4.0	4.2	3.4
Saskatchewan	2.9	3.2	2.7	2.9
Alberta	9.4	8.5	6.5	9.3
British Columbia	13.9	14.1	12.4	13.8
Living Arrangement				

Unattached alone	18.1	31.7	42.7	20.2
Unattached other	2.1	3.8	4.6	2.3
With spouse/partner	46.4	41.7	39.0	45.7
Parent spouse/child	28.2	14.2	7.4	26.1
Parent with child	4.3	6.2	5.3	4.5
Child with parent	1.0	2.4	1.0	1.2

Logistic Regression and Marginal Analysis

Logistic Regression and Marginal Analysis – Informal Care

Table 2 presents the results from the logistic regression model for receipt of informal care using the household income distribution deciles variable with coefficients presented as odds ratios along with standard errors, p-values, t-values, and 95% confidence intervals. The coefficients were jointly significant as indicated by the Wald chi-squared test. The model explains 22.4% of the variance in the probability to receive informal care as indicated by the pseudo r-squared. Generally, all “need” variables were significant. Using the “no impairment group” as the reference, as the functional limitation class increased, the odds of receiving informal care also increased. Compared to individuals with no impairment, individuals in the mild impairment category had an odds ratio of 7.6 of receiving informal care, followed by moderate impairment (OR=30.2), severe impairment (OR=35.6), and individuals with total impairment had the greatest odds of receiving informal care with an odds ratio of 52.0. Considering the age category, and using 45-54 as the reference group, as age increases, the odds of receiving informal care also increased. Individuals between the ages 55-64 had an OR of 1.3, those between the ages of 65-74 had an OR of 1.4, those between the ages of 75-84 had an OR of 2.2, and those who were 85+ years old had an OR of 1.9 of receiving informal care. After controlling for other covariates, compared to males, females had a 54% increased odds of receiving informal care.

From decile one to decile ten, the trend that emerges is a reduction in the odds of receiving informal care as income increases. Using the first (poorest) decile as the reference group, six of the nine other deciles had significantly decreased odds of receiving informal care. Compared to the first decile, the third, fourth, and fifth deciles had a 22%, 32% and a 26% reduction in the odds of receiving informal care, respectively. In a similar pattern, compared to the first decile, the seventh, ninth, and tenth deciles had a 37%, 48%, and a 43% reduction in the odds of receiving informal care. The second, sixth, and ninth deciles were insignificant.

Compared to those living in a CMA, those not living in a CMA had a 50% increased odds of receiving informal care. There was no significant difference between immigrants and non-immigrants in the odds of receiving informal care. Compared to

individuals living in Ontario, those who were living in Newfoundland and Labrador and Prince Edward Island had 45% and 38% decreased odds of receiving informal care, respectively. There was no significant difference in the odds of receiving informal care across education categories of the respondent. Compared to those living unattached and alone, individuals who were living with a spouse or partner, and individuals who were living with a spouse or partner and children had a 34% and 30% reduced odds of receiving informal care, respectively, while (adult) children who were living with their parents had an OR of 2.9 of receiving informal care.

	Odds ratio	Stand. Error	t-value	p-value	[95% Confidence interval]	
						Pseudo-r-sqd. 0.224
						Wald chi2 1707.619
						BIC 5734165.006
Functional limitation class						
No impairment	1					
Mild impairment	7.640***	0.737	21.074	0	6.323	9.23
Moderate impairment	30.175***	5.041	20.393	0	21.749	41.865
Severe impairment	35.627***	9.488	13.417	0	21.139	60.044
Total Impairment	51.985***	23.022	8.921	0	21.823	123.835
Age Category						
45-54	1					
55-64	1.268*	0.143	2.103	0.035	1.016	1.582
65-74	1.367*	0.166	2.57	0.01	1.077	1.734
75-84	2.152***	0.266	6.211	0	1.69	2.741
85+	1.886***	0.279	4.284	0	1.411	2.521
Sex						
Female	1.541***	0.129	5.186	0	1.309	1.815
Male	1					
Household income distribution						
Decile 1	1					
Decile 2	0.912	0.105	-0.802	0.422	0.728	1.143
Decile 3	0.780*	0.099	-1.962	0.05	0.608	1
Decile 4	0.680**	0.091	-2.897	0.004	0.524	0.883
Decile 5	0.735*	0.107	-2.107	0.035	0.552	0.979
Decile 6	0.915	0.154	-0.53	0.596	0.658	1.272
Decile 7	0.630**	0.109	-2.671	0.008	0.449	0.884
Decile 8	0.719	0.146	-1.626	0.104	0.483	1.07
Decile 9	0.519***	0.099	-3.451	0.001	0.357	0.753
Decile 10	0.573*	0.128	-2.487	0.013	0.369	0.889
Urban-Rural						
Non-CMA	1.503***	0.132	4.647	0	1.265	1.784
CMA	1					
Immigrant Status						
Immigrant	1					
Non-immigrant	1.163	0.107	1.635	0.102	0.97	1.393
Province						
Newfoundland and Labrador	0.549**	0.104	-3.164	0.002	0.378	0.796

Prince Edward Island	0.621**	0.1	-2.96	0.003	0.453	0.851
Nova Scotia	1.029	0.153	0.191	0.849	0.768	1.378
New Brunswick	0.94	0.138	-0.421	0.674	0.705	1.253
Quebec	0.825	0.096	-1.654	0.098	0.657	1.036
Ontario	1	.	.	.	1	1
Manitoba	1.15	0.144	1.117	0.264	0.9	1.471
Saskatchewan	1.081	0.148	0.567	0.571	0.826	1.414
Alberta	1.086	0.148	0.605	0.545	0.831	1.419
British Columbia	0.998	0.116	-0.02	0.984	0.794	1.254
Education						
Less than secondary	1					
Secondary graduate	1.117	0.141	0.88	0.379	0.873	1.43
Some post-secondary	1.216	0.203	1.176	0.24	0.878	1.686
Post-secondary graduate	0.995	0.098	-0.048	0.962	0.821	1.207
Living arrangement						
Unattached-alone	1					
Unattached-others	1.456	0.458	1.197	0.231	0.787	2.696
Spouse/partner	0.755***	0.064	-3.336	0.001	0.64	0.89
Parent-spouse, children	0.697*	0.098	-2.565	0.01	0.528	0.918
Single-child	1.123	0.164	0.792	0.428	0.843	1.495
Child-parent	2.899*	1.26	2.448	0.014	1.236	6.797
Constant	0.055***	0.01	-	0	0.039	0.078
* p<0.05, ** p<0.01, *** p<0.001						

Figure 1 presents the predictive margins for the probability to receive informal care by household income decile with confidence intervals included above and below each point estimate. Generally, as income increases, the probability of receiving informal care tends to decrease, holding other variables at their means. Household incomes deciles one and two share a similar probability of receiving care around 0.20, deciles three through six share a similar probability of receiving informal care slightly above 0.1, while decile seven through ten have a further reduction in probability at around 0.05.

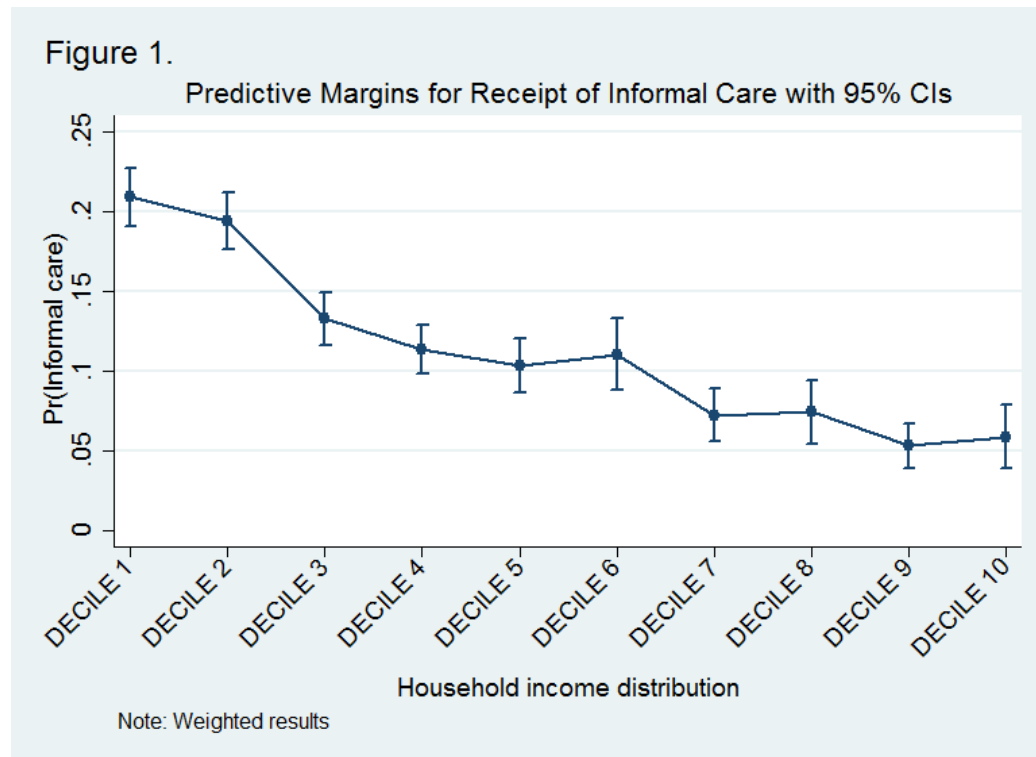


Table A1 in Appendix 1 presents the results from the logit models testing the robustness of the model to substitution of different income variables. Generally, there are no substantial differences across models in magnitude, direction, or significance for all covariates upon substitution of the income variable. When household income to LICO ratio was substituted in for the ten income decile dummies, it was non-significant. However, the log of this ratio was significant and below one – an indication that the household income ratio variable may be skewed and that the log of this ratio provides a more normal frequency distribution for the analysis. The final model used for analysis of the OR, model 1, had a pseudo-r-squared of 22.4%, and the model used for the CI and concentration curve had a pseudo-r-squared of 22.2%.

Logistic Regression and Marginal analysis – Home Care

Table 3 presents the results from the logistic regression model for receipt of home care using the household income distribution deciles variable with coefficients presented as odds ratios along with standard errors, p-values, t-values, and 95% confidence intervals. The Wald Chi-squared significance test indicates that the model parameters are jointly significantly different from zero. The model explains 28.8% of the variance in the probability to receive home care as indicated by the pseudo r-squared. Besides sex, nearly all “need” variables were significant in explaining the probability to receive home care. Compared to those with no functional impairment, those in the mild

impairment category had an OR of receiving home care of 8.4, followed by moderate impairment (OR=22.6), severe impairment (OR=27.4), and total impairment (OR=47.5). As age increased, there was an increased odds of receiving home care. Compared to those in the 45-54 age group, individuals in the 65-74 age group had an odds ratio of 2.2 of receiving home care, followed by the 75-84 age group (OR=3.4), and the 85+ age group (OR=5.4). There was no significant difference between males and females in the odds of receiving home care after controlling for other need and non-need covariates.

Compared to the lowest income decile, the second decile had a 24% decreased odds of receiving home care, and the ninth decile had a 45% decreased odds of receiving home care. No clear trend emerged in the odds of receiving home care across income deciles, and no other income deciles were statistically significant.

Individuals living outside of a CMA had a statistically significant 25% increased odds of receiving home care compared to those living within a CMA. Compared to immigrants, Canadian-born individuals had significantly higher odds of receiving home care services. Non-immigrants were 38% more likely to receive home care than immigrants after controlling for “need” and “non-need” covariates. Compared to Ontario, individuals who lived in Newfoundland and Labrador (OR=0.59), Prince Edward Island (OR=0.52), Quebec (OR=0.77), Alberta (OR=0.71), and British Columbia (OR=0.71) had statistically significant reduced odds of receiving home care. There was no significant difference found for Nova Scotia, New Brunswick, Manitoba, or Saskatchewan. Compared to individuals who had less than a secondary school education, there was no significance difference in the odds of receiving home care across education categories. Finally, compared to individuals who were unattached (single) and living alone, those who lived with a spouse or partner (OR=0.52), those who lived with a spouse or partner and children (OR=0.35), and those who were single and lived with a child (OR=0.63) had a significantly reduced odds of receiving home care. There was no significant difference between individuals who lived unattached alone, unattached and with others, or those who were an adult child living with their parent.

	Odds ratio	Stand. Error	t-value	p-value	[95% Confidence interval]	Pseudo-r-squared	
						0.288	
						Wald chi2	1774.241
						BIC	2976056.301
Functional limitation class							
No impairment	1						
Mild impairment	8.441***	0.866	20.784	0	6.903		10.321
Moderate impairment	22.592***	4.357	16.167	0	15.482		32.969
Severe impairment	27.422***	7.168	12.668	0	16.428		45.771

Total Impairment	47.491***	13.89	13.199	0	26.77	84.251
Age Category						
45-54	1					
55-64	1.416	0.271	1.82	0.069	0.974	2.06
65-74	2.218***	0.443	3.989	0	1.5	3.281
75-84	3.408***	0.661	6.327	0	2.331	4.983
85+	5.353***	1.121	8.013	0	3.551	8.068
Sex						
Female	1.13	0.118	1.171	0.242	0.921	1.387
Male	1					
Household income distribution						
Decile 1	1					
Decile 2	0.759*	0.104	-2.014	0.044	0.58	0.993
Decile 3	0.781	0.115	-1.674	0.094	0.585	1.043
Decile 4	0.914	0.149	-0.553	0.58	0.665	1.257
Decile 5	0.831	0.164	-0.939	0.348	0.565	1.223
Decile 6	0.854	0.151	-0.895	0.371	0.604	1.207
Decile 7	0.61	0.178	-1.695	0.09	0.344	1.08
Decile 8	0.999	0.246	-0.004	0.997	0.616	1.619
Decile 9	0.548*	0.144	-2.282	0.022	0.327	0.919
Decile 10	0.808	0.185	-0.932	0.351	0.517	1.265
Urban-Rural						
Non-CMA	1.248*	0.122	2.263	0.024	1.03	1.513
CMA	1					
Immigrant Status						
Immigrant	1					
Non-immigrant	1.380*	0.191	2.333	0.02	1.053	1.809
Province						
Newfoundland and Labrador	0.588*	0.155	-2.008	0.045	0.351	0.987
Prince Edward Island	0.520**	0.13	-2.608	0.009	0.318	0.85
Nova Scotia	0.753	0.112	-1.904	0.057	0.562	1.008
New Brunswick	0.91	0.168	-0.508	0.611	0.562	1.308
Quebec	0.766*	0.102	-2.01	0.044	0.562	0.993
Ontario	1	.	.	.	0.562	1
Manitoba	1.042	0.154	0.279	0.78	0.562	1.392
Saskatchewan	0.889	0.17	-0.611	0.541	0.562	1.295
Alberta	0.713*	0.116	-2.085	0.037	0.562	0.98
British Columbia	0.709*	0.115	-2.127	0.033	0.562	0.973
Education						
Less than secondary	1					
Secondary graduate	1.171	0.166	1.118	0.264	0.562	1.546
Some post-secondary	1.068	0.199	0.35	0.726	0.562	1.539
Post-secondary graduate	1.174	0.138	1.36	0.174	0.562	1.478
Living arrangement						
Unattached-alone	1					
Unattached-others	0.79	0.215	-0.868	0.385	0.562	1.346
Spouse/partner	0.519***	0.053	-6.455	0	0.562	0.633
Parent-spouse, children	0.350***	0.083	-4.409	0	0.562	0.558
Single-child	0.634*	0.135	-2.132	0.033	0.562	0.964
Child-parent	0.899	0.413	-0.231	0.817	0.562	2.214
Constant	0.020***	0.005	15.941	0	0.562	0.032

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

Figure 2 presents the results for the predictive margins of the probability to receive home care across household income deciles with confidence intervals included. The probability to receive home care is highest for the lowest income decile, and then decreases as income deciles increase. While income deciles one and two share a similar probability to receive care of around 0.1, deciles three through six are approximately around 0.05, while deciles six through ten are further reduced in probability of around 0.025.

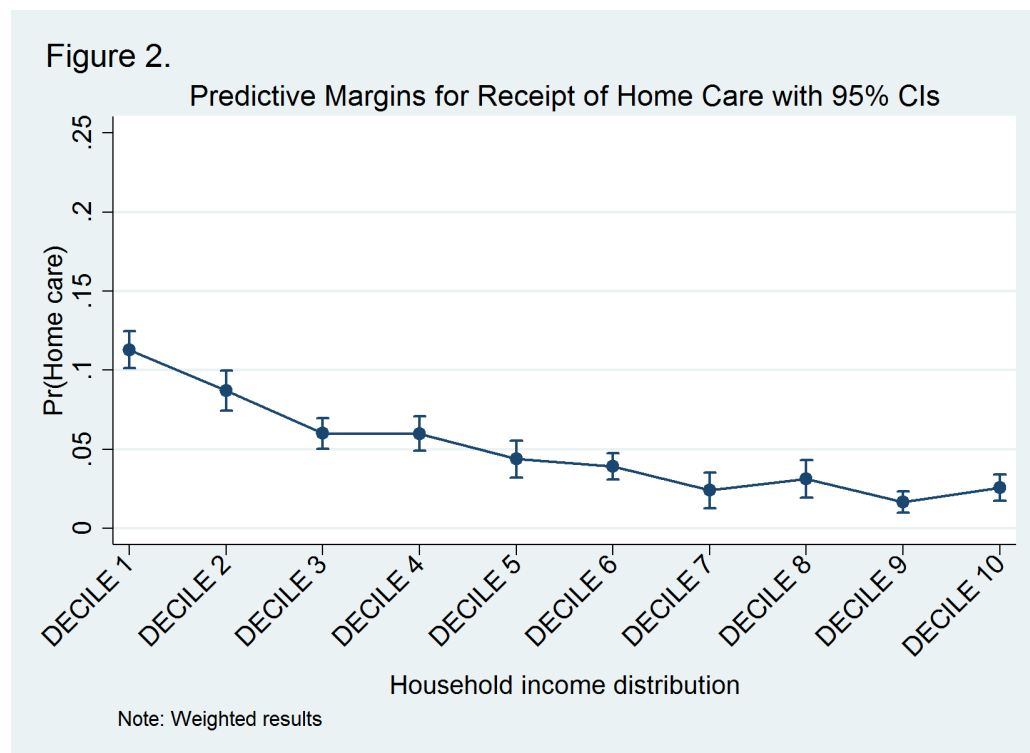


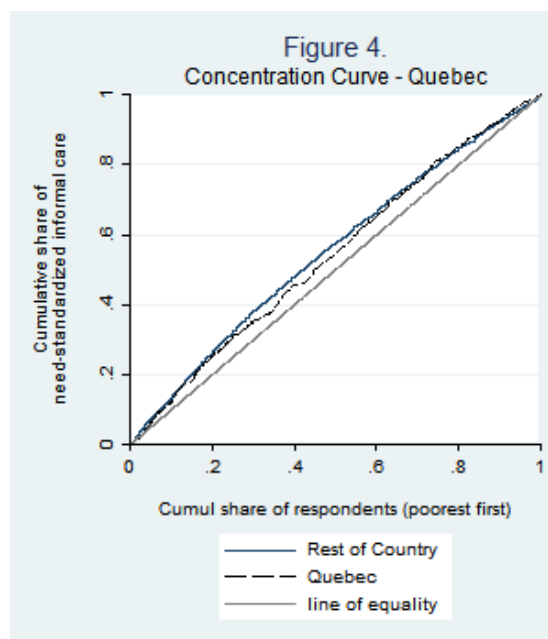
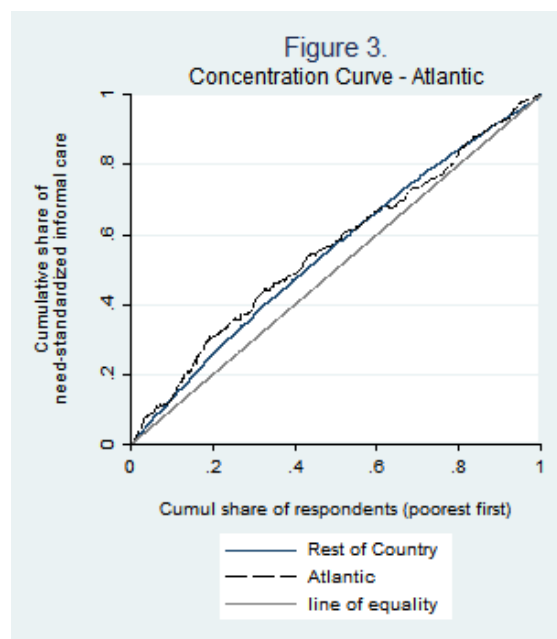
Table A2 in the appendix presents the results for the three different logistic regression models for the probability to receive home care with income variable substitution. The first model includes all explanatory variables entered as dummy variables. Neither the household income to LICO ratio nor the log of this ratio was a significant predictor for the probability to receive home care in the second and third model, respectively. There was no substantial change in direction, magnitude, or significance of parameters upon substitution of the income variable. The pseudo-r-squared was similar across models, ranging from 28.8% to 29.5%. The lowest BIC reported was the model that included the household income deciles, followed by the log of the household income to LICO ratio.

Concentration Index and Curve

Concentration Index and Curve – Informal care

The concentration curve for the need-standardized predicted values for the receipt of informal care by region are presented in figures 3 through 7, along with the need-standardized predicted values for the rest of the country plotted on the same graph, thus representing a measure of inequity rather than inequality. The x-axis represents the cumulative proportion of the log of the household income to LICO ratio, and the y-axis represents the cumulative proportion of need-standardized predicted care received.

All concentration curves demonstrate pro-poor receipt of informal care. In the Atlantic provinces, the curve progresses along a similar pattern as the rest of the country until roughly the 50th percentile where it begins to approach the line of perfect horizontal equity. In Quebec, the curve first goes below the rest of the country, but then returns to the pro-poor inequity curved observed for the rest of the country around the 60th percentile. Both the Ontario and West curve exhibit a similar pro-poor level of inequity as that of the rest of the country, while the Prairies region are slightly more pro-poor compared to the rest of the country along the entire income distribution.



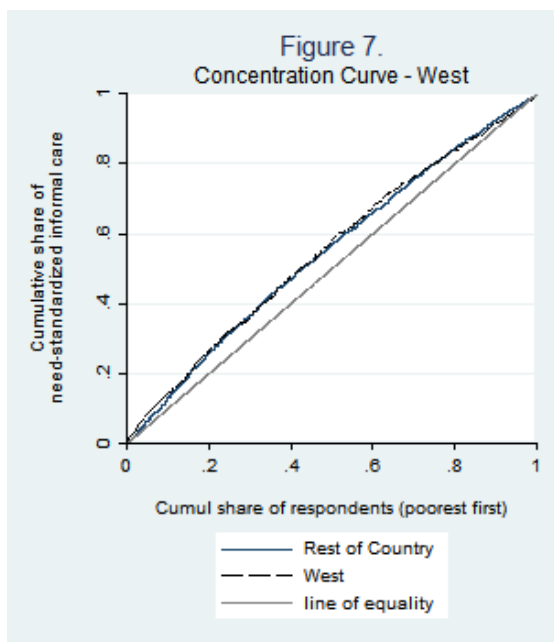
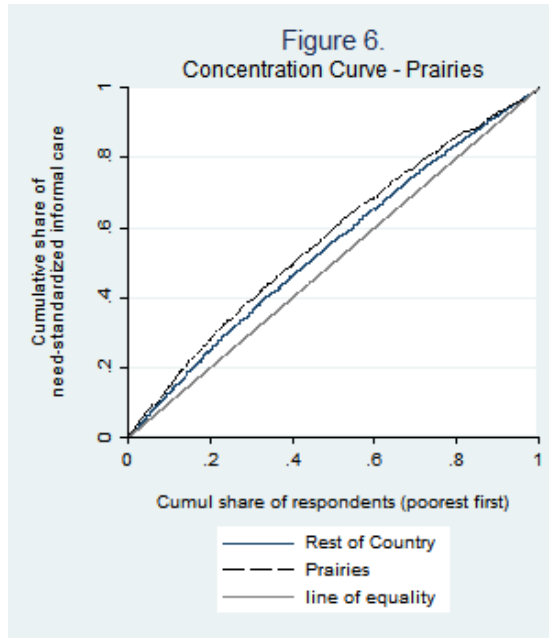
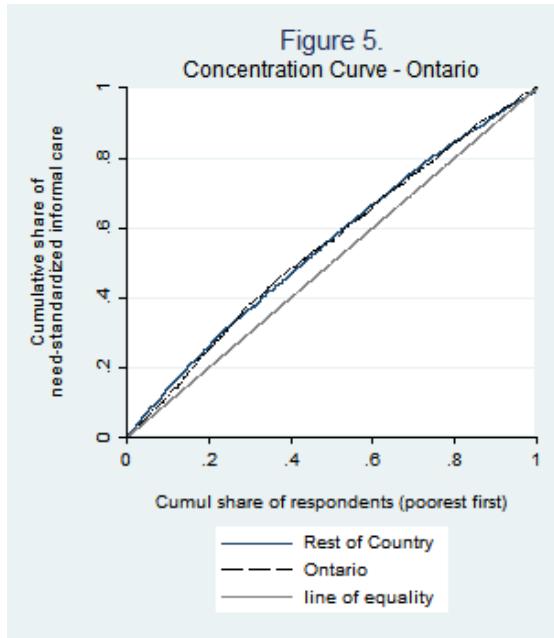


Table 6 displays the concentration indices (CI), using observed values, and horizontal inequity indices (HI), using the need-standardized predicted values, along with their associated standard errors for the probability to receive informal care for all regions and for the total sample. For all regions, the CI is negative and significantly different than zero, indicating significant inequality in the receipt of informal care that favours the poor. While the national CI for the receipt of informal care services is -0.243, the regions range from a low of -0.226 in Ontario, followed by -0.237 in Quebec, -0.254 in the Atlantic, and then -0.265 in the Prairies, to a high of -0.277 in the West. After

standardizing for need, there is statistically significant horizontal inequity in the receipt of informal care favouring the poor in the total sample (-0.084) as well as Ontario, the Prairies, and the West. The most pro-poor horizontal inequity in receipt of informal care was in the West (-0.111), followed by the Prairies (-0.106), and then Ontario (-0.092).

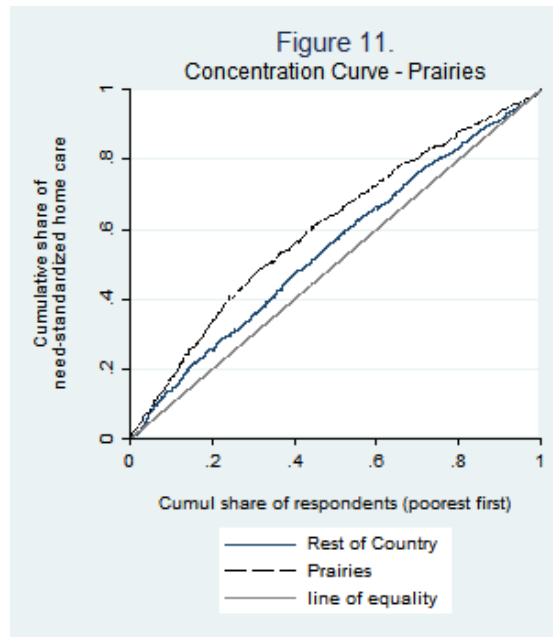
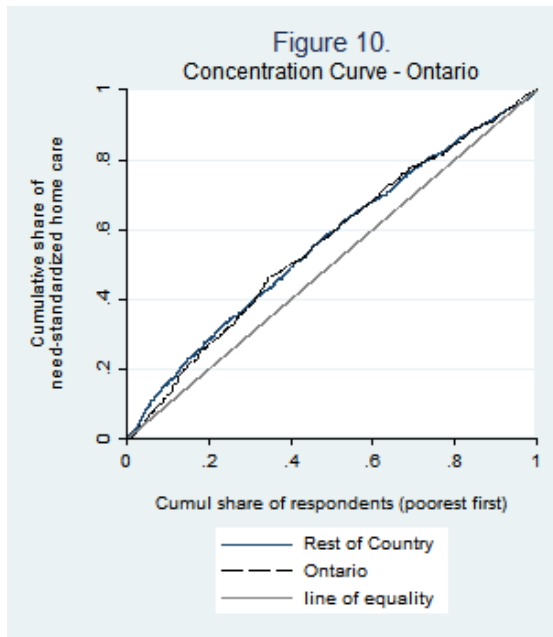
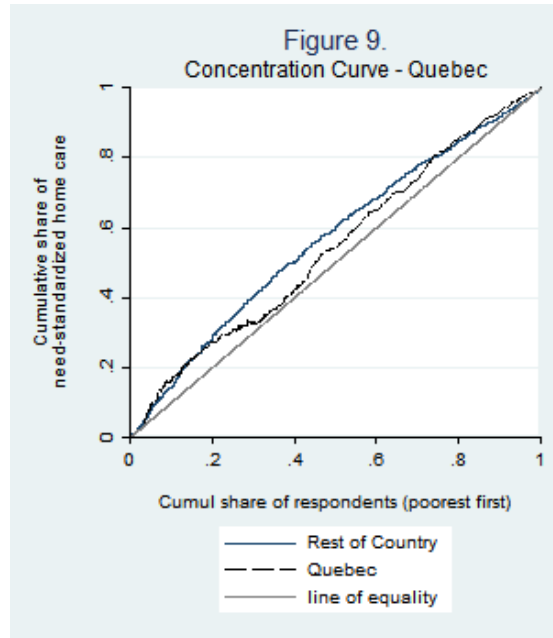
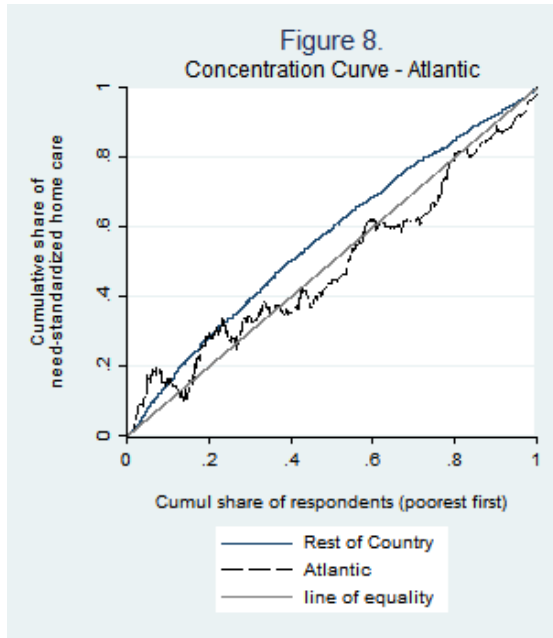
Table 6. Concentration index and horizontal inequity index for the probability to receive informal care				
Region	CI	SE	HI	SE
Total	-0.243	0.017	-0.084	0.015
Atlantic	-0.254	0.083	-0.040	0.072
Quebec	-0.237	0.042	-0.051	0.032
Ontario	-0.226	0.030	-0.092	0.028
Prairies	-0.265	0.028	-0.106	0.024
West	-0.277	0.026	-0.111	0.023

Note: Statistically significant ($P < 0.05$) values in bold. Weighted results

Concentration Index and Curve – Home care

The concentration curve for the need-standardized predicted values for the receipt of home care are presented in figures 8 through 12, along with the need-standardized predicted values for the rest of the country plotted on the same graph. The x-axis represents the cumulative proportion of the log of the household income to LICO ratio, and the y-axis represents the cumulative proportion of need-standardized predicted care received.

With the exception of the Atlantic region, all provinces and total sample display a pro-poor concentration in the receipt of home care after standardizing for need. After crossing over the line of perfect equity several times, the concentration curve for the Atlantic region is generally pro-rich after about the 35th percentile. In Quebec, the need-standardized concentration curve is above the line of perfect equity, but approaches it between the 20th and 40th percentile before moving back toward the rest of the country curve, and even surpassing it at the highest levels of income. The concentration curve for Ontario and the West is also pro-poor and runs in a similar pattern as that of the rest of the country. Compared to the rest of the country, the Prairies exhibits substantially greater pro-poor inequity in the receipt of home care after standardizing for need.



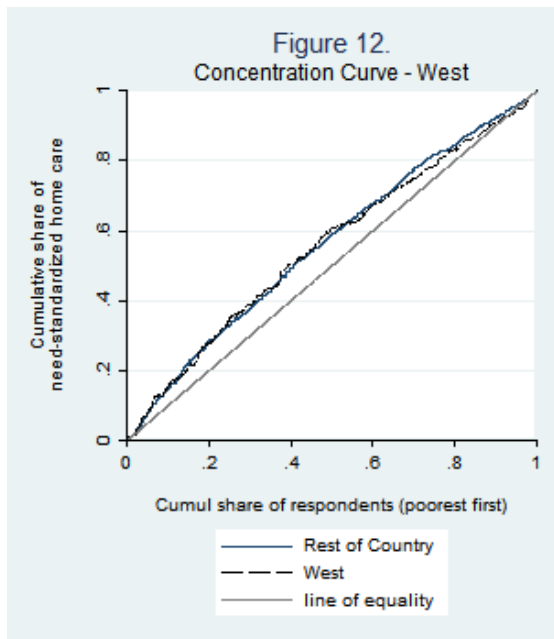


Table 7 displays the concentration indices, using observed values, and horizontal equity indices, using the need-standardized predicted values, along with their associated standard errors for the probability to receive home care for all regions and for the total sample. For all regions, with the exception of the Atlantic provinces, the CI is negative and significantly different than zero, indicating significant inequality in the receipt of home care that favours the poor. While the national CI for the receipt of home care services is -0.299, the regions range from a low of -0.234 in Ontario, followed by the West (-0.328), Quebec (-0.355), and the Prairies (-0.370). After controlling for need, there is statistically significant horizontal inequity in the receipt of home care services favouring the poor in the total sample (-0.087), Quebec (-0.116), Ontario (-0.067), and in the Prairies (-0.156).

Table 7. Concentration index and horizontal inequity index for the probability to receive home care				
Region	CI	SE	HI	SE
Total	-0.299	0.021	-0.087	0.018
Atlantic	-0.261	0.232	0.033	0.161
Quebec	-0.355	0.043	-0.116	0.035
Ontario	-0.234	0.034	-0.067	0.031
Prairies	-0.370	0.040	-0.156	0.035
West	-0.328	0.044	-0.059	0.038

Note: Statistically significant ($P < 0.05$) values in bold. Weighted results

Decomposition of Inequality

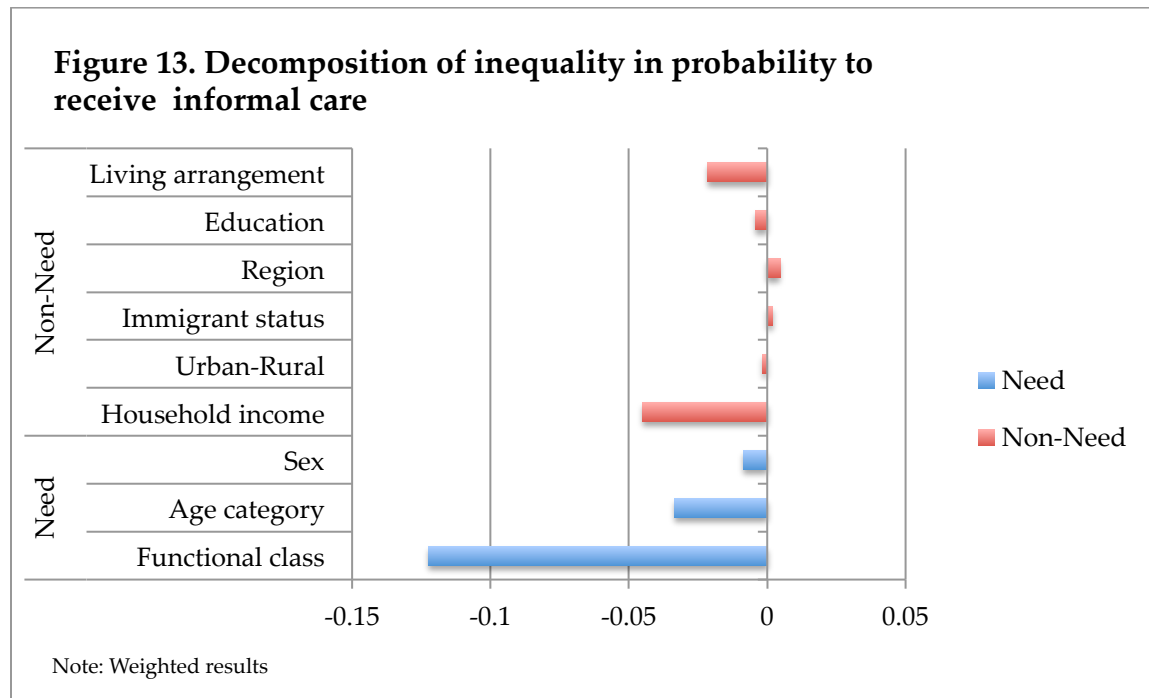
Decomposition of Inequality – Informal Care

The decomposition of inequality for the receipt of home care and informal care for the entire sample by “need” and “non-need” factors are displayed in tables 8 and 9 respectively. Included in the tables is the absolute contribution of each variable to the overall unstandardized CI, which is the product of the elasticity for that variable (the sensitivity of the CI to that variable) and the CI for that variable. A positive contribution to the CI indicates that if that variable were the only determinant in the receipt of care, than the CI would be pro-rich, and a negative contribution to inequality indicates if it were the only determinant in the receipt of care, than it would result in a pro-poor phenomenon. The horizontal inequity index is then computed as the non-standardized CI less the sum of the contributions from the “need” factors (computed using the linear approximation).

For informal care, using the linear approximation and partial effects approach to compute contributions for each type of “need” variable and then subtracting the sum of these contributions from the unstandardized CI, the horizontal inequity index was computed as -0.078. Functional class, age category, sex, household income, rurality, education, and living arrangement were all factors which contributed to pro-poor inequalities in the receipt of informal care with functional class providing the greatest contribution at -0.122, followed by household income (-0.045), age category (-0.034), living arrangement (-0.021), sex (-0.009), education (-0.004), and rurality (-0.002). Immigrant status and region both provided positive contributions to inequality at 0.002 and 0.005, respectively. The elasticity, CI, absolute contribution, and percent contribution for each factor are provided in table A3 in Appendix 2. Contributions to inequality in the receipt of informal care for “need” factors was pro-poor (-0.165), while inequality due to “non-need” factors was also pro-poor (-0.066). Figure 13 presents these results in a graphical format.

		Contribution	
		Need	Non-Need
Need	Functional class	-0.122	
	Age category	-0.034	
	Sex	-0.009	
Non-Need	Household income		-0.045
	Urban-Rural		-0.002
	Immigrant status		0.002

	Region		0.005
	Education		-0.004
	Living arrangement		-0.021
Inequality due to need factors: -0.165			
Inequality due to non-need factors: -0.066			
Horizontal Inequity Index: -0.078			
Note: Weighted results. Linear approximation to non-linear model using partial effects.			

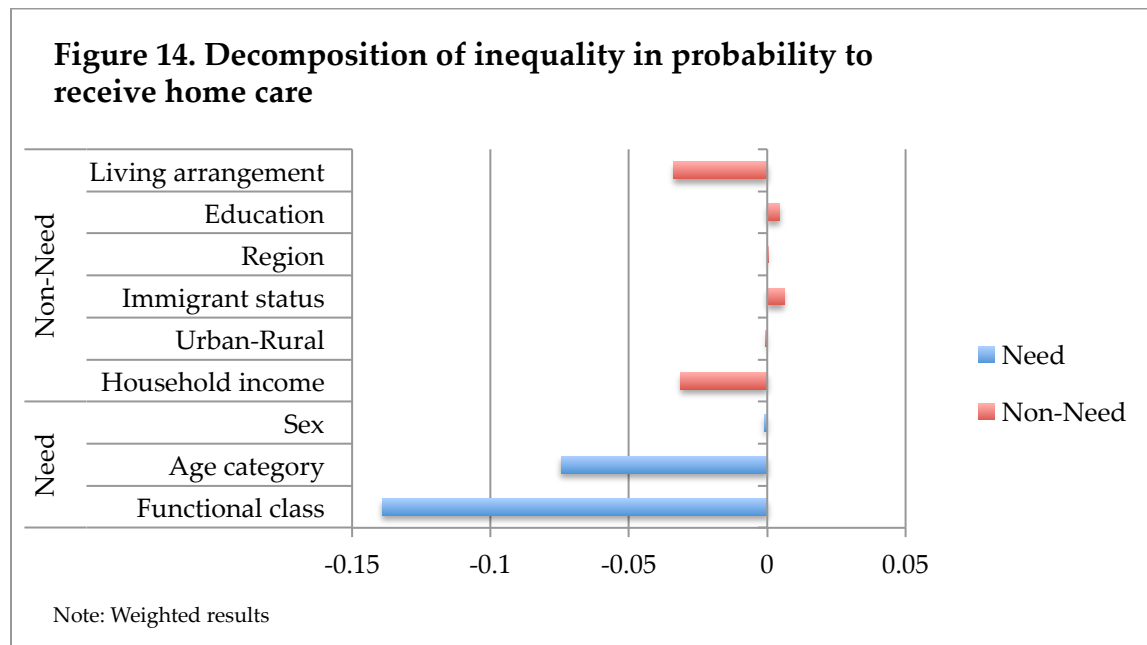


Decomposition of Inequality – Home care

For home care, using the linear approximation and partial effects approach to compute contributions for each type of “need” variable and then subtracting the sum of these contributions from the unstandardized CI, the horizontal inequity index was computed as -0.084. Functional class, age category, sex, household income, rurality, and living arrangement were all factors which contributed to pro-poor inequalities in the receipt of home care with functional class providing the greatest contribution at -0.139, followed by age category (-0.074), living arrangement (-0.034), household income (-0.031), sex (-0.001), and rurality (-0.001). Immigrant status and education provided positive contributions to inequality at 0.006, 0.005, respectively, while region provided negligible contributions to inequality. The elasticity, CI, absolute contribution, and percent contribution for each factor are provided in table A4 in Appendix 2. Contributions to

inequality in the receipt of home care for “need” factors was pro-poor (-0.215), and inequality due to “non-need” factors was also pro-poor (-0.054). Figure 13 presents these results in a graphical format.

Table. 9 Decomposition of inequality in probability to receive home care			
		Contribution	
		Need	Non-Need
Need	Functional class	-0.139	
	Age category	-0.074	
	Sex	-0.001	
Non-Need	Household income		-0.031
	Urban-Rural		-0.001
	Immigrant status		0.006
	Region		0.000
	Education		0.005
	Living arrangement		-0.034
Inequality due to need factors: -0.215			
Inequality due to non-need factors: -0.054			
Horizontal Inequity Index: -0.084			
Note: Weighted results. Linear approximation to non-linear model using partial effects.			



Discussion

Descriptive Statistics

First, the descriptive statistics results presented suggest that recipients of home care generally face more severe impairments than recipients of informal care as demonstrated by their functional impairment classification, and so are in greater need of not just care, but professional-based home care, as expected. The proportions of individuals who fall into the no impairment category for both informal care and home care calls into question the accuracy of the functional impairment classification variable to control for need. It would be expected that individuals who receive home care, and certainly informal care, would have some degree of functional impairment. Concerning home care, the lack of functional impairment could be due to individuals receiving post-hospital discharge acute care. As well, because of the nature of the questions used for this derived variable, it may be missing individuals who face cognitive impairments associated with old age and dementia. The use of the functional impairment classification to control for need is further discussed in the limitations section below. As perhaps another measure of need, home care recipients are also of older age, but females represent a greater proportion of informal care and home care recipients than males do. Although this finding was unexpected as most informal caregivers are female, it may be that female care recipients are receiving care from individuals outside of the household. Similarly, females may be more likely to reach out to friends or relatives for informal care, whereas males may feel more inclined to pursue

independence. Compared to the individuals who received no care, both home care and informal care recipients tend to be from lower income households, and this effect is more pronounced for home care recipients.

Logistic Regression

Concerning the “need” variables (functional class, age, sex), the findings are consistent with other literature, which suggests that as age and functional impairment increase, so too does the odds and need to receive both home care and informal care. However, if the age group variable is capturing some portion of the need for care, then this result is reasonable, but if the functional impairment variable captures most of the “need” for care, then it is less clear why age should be such a strong predictor for the receipt of care. There is a possibility that health care workers, who coordinate care and who assess individuals for eligibility of home care may be discriminating against younger people to receive care. The finding that females are more likely to receive informal care than are males is somewhat contradictory to the literature – females are often the providers of informal care, so one would expect males to be more likely to receive care (Mery, Wodchis et al. 2016). Because of the social constructions related to the receipt of care and independence, it may be that males are less likely to seek out informal care for a given level of need, as this may be associated with perceptions of decreased independence, or this effect could be observed because of the longer life expectancies of females and therefore time to receive informal care.

Using income deciles as a reflection of SES, the results are consistent with other work investigating the relationship between income and the probability to receive informal care after controlling for need (Kitchen, Williams et al. 2011; Stabile, Laporte et al. 2006). As this survey sample did not include individuals residing in private or public institutions, it is possible that individuals of higher income have opted to privately pay for care that might not be affordable for lower income individuals, resulting in a bias in the coefficient. Despite income decile two and nine exhibiting a significant reduction in the odds of receiving home care compared to the first decile, there was no general trend that emerged across income deciles for the probability to receive home care. Although this is a central tenet of the Canadian healthcare system, it is somewhat unexpected considering the income-tested co-payments in many of the provinces for home care services. This result is also contrary to much of the literature, which has suggested that lower income households are more likely to receive home care (Stabile, Laporte et al. 2006, Kitchen, Williams et al. 2011). This discussion will be explored further in the analysis of the concentration curves and indices.

Increased odds of receiving both home care and informal care for individuals who live outside of a CMA may be interpreted in several different ways. One, because of the

distance to care-coordination centres, this may be a barrier to access and so individuals may substitute informal care services for home care services. Two, this may be reflective of different cultural norms where individuals in rural settings prefer independence from institutions and opt to provide informal care. Three, because this model did not control for individuals who receive home care because of possible endogeneity, it may be possible that individuals who live in rural settings are more prone to receive home care services as it may be more feasible than hospital-based care, and so informal care services could be complementary to these home care services. Regardless of the interpretation, the caregiver burden and reduced labour force participation associated with informal care warrants further support for individuals living in a rural setting. However, individuals living in a rural setting might have less access to informal care because of decreased proximity to social networks and relatives, and thus may be required to substitute it for home care services. It could be argued that living in a rural setting, with less access to informal care services, may be a legitimate source of need. Other Canadian based research has demonstrated that individuals living in a rural setting are more likely to receive home care services (Kitchen, Williams et al. 2011). A lack of health care facilities and opportunities for health services in rural settings may lead rural residents to receive more home care services as a type of substitution for facility based care.

A lower probability to receive informal care in both Newfoundland and PEI compared to Ontario suggests that there are unobservable, fixed characteristics occurring in these provinces that may be a result of institutional policies. Compared to Ontario, Newfoundland and Labrador, PEI, Quebec, Alberta, and British Columbia had a significant reduction in the probability to receive home care services. There is large variation in the public provisions and government contribution of home care services that is likely contributing to this discrepancy. Nonetheless, this finding demonstrates significant inequities in the receipt of home care across the country. For a given level of need, depending on where a person resides, he or she may face different probabilities in accessing home care. Most concerning is the 48% reduction in odds of receiving home care in PEI compared to Ontario. The current results provide a first step in understanding the provincial differences in home care. However, because of the possibility of better support for informal care givers, and provisions of institutional long-term care along with the lack of inclusion of individuals residing in institutional long-term care facilities in the current dataset, further research should attempt to investigate these provincial policies that may contribute to provincial inequities in the receipt of home care.

Other literature has demonstrated that education could affect the probability to receive home care, and thus informal care as well (complements or substitutes, but in opposite

directions). If education was capturing a dimension of SES that income was not, then the insignificance of the education variable suggests that the included SES variable (household income decile) captures SES more accurately. But, if the significance of education in predicting the use of informal care and home care in the literature was because of a better capacity to navigate the health care system, then these results are contrary to most of the literature. However, it is possible that the income variable is capturing some potential capacity of the care recipient to navigate the health care system as well.

There is a school of thought in the literature that suggests that other cultures, particularly of eastern and Asian origin, may be more prone to care for elders in the home setting using informal sources, rather than rely on formal or institutional services. Indeed, the individualism entrenched in Canadian society might suggest that Canadian born residents would be less likely to receive informal care due to spouses and relatives, adhering to the motivation brought on by individualism and focusing their time by contributing to the labour force. However, there was no significant difference in the probability to receive informal care between immigrants and Canadian born residents. This cultural difference in the approach to receive informal care by immigrants may be offset by the lack of relatives and social networks that would be in a reasonable proximity to provide care. Other literature has found that immigrants were significantly less likely to receive home care services than Canadian born residents (Laporte, Coyte et al. 2002). One argument is that immigrants could be more likely to rely on informal care services as a substitute because of different cultural norms and values in the approach to care; however, the results from the informal care model do not support this claim. A reduced probability to receive home care services could be due to the recipient – language barriers to the health care system – or it could be due to possible discrimination of the health care system. Regardless of the reason, the finding that immigrants are less likely to access home care after controlling for need constitutes an illegitimate source of inequity and should be considered in the development of the health care system, as well as consideration for unmet need.

Concerning informal care, compared to individuals who were living unattached and alone, individuals who were living with only their spouse, or spouse and children were more likely to receive informal care – a result that was expected given that spouses provide a majority of care. The positive and significant OR for receipt of informal care for individuals who were an adult child and living with their parent may be reflective of the endogenous decision of the (adult) parent to abandon independence and live with his or her children to receive care. Indeed, the federal government provides a tax credit for this behaviour through the Canada Caregiver tax credit. Nonetheless, as a descriptive exercise, this result suggests that individuals who require care may be more

likely to receive it if they reside with a parent. Some provincial home care methods' assessment for need consider the living arrangement of the individual and possible sources of informal care. This policy is consistent with the results of this research: compared to unattached individuals living alone, individuals who were living with only a spouse, a spouse and children, or who were single and living with a child were significantly less likely to receive home care services. Although the results are reflective of the policies related to home care assessment for need, there is a possibility that this lack of home care provision to individuals living with spouses or children may place additional stress on the sources of informal care in the household that are associated with informal caregiving.

The non-significance of the household income to LICO ratio in the second model for the receipt of informal care warrants some attention, although the direction is consistent with the household income deciles used in the first and third model. Because of the right skewed distribution of this income ratio variable that is often observed in other income distributions, the smaller n values at the higher end of this continuous variable may have resulted in its insignificance. For this reason, the natural log of this variable was taken. Indeed, after normalizing the household income to LICO ratio by taking the natural log of it, the income variable became significant in predicting the use of informal care. This finding, which indicates more disadvantaged households are more likely to receive informal care services, is consistent with other Canadian research investigating the relationship between income and the use of informal care services (Kitchen, Williams et al. 2011; Stabile, Laporte et al. 2006). Similar to the model for receipt of informal care, the model for the receipt of home care was generally robust to the substitution of income variables. There was no change in direction or significance of any of the variables upon substitution of income variables. However, even after taking the log of the household income to LICO ratio variable, this variable remained insignificant, which could be reflective of the lack of trend that emerges across income deciles.

Concentration Curves and Indices

Concentration Curves and Indices – Informal Care

This is the first time horizontal inequity for the receipt of home care and informal care has been measured in Canada. Because of the methodology used, these results are directly comparable to the results obtained by (Rodrigues, Ilinca et al. 2014) who used similar methodologies to quantify the need-standardized horizontal inequity in the use of informal care and home care across European countries along with the decomposition approach.

The significant, and negative CI for the total sample and all regions for the receipt of informal care is consistent with other work which has suggested that after controlling for need, individuals of lower income are more likely to receive informal care (Kitchen, Williams et al. 2011). However, this analysis goes further to quantify the horizontal inequities that exist which favour the poor for informal care. The interpretations of these results require some assumptions and value judgements to be made. While the receipt of other health care services are generally seen a “good”, it is less certain whether or not the receipt of informal care is “good” or “bad”. Because of the caregiver burden associated with informal care, and the subsequent reduced labour force participation, the receipt of informal care should qualify as a “bad” social phenomenon. Additionally, if individuals were substituting professional care for informal care because of private costs of professional services, than this would also suggest possible unmet need and reasons that informal care can be undesirable. Alternatively, some of this horizontal inequity could be due to the complementary nature of the two types of care and the higher concentration of home care in lower income households that result from income-tested co-payments.

Similar to the results from Rodrigues, Ilinca et al. (2014) who found that nearly all countries in Europe exhibited pro-poor receipt of informal care, these results also suggest negative inequality in all regions and total sample, and horizontal inequity in the total sample, and a majority of the regions. The horizontal inequity in the receipt of informal care has important policy implications for labour force participation and caregiver burden. Governments should seek to first understand if there is unmet need because of the costs associated with professional care, and seek to support informal caregivers. For example, it is possible that for a given level of need, individuals of higher income are using private, institutional-based services for care that lower income households cannot afford. Similarly, the results suggest that the caregiver burden associated with informal care is more concentrated among lower income households.

The negative horizontal inequity also has implications for labour force participation. Not only does the negative horizontal inequity index suggest that the burden of informal care is more concentrated among lower income households even after standardizing for need, but the subsequent reduced labour force participation associated with informal caregiving will further exacerbate economic disadvantage.

Concerning informal care, the current results concerning horizontal inequity are comparable to the results obtained by Rodrigues, Ilinca et al. (2014) in their analysis across European countries. While Austria (-0.1), Germany (-0.9), and Sweden (-0.1) exhibited greater pro-poor horizontal inequity than that found in Canada for the receipt of informal care, France (-0.07) and Belgium (-0.05) both had lower reported pro-poor

horizontal inequity (Rodrigues, Ilinca et al. 2014). Despite these significant results for horizontal inequity, it should be noted that these measures rely heavily on the functional impairment capturing need accurately, otherwise, the results could be indicative of inequality rather than inequity. The -0.084 horizontal inequity index represents the proportion of the total informal care received that would need to be transferred to the richer half of the population in order for there to be a perfectly equitable distribution for the receipt of informal care, or a horizontal inequity index of zero (Koolman and van Doorslaer 2004).

Decomposition – Informal care

As expected, the decomposition of the inequality to receive informal care found that functional class and age category both contribute to pro-poor inequalities, which is consistent with the greater “need” found in lower income households. The magnitude of the income contribution is larger than expected – the highest contribution for income inequalities in the receipt of informal care in Europe was -0.008 in France (Rodrigues, Ilinca et al. 2014). However, this large and significant contribution to pro-poor inequalities is attenuated by other pro-poor contributions of need in the analysis for equity. The low value for the contribution of region to inequalities in the receipt of informal care suggests that if region were the only determinant for the receipt of care, then it would be equitably distributed. However, as a whole, this summative contribution of each region could be balanced by high pro-rich contributions in one region, and high pro-poor contribution in another region. The large pro-poor contribution of living arrangement suggests that low income households are more likely to be from living arrangements that are associated informal care – another important consideration in the decision to provide informal care, and the burden associated with it, and for labour force participation.

Concentration Curves and Indices – Home care

Similar to the pro-poor inequality of home care found in European countries by Rodrigues, Ilinca et al. (2014), there was significant inequality in the receipt of home care in the total Canadian sample and all regions less Atlantic, and after controlling for need there was still significant horizontal pro-poor inequity in the total sample, Quebec, Ontario, and the Prairies. Although other regions exhibited negative horizontal inequity, only Quebec, Ontario, and the Prairies and the total sample were significantly different from zero. This finding suggests that there are factors associated with these regions not accounted for in the model that may contribute to this result, such as policy differences or cultural differences in the receipt of home care. Indeed, the income-tested co-payment employed by many provinces may contribute to greater use of home care services among lower income households who face a lower co-payment. The provision of insurance through subsidization may result in changes in consumption behaviour for

those who pay a lower co-payment, notably, those of lower income households. However, whether or not this increased utilization is due to income effects, which would contribute to welfare gains, or due to price effects, which would decrease welfare, remains to be determined. If there were unmet need in the lower income population that was being satisfied with larger subsidization of the home care co-payments, then this horizontal inequity would be beneficial. However, if the pro-poor inequity demonstrated in the present research, which may result from the lower private cost from the income-tested co-payments, is due to over-utilization, that would otherwise have been foregone had the subsidization been through a type of cash payment, then the mechanics of the cost sharing arrangements for homecare warrants a comprehensive review.

Although other Canadian-based research has estimated the between income and the probability of receiving home care through multivariate logistic regression analysis (Kitchen, Williams et al. 2011, Mery, Wodchis et al. 2016), the present thesis actually quantifies the direction and degree of this inequity. Relative to the degree of horizontal inequity in European countries, Canada exhibits substantially greater horizontal inequity (-0.087) in the receipt of home care compared to Denmark (-0.04), which was the most pro-poor country analyzed. The -0.087 horizontal inequity index represents the proportion of the total home care received that would need to be transferred to the richer half of the population in order for there to be a perfectly equitable distribution of home care, or a horizontal inequity index of zero (Koolman and van Doorslaer 2004).

Decomposition – Home care

Although there are several promising results from the decomposition of the probability to receive home care, there are also some concerning, but interesting findings worth addressing. As expected, and consistent with the intent of home care policy, the decomposition of inequality for home care indicates functional classification and age category contribute to pro poor inequalities, which is expected given the greater need for care among the poor. However, living arrangement, which also contributed to pro-poor inequalities, may be due to living situations that necessitate care from professional based services among the poor, or less access to informal care services as a substitute. Household income also contributed to pro-poor inequalities in the receipt of home care - that is, if income were the only determinant in the receipt of care, it would be pro-poor. Although there may be concern that higher income households may not have access to home care, there is a possibility that these households are paying for institutional-based private care.

Strengths and Limitations

Disentangling the factors which contribute to the decision, or lack thereof, to pursue care for a dependent seniors is an inherently difficult task because of the many social, economic, demographic, and institutional factors that will affect this decision. Further contributing to the difficulty in the analysis of this decision is the lack of publicly administered, national surveys and datasets that include both community dwelling and institutional based individuals. A limitation of the current research investigating the relationship between income and the probability to receive home care or informal care is the sample bias that results from the survey excluding individuals who reside in institutional long-term care facilities. It is possibly, and likely, that individuals of higher income may pay for private institutional long-term care if they become dependent – thus increasing the apparent pro-poor inequity in the receipt of both home care and informal care, assuming there is some degree of substitutability between these types of care.

Of critical importance to the determination of whether or not horizontal inequity exists for a particular health care utilization variable is controlling for “need” – a notoriously elusive concept. The present thesis relied on age, sex, and functional impairment classification to standardize for “need”. Functional impairment classification was a derived variable that employed seven questions regarding one’s ability to complete basic activities of daily living, and seven questions regarding the ability to complete instrumental activities of daily living. The horizontal inequity measure assumes that “need” is accurately captured; however, if need for home care or informal care goes beyond these variables used, then there is a possibility that the measure could be invalid, particularly so if the need that is unaccounted for is unequally distributed in lower income households, which is often the case. Thus, the most significant limitation to the present study is the reliance on functional impairment classification, and whether or not this was sufficient. Because the horizontal inequity index is the unstandardized concentration index less the contribution from the needs variables, if there was additional need contributions that was concentrated in the poor, then the HI would overestimate the degree of pro-poor care received. Readers should take this limitation into consideration when interpreting the results.

Another limitation of the study is the number of observations for which income estimates were not reported and were dropped. Out of the 30,865 respondents, 5,266 observations needed to be dropped for the construction and analysis of the concentration index and horizontal inequity indices. If individuals who did not report their income were a random subset of individuals, then this would be acceptable. However, if individuals who did not report their income were systematically different

than individuals who did report their income, than there would be some degree of bias in the estimates.

Although inevitable, the decomposition of inequality in receipt of informal care and home care relies on a linearly additive model. In the case of a non-linear model, such as that used in the present research, a linear approximation is required, which may compromise the accuracy of the estimates used for decomposition. The linear approximation also results in estimates that are not unique, which is different than what is observed for the non-linear model – that is, an average effect of each parameter is taken, rather than the parameter accounting for changes in other covariates at different points.

The current thesis also has several notable strengths worth highlighting. First, the present research uses a nationally representative sample of Canadians aged 45 and older in the year 2008/2009, which lends the results to be generalizable to the rest of the Canadian population. Second, the study also used methodologies that have been employed by other international researchers investigating the determinants and equity in the receipt of home care and informal care, allowing direct comparisons to other work in this field. As well, the combination of the logistic regression and concentration indices offers an opportunity to contrast the different interpretations between estimating the relationship between income and the probability to use informal care and home care for logistic regressions and the concentration index. Finally, the regional sub-analysis provides an opportunity to make inferences about the potential income-related consequences that arise from the various cost-sharing arrangements employed by different provinces.

Conclusion

This research has described some of demographic, socioeconomic, and “need” factors associated with the receipt of informal care and home care among the Canadian population. For both informal care and home care, lower income households are more likely to receive care, after controlling for other “need” and “non-need” factors, as demonstrated by the horizontal inequity index. Further, the pro-poor concentration of both home care and informal care results in significant and negative horizontal inequity in the receipt of care. Although it appears the income-tested co-payments for home care encourage the use of home care among lower income households, it should be further investigated if there is an inequitable distribution in the quality of care received (public or private), and if there is unmet need in this population. Furthermore, the horizontal inequities found for the receipt of informal care also warrant further investigation into

the possible substitution that is being made with home care services because of possible costs or unmet need, and the resulting responses in labour force participation and caregiver burden. The variation in policies related to caring for dependent seniors across provinces provide an opportunity to study the different impact of these policies and how they could contribute to equitable developments in the Canadian healthcare system as the aging demographic will contribute to changes in the demand for these services.

Appendix 1. – Robustness Checks

	Model 1		Model 2		Model 3	
	Odds Ratio	Stand. Error	Odds ratio	Stand. Error	Odds ratio	Stand. Error
Functional limitation class						
No impairment	1		1		1	
Mild impairment	7.640***	0.737	7.778***	0.762	7.714***	0.758
Moderate impairment	30.175***	5.041	31.246***	5.206	30.903***	5.152
Severe impairment	35.627***	9.488	36.209***	9.309	35.472***	9.195
Total Impairment	51.985***	23.022	54.070***	23.735	53.125***	23.472
Age Category						
45-54	1		1		1	
55-64	1.268*	0.143	1.280*	0.146	1.275*	0.146
65-74	1.367*	0.166	1.399**	0.172	1.393**	0.172
75-84	2.152***	0.266	2.192***	0.275	2.181***	0.273
85+	1.886***	0.279	1.925***	0.289	1.924***	0.289

Sex						
Female	1.541***	0.129	1.548***	0.128	1.539***	0.129
Male	1		1		1	
Household income distribution						
Decile 1	1					
Decile 2	0.912	0.105				
Decile 3	0.780*	0.099				
Decile 4	0.680**	0.091				
Decile 5	0.735*	0.107				
Decile 6	0.915	0.154				
Decile 7	0.630**	0.109				
Decile 8	0.719	0.146				
Decile 9	0.519***	0.099				
Decile 10	0.573*	0.128				
Hhld inc. ratio to LICO			0.958	0.037		
ln(Hhld inc. ratio to LICO)					0.854**	0.047
Urban-Rural						
Non-CMA	1.503***	0.132	1.505***	0.134	1.511***	0.133
CMA	1		1		1	
Immigrant Status						
Immigrant	1		1		1	
Non-immigrant	1.163	0.107	1.129	0.104	1.154	0.106
Province						
Newfoundland and Labrador	0.549**	0.104	0.570**	0.107	0.562**	0.107
Prince Edward Island	0.621**	0.1	0.633**	0.101	0.614**	0.099
Nova Scotia	1.029	0.153	1.039	0.153	1.037	0.155
New Brunswick	0.94	0.138	0.959	0.139	0.945	0.139
Quebec	0.825	0.096	0.841	0.097	0.837	0.098
Ontario	1	.	1	.	1	.
Manitoba	1.15	0.144	1.165	0.146	1.159	0.146
Saskatchewan	1.081	0.148	1.08	0.148	1.08	0.148
Alberta	1.086	0.148	1.089	0.148	1.096	0.148
British Columbia	0.998	0.116	0.993	0.116	0.996	0.117
Education						
Less than secondary	1		1		1	
Secondary graduate	1.117	0.141	1.071	0.138	1.102	0.142
Some post-secondary	1.216	0.203	1.148	0.191	1.186	0.198
Post-secondary graduate	0.995	0.098	0.932	0.088	0.963	0.091
Living arrangement						
Unattached-alone	1		1		1	
Unattached-others	1.456	0.458	1.401	0.442	1.435	0.452
Spouse/partner	0.755***	0.064	0.702***	0.061	0.728***	0.061
Parent-spouse, children	0.697*	0.098	0.656**	0.087	0.680**	0.093
Single-child	1.123	0.164	1.095	0.159	1.102	0.161
Child-parent	2.899*	1.26	2.898*	1.276	2.974*	1.316
Constant	0.055***	0.01	0.051***	0.009	0.048***	0.008
Pseudo-r-squared	0.224		0.221		0.222	
Chi2	1707.619		1732.228		1673.95	
BIC	5734165.006		5755128.138		5742077.285	
* p<0.05, ** p<0.01, *** p<0.001						

Table A2. Logistic regression for receipt of home care - robustness to income variable substitution						
	Model 1		Model 2		Model 3	
	Odds ratio	Stand. Error	Odds ratio	Stand. Error	Odds ratio	Stand. Error
Functional limitation class						
No impairment	1		1		1	
Mild impairment	8.441***	0.866	8.533***	0.881	8.435***	0.872
Moderate impairment	22.592***	4.357	22.923***	4.437	22.591***	4.378
Severe impairment	27.422***	7.168	27.233***	7.035	26.621***	6.884
Total Impairment	47.491***	13.89	49.612***	14.743	48.588***	14.412
Age Category						
45-54	1		1		1	
55-64	1.416	0.271	1.417	0.266	1.405	0.265
65-74	2.218***	0.443	2.178***	0.429	2.170***	0.426
75-84	3.408***	0.661	3.300***	0.627	3.296***	0.625
85+	5.353***	1.121	5.191***	1.064	5.186***	1.062
Sex						

Female	1.13	0.118	1.13	0.118	1.123	0.118
Male	1		1		1	
Household income distribution						
Decile 1	1					
Decile 2	0.759*	0.104				
Decile 3	0.781	0.115				
Decile 4	0.914	0.149				
Decile 5	0.831	0.164				
Decile 6	0.854	0.151				
Decile 7	0.61	0.178				
Decile 8	0.999	0.246				
Decile 9	0.548*	0.144				
Decile 10	0.808	0.185				
Hhld inc. ratio to LICO			0.971	0.028		
ln(Hhld inc. ratio to LICO)					0.883	0.059
Urban-Rural						
Non-CMA	1.248*	0.122	1.242*	0.122	1.246*	0.123
CMA	1		1		1	
Immigrant Status						
Immigrant	1		1		1	
Non-immigrant	1.380*	0.191	1.364*	0.19	1.380*	0.192
Province						
Newfoundland and Labrador	0.588*	0.155	0.591*	0.158	0.582*	0.155
Prince Edward Island	0.520**	0.13	0.519**	0.13	0.511**	0.128
Nova Scotia	0.753	0.112	0.752	0.112	0.748	0.111
New Brunswick	0.91	0.168	0.905	0.168	0.888	0.166
Quebec	0.766*	0.102	0.762*	0.101	0.757*	0.1
Ontario	1	.	1	.	1	.
Manitoba	1.042	0.154	1.037	0.151	1.028	0.15
Saskatchewan	0.889	0.17	0.877	0.167	0.875	0.167
Alberta	0.713*	0.116	0.708*	0.114	0.709*	0.115
British Columbia	0.709*	0.115	0.701*	0.113	0.698*	0.113
Education						
Less than secondary	1		1		1	
Secondary graduate	1.171	0.166	1.153	0.164	1.182	0.169
Some post-secondary	1.068	0.199	1.057	0.191	1.085	0.2
Post-secondary graduate	1.174	0.138	1.153	0.129	1.189	0.136
Living arrangement						
Unattached-alone	1		1		1	
Unattached-others	0.79	0.215	0.762	0.206	0.778	0.212
Spouse/partner	0.519***	0.053	0.505***	0.051	0.521***	0.053
Parent-spouse, children	0.350***	0.083	0.336***	0.08	0.347***	0.082
Single-child	0.634*	0.135	0.615*	0.129	0.626*	0.132
Child-parent	0.899	0.413	0.826	0.39	0.838	0.397
Constant	0.020***	0.005	0.018***	0.005	0.018***	0.004
Pseudo-r-squared	0.288		0.285		0.286	
Chi2	1774.241		1628.281		1617.752	
BIC	2976056.301		2984419.156		2980173.758	
* p<0.05, ** p<0.01, *** p<0.001						

Appendix 2. – Decomposition Results

Table A3. Decomposition Results - Informal Care				
	Elasticity	CI	Contribution	% Contribution
Functional Class_1				
Functional Class_2	0.2007	-0.2886	-0.0579	0.2386
Functional Class_3	0.1035	-0.3761	-0.0389	0.1604
Functional Class_4	0.0303	-0.4403	-0.0133	0.0550
Functional Class_5	0.0254	-0.4788	-0.0122	0.0502
Age Cat_1				
Age Cat_2	0.0452	0.0536	0.0024	-0.0100
Age Cat_3	0.0355	-0.2250	-0.0080	0.0329
Age Cat_4	0.0653	-0.3273	-0.0214	0.0881
Age Cat_5	0.0156	-0.4204	-0.0066	0.0271

Sex_Female				
Sex_Male	-0.1465	0.0588	-0.0086	0.0355
Ln(HHldIncome)	-0.0850	0.5306	-0.0451	0.1858
Non-CMA				
CMA	-0.1622	0.0102	-0.0016	0.0068
Immigrant				
Non-Immigrant	0.1042	0.0196	0.0020	-0.0084
Region_Atl	-0.0049	-0.1578	0.0008	-0.0032
Region_Que	-0.0403	-0.0857	0.0035	-0.0142
Region_On				
Region_Prairies	0.0042	0.0094	0.0000	-0.0002
Regions_West	0.0040	0.0895	0.0004	-0.0015
Education_1				
Education_2	0.0132	-0.0144	-0.0002	0.0008
Education_3	0.0032	0.0562	0.0002	-0.0007
Education_4	-0.0279	0.1500	-0.0042	0.0173
Living Arrangement_1	0.0373	-0.2915	-0.0109	0.0448
Living Arrangement_2	0.0100	-0.1755	-0.0018	0.0072
Living Arrangement_3				
Living Arrangement_4	-0.0235	0.1326	-0.0031	0.0128
Living Arrangement_5	0.0105	-0.2249	-0.0024	0.0097
Living Arrangement_6	0.0129	-0.2601	-0.0034	0.0138

Table A4.

Table A4. Decomposition Results - Home Care				
	Elasticity	CI	Contribution	% Contribution
Functional Class_1				
Functional Class_2	0.2059	-0.2886	-0.0594	0.1989
Functional Class_3	0.1148	-0.3761	-0.0432	0.1445
Functional Class_4	0.0384	-0.4403	-0.0169	0.0566
Functional Class_5	0.0409	-0.4788	-0.0196	0.0655
Age Cat_1				
Age Cat_2	0.0657	0.0536	0.0035	-0.0118
Age Cat_3	0.0905	-0.2250	-0.0204	0.0682
Age Cat_4	0.1044	-0.3273	-0.0342	0.1143
Age Cat_5	0.0559	-0.4204	-0.0235	0.0786

Sex_Female				
Sex_Male	-0.0193	0.0588	-0.0011	0.0038
Ln(HHldIncome)	-0.0589	0.5306	-0.0312	0.1045
Non-CMA	-0.0553	0.0102	-0.0006	0.0019
CMA				
Immigrant				
Non-Immigrant	0.3142	0.0196	0.0061	-0.0206
Region_Atl	-0.0037	-0.1578	0.0006	-0.0019
Region_Que	-0.0329	-0.0857	0.0028	-0.0094
Region_On				
Region_Prairies	-0.0018	0.0094	0.0000	0.0001
Regions_West	-0.0328	0.0895	-0.0029	0.0098
Education_1				
Education_2	0.0100	-0.0144	-0.0001	0.0005
Education_3	-0.0011	0.0562	-0.0001	0.0002
Education_4	0.0316	0.1500	0.0047	-0.0159
Living Arrangement_1	0.0905	-0.2915	-0.0264	0.0883
Living Arrangement_2	0.0067	-0.1755	-0.0012	0.0040
Living Arrangement_3				
Living Arrangement_4	-0.0288	0.1326	-0.0038	0.0128
Living Arrangement_5	0.0079	-0.2249	-0.0018	0.0059
Living Arrangement_6	0.0022	-0.2601	-0.0006	0.0020

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