THREE ESSAYS ON THE WELL-BEING OF CANADIAN CHILDREN AND THEIR FAMILIES

by

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Abstract

This dissertation pertains to the well-being of Canadian children and families. I focus on the relationship between socio-economic status and health, while emphasizing vulnerable populations. In Chapter 2, my co-authors and I provide the first direct estimates of poverty and inequality in Northern Canada compared to the rest of the country. A novel aspect of this work is that we account for cost of living, which is 46 percent higher in the North. This has important implications for poverty and inequality in the region. We find that 20.5 percent of Northern families with children are poor compared to 9.5 percent in the South. And, while ten percent of the Southern population is represented in each income decile, 31 percent of Northern families with children are at the bottom of the distribution. In Chapter 3, I transition from describing income (and disparities thereof) to considering its effect on health. I exploit an exogenous increase in income for Canadian families with young children (i.e. Universal Child Care Benefit) to answer the following questions: Is there a relationship between income and mental health among Canadian mothers? Is it corroborated by other measures of well-being (i.e. stress, life satisfaction)? Is the effect different for lone mothers compared to those in two-parent families? I examine these issues with a triple difference model and microdata from the Canadian Community Health Survey. I find the income transfer improves mental health and life satisfaction regardless of family structure. It also reduces stress among lone mothers. Finally, in Chapter 4, I compare prenatal smoking and exposure to second-hand smoke between Aboriginal and non-Aboriginal women. I find that 42 percent of Aboriginal women smoke during pregnancy compared to 15 percent of the non-Aboriginal population. Likewise a relatively large proportion of Aboriginal women are regularly exposed to second-hand smoke (i.e. 39.5 versus 17 percent). Important correlates include: marital status; income; geography; age at childbirth; and education. The latter two are particularly important for Aboriginal women. And, while Aboriginal women are more likely to smoke during pregnancy, there is no difference in the number of cigarettes per day among those who do.

List of Abbreviations Used

CCHS	Canadian Community Health Survey
DD	Difference-in-Differences
LCDI	Living Cost Differential Index
LICO	Low Income Cut-Off
OLS	Ordinary Least Squares
SHS	Survey of Household Spending
TD	Triple Difference
UCCB	Universal Child Care Benefit

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Chapter 1
Introduction

This dissertation pertains to the well-being of Canadian children and their families, especially mothers. I focus on socio-economic status and its relationship with health. In doing so, I emphasize vulnerable populations such as Northern Canada (i.e. Yukon, Northwest Territories, Nunavut), lone mothers and Aboriginal women. The latter include First Nations, Métis and Inuit women. These vulnerable populations require special attention because they tend to be different in ways that affect well-being (e.g. isolation and access to services in Northern Canada). At the same time, they are underrepresented in the economics literature. I intend to address this gap, at least in part.

In Chapter 2, which is co-authored with Peter Burton and Shelley Phipps, we provide the first direct estimates of poverty and inequality in Northern Canada compared to the rest of the country. This is necessary for a better understanding of material well-being in Canada, as well as the extent of regional disparities. We cannot simply generalize findings from other contexts. For example, the North is a remote, sparsely populated region with a challenging climate (e.g. extended periods of darkness and sub-zero temperatures for much of the year). Thus, transportation is costly and prices are much higher compared to the rest of the country. Given these and other differences, it is important to understand how families in the North fare compared to those in Southern Canada. However, income-based measures of poverty (i.e. Low Income Cut-Offs (LICOs), Low Income Measures, the Market Basket Measure) are derived from surveys that do not include the North. And, we cannot apply poverty lines for Southern Canada to the North because of the much higher cost of living. Therein is the contribution of this chapter.

First, we construct an equivalence scale to estimate differences in cost of living. Based on an Engel methodology, we estimate the extra income needed by a Northern household to spend the same share on necessities, and thus have the same standard of living, as an otherwise similar household in the South. Using multivariate techniques and microdata from the Survey of Household Spending (SHS), we find that cost of living is 46 percent

higher in the North. We estimate incidence, depth and distribution of poverty in Northern versus Southern Canada based on this scale. Specifically, we multiply rural LICOs by 1.46 to construct poverty lines for the North. And, for inequality estimates, we adjust the incomes of Northern families so that purchasing power is equal to that in the South. We focus on families with children because the North has a relatively young population. For example, 34 percent of residents in Nunavut are under the age of 15 versus 18 percent in all of Canada (Statistics Canada 2007). At the same time, there is little statistically reliable information about child well-being in the region.

We find that incidence and depth of poverty are much higher in the North. For example, 20.5 percent of Northern families with children are poor compared to 9.5 percent in the South. We also find that Northern families are disproportionately represented at the bottom of the Canadian income distribution. While approximately ten percent of the Southern population is represented in each decile, 31 percent of Northern families with children are at the bottom of the distribution. And, only three percent have incomes that would place them among the richest ten percent of Canadians.

In Chapter 3, I transition from describing income (and disparities thereof) to considering its effect on health. However, the relationship is endogenous due to reverse causation and omitted variables. For example, poor health impedes income, which limits access to health-enabling resources. Likewise underlying factors, such as family background and time preference, may influence both income and health. I address endogeneity, and thus make causal inferences, using the Universal Child Care Benefit (UCCB). Introduced in 2006, the UCCB is an income transfer for Canadian families with young children. I exploit this exogenous increase in income to answer the following questions: (1) Is there a relationship between income and mental health among Canadian mothers? (2) Is it corroborated by other measures of well-being (i.e. stress, life satisfaction)? (3) Is the effect different for lone mothers compared to those in two-parent families? I examine these issues with a triple difference (TD) model and microdata from the Canadian Community Health Survey (CCHS) (i.e. Cycles 2.1 (2003), 3.1 (2005), 4.1 (2007) and 2008). Mothers with children younger than six are treated to the income transfer. The control group includes those with children aged six to 11.

I find the income transfer improves mental health regardless of family structure. This is corroborated by gains in life satisfaction. The transfer also reduces stress among lone mothers. This makes sense since they are most in need of assistance. For example, they are particularly vulnerable to time shortages, low income and economic insecurity.

Of course, other factors are also important for maternal health (i.e. in addition to income). This is the premise of Chapter 4, which pertains to prenatal smoking and exposure to second-hand smoke. Both are harmful to fetal development with profound implications for the affected infants, their families and society. Thus, it is necessary to identify characteristics of women who are most likely to engage in these risky behaviours. Evidence is lacking in a Canadian context, especially comparisons between Aboriginal and non-Aboriginal women. This is important because prenatal smoking and exposure to second-hand smoke may perpetuate existing inequalities between these groups.

In this chapter, I examine the prevalence and correlates of prenatal smoking and exposure to second-hand smoke among Aboriginal and non-Aboriginal women, respectively. Then, I use Blinder-Oaxaca decompositions to show how group differences in relevant characteristics and size/strength of the associations contribute to group differences in these risky behaviours. I also consider the frequency with which women smoke during pregnancy. My analysis is conducted with microdata from the CCHS (i.e. Cycles 1.1 (2001), 2.1 (2003) and 3.1 (2005)).

I find that 42 percent of Aboriginal women smoke during pregnancy compared to 15 percent of the non-Aboriginal population. Likewise a relatively large proportion of Aboriginal women are regularly exposed to second-hand smoke (i.e. 39.5 versus 17 percent). Important correlates (not necessarily causal factors) include: marital status; income; geography; age at childbirth; and education. The latter two are particularly important for Aboriginal women. For example, prevalence of prenatal smoking among Aboriginal women would fall by 14.5 percentage points if they had the same characteristics as non-Aboriginal women; more than five percentage points are attributable to education. It is also interesting to note that, while Aboriginal women are more likely to smoke during pregnancy, there is no difference in the number of cigarettes per day among those who do. This might be interpreted favourably in terms of inequality

between Aboriginal and non-Aboriginal women since risks increase with the amount of smoking.

Chapter 2
Measuring Poverty and Inequality in Northern Canada

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2.1 Introduction

2.1.1 Northern Canada

There are marked differences between the Territorial North (i.e. Yukon, Northwest Territories, Nunavut) and elsewhere in Canada. For instance, the North has a distinct physical environment, characterized by habitually cold temperatures and extended periods of daylight/darkness. Moreover it is a remote, sparsely populated region with a relatively large proportion of Aboriginal residents. According to the 2006 Census of Population, the proportion of Aboriginal residents ranges from 25 percent in Yukon to 85 percent in Nunavut; while only four percent of all Canadians identify as Aboriginal (Statistics Canada 2008-a).

An implication of remoteness is that transportation to/from and within Northern Canada is limited, resulting in a relatively high cost of living. For example, Nunavut is not connected to other provinces/territories by road, nor are there roads linking communities within the territory. As such, prices of many necessities are double or triple those in Southern Canada (Nunavut Roundtable for Poverty Reduction 2012).

The preceding characteristics of Northern Canada have curbed the development of many industries that operate elsewhere in the country. For example, the North experiences sub-zero temperatures for much of the year, which encumbers large-scale agriculture. Many

Northern communities do not have a natural economic base; thus labour demand is largely contained to a few geographical centres such as those proximate to mines or government offices (Nunavut Roundtable for Poverty Reduction 2012). Employment often involves costly re-location should individuals be qualified for jobs that require literacy, numeracy and technological skills. Reportedly, there is mismatch between skills demanded in the Northern labour market and those possessed by many residents who are adept in traditional subsistence such as harvesting country food and sewing (Nunavut Roundtable for Poverty Reduction 2012). This has resulted in a mixed economy with some individuals engaged in traditional subsistence, others working for wages and many reliant on the welfare state. For example, 49 percent of Nunavummiut received welfare income in 2008 compared to 5.7 percent of individuals in Southern Canada (Battle and Torjman 2013).[1] Regarding inequality between individuals in the wage economy and those who are unable/unwilling to participate, the Nunavut Economic Forum (2010) reports there are "…some Nunavummiut who prefer a more traditional Inuit life. But others have seemingly lost their way in the transition from a traditional Inuit way of life to a wage-based culture and lifestyle" (page 72).

In addition to the preceding labour market challenges, Northern Canada is characterized by lower levels of education and health. For example, the high school dropout rate ranged from 15.5 percent in Yukon to 50 percent in Nunavut over the period 2007 to 2010; it was nine percent in the rest of Canada (Statistics Canada 2010-a). In terms of health, only 43 percent of Nunavummiut aged 12 and older report very good/excellent overall health compared to 59 percent of individuals in Southern Canada (Statistics Canada n.d.-d).[2] Moreover residents in remote Northern communities have limited local access to health services. For example, the Northwest Territories reports major challenges in recruiting health professionals to remote communities, many of which are accessible only by ice road or air (Office of the Auditor General of Canada 2011). This often results in residents having to travel far distances for diagnosis or treatment, usually to hospitals in Northern capital cities or Southern Canada.

[1] Yukon and Northwest Territories are below the national average at 2.7 and 4.4 percent, respectively.
[2] In Yukon (Northwest Territories), 57(52) percent of individuals report very good/excellent overall health. Estimates are based on the 2012 CCHS.

2.1.2 Children

This chapter highlights poverty among children because they comprise a large, vulnerable subset of the population in Northern Canada.[3] Children are particularly susceptible to the effects of poverty (e.g. nutrition is important during the formative years of childhood); however they have little influence over their material situation. In general, children have limited agency and do not participate in formal markets; rather they rely on the distribution of resources by their families and communities. Both are responsible for providing children with the basis for a healthy, productive and fulfilling life. This is set out in the Convention on the Rights of the Child. The Convention, adopted by the United Nations in 1989, is a legally binding international treaty that promotes the civil, cultural, economic, political and social rights of children (UNICEF Office of Research n.d.).

Material situation is an important dimension of the Convention with implications for present and future well-being. First, in terms of present well-being, childhood is a distinct life stage with its own value. Material situation reflects the household's ability to provide a stimulating environment for children together with the necessities of life. In terms of future well-being, there is evidence that health is a mechanism for the inter-generational transmission of socio-economic status. Specifically, low socio-economic status is associated poor child health (Case et al 2002; Currie and Stabile 2003; Currie and Moretti 2003). And, poor child health manifests in later-life socio-economic status (Case and Paxson 2009; Almond 2006). It follows that some North/South differences (e.g. levels of education and health) may be perpetuated to the extent that childhood circumstance manifests throughout the lifecycle and across generations. This implies the importance of poverty research that is specific to Northern Canada; and, the material situation of children is especially relevant, both now and for future prospects of the region.

2.1.3 Measuring Poverty

There have been several studies of child poverty in Northern and Southern Canada, respectively; however findings are not directly comparable. In particular, mainstream

[3] For example, according to the 2006 Census of Population, 34 percent of residents in Nunavut are under the age of 15 versus a provincial average of 17 percent (Statistics Canada 2007).

approaches to measuring poverty in Southern Canada do not apply to the North and vice versa.

Common thresholds used to define poverty in Southern Canada are: LICOs; Low Income Measures; and the Market Basket Measure. LICOs, based on an Engel methodology, are thresholds below which families spend a relatively large proportion of income on necessities (i.e. at least 20 percentage points more than average). Low Income Measures are commonly used for international comparisons; they delineate poverty relative to 50 percent of median equivalent income. The Market Basket Measure compares families' disposable incomes to the cost of necessities required to meet a modest standard of living. These measures allow direct comparisons across Southern regions and time; however they do not apply to the North because of data limitations and differences in relative prices. Specifically LICOs, Low Income Measures and the Market Basket Measure are based on data that do not include the Territorial North. And, poverty lines for Southern Canada cannot be applied to the North due to a much higher cost of living in the latter.

In absence of LICOs, Low Income Measures and the Market Basket Measure, poverty in Northern Canada is measured using alternate approaches such as: social assistance caseloads; food insecurity; educational attainment; housing issues; and life expectancy at birth (Canada Without Poverty 2013; Nunavut Roundtable for Poverty Reduction 2012). These absolute measures are observed in the South; however we cannot make direct comparisons because necessities required to meet a modest standard of living vary between Northern and Southern Canada. For example, many families in the North have access to alternate food sources through traditional subsistence and sharing (Poppel 2006). And, there may be North/South differences in the definition of food insecurity (e.g. having enough to eat versus eating healthy). Likewise the housing shortage in Northern Canada is exacerbated by extreme weather conditions and lack of emergency shelters; while many individuals receive refuge from family and friends.

In addition to the preceding indicators, poverty in the North is measured using: an income threshold of $30,000 (Wilson 2009); and LICOs for a local area population of less than 30,000 residents (Yukon Department of Health and Social Services 2010). Neither approach can be used to compare poverty in Northern and Southern Canada due to

differences in relative prices. Moreover the former measure is arbitrary; while the latter does not account for a higher cost of living in the North, and therefore understates poverty.

2.1.4 Cost of Living Adjustments

Until recently, the North was excluded from most Canadian microdata. However, some population-level surveys have been extended to the region; thus there is an emergent need to characterize North/South differences in cost of living. Efforts are largely based on information from existing government initiatives such as the Food Mail Program and Nutrition North Canada; these are alternate schemes for subsidizing the transportation of nutritious perishable food to isolated Northern communities.[4] To monitor these programs, the federal government records the cost of a 'Northern Food Basket'/'Revised Northern Food Basket' across time for participating communities, as well as Southern supply centres.[5] This information can be used to create an annual price index, defined as average cost of the basket in the North divided by that for Southern Canada, all multiplied by 100. Burton et al (2015) use this method to adjust for differences in cost of living between the Territorial North and Southern Canada. Likewise Duhaime and Édouard (2012) characterize differences in relative prices between Inuit Nunangat and Southern Canada by averaging indices across the four Inuit regions in Canada.[6]

Another approach to adjusting for higher cost of living in Northern Canada is based on the Isolated Posts and Government Housing Directive. In particular, Living Cost Differential Indices (LCDIs) are used by the Treasury Board of Canada Secretariat and National Joint Council to determine compensation for federal employees serving in remote locations. LCDIs measure the relationship between prices in isolated communities versus those in urban centres. Every community in the North has an isolation score based on population, climate and availability of commercial transportation. Isolation scores correspond to LCDIs, which are given in five-point ranges to reflect seasonal variation in

[4] The Food Mail Program was replaced by Nutrition North Canada in 2011.
[5] The 'Northern Food Basket' was replaced by the 'Revised Northern Food Basket' in 2007 to be more culturally appropriate for Aboriginal families.
[6] The four Inuit regions in Canada, collectively known as Inuit Nunangat, are: Inuvialuit in Northwest Territories; Nunavut; Nunavik in Quebec; Nunatsiavut in Newfoundland and Labrador.

cost of living. Burton et al (2015) use this method to adjust for differences in cost of living between the Territorial North and Southern Canada. For each census division in the North, they find an average isolation score and corresponding LCDI. Their adjustment is based on the average of LCDI midpoints across Northern regions.

The preceding cost of living adjustments are easy to calculate; however they require continuity in government programs. Moreover the approaches are not based on actual spending by families in the North. For example, the 'Northern Food Basket'/'Revised Northern Food Basket' excludes convenience food and that with little nutritional value; while LCDIs do not include clothing or shelter. Likewise LCDIs are based on spending by federal employees in the North, which likely differs from that of native-born residents. A further limitation is that adjustments are not representative of the entire North. For example, Northern communities with year-round access to surface transportation do not partake in the Food Mail Program or Nutrition North Canada.[7] And, data are not available for all time-community combinations among those that participate. Finally, these approaches overstate cost of living for Northern families that engage in traditional subsistence and sharing, as well as those that obtain necessities through public provision.[8]

In this chapter, we measure child poverty and inequality in the Territorial North with comparisons to Southern Canada using new estimates of differences in cost of living. Our approach is based on the Engel methodology employed by Statistics Canada to estimate LICOs.[9] Specifically, we estimate the difference in income needed for otherwise similar households in Northern Canada to devote the same share to necessities, and thus be equally well-off (i.e. Northern equivalence scale). We use this equivalence scale to adjust up LICOs for households in the North. This allows us to directly compare incidence and depth of poverty in Northern versus Southern Canada. We also examine inequality between and within regions.

[7] These communities are less isolated, and thus have lower prices compared to those without year-round access to surface transportation.
[8] For example, most Nunavummiut live in public housing, which comprises more than half of all occupied dwellings in the territory (Nunavut Bureau of Statistics 2011).
[9] Engel argued that poorer families, or larger ones with the same income, spend a greater share on necessities. And, the proportion of income spent on necessities is indicative of material well-being (Blackorby and Donaldson 1991; Phipps and Garner 1994).

2.2 Data

We use cross-sectional microdata from the SHS, public-use files. A key advantage of the SHS is that coverage is extended to Northern households in 1997, 1998, 1999 and every second year thereafter until 2009; thus we have enough pooled sample for statistically meaningful analysis despite a sparse population in the North.[10] The target population of the SHS is private households; for example, it excludes prison inmates, residents of old-age institutions and members of the military. In Southern Canada, people living on Aboriginal reserves or Crown land are also excluded; though this is not the case for the North. The SHS covers 98 percent of the population in Southern Canada and 92 percent of the North (Statistics Canada 2010-b).

The SHS is voluntary; however response rates are reasonable given the high burden involved. For example, in 2009, the overall response rate was 64.5 percent (Statistics Canada 2010-b).[11] The SHS collects detailed information about household expenditures, as well as basic demographic information. Data are collected in two stages: 1) a personal meeting with a Statistics Canada interviewer; 2) a two-week diary of daily expenditures by all household members. An additional advantage of the SHS is that income data are recovered from administrative records (i.e. tax files) with respondents' permission; thus they are more accurate than self-reports.

We pool eight cycles of the SHS that include the Territorial North, ranging from 1997 to 2009. We scale sampling weights to sum to one within each cycle since they can be regarded as separate draws on the same population and sample size varies across cycles. Dollar values adjusted for inflation using the all-items Consumer Price Index by province/territory; the base year is 2002 (Statistics Canada n.d.-c).

For purposes of estimating the equivalence scale, we compare households from the North to rural regions of Southern Canada. This seems to be a more meaningful comparison

[10] Households in very remote areas are not included for reasons of cost.
[11] Response rates in the provinces and territories were 64.2 and 69.7 percent, respectively.

than with large metropolitan areas of the South.[12] This leaves a sample of 29,110 households for estimating Engel curves; roughly 20 percent are from the North. We use a sample of 101,382 households for the poverty and inequality calculations (i.e. 29,110 households as described above plus 72,272 from urban regions in Southern Canada).[13] Both samples exclude Prince Edward Island as we do not observe the urban/rural status of respondents in that province. We also drop part-year households and those with two or more economic families.[14,15]

2.3 Methodology

We employ Statistics Canada LICOs as poverty lines because they are widely-used thresholds for the measurement of low income in Canada.[16] LICOs are incomes at which households spend 20 percentage points more than average on the necessities of food, clothing and shelter. They are given by household size and local area population (Statistics Canada 2013-b).[17]

We measure incidence of poverty as the proportion of families with income, after taxes and transfers, below the appropriate LICO. We also measure relative depth of poverty for families below the threshold. Relative depth is the average income shortfall expressed as a percentage of the poverty line.

We initially report incidence and depth of poverty in the North using LICOs for rural regions of Southern Canada, without adjusting for differences in cost of living. These

[12] For example, Teitelbaum and Beckley (2006) find that self-provisioning is common in rural regions of Canada; 82 percent of households participate in subsistence activities such as gardening, foraging and harvesting fuel wood. Moreover Wright Morton et al (2008) find that low-income rural households are more likely to participate in reciprocal non-market food exchanges (i.e. sharing) compared to those in urban centres. This is consistent with practices in Northern Canada. And, it is pertinent to the equivalence scale by way of spending on necessities.

[13] There are 35,012 households when limiting the sample to families with children (i.e. 2,760 households from the North plus 32,252 from Southern Canada).

[14] Part-year households consist of individuals who were members of other households during the sample period (Statistics Canada 2010-b). Our sample includes households in which at least one member is present throughout the reference year (i.e. full-year households). Results are not sensitive to the inclusion/exclusion of part-year households.

[15] An economic family is defined as two or more people living in the same dwelling who are related by blood, marriage, common-law or adoption (Statistics Canada n.d.-g). It includes co-resident, related census families as are common in the North (Statistics Canada 2012).

[16] For ease of exposition, we use poverty lines and LICOs interchangeably.

[17] LICOs are based on the 1992 Family Expenditures Survey and adjusted for inflation by Statistics Canada. They do not account for changes in average spending on necessities across time.

estimates are similarly reported for: 1) rural areas in the South; 2) urban areas in the South; and 3) all South using LICOs for the appropriate household size and local area population.[18]

Next, we adjust for higher cost living in Northern Canada by scaling LICOs for households in the region. We do so by estimating an equivalence scale, which indicates the relative income needed by a Northern household to be equally well-off as an otherwise similar household in the South. The approach is based on an Engel methodology of constructing equivalence scales to account for economies of scale in households of different sizes (Phipps and Garner 1994).[19] It relies on the assumption that two households are equally well-off if they devote the same share of income to necessities such as food, clothing and shelter.[20] Thus we estimate the following Engel curve using pooled data from the North and rural regions of Southern Canada:

$$\ln(Expenditure) = \alpha + \beta \ln(Income) + \delta North + \sum_{i=1}^{5} \gamma_i \, Household\ Size\ i + \sum_{j=1}^{7} \rho_j \, Cycle\ j + \varepsilon \qquad [2.1]$$

$Expenditure$ is household spending on food, clothing and shelter; this is the same definition of necessities employed by Statistics Canada for the estimation of LICOs. $Income$ is after taxes and transfers. $North$ is a dummy variable to indicate residence in the Territorial North. $Household\ Size$ is a set of five categorical variables to indicate household size; the base is a single person. $Cycle$ is a set of seven categorical variables for survey year; we use 1997 as the base. α, β, δ, γ_i for i = [1,5] and ρ_j for j = [1,7] are parameters to be estimated. ε is the error term.

Rearranging the predicted values yields an expression for log income share devoted to necessities (i.e. $Share$ equals $Expenditure$ divided by $Income$).

[18] We drop urban regions in Newfoundland and Manitoba from 1997 to 1999 because we do not observe size of the local area population; thus we cannot match these observations with the appropriate LICOs.
[19] We use the methodology of Phipps and Garner (1994) to construct the Northern equivalence scale; it is based on the approach used by Statistics Canada to estimate LICOs. This is relevant since we use the scale to adjust up LICOs for Northern households.
[20] We follow the approach of Phipps and Garner (1994) in defining food, clothing and shelter. Specifically, food excludes spending on alcoholic beverages and restaurants; it includes that purchased as part of day/overnight board. Clothing excludes laundry and dry cleaning services. Shelter includes payments for principal living accommodations (e.g. rent, mortgage payments), as well as water, fuel, electricity and communications.

$$\ln(Share) = \alpha + (\beta - 1)\ln(Income) + \delta North + \sum_{i=1}^{5} \gamma_i \, Household\ Size\ i + \sum_{j=1}^{7} \rho_j \, Cycle\ j \quad [2.2]$$

For a given household size and survey year, a family in Southern Canada with $Income_S$ will be equally well-off as a family in the North with $Income_N$ if:

$$\alpha + (\beta - 1)\ln(Income_S) + \gamma + \rho = \alpha + (\beta - 1)\ln(Income_N) + \delta + \gamma + \rho \quad [2.3]$$

Cancelling and rearranging terms gives the equivalence scale for a Northern versus Southern household of the same size in a particular survey year (i.e. relative income needed by a Northern household to spend the same share on necessities, and thus be equally well-off as an otherwise similar household in the South).

$$\frac{Income_N}{Income_S} = e^{\frac{\delta}{1-\beta}} \quad [2.4]$$

We multiply rural LICOs by this equivalence scale to construct poverty lines for Northern Canada. Then, we provide adjusted estimates of poverty incidence and depth for the North using the newly defined thresholds.

We also use the equivalence scale to adjust disposable incomes of families in the North so that purchasing power of a dollar is the same in Northern and Southern Canada.[21] Using these adjusted incomes, we examine inequality between and within regions.

Unlike other cost of living adjustments, the Northern equivalence scale is estimated using microdata. It is more representative of the North; recall the SHS covers 92 percent of the population (Statistics Canada 2010-b). And, it is based on actual spending. However, like other cost of living adjustments, we do not observe non-market procurement of necessities via traditional subsistence, sharing and public provision.

[21] For example, one dollar in Southern Canada has the same purchasing power as 1/1.46 = 0.68 cents in the North; therefore x dollars of $Income_S$ is equivalent to x/1.46 dollars of $Income_N$.

2.4 Findings

2.4.1 Descriptive Statistics

Table 2.1 describes incomes, expenditures and household size for the North compared to rural regions and all families in Southern Canada. Mean income, after taxes and transfers, is highest for families in the North. The standard deviation of income in the region is also greater compared to Southern Canada. Moreover expenditures on food, clothing and shelter are higher in the North such that the percentage of income spent on necessities is slightly larger, despite higher average disposable income (i.e. 47.8 percent versus 43.9 percent in the rural South). Finally, families are much larger in Northern Canada, with one third having four or more members versus one quarter of all families in the South.

2.4.2 Northern Equivalence Scale and Poverty Lines

Estimation of Equation 2.1 via Ordinary Least Squares (OLS) yields a coefficient of 0.183 for the Northern dummy variable (i.e. $\delta = 0.183$).[22] Moreover the point estimate for log income is 0.519 (i.e. $\beta = 0.519$). Using Equation 2.4, we find that a household in Northern Canada requires 1.46 times the income of a same-sized family in the rural South to attain an equivalent standard of living.[23] We estimate the standard error of the equivalence scale to be 0.02 using the procedure outlined in Appendix A.

It could be argued the equivalence scale is an upper bound estimate of relative income needs for Northern households. In a market context, they require 46 percent more income to purchase a similar material standard of living. However, many Northern households acquire necessities through other channels (e.g. traditional subsistence, sharing, public provision) and thus need less income per se. Alternatively, we propose the equivalence scale is an intermediary representation of relative income needs. In particular, subsistence activities require participation in formal markets and are costly (Chabot 2003). Also, for the purposes of estimating the equivalence scale, we compare households in the North to

[22] Coefficients for the estimated Engel curves are reported in Appendix Table A.1. Coefficients are precisely estimated (e.g. the t-statistic for the Northern dummy variable is 26.42).
[23] As a robustness check, we include interactions of the Northern dummy variable with categorical variables for household size; this provides equivalence scales for Northern and Southern households of different sizes relative to a single person in the South. Interactions are extremely small and/or statistically insignificant.

those in rural regions of Southern Canada; both partake in subsistence activities and sharing to some extent. Finally, our sample includes Aboriginal and non-Aboriginal families; the latter are less likely to acquire necessities from outside formal markets.

The size of the equivalence scale makes sense compared to basic calculations of North/South differences in cost of living that are reported in the literature. For example, Duhaime and Édouard (2012) use information from the Food Mail Program; they find that one dollar of expenditure in Southern Canada requires $1.66 in Inuit Nunangat.[24] Likewise, using LCDIs, we find that one dollar of expenditure in Southern Canada requires $1.54 in the North (National Joint Council 2007).

Table 2.2 presents a sample set of LICOs from 2009 including our Northern poverty lines, which we calculate by multiplying rural LICOs by a factor of 1.46. Given these estimates, poverty in the North will be understated using LICOs for a Southern region with a local area population of less than 30,000 residents (i.e. as suggested by the Yukon Department of Health and Social Services).

2.4.3 Poverty Estimates

Figures 2.1 to 2.4 depict incidence and depth of poverty, with and without the adjustment for higher cost of living in Northern Canada.[25] Clearly, the adjustment is extremely important to understanding how poverty in the North compares to elsewhere in Canada. Without the adjustment, incidence of poverty for all families in the North is only seven percent compared to 10.4 percent in the South. However, adjusting up LICOs with the equivalence scale, we find that incidence of poverty in Northern Canada is 18.1 percent; this is much higher than elsewhere in the country. Moreover incidence of poverty in the North is higher for families with children. Using our adjusted poverty lines, we find that 20.5 percent of Northern families with children are poor versus only 9.5 percent in the South.

[24] Inuit Nunangat is more isolated than other Northern regions; thus we expect larger differences in relative prices.
[25] Standard error bars represent uncertainty due to sampling, as well as that associated with estimating the Northern equivalence scale.

Our adjustments also yield substantial increases in the depth of poverty for Northern households compared to estimates using unscaled LICOs. For families with children, average shortfall in Northern Canada is 26 percent of the poverty line compared to 18.4 percent without the cost of living adjustment. This is higher than elsewhere in the country; for example, average shortfall in Southern Canada is 20.7 percent of the poverty line.[26]

2.4.4 Inequality Estimates

We characterize inequality between, within Northern and Southern Canada using disposable incomes with adjustments for household size and higher cost of living in the North.[27] We first consider inequality between regions by examining the Canadian income distribution as a whole. Tables 2.3A, 2.3B, 2.4A and 2.4B show how Northern and Southern households are represented within and across income deciles.[28] In particular, Tables 2.3A and 2.4A describe the composition of each income decile (i.e. percentage of observations from Northern and Southern Canada). Northern households are disproportionately represented at the bottom of the Canadian income distribution. For example, Northern families with children represent 1.1 percent of the bottom decile, but only a fraction of that in each of the other groups (e.g. they represent 0.1 percent of the top decile). Similarly Table 2.4B shows that, while approximately ten percent of the Southern population is represented in each income decile, 31.1 percent of Northern families with children are at the bottom of the distribution. And, only three percent of have incomes that would place them among the richest ten percent of Canadians. A similar pattern exists for the full sample of families, as given in Table 2.3B.

[26] As a robustness check, we evaluate poverty using Low Income Measures (i.e. 50 percent of median income with adjustments for household size and higher cost of living in the North as described below). Estimates are generally larger, especially in the North and rural regions of Southern Canada; however the overall narrative is unchanged. Incidence and depth of poverty are much higher in Northern Canada. And, the cost of living adjustment is very important to such North/South comparisons.

[27] We use the widely accepted 'Luxembourg Income Study' equivalence scale to adjust for economies of scale in household consumption (i.e. we divide incomes by the square root of family size). Moreover we use the Northern equivalence scale to adjust for differences in cost of living (i.e. we divide Northern incomes by 1.46).

[28] Deciles divide the income distribution into ten equally sized groups. For example, in Tables 2.4A and 2.4B, P(10) = 12,872 implies that ten percent of families with children have incomes below this threshold; 20 percent have incomes below P(20) = 16,828 and so on.

Inequality between regions is also shown in Figures 2.5 and 2.6, which are kernel density plots of income for families in Northern and Southern Canada. The Northern distributions are shifted leftward, indicating a poorer material situation. Moreover the relative shapes indicate slightly more equality in the South. We investigate further using Tables 2.3C and 2.4C, which provide summary measures of inequality within Northern and Southern Canada. As shown in Table 2.4C, the 90/10 ratio for the North is approximately 4.8. Thus, the poorest of the richest ten percent of families with children earn almost five times the richest of the poorest ten percent. Income inequality is greater in the North, relative to a 90/10 ratio of 3.6 for Southern Canada. Comparing 90/50 and 50/10 ratios for the North, we find it is largely driven by inequality at the bottom end of the distribution. Similarly Gini coefficients, derived from Lorenz curves in Figures 2.7 and 2.8, measure the extent to which income distributions diverge from perfect equality. They indicate that income distributions are more equal in Southern Canada compared to the North, except perhaps at the ends of the cumulative distributions. This is confirmed by Theil indices, which further suggest the majority of income inequality occurs within Northern and Southern Canada, as opposed to between regions. Finally, Theil indices indicate the income distribution among families with children is slightly more equal than that of the full sample, except between regions.

2.5 Conclusions

In this chapter, we extend the Engel methodology underlying Statistics Canada LICOs (i.e. the most frequently used thresholds for the measurement of low income in Canada) to estimate the difference in income needed for otherwise similar households in Northern Canada to devote the same share to necessities, and thus be equally well-off. This was not previously possible; for reasons of cost, most Canadian microdata have historically excluded the North, making it impossible to compare poverty and inequality in Northern versus Southern Canada. Focusing on children, we use the SHS to provide the first direct estimates of relative poverty in the Territorial North compared to elsewhere in Canada. We also examine inequality between and within regions.

Our estimates suggest that poverty lines for Northern households should be 1.46 times higher to account for differences in cost of living; this adjustment is extremely important

to our understanding of poverty and inequality in Northern Canada (e.g. incidence of child poverty in the North increases from 7.7 to 20.5 percent with the adjustment). We find that incidence of poverty is about 75 percent higher in the North compared to Southern Canada; for families with children, incidence is more than twice as large in the North. This is particularly important given that Northern Canada has a very young population. Our findings also indicate more inequality within the North compared to Southern Canada, largely driven by incomes at the bottom of the distribution. Finally, while approximately ten percent of the Southern population is represented in each income decile, 31.1 percent of Northern families with children have incomes in the bottom ten percent. And, only three percent have incomes that would place them among the richest ten percent of Canadians.

2.5.1 Limitations

A number of caveats should be noted. First, we cannot examine finer levels of geography in Northern Canada due to data constraints; yet there is stark variation in cost of living, poverty and inequality. For example, based on LCDIs, prices are 15 to 84 percent higher in Northern versus Southern Canada (National Joint Council 2007).[29] Likewise we cannot distinguish between Aboriginal and non-Aboriginal families. Another limitation is that LICOs are derived from spending on necessities by households in the South, which likely differs from that of Northern residents (e.g. traditional subsistence, sharing, public provision). Also, without longitudinal data, we cannot examine poverty chronicity or dynamics in the North. Likewise we recognize that survey data may exclude individuals who are most susceptible to poverty, such as those not part of a household. Consequently, our findings may overstate material well-being in Northern Canada given the extent of 'hidden homelessness'.[30] Finally, we measure poverty at the household-level. This recognizes sharing of resources; however we do not observe intra-household distributions. Therefore, we cannot infer how higher incidence and depth of poverty in Northern Canada affect the lives of children (e.g. parents may shelter their children from

[29] The lower bound pertains to Whitehorse and Carcross in Yukon, as well as Yellowknife in Northwest Territories. The upper bound pertains to Kugaruuk in Nunavut.
[30] For example, the Nunavut Housing Corporation (2012) reports that four percent of the population are without their own homes, living semi-permanently with family and friends.

a poor material situation). This would require a more extensive set of child well-being indicators as in Burton et al (2015).

Despite these limitations, we provide the first direct estimates of child poverty and inequality in Northern versus Southern Canada, accounting for differences in cost of living. This is important for understanding income inequality in Canada as a whole; existing evidence generally excludes the North. And, our equivalence scale can be used in future studies, spanning multiple contexts, to adjust incomes of Northern residents. This is relevant as the North is increasingly included in Canadian microdata.

2.5.2 Directions for Future Research

We could better inform material well-being in Northern Canada with improvements to data. Specifically, it would be useful to construct equivalence scales, as well as to measure poverty and inequality at finer levels of geography in the North. Likewise there is need for information about non-market procurement of necessities via traditional subsistence, sharing and public provision.

Also in future work, it is important to examine the role of policy in reducing income inequality in Canada, especially North/South disparities. For example, should child benefits be higher for Northern families? Moreover data pertain to a period during which the Food Mail Program was operational in many parts of the North. How effective was it in equalizing cost of living among Canadians? Despite subsidies, necessities cost 46 percent more in the North. This is a staggering number with major implications for child poverty and inequality.

Table 2.1
Variable Means, All Families

	North	Rural South	All South
Income - Dollars	55,505 (541.9)	41,159 (287.5)	46,817 (151.3)
Standard Deviation of Income - Dollars	35,474	24,867	31,062
Food, Clothing and Shelter - Dollars	23,158 (189.5)	16,041 (99.1)	19,366 (51.0)
Food - Dollars	7,358 (72.5)	5,018 (31.2)	5,083 (14.3)
Clothing - Dollars	2,635 (39.0)	1,957 (21.9)	2,321 (12.5)
Shelter - Dollars	13,166 (138.8)	9,066 (74.0)	11,962 (37.5)
Income Spent on Necessities - Percent	47.8 (0.3)	43.9 (0.2)	47.5 (0.1)
Household Size of One - Percent	25.0 (0.6)	20.6 (0.4)	25.7 (0.2)
Household Size of Two - Percent	27.1 (0.7)	38.1 (0.5)	32.5 (0.2)
Household Size of Three - Percent	13.4 (0.5)	14.5 (0.4)	14.5 (0.2)
Household Size of Four - Percent	16.5 (0.5)	16.5 (0.4)	16.9 (0.2)
Household Size of Five - Percent	9.9 (0.5)	7.2 (0.3)	7.2 (0.1)
Household Size of Six or More - Percent	8.3 (0.4)	3.2 (0.2)	3.1 (0.1)
Number of Observations	5,608	23,502	95,774

Standard errors are reported in parentheses. Dollar values are not adjusted for higher cost of living in Northern Canada.

Table 2.2
Sample Set of LICOs from 2009

Household Size	Rural South	North	Urban South < 100,000	Urban South ≥100,000
One	12,050	17,619	14,588	17,000
Two	14,666	21,444	17,755	20,690
Three	18,263	26,703	22,108	25,764
Four	22,783	33,312	27,582	32,142
Five	25,944	37,934	31,408	36,601
Six or More	30,188	44,139	36,545	42,586

Table 2.3A
Distribution within Income Deciles, All Families

	P(10) 12,857	P(20) 16,211	P(30) 19,340	P(40) 22,685	P(50) 26,095	P(60) 29,929	P(70) 34,538	P(80) 40,475	P(90) 50,752	Top Ten Percent
North	0.0067	0.0023	0.0022	0.0022	0.0020	0.0022	0.0021	0.0020	0.0020	0.0012
South	0.9933	0.9977	0.9978	0.9978	0.9980	0.9978	0.9979	0.9980	0.9980	0.9988

Table 2.3B
Distribution across Income Deciles, All Families

	P(10) 12,857	P(20) 16,211	P(30) 19,340	P(40) 22,685	P(50) 26,095	P(60) 29,929	P(70) 34,538	P(80) 40,475	P(90) 50,752	Top Ten Percent
North	0.2863	0.0906	0.0883	0.0879	0.0817	0.0898	0.0841	0.0792	0.0803	0.0497
South	0.0996	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1001	0.1001

Table 2.3C
Summary Measures of Inequality, All Families

	P90/P10	P90/P50	P50/P10	Gini	Theil
North	5.4366	2.0476	2.6551	0.3325	0.1776
South	3.9425	1.9451	2.0269	0.2985	0.1498
Canada	3.9470	1.9450	2.0284	0.2986	0.1499

Within	0.1498
Between	0.0001

Disposable incomes of Northern households have been adjusted to account for lower purchasing power per dollar. We also adjust for household size.

Table 2.4A
Distribution within Income Deciles, Families with Children

	P(10) 12,872	P(20) 16,828	P(30) 19,851	P(40) 22,790	P(50) 25,736	P(60) 28,915	P(70) 32,716	P(80) 37,799	P(90) 46,338	Top Ten Percent
North	0.0106	0.0041	0.0035	0.0032	0.0029	0.0025	0.0025	0.0020	0.0018	0.0010
South	0.9894	0.9959	0.9965	0.9968	0.9971	0.9975	0.9975	0.9980	0.9982	0.9990

Table 2.4B
Distribution across Income Deciles, Families with Children

	P(10) 12,872	P(20) 16,828	P(30) 19,851	P(40) 22,790	P(50) 25,736	P(60) 28,915	P(70) 32,716	P(80) 37,799	P(90) 46,338	Top Ten Percent
North	0.3111	0.1211	0.1027	0.0948	0.0834	0.0720	0.0735	0.0583	0.0530	0.0301
South	0.0993	0.0999	0.1000	0.1000	0.1001	0.1001	0.1001	0.1001	0.1002	0.1002

Table 2.4C
Summary Measures of Inequality, Families with Children

	P90/P10	P90/P50	P50/P10	Gini	Theil
North	4.8271	1.9266	2.5054	0.3102	0.1533
South	3.5893	1.8001	1.9939	0.2734	0.1257
Canada	3.6000	1.8000	2.0000	0.2737	0.1260

Within 0.1258
Between 0.0002

Disposable incomes of Northern households have been adjusted to account for lower purchasing power per dollar. We also adjust for household size.

Figure 2.1
Incidence of Poverty (Percent), All Families

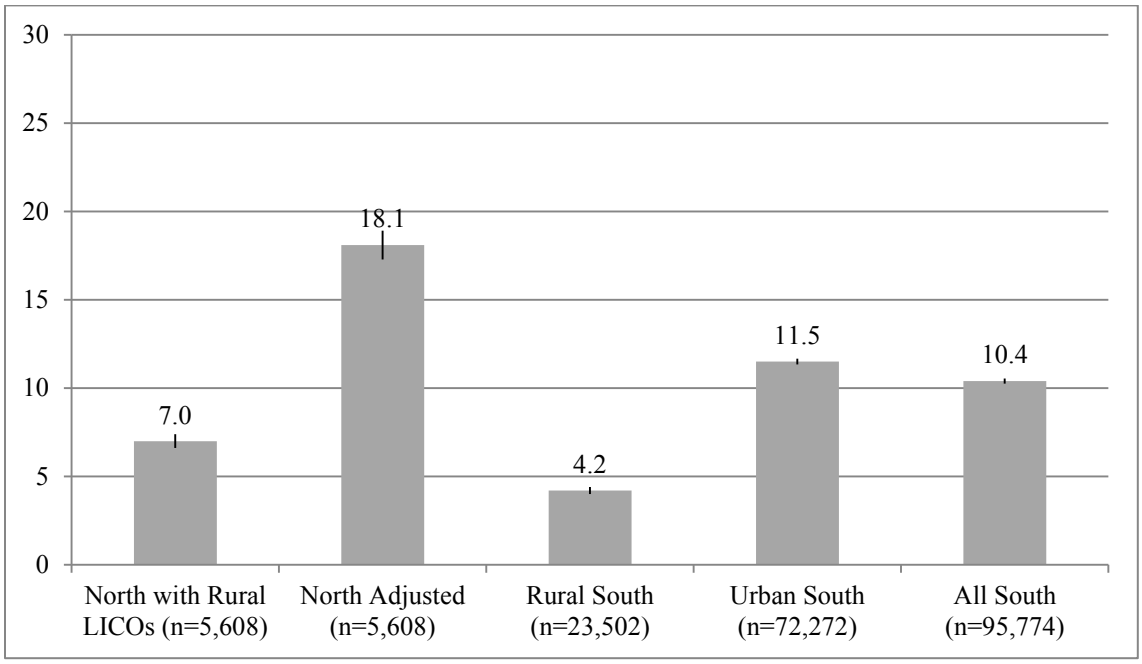


Figure 2.2
Depth of Poverty (Percent), All Families

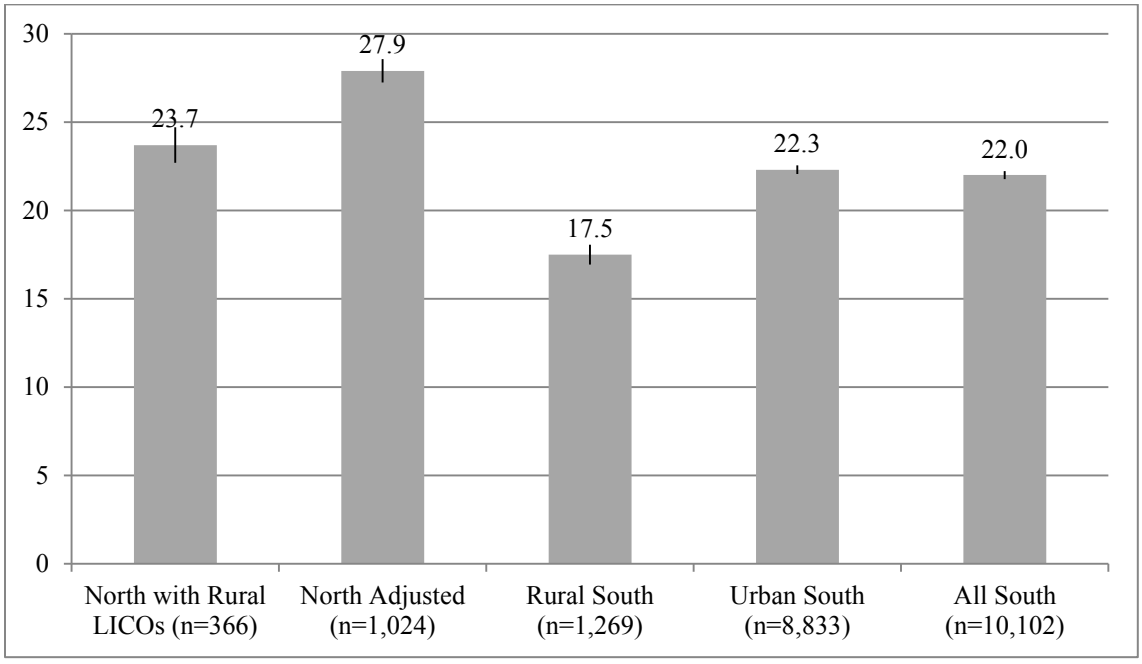


Figure 2.3
Incidence of Poverty (Percent), Families with Children

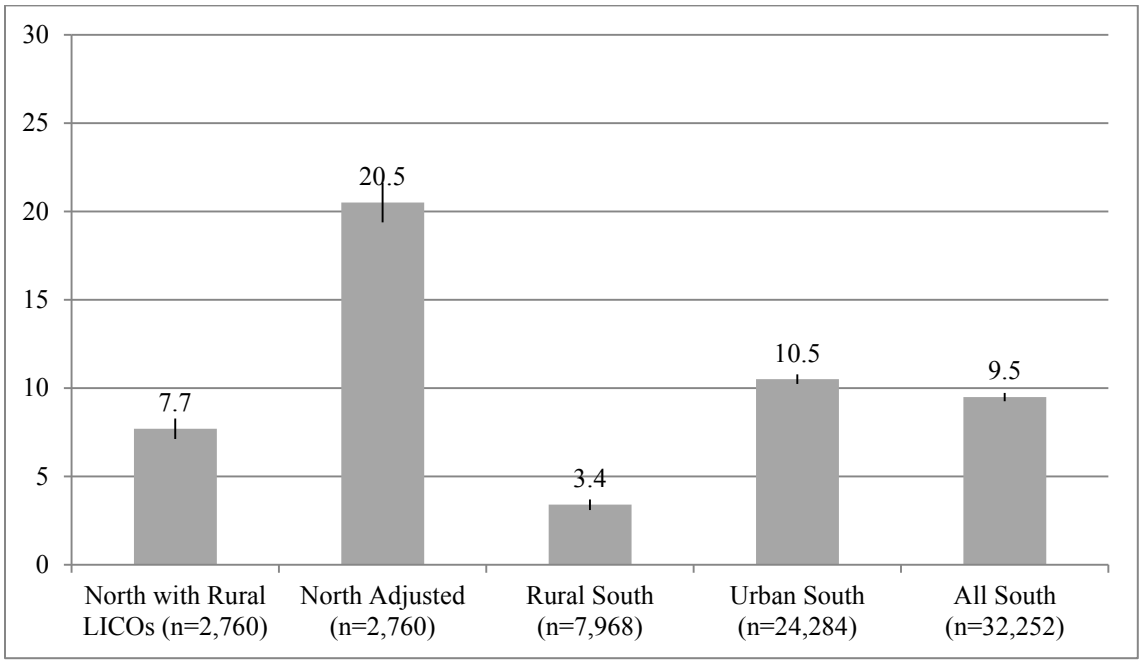


Figure 2.4
Depth of Poverty (Percent), Families with Children

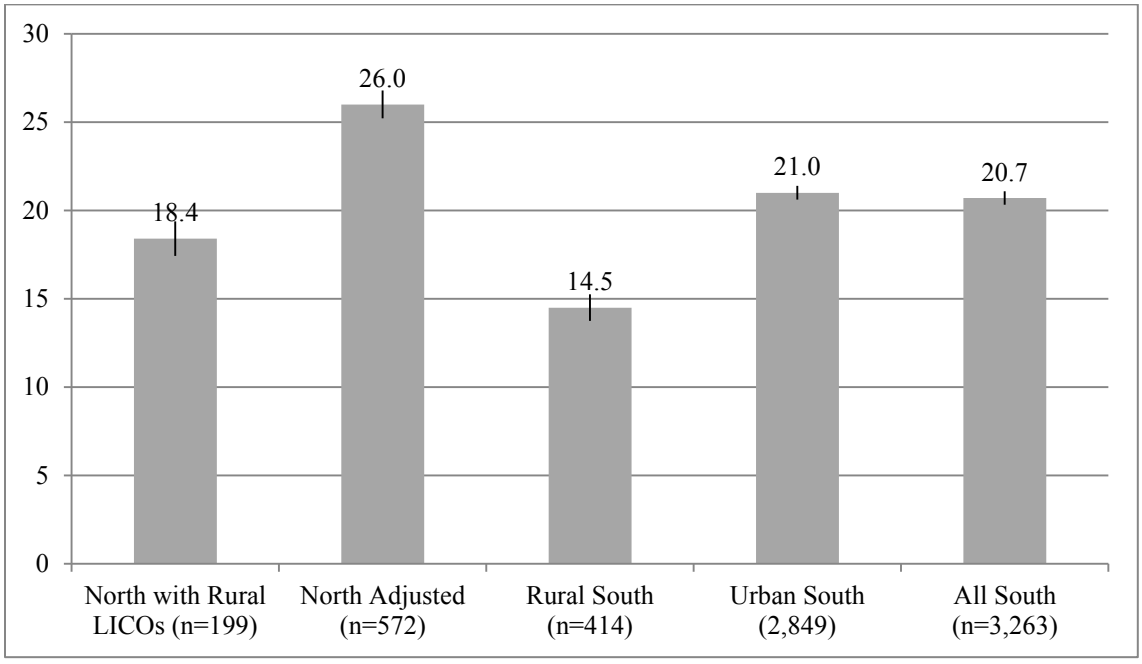


Figure 2.5
Kernel Density Plot of Income, All Families
Adjustments for Household Size and Higher Cost of Living in Northern Canada

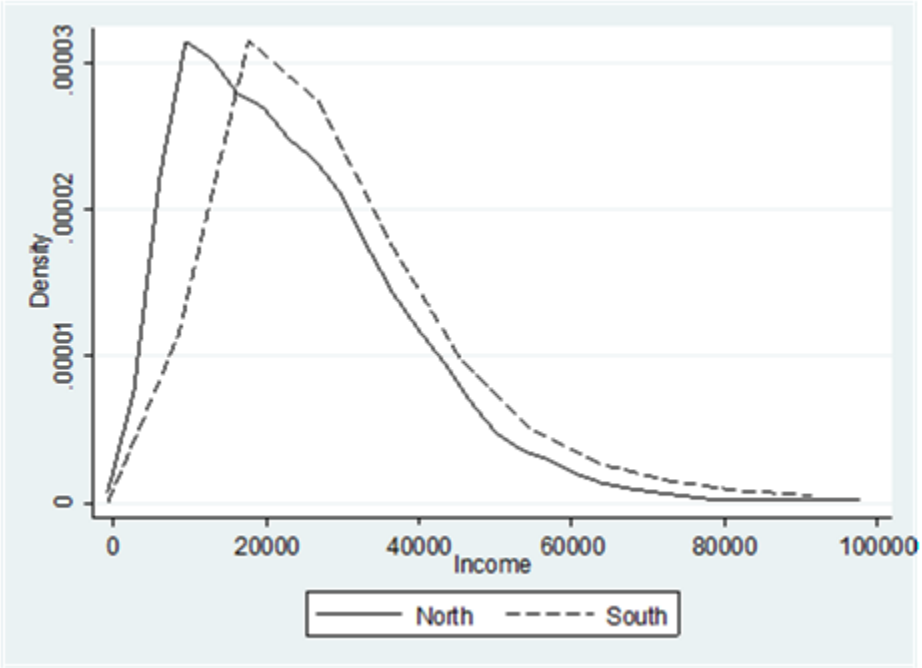


Figure 2.6
Kernel Density Plot of Income, Families with Children.
Adjustments for Household Size and Higher Cost of Living in Northern Canada

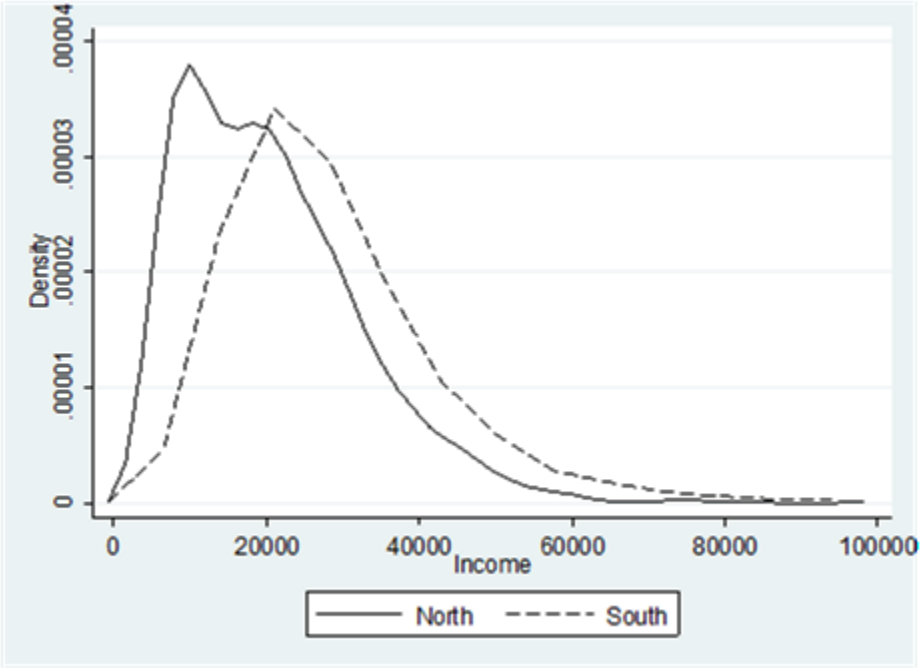


Figure 2.7
Lorenz Curves, All Families
Adjustments for Household Size and Higher Cost of Living in Northern Canada

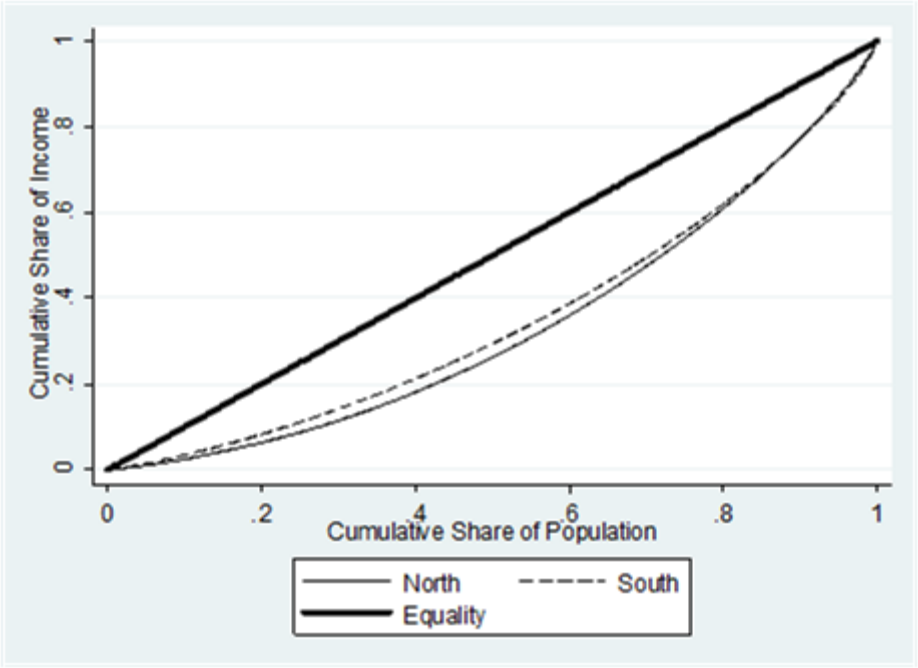
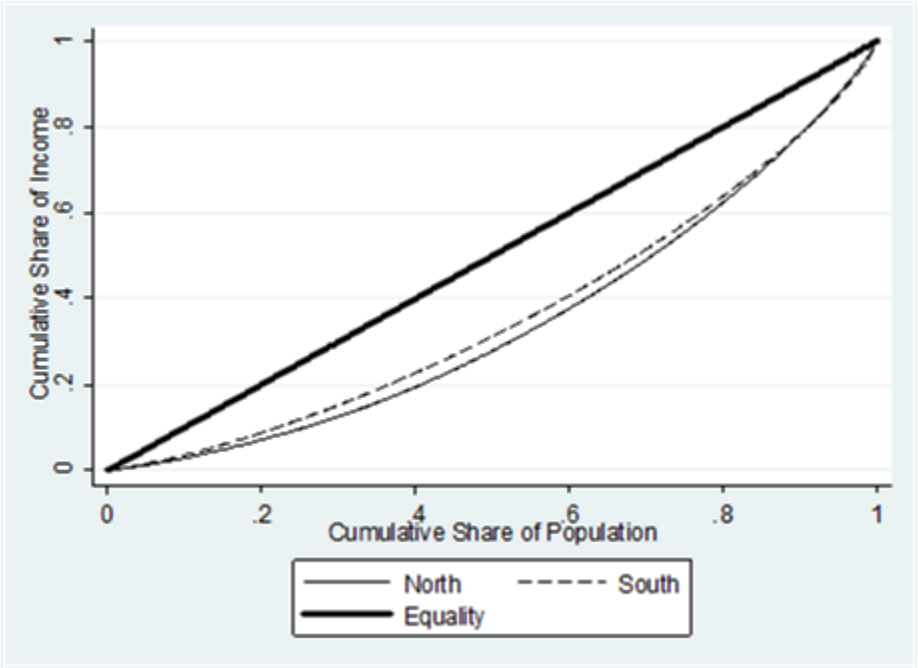


Figure 2.8
Lorenz Curves, Families with Children
Adjustments for Household Size and Higher Cost of Living in Northern Canada



Chapter 3

Income and the Mental Health of Canadian Mothers: Evidence from the Universal Child Care Benefit

3.1 Introduction

The UCCB, introduced in 2006, is an income transfer for Canadian families with young children. I use this policy change to estimate the relationship between income and maternal health, which is otherwise endogenous. This is important because past studies pertain to the United States where the policy context is very different (e.g. Evans and Garthwaite 2014). To my knowledge, there is only one Canadian study on this issue, but it emphasizes children with limited attention to mothers (Milligan and Stabile 2011). In this chapter, I examine the relationship between income and maternal health in a Canadian context. I focus on mental health, in addition to corroborating measures (i.e. stress, life satisfaction). Moreover I make the important distinction between lone and married mothers because they face very different constraints on time and financial resources.

In the rest of this section, I provide background information on the relationship between income and health, the UCCB and maternal well-being. I subsequently describe the data, descriptive statistics and TD methodology. This is followed by the regression analysis and arguments for plausibility of the model. Finally, I present a number of robustness checks, extensions and conclusions.

3.1.1 Income and Health

There is a well-established literature on the relationship between income and health among adults.[31] Conceptually, health status can be defined by a production function. Income reflects access to inputs including those related to lifestyle, environment and medical care (Folland et al 2009). Likewise Grossman (1972) postulates a model in which individuals are endowed with a depreciating health stock. It can be improved by

[31] There is also evidence that health is a mechanism for the inter-generational transmission of socio-economic status. Specifically, low parental socio-economic status impairs child health, which manifests in later-life education and earnings. Refer to Currie (2009) for a review of the literature.

engaging in health production or purchasing medical care. Individuals implicitly choose the duration of their lifespan through such investments, which are facilitated by socio-economic status.

Empirically, the relationship between income and health is endogenous due to reverse causation and omitted variables. For example, poor health may impede labour productivity and thus income, while individuals with low socio-economic status may have limited access to health-enabling resources (e.g. medical care, nutritious food). Likewise underlying factors, such as family background and time preference, may influence both income and health.

To address endogeneity, Ettner (1996) uses instrumental variables including the unemployment rate and parental education. She finds that income has a positive effect on self-assessed health and depression. However, instruments may affect well-being in ways that are unrelated to income (e.g. refer to Ruhm (2008) for a review of the literature on macroeconomic conditions and health).

Other studies exploit shocks to individual wealth via lottery winnings and inheritances. For example, Gardner and Oswald (2007) estimate the effect of lottery winnings on mental health in the United Kingdom. They find a positive relationship that is lagged by two years. Moreover Meer et al (2003) find a small, positive relationship between income and self-assessed health using inheritances, which may be correlated with unobserved factors that affect well-being (e.g. an affluent family background may be associated with better health and receipt of a bequest).

Another approach, which is the basis for this study, is to use policy reform to attain exogenous variation in income. For instance, Case (2004) finds that a large, unanticipated increase in old age pension for Black and Coloured South Africans protects the health of recipients and other household members. However, it is unclear whether this finding is generalizable to younger adults in developed countries. Similarly, Frijters et al (2005) use an exogenous increase in income for East Germans after re-unification. They find a small, positive relationship between income and health. Frijters et al (2004) find large improvements in life satisfaction using the same methodology.

Finally, there is evidence that child-related transfers improve maternal health. For example, Milligan and Stabile (2011) exploit variation in the Canada Child Tax Benefit and National Child Benefit Supplement across provinces, time and number of children. They find that increased child benefits reduce maternal depression. Likewise Evans and Garthwaite (2014) consider the effect of an expanded Earned Income Tax Credit in the United States; families with two or more children were given a much larger refundable tax credit than those with one child. They find a significant reduction in the number of bad mental health days, as well as a higher probability of very good/excellent health among mothers without post-secondary education.

3.1.2 Universal Child Care Benefit

In this chapter, I examine the relationship between income and maternal health using the UCCB as a plausibly exogenous increase in income for mothers with children younger than six (i.e. treatment group). Those with children aged six to 11 do not receive the transfer. They are the control group.

Introduced in 2006, the UCCB is an income transfer for Canadian families with young children. It is intended to encourage work-life balance "by supporting their child care choices through direct financial support" (Canada Revenue Agency n.d.).[32] Families that receive the Canada Child Tax Benefit are automatically enrolled in the UCCB. Otherwise parents apply to the Canada Revenue Agency.[33] They receive benefits within 80 calendar days and are entitled to retroactive payments for up to 11 months. The Treasury Board of Canada Secretariat (2009) reports that 99 percent of eligible families receive the UCCB.

The UCCB pays $100 per month, or $1,200 annually, for each child under the age of six.[34] This is a sizeable transfer, especially for those at the bottom of the income distribution.[35] For instance, the before-tax LICO for a family of three in a small urban

[32] The UCCB was initially called the Choice in Child Care Allowance.
[33] Some provinces/territories have recently implemented the Automated Benefits Application. Under this system, information is transmitted from vital records to the Canada Revenue Agency in application for child benefits. This occurs upon registration of a birth with parental consent.
[34] As of January 2015, the UCCB pays $160 per month, or $1,920 annually, for each child under the age of six. Families also receive $60 per month, or $720 annually, for each child aged six to 17. However, the UCCB will be replaced by a new child benefit program as of July 2016.
[35] However, I argue the UCCB is too small to induce changes in fertility. Refer to Section 3.6.

area was $25,409 in 2006 (Statistics Canada 2013-b). The UCCB represents a 4.7 percent increase in income for such a family, assuming one child under the age of six. Moreover income-tested benefits, such as the Canada Child Tax Benefit and social assistance, are not affected by the UCCB. However, pre-tax gains are effectively smaller for low- and modest-income families because the Young Child Supplement was eliminated upon introduction of the UCCB (Battle 2008; Battle et al 2006).[36]

The UCCB is taxed progressively such that net benefits fall as household income rises (Battle 2008). However, net benefits vary by family type for a given level of income, except below the taxpaying threshold. They are generally smaller for lone parents and dual-earner families compared to those with one earner.[37,38] For example, Battle et al (2006) calculate net benefits for Ontario families with a household income of $50,000. Net benefits for lone parents and dual-earner families are $826 and $935, respectively; while those with one earner receive $987. Likewise Battle (2008) calculates net benefits for Manitoba families at various income levels. At $10,000, all families receive the full amount of the UCCB. At $20,000, two-parent families keep the full amount, while lone parents receive only $1,057. At higher income levels, net benefits are smallest for lone parents and dual-earner families.

The UCCB represents 4.5 percent of federal payments to individuals, making it one of the largest transfer programs in Canada (Schirle 2015). Despite an annual cost of $2.5 billion, Friendly (2013) argues the UCCB has failed to support the child care choices of Canadian families. This is evidenced by negligible improvements in access to child care. And, programs remain mediocre rather than high quality. Likewise the UCCB offsets only a

[36] The Young Child Supplement, worth $249 annually as of July 2006, was paid to families that did not claim the Child Care Expense Deduction. This largely consisted of low- and modest-income families. Those with higher incomes typically claimed the Child Care Expense Deduction because it was worth more in tax savings.
[37] For tax purposes, the UCCB is claimed by lone parents or lower-earning spouses. However, as of July 2011, lone parents may include it in: (1) their own income; (2) the income of a dependant for whom an Eligible Dependant Credit is claimed; or (3) the income of a child for whom the UCCB is paid.
[38] Net benefits also vary by province/territory because of differences in taxation.

fraction of annual child care costs.[39] In fact, the UCCB is not limited to child care. Parents may spend it as they see fit.

Kooreman (2000) finds that parents treat child benefits differently than other income sources. He concludes they experience a 'moral obligation' to spend a relatively large share on child-related goods. In contrast, Blow et al (2012) find that, in the United Kingdom, an unanticipated increase in child benefits leads parents to spend more on themselves.

Of course, in two-parent families, this depends on who receives the transfer. Mothers tend to manage household spending on goods that benefit children, such as food and clothing (Woolley 2004). Thus, issuing the transfer to mothers may facilitate the purchase of these items. Similarly, in the United Kingdom, paying benefits to mothers is associated with higher spending on clothing for women and children (Lundberg et al 1997). Finally, Schirle (2015) finds that married mothers use the UCCB to purchase time away from the labour market. This may reflect an increase in household production, though it is unclear how mothers actually spend the time.

3.1.3 Maternal Well-Being

Child-related transfers affect the well-being of parents by facilitating their own needs, as well as those of their children. This is particularly true for mothers because they are primarily responsible for child rearing, often with limited resources. As mentioned, they tend to manage household spending on goods that benefit children. And, despite increased labour market participation, women dedicate more time to household production, especially in the presence of children (Marshall 2006).

Of course, lone and married mothers face very different constraints on time and financial resources. For example, married mothers tend to have higher household income and more flexibility in allocating non-market time to household production and leisure. Indeed, Burton and Phipps (2007) find that lone mothers are particularly vulnerable to time shortages, in addition to low income. Likewise they are more susceptible to economic

[39] Outside of Quebec, annual fees for full-time regulated care range from $5,000 to $12,000 depending on the child's age (Battle 2008).

insecurity, defined as "anxiety produced by a lack of economic safety – i.e. by an inability to obtain protection against subjectively significant potential economic losses" (Osberg 2009, page v).

In short, parents "need both income and some time for self to preserve quality of life and personal health" (Burton and Phipps 2007, page 481). By expanding the budget set, a positive income shock facilitates the purchase of necessities and other health-enabling resources. It also provides protection against potential economic losses. So, how does it affect maternal health? Specifically:

(1) Is there a relationship between income and mental health among Canadian mothers?
(2) Is it corroborated by other measures of well-being (i.e. stress, life satisfaction)?
(3) Is the effect different for lone mothers compared to those in two-parent families? [40]

It is important to address these issues because past studies pertain to the United States where the policy context is very different (e.g. Evans and Garthwaite 2014). Moreover Milligan and Stabile (2011) emphasize Canadian children with cursory attention to mothers. That is, they do not include corroborating measures of maternal well-being, nor do they distinguish between lone and married mothers.

In this chapter, I answer the preceding questions, and thus make causal inferences in the relationship between income and maternal health, using a TD model. The UCCB is appropriate for this purpose because it is paid to mothers by default and represents an exogenous increase in income for those with young children. The UCCB may be paid to fathers with written consent. For lone parents, benefits are paid to the primary care giver; however those with shared custody may split the UCCB as of July 2011.

3.2 Data

I use cross-sectional microdata from the CCHS, which includes private households in all provinces/territories except full-time members of the military, institutional residents, those on Crown land and First Nations reserves. The CCHS also excludes very remote

[40] Recall that lone mothers typically receive lower net benefits compared to those in two-parent families, all else constant. At the same time, they are particularly vulnerable to time shortages, low income and economic insecurity.

regions such as those outside the ten largest communities in Nunavut. Nevertheless it covers approximately 98 percent of the Canadian population aged 12 and older (Statistics Canada 2005). And, response rates are close to 80 percent in each of the four cycles used in this chapter.[41]

The CCHS was conducted every two years over the period 2001 to 2007 and annually thereafter. I pool four cross-sections of the CCHS master files: Cycles 2.1 (2003); 3.1 (2005); 4.1 (2007); and 2008. These cycles include the periods before and after implementation of the UCCB. And, pertinent variables are available and consistently defined over this interval. I scale sampling weights to sum to one within each cycle since they are representative of the same population and sample size varies across cycles.

My sample includes Canadian mothers aged 18 to 59.[42] I focus on those with children younger than 12 to facilitate comparisons between treatment and control groups. Mothers with children younger than six are treated to the income transfer as of 2006.[43] The control group includes those with children aged six to 11.[44]

I drop proxy interviews (i.e. approximately 300 observations) given the subjective nature of the dependent variables.[45] The main dependent variable is self-assessed mental health. It is rated on a five-point scale, ranging from 'poor' to 'excellent'. As corroborating

[41] Response rates in Cycles 2.1 (2003), 3.1 (2005), 4.1 (2007) and 2008 are 80.7, 78.9, 77.6 and 75.2 percent, respectively (Statistics Canada 2005; Statistics Canada 2006; Statistics Canada 2008-b; Statistics Canada 2009).

[42] Results are robust to various age ranges (e.g. 18 to 44, 18 to 49, 25 to 49, unrestricted). Milan (2013) reports that fertility among women younger than 30 has been declining since 1960. On the other hand, it has been increasing among those aged 30 to 44 since 1975. There has been a corresponding increase in the average age of mothers at their first childbirth, which was 28 years in 2005.

[43] I do not observe whether mothers actually receive the UCCB. Rather, I identify the treatment group based on eligibility (i.e. the presence of a child younger than six as of 2006). Schirle (2015) uses the Survey of Labour and Income Dynamics to quantify errors in defining the treatment group based on this criterion (e.g. eligibility is falsely identified when a woman indicates the presence of a young child for whom she does not have primary custody). Schirle (2015) finds that errors randomly occur in 2.5 percent of two-parent families. And, they are not more frequent among those headed by separated or divorced individuals.

[44] This seems to be a more meaningful comparison than with much older children. Indeed, Tables 3.1A and 3.1B indicate that treatment and control groups are comparable for lone and married mothers. For instance, the proportion of lone mothers with high school education is similar across groups. The same is true for rural/urban status. Likewise the proportion of married mothers who identify as Aboriginal is similar across groups, as is the proportion with less than high school education. And, while there are several statistically significant differences across groups, most are relatively small. Not surprisingly, mothers with children aged six to 11 are much older than the treatment group.

[45] A proxy interview is completed by a household member on behalf of the respondent if she is unable to participate due to poor physical or mental health.

evidence, I also consider stress and life satisfaction. In the CCHS, individuals report being 'not at all', 'not very', 'a bit', 'quite a bit' or 'extremely' stressed on a daily basis. And, life satisfaction is inferred from the question 'How satisfied are you with your life in general?' Responses are given on a five-point scale, ranging from 'very dissatisfied' to 'very satisfied'.

3.3 Descriptive Statistics

As shown in Tables 3.1A and 3.1B, the estimating sample includes 26,886 mothers, 6,273 of whom are lone parents. A relatively large proportion of lone mothers are Aboriginal (i.e. 6.9 percent compared to 2.1 percent of those who are married). And, lone mothers have lower socio-economic status. For example, 14.4 percent have less than high school education, compared to only 6.2 percent of married mothers. Likewise average household income is much lower among lone mothers (i.e. $17,886 versus $38,614 among those in two-parent families).[46] Finally, relatively large proportions of married mothers are immigrants (i.e. 21.5 percent) and rural residents (i.e. 19.4 percent).

3.3.1 Distributions of Well-Being Indicators

Figures 3.1A to 3.3D depict distributions of well-being indicators before and after the policy change. They are given for treatment and control groups, separately for lone and married mothers. I aggregate the bottom categories of mental health and life satisfaction due to small proportions of married mothers (i.e. to maintain confidentiality of respondents).

Figures 3.1A and 3.1B indicate that lone mothers have marginally better mental health in the post-policy period. This is true for treatment and control groups. Moreover, as shown in Figure 3.1C, there are improvements in mental health among married mothers who receive the income transfer. Specifically, a larger proportion report 'excellent' mental health (i.e. 43.4 percent compared to 39.1 percent in the pre-policy period). The improvement comes at the expense of 'very good' health since there is little change at the

[46] Income is before taxes and after transfers. As described below, I make adjustments for inflation, economies of scale in consumption and higher cost of living in Northern Canada.

bottom of the scale. At the same time, mental health declines among married mothers in the control group (i.e. Figure 3.1D).

Figure 3.2A indicates that lone mothers are markedly less stressed after receiving the transfer. For example, only 24.4 percent report 'quite a bit' of stress compared to 30.1 percent in the pre-policy period. At the same time, stress worsens among lone mothers in the control group (i.e. Figure 3.2B). Moreover, as shown in Figures 3.2C and 3.2D, there are negligible changes in stress among married mothers. This is true for treatment and control groups.

Figures 3.3A and 3.3B indicate that lone mothers have better life satisfaction in the post-policy period. This is true for treatment and control groups. Moreover, as shown in Figure 3.3C, there are improvements in life satisfaction among married mothers who receive the income transfer. Specifically, a larger proportion report being 'very satisfied' with life (i.e. 51.2 percent compared to 47.3 percent in the pre-policy period). The improvement comes at the expense of being 'satisfied' with life since there is little change at the bottom of the scale. The opposite is true for the control group (i.e. Figure 3.3D).

3.4 Methodology

In what follows, I estimate whether improvements in well-being among mothers with children younger than six are caused by the income transfer. I do so using a TD model as outlined in Equation 3.1.[47] Mothers with children younger than six are treated to the income transfer as of 2006. The control group includes those with children aged six to 11.

The model allows for different effects by family type. Recall that net benefits are generally smaller for lone mothers, all else constant.[48] At the same time, they have higher marginal utility of income. As described above, average household income among lone mothers is $17,886 compared to $38,614 among those in two-parent families.

[47] I use the following to characterize the TD model: Angrist and Pischke (2009); Blundell and Costa Dias (2000); Imbens and Wooldridge (2009).
[48] I cannot differentiate between dual-earner families and those with one earner.

$$Y_i = \beta_1 Lone_i + \beta_2 Young_i + \beta_3(Lone_i \times Young_i) + \beta_4 Post_i + \beta_5(Lone_i \times Post_i)$$
$$+\beta_6(Young_i \times Post_i) + \beta_7(Lone_i \times Young_i \times Post_i) + \alpha X_i + \varepsilon_i \qquad [3.1]$$

i indexes individuals. Y_i represents self-assessed mental health, as well as stress and life satisfaction, respectively. $Young_i$ denotes the presence of a child younger than six, which implies eligibility for the income transfer. $Post_i$ is a dummy variable to indicate the post-policy period of 2007 and 2008. The coefficient on the interaction of $Young_i$ and $Post_i$ is the difference-in-differences (DD) estimator. It is the average causal effect of the income transfer on mental health among married mothers.[49] I also include $Lone_i$ and related interactions such that β_7 is the additional effect for lone mothers compared to those in two-parent families (i.e. the TD estimator). Thus, the average causal effect of the transfer on mental health among lone mothers is β_6 plus β_7.

Further to the main variables, X_i is a vector of covariates. It includes a constant, age and age-squared, as well as dummy variables for immigrant status and Aboriginal identity. The latter is based on self-identification as First Nations, Métis or Inuit.[50] In terms of socio-economic status, I include dummy variables for education (i.e. less than high school and post-secondary compared to high school), as well as the natural logarithm of household income with adjustments for inflation, economies of scale in consumption and higher cost of living in Northern Canada.[51] Income is before taxes and after transfers. Results are robust to reducing income by the amount of the UCCB for mothers with young children in the post-policy period, and to excluding income. I opt to include it because the TD model relies on variation in net benefits by family type for a given level of income.

[49] Of course, causal inferences are contingent on assumptions of the TD model.
[50] I cannot differentiate between First Nations, Métis and Inuit mothers because this information is not available in all cycles of the CCHS.
[51] I deflate income to real 2002 dollars using the all-items Consumer Price Index by province/territory (Statistics Canada n.d.-c). Then, based on the 'Luxembourg Income Study' equivalence scale, I divide income by the square root of household size to account for economies of scale in consumption. For instance, a four-person household with an income of $40,000 is thought to have the same standard of living as a single individual with $20,000 (Buhmann et al 1988). Finally, I adjust for higher cost of living in Northern Canada using information about Northern Residents Deductions, which are administered through the income tax system (Burton et al 2015).

Finally, I account for the local environment by including the unemployment rate, rural/urban status and province/territory.[52] In addition to the local environment, province/territory dummy variables capture variation in net benefits due to differences in taxation. α and β_j for j = [1,7] are parameters to be estimated. ε_i is the error term.

I estimate Equation 3.1 via OLS with robust standard errors.[53] I use OLS despite having ordinal dependent variables because the TD model is theorized in this context (Blundell and Costa Dias 2000; Imbens and Wooldridge 2009).[54]

3.5 Regression Analysis

Table 3.2 contains OLS estimates of Equation 3.1 for mental health, stress and life satisfaction, respectively. I find that, relative to those in two-parent families, lone mothers have lower self-assessed mental health (i.e. $\hat{\beta}_1$ = -0.18, or 19.9 percent of a standard deviation). They are also more stressed and less satisfied with life. The former is especially true for lone mothers with young children.

Recall that DD and TD estimators, which are highlighted in grey, indicate the average causal effect of the income transfer on maternal health. I find the transfer has a small, positive effect on mental health regardless of family structure (i.e. $\hat{\beta}_6$ = 0.08, or 8.9 percent of a standard deviation; the TD estimator is small, negative and statistically insignificant). This is corroborated by gains in life satisfaction.[55] Moreover the transfer reduces stress among lone mothers (i.e. $\hat{\beta}_7$ = -0.22, or 25.2 percent of a standard deviation).

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[52] Unemployment rates are annual averages by province/territory. They are not seasonally adjusted because such data are not available for Nunavut (Statistics Canada n.d.-e; Statistics Canada n.d.-f).

[53] Results are robust to clustering standard errors by province/territory. I use the wild cluster bootstrap method to account for the small number of clusters (Cameron and Miller 2015). Results are also robust to clustering standard errors by interactions of province/territory and policy (i.e. four combinations resultant from $Lone_i$and $Young_i$).

[54] As shown in Appendix Tables B.1A and B.1B, sign and statistical significance of ordered probit estimates are comparable to those obtained via OLS. I include marginal effects because ordered probit estimates do not directly indicate the size of the effects. Again, the narrative is consistent with OLS. Regardless of family structure, the transfer reduces the probability of being at the bottom of the mental health scale and increases the probability of being at the top. The same is true for life satisfaction. Moreover, among lone mothers, the transfer increases the probability of being at the bottom of the stress scale and reduces the probability of being at the top.

[55] Results for mental health and life satisfaction are robust to using DD models with the full sample of mothers (i.e. excluding interactions with $Lone_i$).

On balance, the transfer improves maternal health regardless of family structure (i.e. mental health, life satisfaction).[56] Presumably, a positive income shock facilitates the purchase of necessities and other health-enabling resources. It also provides protection against potential economic losses. This is important for mothers because they are primarily responsible for child rearing, often with limited means. In addition to gains in mental health and life satisfaction, the transfer reduces stress among lone mothers. This makes sense as they are most in need of assistance (i.e. they are particularly vulnerable to time shortages, low income and economic insecurity).

To complement the main results, I consider other parameter estimates. They are generally as expected but should be interpreted with caution due to endogeneity (e.g. education, income). Not surprisingly, socio-economic status is an important correlate of maternal health. For example, relative to mothers with high school education, those who do not graduate have lower self-assessed mental health (i.e. the parameter estimate is -0.15, or 17.6 percent of a standard deviation). They are also less satisfied with life. Likewise post-secondary education is associated with better mental health and life satisfaction, in addition to increased stress. And as expected, there is a positive relationship between income and maternal well-being (i.e. mental health, life satisfaction).

Aboriginal mothers have poorer mental health, on average (i.e. the parameter estimate is -0.14, or 16 percent of a standard deviation). Paradoxically, immigrants have lower life satisfaction but are less stressed relative to native-born mothers. Finally, compared to those who live in urban areas, rural residents fare better in all aspects of maternal well-being.

3.6 Assumptions of the Triple Difference Model

In this section, I consider whether assumptions of the TD model are plausible. In doing so, I argue that improvements in maternal health are indeed caused by the income transfer as indicated by the DD and TD estimators (i.e. β_6 and β_7).

[56] I examine potential mechanisms including: food insecurity; satisfaction with financial situation, housing and leisure; changes made to improve health. These factors do not facilitate the relationship between income and maternal health, perhaps due to small samples as they are optional modules; health regions and provinces/territories select optional modules to address local priorities. It is also possible that actual mechanisms are not observed in the CCHS.

3.6.1 Exogeneity

The TD model is based on the assumption that treatment is exogenous. Specifically, the error term should not contain unobserved, transitory characteristics of mothers that affect eligibility for the transfer. This is facilitated by its universality (i.e. benefits are paid to all mothers with young children).

However, a possible threat to identification is that women 'opt in' to the transfer by having a child. This is unlikely because the transfer is small compared to the cost of doing so. For example, Phipps (1998) finds that, relative to a childless couple, those with one child require 15.5 percent more income to maintain the same standard of living. This implies an annual cost of $12,623.[57] A couple with two children requires 27.9 percent more income or $10,098 annually for the second child.[58] The transfer represents only 9.5 and 11.9 percent of annual costs for the first and second child, respectively. And, opportunity costs associated with changes in labour supply are not considered in these calculations.

Empirically, there is mixed evidence regarding financial incentives and fertility (Moffitt 1998; Gauthier 2007). For example, Gauthier (2007) reports considerable variation by data and policy design (e.g. level of benefits, eligibility criteria). She concludes that "while the additional financial support is bound to be welcomed by parents, the overall effect on fertility is likely to be small" (page 339). Indeed, trends in fertility are stable during the period in which the UCCB was implemented (Milan 2013).

3.6.2 Composition of Treatment and Control Groups

Similar to the exogeneity assumption, Blundell and Costa Dias (2000) argue that, with pooled cross-sectional data, it is difficult to control changes in treatment and control groups over time when individuals self-select according to an unobserved rule; "the composition of groups may change over time and be affected by the intervention" (page 443). In effect, the treatment group should be comparable in pre- and post-policy periods to remove unobserved, time-invariant characteristics that affect maternal health and

[57] Average total income of a childless couple was $81,438 in 2006 (Statistics Canada n.d.-a; Statistics Canada n.d.-c). Thus, the annual cost of one child is ($81,438*1.155) - $81,438 = $12,623.
[58] The annual cost of two children is ($81,438*1.279) - $81,438 = $22,721 or $10,098 for the second child.

eligibility for the transfer. The same applies to the control group. Tables 3.3A and 3.3B indicate that treatment and control groups are similar across time in terms of observables (i.e. there are few statistically significant differences, and those that exist are generally small).[59]

3.6.3 Parallel Trends

The TD model also relies on the assumption that maternal health would have evolved similarly for treatment and control groups in absence of the policy change. I have limited ability to check this assumption with ex-ante trends because the CCHS does not contain a long history of maternal health (i.e. data are limited to two pre-policy cycles ranging from 2003 to 2005). Nevertheless, Figures 3.4A to 3.6B depict trends for treatment and control groups, separately for lone and married mothers. I find that, among the latter, mental health and life satisfaction evolve similarly for treatment and control groups prior to the policy change (i.e. Figures 3.4B and 3.6B).[60] Moreover Figure 3.5A indicates parallel trends in ex-ante stress among lone mothers. Thus, I conclude the parallel trends assumption is plausible as related to regression results (i.e. improvements in mental health and life satisfaction regardless of family structure, as well as stress among lone mothers). I use supplementary data from the General Social Survey to substantiate this conclusion as stress is observed over three pre-policy cycles ranging from 1998 to 2005. As depicted in Appendix Figures B.1A and B.1B, stress evolves similarly for treatment and control groups prior to the policy change. This is true for lone and married mothers.

On balance, I find that assumptions of the TD model are plausible. Specifically: (1) treatment is exogenous; (2) treatment and control groups are comparable across time, as well as to each other; (3) maternal health evolves similarly for treatment and control groups prior to the policy change. Thus, I conclude that improvements in maternal health are indeed caused by the income transfer as indicated by the DD and TD estimators (i.e. β_6 and β_7). I substantiate this conclusion with various robustness checks in the next section.

[59] Likewise treatment and control groups should be comparable to each other to remove unobserved, group-invariant characteristics. This is confirmed in Tables 3.1A and 3.1B (i.e. refer to Section 3.2).
[60] The same is true for the full sample of mothers. Results are available upon request.

3.7 Robustness Checks

3.7.1 Other Child-Related Policies

First, I consider whether changes in other child-related policies affected mothers with young children differently than the control group (i.e. to ensure they are not driving the results). Incidentally, most were already established and did not change during the period in which the UCCB was implemented. These include the Canada Child Tax Credit and National Child Benefit Supplement, which were introduced in 1993 and 1998, respectively.[61] Similarly, there were no widespread changes in the availability or cost of child care. For example, Quebec has provided affordable child care for those younger than five since 2000 (Lefebvre and Merrigan 2008). And, like Schirle (2015), I argue that other benefits introduced during the study period did not affect mothers with young children differently than the control group (i.e. Child Disability Benefit in 2006, Children's Fitness Tax Credit and Child Tax Credit in 2007).

On the other hand, there was a major change in paid maternity and parental leave in Quebec. As of January 2006, the province administers benefits through the Quebec Parental Insurance Plan. Like other jurisdictions in Canada, they were previously paid through employment insurance, which is relatively less generous.[62] Thus, as a robustness check, I exclude Quebec to ensure that results reflect the impact of the UCCB on maternal health, not the more generous benefits for new mothers in Quebec. Then, as a separate robustness check, I exclude all new mothers who are more likely to be on paid leave (i.e. those with children younger than one).[63] Results are given in Table 3.4.

DD and TD estimators are generally consistent with the baseline in terms of size, sign and statistical significance. Without Quebec, DD and TD estimators are slightly smaller than the baseline for mental health and life satisfaction. The opposite is true for stress.

[61] The Canada Child Tax Benefit is a non-taxable, income-tested transfer for families with children younger than 18. The National Child Benefit Supplement provides additional support for low-income families, though some provinces/territories reduce social assistance by the amount of the Supplement. Refer to Milligan and Stabile (2011) for more information.

[62] As of January 2016, employment insurance covers 55 percent of average earnings to a maximum of $537 per week. Mothers may claim benefits for up to 50 weeks (Government of Canada n.d.). Alternatively, the Quebec Parental Insurance Plan covers 55 to 75 percent of average weekly earnings. Mothers may claim benefits for 40 to 50 weeks depending on the replacement rate (Nomandin Beaudry 2005).

[63] I do so using a sample of biological mothers aged 18 to 55 as outlined in Section 3.8.2.

When I exclude all new mothers, DD and TD estimators are larger than the baseline for mental health and stress. This suggests the UCCB is particularly important for mothers with children aged one to five compared to new mothers who are more likely to be on paid leave. On balance, results are robust to accounting for other child-related policies; there remains a positive relationship between the income transfer and maternal health.

3.7.2 Economic Conditions

Next, I exclude mothers who were surveyed after September 2008 in case the recession affected mothers with young children differently than the control group. As outlined in Table 3.4, DD and TD estimators are generally consistent with the baseline in terms of size, sign and statistical significance. However, it is interesting to note the income transfer is slightly more effective in reducing stress with the inclusion of lone mothers who were surveyed during the recession. This suggests the extra income is particularly important in times of economic uncertainty.

3.7.3 Alternate Control Groups

As a further robustness check, I estimate the effect of the income transfer on maternal health using alternate control groups. I consider: (1) mothers with children older than five (i.e. without the upper age limit); (2) mothers with children older than five and those who are childless. As shown in Table 3.4, results differ from the baseline. However, the transfer still improves mental health and life satisfaction regardless of family structure. And, it reduces stress among lone mothers. The estimated effects are much smaller in these models and are not always statistically significant.

3.7.4 Alternate Treatment Group

In the preceding analysis, the treatment group consists of mothers with at least one young child. The transfer is worth $1,200 annually or a multiple thereof depending on the number of children younger than six. Thus, as a final robustness check, I limit the treatment group to mothers with one young child. Results are robust as shown in Table 3.4.[64] Specifically, the transfer has a small, positive effect on self-assessed mental health

[64] Results are also robust to limiting the treatment group to mothers with two or more young children.

regardless of family structure (i.e. $\hat{\beta}_6$ = 0.08, or 9.5 percent of a standard deviation). This is corroborated by gains in life satisfaction. Moreover the transfer reduces stress among lone mothers (i.e. $\hat{\beta}_7$ = -0.23, or 25.6 percent of a standard deviation). These estimates are statistically significant. I conclude that results are not driven by mothers with several young children who receive a much larger transfer. The transfer improves maternal health for those with one or more children younger than six. This suggests that $1,200 annually per young child matters more than the total amount of the transfer. I revisit this notion in Section 3.8.1.

On balance, I find that results are consistent across various robustness checks. They are extraneous to changes in other child-related policies and economic conditions. And, for the most part, they persist when using alternate control and treatment groups.

3.8 Extensions

In this section, I consider extensions to the TD model as outlined in Equation 3.1. Specifically, I examine the effect of a larger transfer that ensues from having an additional young child since the UCCB pays $1,200 annually for each child under the age of six. I also examine the effect of having a younger child, which implies the mother will receive benefits over a longer period. Finally, I consider how the income transfer affects maternal health in the tails of the distributions.[65]

3.8.1 Number of Children Younger than Six

First, I replace the $Young_i$ dummy variable with number of children younger than six. In this model, the DD estimator is the effect on maternal health of an additional young child in the post-policy period, and thus an extra $1,200 annually. The TD estimator is the additional effect for lone mothers compared to those in two-parent families.

As shown in Table 3.5, mental health is not affected by a larger transfer that ensues from having an additional young child (i.e. DD and TD estimators are small and statistically insignificant). Moreover there is a very small, positive effect on life satisfaction

[65] In addition to these extensions, I assess whether the transfer has a distinct effect on vulnerable groups (e.g. young mothers, immigrants, those with low education). I do not find heterogeneity in response to the treatment.

regardless of family structure (i.e. $\hat{\beta}_6$ = 0.03, or 4.9 percent of a standard deviation). Combined with the main results and an earlier robustness check (i.e. Section 3.7.4), this suggests that $1,200 annually per young child matters more than the total amount of the transfer. It is also possible that needs associated with an additional young child are greater than the amount of the transfer.

On the other hand, having an additional young child in the post-policy period, and thus an extra $1,200 annually, reduces stress among lone mothers (i.e. $\hat{\beta}_7$ = -0.15, or 17.3 percent of a standard deviation). This makes sense as they are particularly vulnerable to time shortages, low income and economic insecurity. Presumably, an increase in the total amount of the transfer helps to relax binding constraints on time and financial resources, as well as to provide protection against potential economic losses.

3.8.2 Duration of Benefits

Next, I estimate whether the amount of the transfer matters in the context of the Permanent Income Hypothesis (i.e. a larger transfer that ensues from having a younger child, and thus receiving benefits over a longer period). Postulated by Friedman (1957), the Permanent Income Hypothesis implies that individuals smooth consumption over their lifetimes based on current income and expectations thereof. Transitory changes in income have little influence on consumption, while more permanent changes affect the trajectory. In this context, the amount of the transfer depends on current and future benefits as determined by the child's age. For example, mothers of newborns are entitled to benefits for six years, and thus the transfer is worth $7,200. Likewise mothers with children aged four are entitled to benefits for two years, and thus the transfer is worth $2,400.

The CCHS contains the birth year of the mother's youngest child aged zero to five.[66] I use this information to approximate the child's age and duration of benefits.[67] I then replace the $Young_i$ dummy variable with duration of benefits, which ranges from one to

[66] This information is only available for biological mothers aged 18 to 55.
[67] Child's Age = Survey Year - Birth Year; Duration of Benefits = 6 - Child's Age

six years for the treatment group.[68] It is zero for the control group. In this model, the DD estimator indicates how an extra year of benefits influences maternal health. Again, the TD estimator is the additional effect for lone mothers compared to those in two-parent families.

As shown in Table 3.6, maternal health is not affected by duration of benefits (i.e. DD and TD estimators are small and statistically insignificant). Combined with the main results, this suggests that current benefits matter more than the expected amount of the transfer. This does not coincide with the Permanent Income Hypothesis. However, it is possible that mothers face liquidity constraints, which prevent them from smoothing consumption.

3.8.3 Tails of the Distributions

As a final extension, I focus on maternal health in the tails of the distributions.[69] For example, Figure 3.2A indicates that lone mothers are more likely to be at the bottom of the stress scale in the post- versus pre-policy period. That is, a larger proportion of lone mothers are 'not at all' or 'not very' stressed after receiving the transfer.

Tables 3.7A and 3.7B contain OLS estimates of the TD model with binary outcomes (i.e. probability of being at the bottom and top of the scales, respectively). I find that improvements in the tails of the distributions are limited to lone mothers. Specifically, the income transfer reduces the probability of being at the top of the stress scale (i.e. the TD estimator is large, negative and statistically significant). It also increases the probability of being at the bottom. Likewise the transfer reduces the probability of being at the bottom of the life satisfaction scale (i.e. $\hat{\beta}_7$ = -0.04, or 25.7 percent of a standard deviation). Again, these findings make sense as lone mothers are particularly vulnerable to time shortages, low income and economic insecurity.

[68] Average duration of benefits is 3.64 years.
[69] The bottom of the mental health scale is defined as 'poor' or 'fair', while the top includes 'very good' and 'excellent'. The bottom of the stress scale is defined as 'not at all' or 'not very', while the top includes 'quite a bit' and 'extremely'. The bottom of the life satisfaction scale is defined as 'very dissatisfied' or 'dissatisfied', while the top includes 'satisfied' and 'very satisfied'.

For married mothers, the income transfer does not affect the probability of being at the bottom or top of the scales (i.e. DD estimators are very small and statistically insignificant). This is not unexpected. For example, Figure 3.1C indicates that improvements in mental health among married mothers who receive the transfer occur within categories at the top of the scale. The same is true for life satisfaction.

To summarize, I find that $1,200 annually per young child matters more than larger transfers that ensue from having an additional young child, as well as a younger child and thus receiving benefits over a longer period. However, having an additional young child in the post-policy period, and thus an extra $1,200 annually, reduces stress among lone mothers. Also for this group, the transfer improves health in the tails of the distributions.

3.9 Conclusions

Introduced in 2006, the UCCB is an income transfer for Canadian families; it is worth $1,200 annually for each child under the age of six. I use this policy change to estimate the relationship between income and maternal health, which is otherwise endogenous. The UCCB is appropriate for this purpose because it is paid to mothers by default and represents an exogenous increase in income for those with young children.

Using a TD model, I find the transfer improves mental health regardless of family structure. This is corroborated by gains in life satisfaction. Presumably, a positive income shock facilitates the purchase of necessities and other health-enabling resources. It also provides protection against potential economic losses. This is important for mothers because they are primarily responsible for child rearing, often with limited means. In addition to gains in mental health and life satisfaction, the transfer reduces stress among lone mothers. This makes sense as they are most in need of assistance (i.e. they are particularly vulnerable to time shortages, low income and economic insecurity). As extensions to the main model, I find that $1,200 annually per young child matters more than larger transfers that ensue from having an additional young child, as well as a younger child and thus receiving benefits over a longer period. I argue that assumptions of the TD model are plausible and show that results are consistent across various

robustness checks. I conclude that improvements in maternal health are indeed caused by the income transfer.

In a related study, Milligan and Stabile (2011, page 198) argue that "a broader set of outcomes should be included in any assessment of the costs and benefits of expanded transfer payments to families with children" (i.e. in addition to the labour market, education and direct consumption). Incidentally, this chapter provides evidence regarding the benefits of the UCCB. However, it should be emphasized that I do not assess its costs and benefits, nor do I argue for/against it per se. Rather, I use the UCCB to make causal inferences in the relationship between income and maternal health.

In future work, I will try to identify the mechanisms through which income affects maternal health. This will require different data with potential mechanisms beyond those observed in the CCHS. Also in future work, it would be interesting to consider whether absolute or relative income matters most. Finally, the UCCB could be used to examine how income affects other aspects of maternal well-being including physical health and family dynamics.

Table 3.1A
Means for Lone Mothers, Overall and by Group

	Lone Mothers	Treatment Group	Control Group	Difference
Age, Years	34.73	30.74	38.01	-7.27***
	(0.16)	(0.20)	(0.18)	(0.27)
Aboriginal, Percent	6.90	8.88	5.26	3.62***
	(0.42)	(0.68)	(0.52)	(0.85)
Immigrant, Percent	17.05	19.04	15.42	3.62*
	(0.99)	(1.48)	(1.32)	(1.98)
Less than High School Education, Percent	14.37	17.85	11.51	6.34***
	(0.74)	(1.16)	(0.94)	(1.50)
High School Education, Percent	28.70	30.25	27.43	2.82
	(1.01)	(1.27)	(1.51)	(1.97)
Post-Secondary Education, Percent	56.93	51.90	61.07	-9.17***
	(1.08)	(1.42)	(1.59)	(2.13)
Real Equivalent Income, 2002 Dollars	17,886	14,811	20,417	-5,606***
	(313.31)	(302.11)	(495.01)	(579.87)
Rural, Percent	11.93	11.57	12.23	-0.66
	(0.59)	(0.70)	(0.90)	(1.14)
Number of Observations	6,273	3,215	3,058	6,273

Standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.1B
Means for Married Mothers, Overall and by Group

	Married Mothers	Treatment Group	Control Group	Difference
Age, Years	35.57	32.96	39.54	-6.58***
	(0.06)	(0.07)	(0.09)	(0.11)
Aboriginal, Percent	2.11	2.21	1.96	0.25
	(0.11)	(0.15)	(0.17)	(0.23)
Immigrant, Percent	21.49	20.78	22.58	-1.80*
	(0.47)	(0.56)	(0.84)	(1.01)
Less than High School Education, Percent	6.22	5.98	6.58	-0.60
	(0.25)	(0.28)	(0.47)	(0.55)
High School Education, Percent	21.99	20.72	23.92	-3.21***
	(0.43)	(0.49)	(0.79)	(0.93)
Post-Secondary Education, Percent	71.79	73.30	69.50	3.81***
	(0.47)	(0.53)	(0.85)	(1.01)
Real Equivalent Income, 2002 Dollars	38,614	37,546	40,238	-2,692***
	(289.42)	(348.09)	(501.71)	(610.62)
Rural, Percent	19.37	18.73	20.34	-1.61**
	(0.37)	(0.41)	(0.68)	(0.80)
Number of Observations	20,613	13,700	6,913	20,613

Standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.2
OLS Estimates of TD Model, Five-Point Scales

	Mental Health	Stress	Life Satisfaction
Mean (Standard Deviation)	4.0940 (0.8805)	3.0620 (0.8830)	4.3414 (0.6874)
Young Child × Post-Policy (i.e. DD estimator)	0.0788* (0.0434)	0.0251 (0.0437)	0.0656** (0.0310)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0484 (0.0971)	-0.2229** (0.0955)	-0.0385 (0.0746)
Age	-0.0206* (0.0121)	0.0262** (0.0119)	0.0050 (0.0091)
Age-Squared	0.0002 (0.0002)	-0.0002 (0.0002)	-0.0001 (0.0001)
Aboriginal	-0.1410*** (0.0384)	-0.0013 (0.0391)	-0.0244 (0.0285)
Immigrant	-0.0089 (0.0244)	-0.1390*** (0.0254)	-0.1766*** (0.0190)
Less than High School Education	-0.1546*** (0.0371)	0.0382 (0.0373)	-0.0553** (0.0274)
Post-Secondary Education	0.0657*** (0.0214)	0.0826*** (0.0210)	0.0344** (0.0152)
Log of Real Equivalent Income	0.1263*** (0.0144)	0.0175 (0.0121)	0.1399*** (0.0118)
Unemployment Rate	0.0063 (0.0132)	0.0270** (0.0136)	-0.0164 (0.0101)
Rural	0.0493*** (0.0187)	-0.0544*** (0.0194)	0.0523*** (0.0139)
Lone Mother	-0.1755*** (0.0414)	0.1781*** (0.0397)	-0.3000*** (0.0338)
Young Child	-0.0124 (0.0252)	-0.0319 (0.0250)	0.0220 (0.0191)
Lone Mother × Young Child	-0.0270 (0.0564)	0.1617*** (0.0541)	-0.0316 (0.0509)
Post-Policy	-0.0483 (0.0395)	-0.0463 (0.0381)	-0.0510* (0.0272)
Lone Mother × Post-Policy	0.0693 (0.0746)	0.1251* (0.0702)	0.0853 (0.0536)
R-Squared	0.0381	0.0278	0.0930
Number of Observations	26,886	26,886	26,886

I include a constant and dummy variables for province/territory in all regressions. Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.3A
Means for Lone Mothers, by Group and Time

	Lone Mothers Treatment Group			Lone Mothers Control Group		
	Pre-Policy	Post-Policy	Difference	Pre-Policy	Post-Policy	Difference
Age, Years	30.81	30.64	0.16	38.10	37.83	0.27
	(0.24)	(0.34)	(0.41)	(0.23)	(0.27)	(0.36)
Aboriginal, Percent	8.45	9.55	-1.10	4.29	7.17	-2.88**
	(0.79)	(1.23)	(1.46)	(0.56)	(1.07)	(1.20)
Immigrant, Percent	16.57	22.78	-6.21*	14.36	17.49	-3.12
	(1.68)	(2.70)	(3.18)	(1.59)	(2.35)	(2.83)
Less than High School Education, Percent	17.49	18.39	-0.91	12.41	9.73	2.68
	(1.26)	(2.20)	(2.54)	(1.23)	(1.41)	(1.87)
High School Education, Percent	31.00	29.12	1.88	28.18	25.95	2.23
	(1.51)	(2.24)	(2.70)	(1.83)	(2.65)	(3.22)
Post-Secondary Education, Percent	51.51	52.49	-0.98	59.41	64.32	-4.91
	(1.63)	(2.59)	(3.06)	(1.94)	(2.75)	(3.37)
Real Equivalent Income, 2002 Dollars	14,791	14,841	-49.27	20,487	20,279	208.19
	(366.91)	(518.25)	(634.98)	(616.08)	(828.14)	(1,032)
Rural, Percent	12.23	10.56	1.67	12.12	12.43	-0.31
	(0.90)	(1.10)	(1.42)	(1.14)	(1.46)	(1.85)
Number of Observations	2,214	1,001	3,215	2,086	972	3,058

Standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.3B
Means for Married Mothers, by Group and Time

	Married Mothers Treatment Group			Married Mothers Control Group		
	Pre-Policy	Post-Policy	Difference	Pre-Policy	Post-Policy	Difference
Age, Years	32.93	33.03	-0.10	39.42	39.80	-0.38*
	(0.08)	(0.12)	(0.15)	(0.10)	(0.17)	(0.20)
Aboriginal, Percent	1.85	2.99	-1.14***	1.80	2.33	-0.53
	(0.16)	(0.31)	(0.35)	(0.20)	(0.35)	(0.40)
Immigrant, Percent	20.08	22.29	-2.21*	21.37	25.39	-4.01**
	(0.65)	(1.09)	(1.26)	(0.97)	(1.63)	(1.90)
Less than High School Education, Percent	6.11	5.70	0.41	6.91	5.80	1.11
	(0.34)	(0.53)	(0.63)	(0.54)	(0.91)	(1.06)
High School Education, Percent	21.95	18.08	3.86***	25.53	20.20	5.32***
	(0.59)	(0.852)	(1.04)	(0.97)	(1.35)	(1.66)
Post-Secondary Education, Percent	71.94	76.22	-4.28***	67.56	74.00	-6.44***
	(0.64)	(0.95)	(1.15)	(1.03)	(1.51)	(1.83)
Real Equivalent Income, 2002 Dollars	36,241	40,347	-4,106***	39,823	41,203	-1,381
	(357.89)	(772.93)	(851.76)	(633.10)	(785.92)	(1,009)
Rural, Percent	18.78	18.61	0.17	20.86	19.13	1.73
	(0.49)	(0.77)	(0.91)	(0.84)	(1.18)	(1.44)
Number of Observations	9,342	4,358	13,700	4,710	2,203	6,913

Standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.4
OLS Estimates of TD Model, Five-Point Scales – Robustness Checks

	Mental Health	Stress	Life Satisfaction	
Young Child × Post-Policy (i.e. DD estimator)	0.0788*	0.0251	0.0656**	
	(0.0434)	(0.0437)	(0.0310)	
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0484	-0.2229**	-0.0385	Baseline (n=26,886)
	(0.0971)	(0.0955)	(0.0746)	
Young Child × Post-Policy (i.e. DD estimator)	0.0506	0.0582	0.0544*	
	(0.0487)	(0.0479)	(0.0338)	Exclude Quebec (n=21,505)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0276	-0.2814**	-0.0145	
	(0.1060)	(0.1013)	(0.0850)	
Young Child × Post-Policy (i.e. DD estimator)	0.1088**	0.0407	0.0621**	
	(0.0445)	(0.0457)	(0.0316)	Exclude New Mothers (n=23,408)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.1084	-0.2630***	-0.0379	
	(0.1022)	(0.1018)	(0.0789)	
Young Child × Post-Policy (i.e. DD estimator)	0.0842*	0.0050	0.0645**	
	(0.0457)	(0.0445)	(0.0324)	Exclude Recession (n=26,042)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0712	-0.1944**	-0.0374	
	(0.1016)	(0.0991)	(0.0769)	
Young Child × Post-Policy (i.e. DD estimator)	0.0178	-0.0069	0.0382	
	(0.0346)	(0.0362)	(0.0252)	Control Group: Children Older than Five (n=35,346)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	0.1322	-0.1758**	0.0873	
	(0.0842)	(0.0870)	(0.0706)	

	Mental Health	Stress	Life Satisfaction	
Young Child × Post-Policy (i.e. DD estimator)	0.0217 (0.0284)	-0.0211 (0.0293)	0.0376* (0.0210)	Control Group: Children Older than Five and Childless (n=82,969)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	0.0689 (0.0676)	-0.1128* (0.0703)	0.0415 (0.0562)	
Young Child × Post-Policy (i.e. DD estimator)	0.0844* (0.0470)	0.0363 (0.0474)	0.0614* (0.0344)	Treatment Group: One Child Younger than Six (n=21,337)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0138 (0.1043)	-0.2283** (0.1036)	-0.0164 (0.0808)	

I include covariates in all regressions. Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.5
OLS Estimates of TD Model, Five-Point Scales – Number of Children Younger than Six

	Mental Health	Stress	Life Satisfaction
Mean (Standard Deviation)	4.0940 (0.8805)	3.0620 (0.8830)	4.3414 (0.6874)
Number of Young Children × Post-Policy (i.e. DD estimator)	0.0325 (0.0248)	0.0087 (0.0247)	0.0337** (0.0168)
Lone Mother × Number of Young Children × Post-Policy (i.e. TD estimator)	-0.0351 (0.0630)	-0.1524** (0.0626)	-0.0240 (0.0493)
R-Squared	0.0380	0.0277	0.0943
Number of Observations	26,886	26,886	26,886

I include covariates in all regressions. Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.6
OLS Estimates of TD Model, Five Point Scales – Duration of Benefits

	Mental Health	Stress	Life Satisfaction
Mean (Standard Deviation)	4.0992 (0.8810)	3.0583 (0.8855)	4.3453 (0.6886)
Duration of Benefits × Post-Policy (i.e. DD estimator)	0.0042 (0.0100)	0.0093 (0.0096)	0.0110 (0.0074)
Lone Mother × Duration of Benefits × Post-Policy (i.e. TD estimator)	0.0004 (0.0256)	-0.0408 (0.0257)	-0.0210 (0.0216)
R-Squared	0.0389	0.0296	0.0990
Number of Observations	25,149	25,149	25,149

I include covariates in all regressions. Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.7A
OLS Estimates of TD Model, Bottom of Scales

	Mental Health	Stress	Life Satisfaction
Mean (Standard Deviation)	0.0434 (0.2037)	0.2315 (0.4218)	0.0235 (0.1515)
Young Child × Post-Policy (i.e. DD estimator)	-0.0088 (0.0110)	-0.0122 (0.0201)	0.0105 (0.0072)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0243 (0.0269)	0.0787** (0.0402)	-0.0390* (0.0219)
R-Squared	0.0185	0.0161	0.0236
Number of Observations	26,886	26,886	26,886

I include covariates in all regressions. Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 3.7B
OLS Estimates of TD Model, Top of Scales

	Mental Health	Stress	Life Satisfaction
Mean (Standard Deviation)	0.7641 (0.4246)	0.2916 (0.4545)	0.9324 (0.2511)
Young Child × Post-Policy (i.e. DD estimator)	0.0200 (0.0205)	0.0167 (0.0215)	-0.0063 (0.0110)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0197 (0.0477)	-0.1423*** (0.0496)	-0.0198 (0.0354)
R-Squared	0.0313	0.0252	0.0469
Number of Observations	26,886	26,886	26,886

I include covariates in all regressions. Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Figure 3.1A Distributions of Mental Health for Lone Mothers with Children Younger than Six (i.e. Treatment Group)

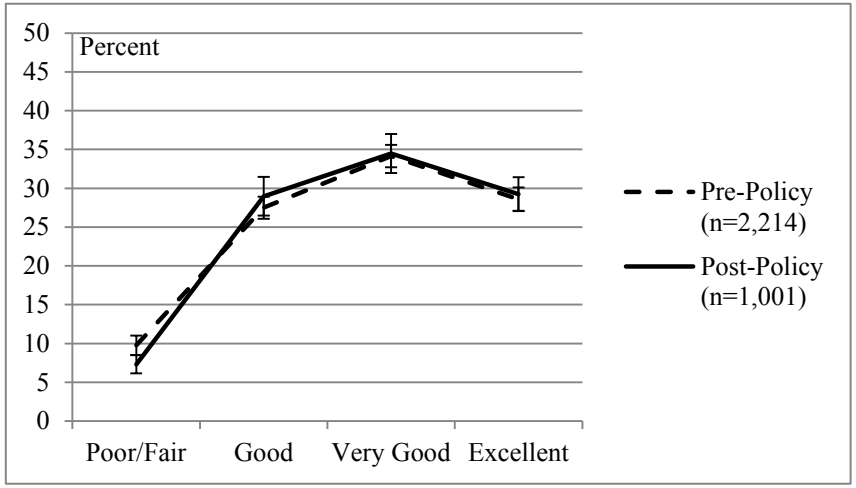


Figure 3.1B Distributions of Mental Health for Lone Mothers with Children Aged Six to 11 (i.e. Control Group)

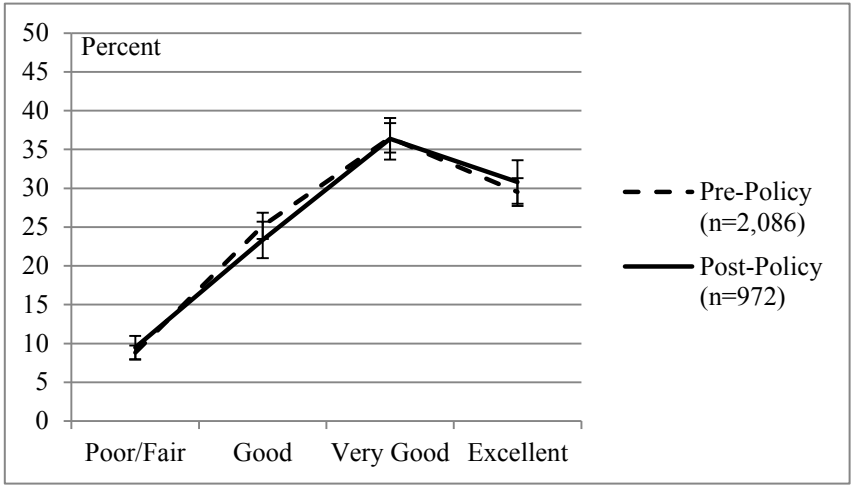


Figure 3.1C Distributions of Mental Health for Married Mothers with Children Younger than Six (i.e. Treatment Group)

Figure 3.1D Distributions of Mental Health for Married Mothers with Children Aged Six to 11 (i.e. Control Group)

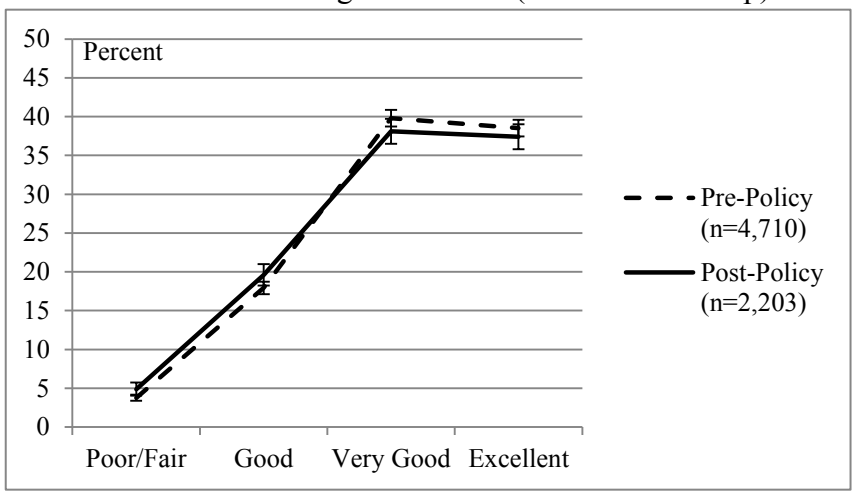


Figure 3.2A Distributions of Stress for Lone Mothers with Children Younger than Six (i.e. Treatment Group)

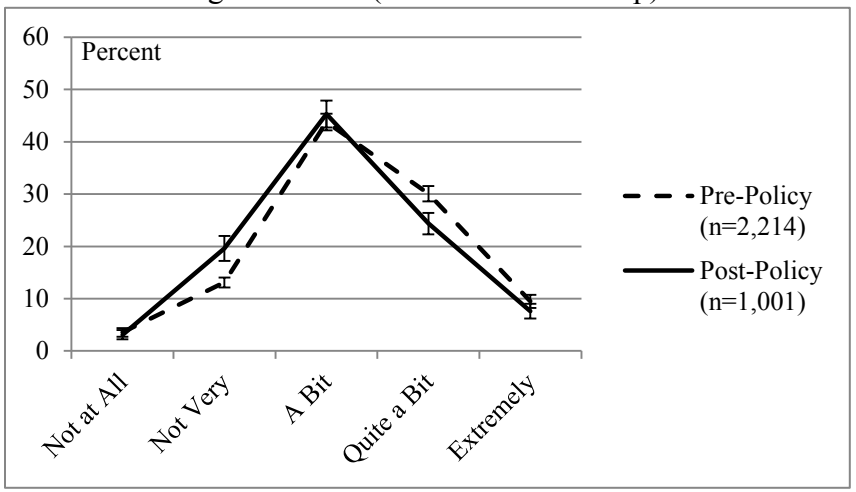


Figure 3.2B Distributions of Stress for Lone Mothers with Children Aged Six to 11 (i.e. Control Group)

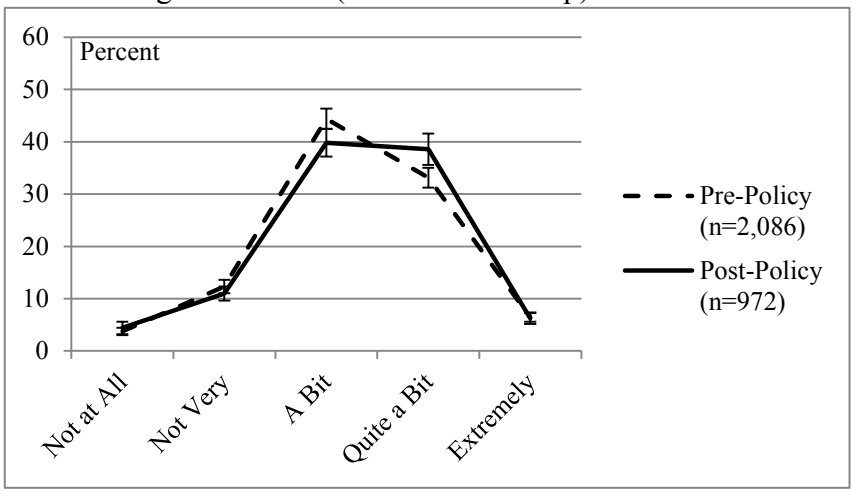


Figure 3.2C Distributions of Stress for Married Mothers with Children Younger than Six (i.e. Treatment Group)

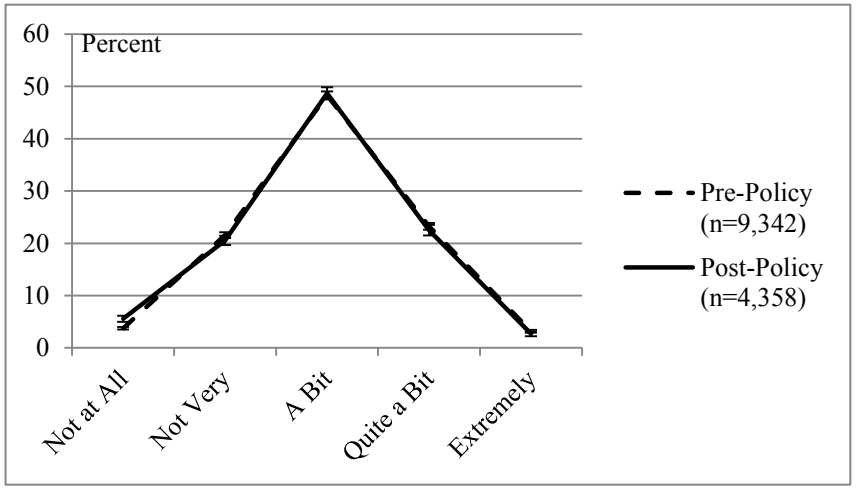


Figure 3.2D Distributions of Stress for Married Mothers with Children Aged Six to 11 (i.e. Control Group)

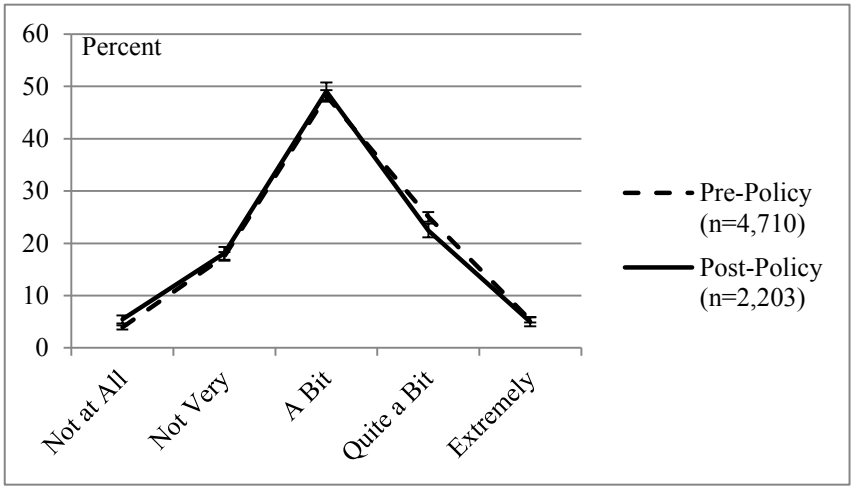


Figure 3.3A Distributions of Life Satisfaction for Lone Mothers with Children Younger than Six (i.e. Treatment Group)

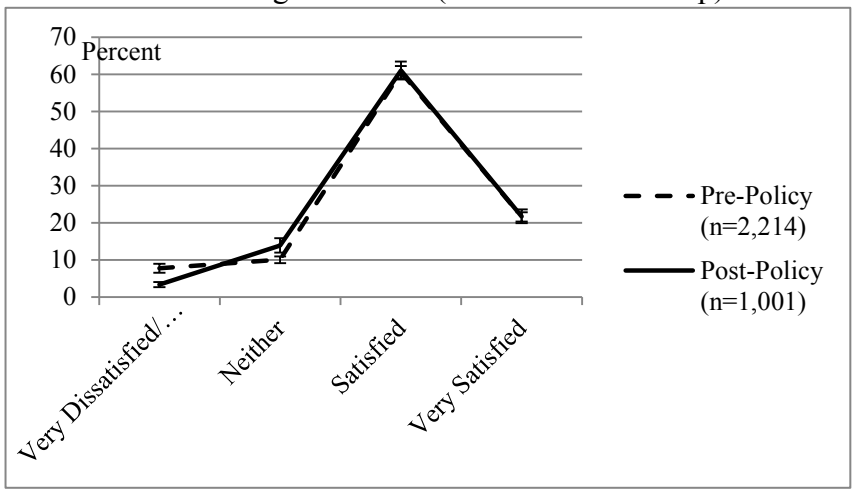


Figure 3.3B Distributions of Life Satisfaction for Lone Mothers with Children Aged Six to 11 (i.e. Control Group)

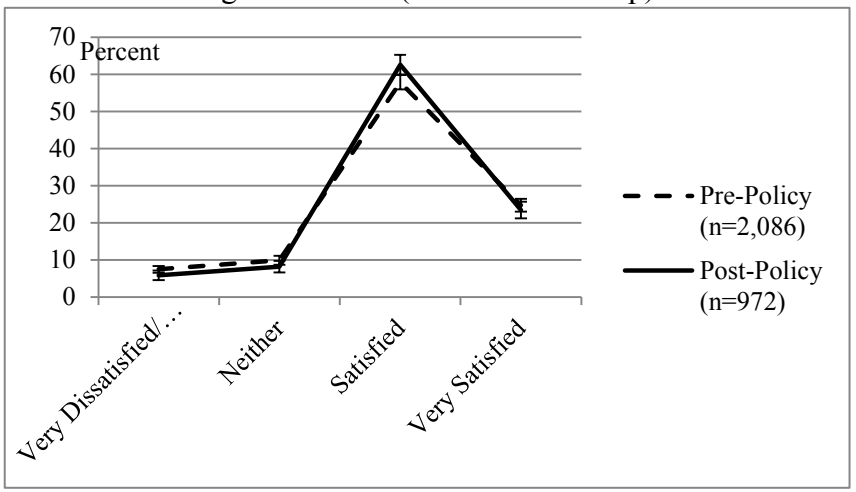


Figure 3.3C Distributions of Life Satisfaction for Married Mothers with Children Younger than Six (i.e. Treatment Group)

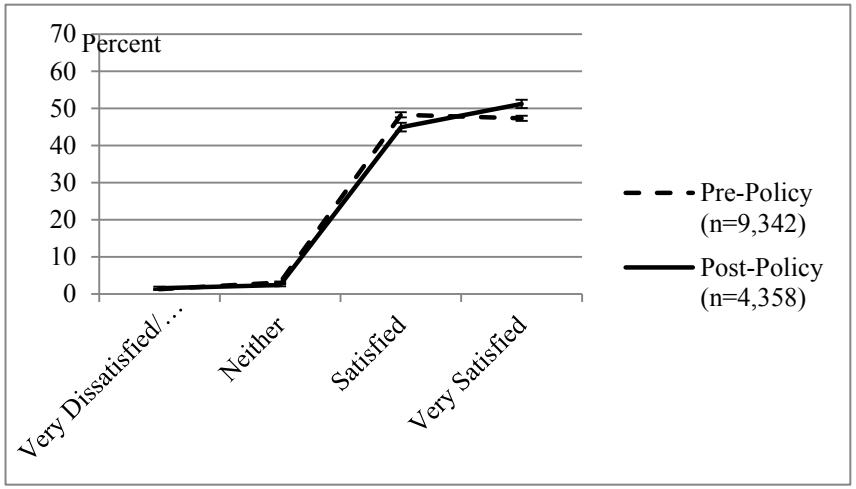


Figure 3.3D Distributions of Life Satisfaction for Married Mothers with Children Aged Six to 11 (i.e. Control Group)

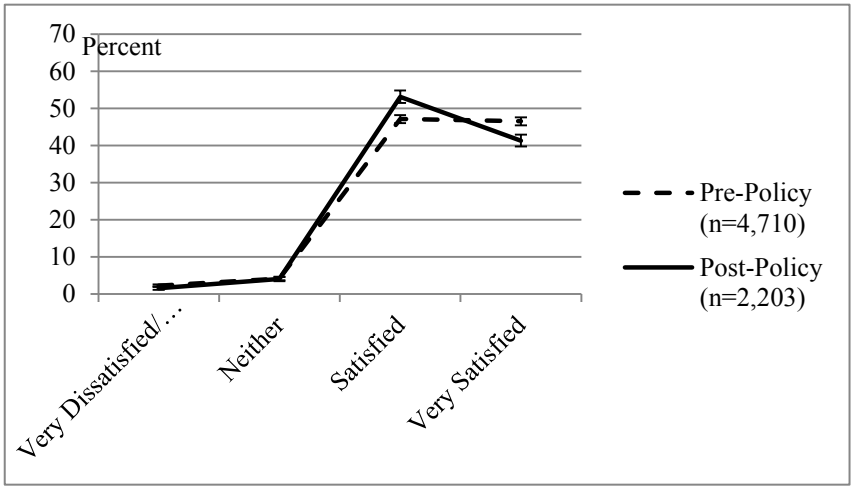


Figure 3.4A
Average Mental Health of Lone Mothers across Time

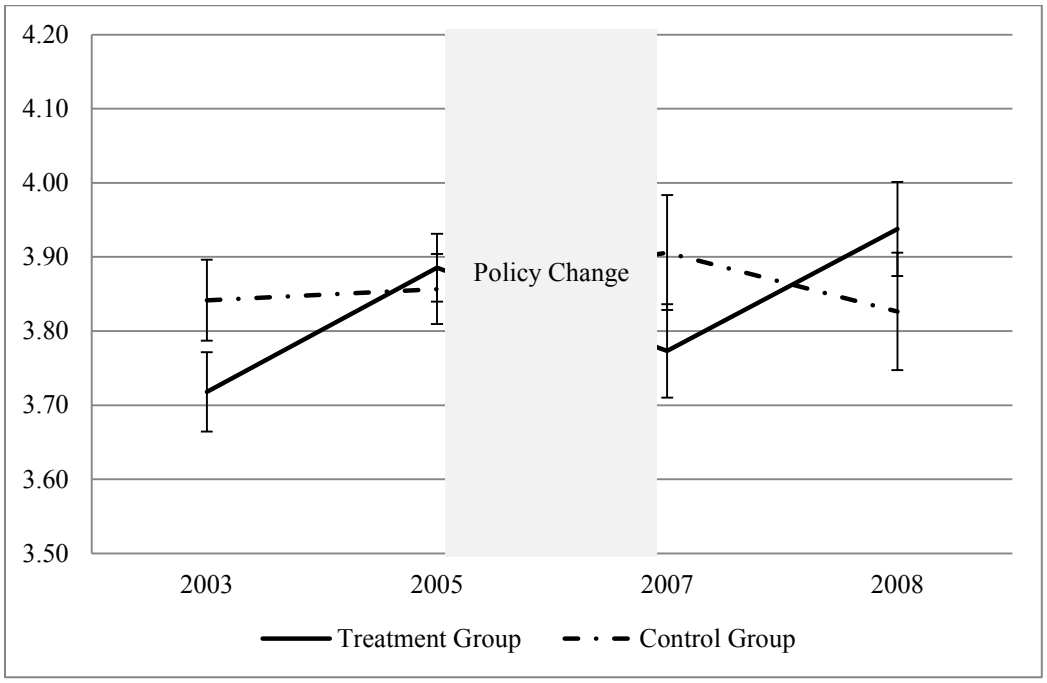
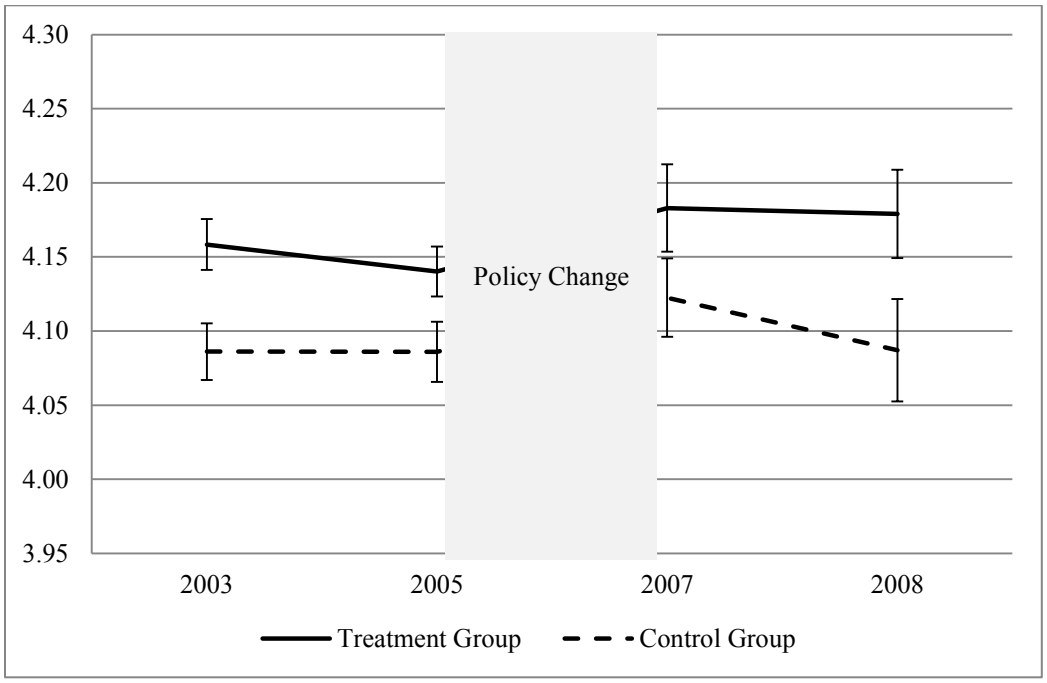


Figure 3.4B
Average Mental Health of Married Mothers across Time



In general, would you say your mental health is:
(1) poor; (2) fair; (3) good; (4) very good; or (5) excellent?

Figure 3.5A
Average Stress of Lone Mothers across Time

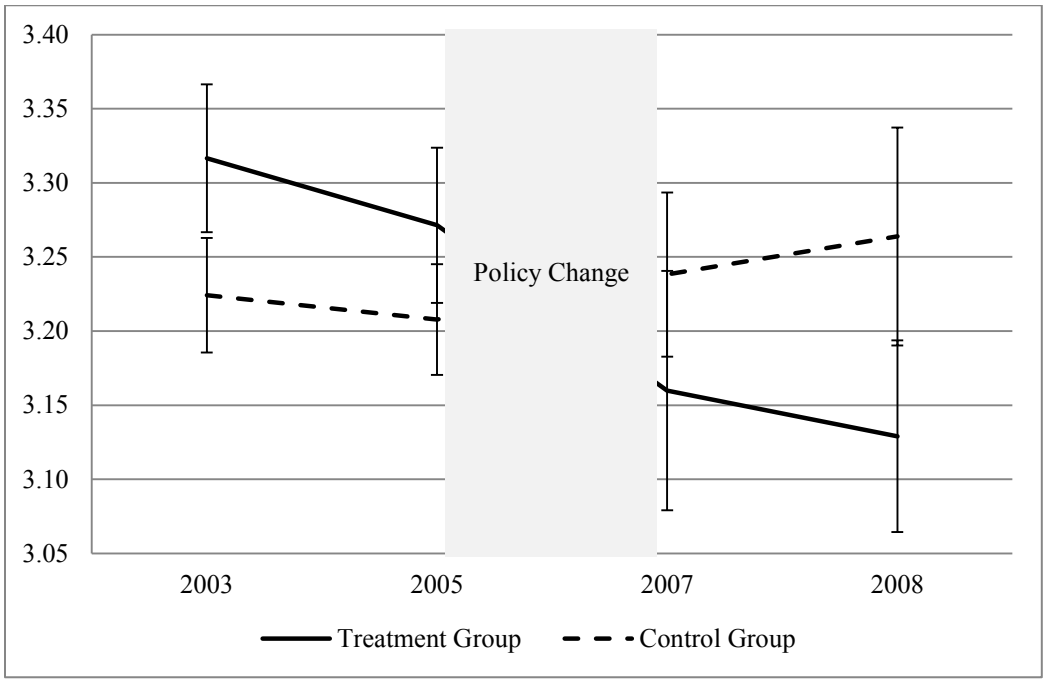
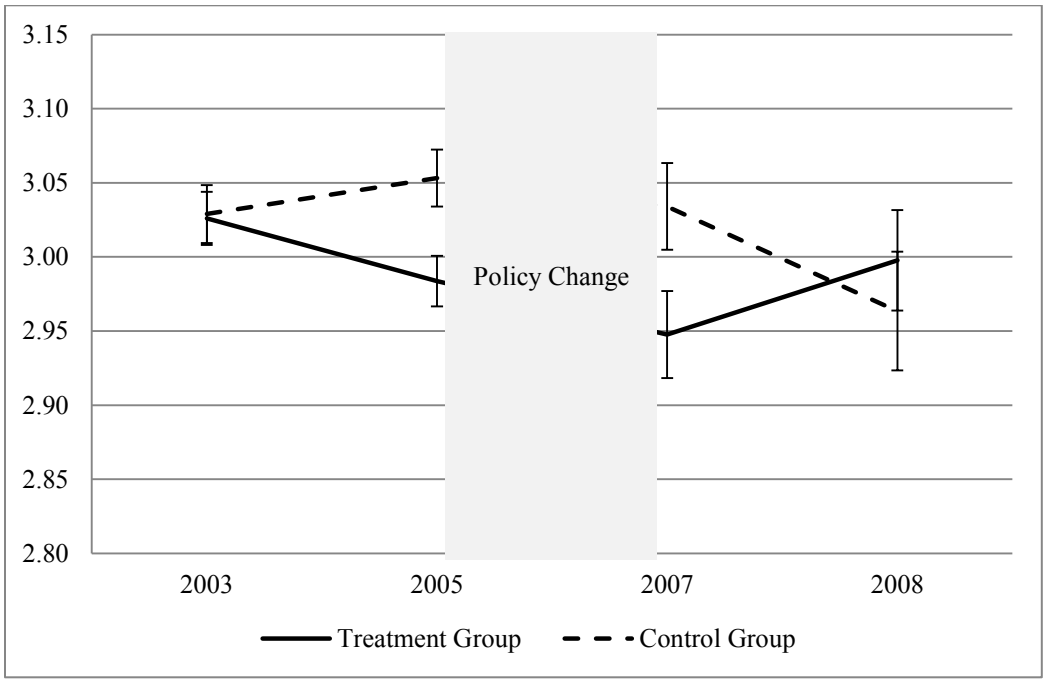


Figure 3.5B
Average Stress of Married Mothers across Time



Thinking about the amount of stress in your life, would you say that most days are:
(1) not at all; (2) not very; (3) a bit; (4) quite a bit; or (5) extremely stressful?

Figure 3.6A
Average Life Satisfaction of Lone Mothers across Time

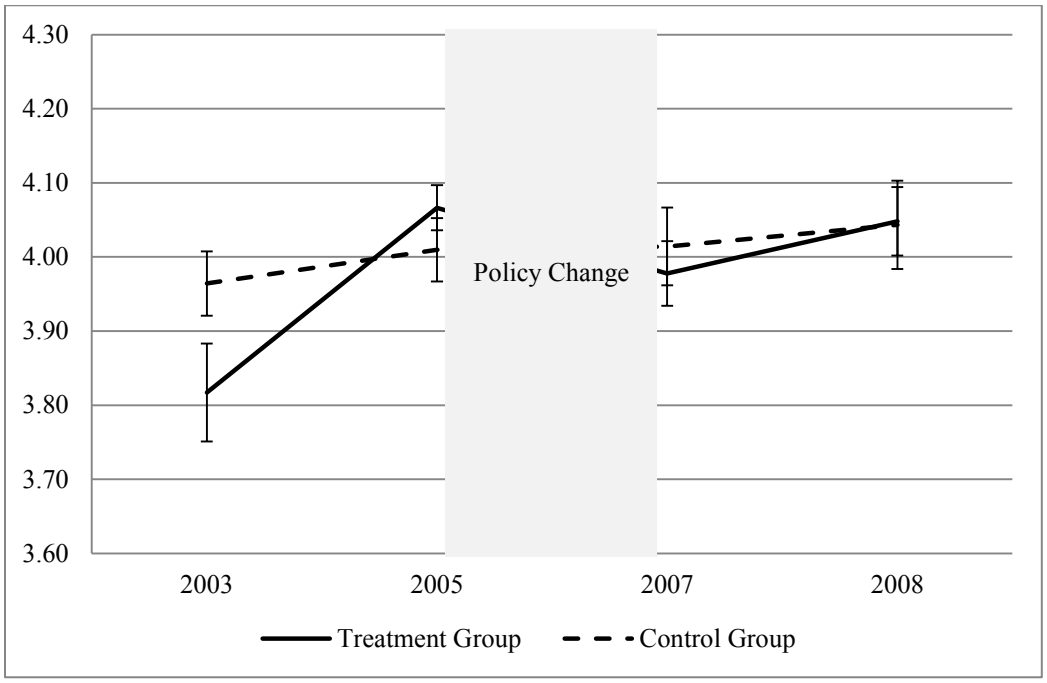
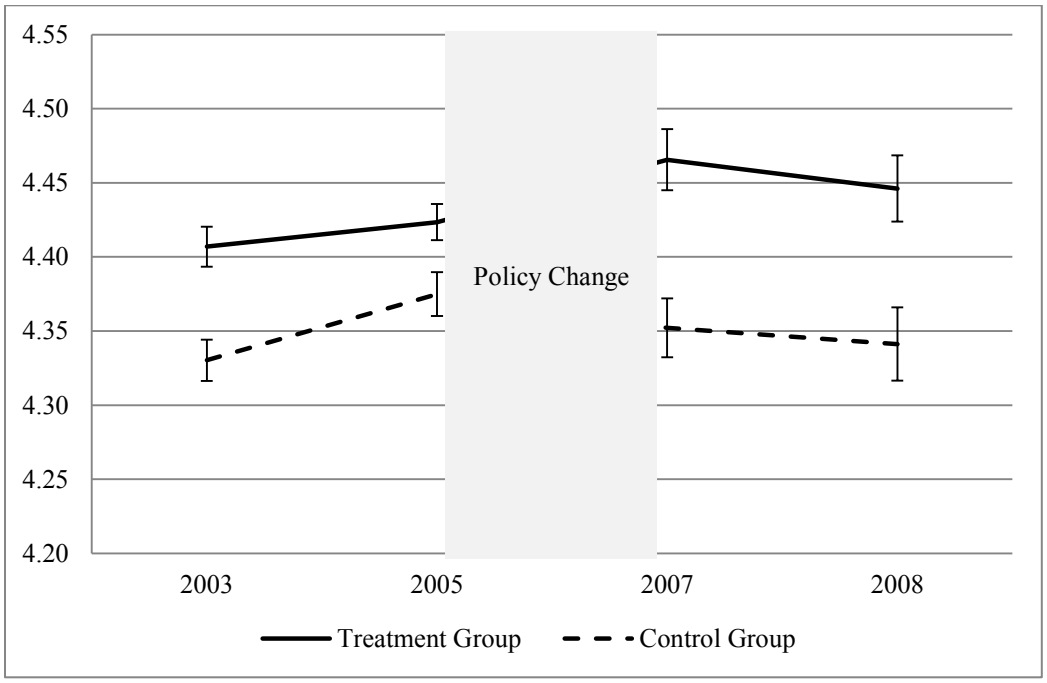


Figure 3.6B
Average Life Satisfaction of Married Mothers across Time



How satisfied are you with your life in general: (1) very dissatisfied; (2) dissatisfied; (3) neither dissatisfied nor satisfied; (4) satisfied; or (5) very satisfied?

Chapter 4

Smoking and Exposure to Second-Hand Smoke during Pregnancy: Explaining Differences between Aboriginal and Non-Aboriginal Women in Canada

4.1 Introduction

Prenatal smoking is a preventable cause of death and illness among infants, with implications for health and human capital throughout the lifecycle (Centers for Disease Control and Prevention 2001). Of course, consequences depend on the amount and timing of exposure (Bernstein et al 2005; Lieberman et al 1994; Jaddoe et al 2008). For example, risks increase with the number of cigarettes. And, smoking in the third trimester is most harmful to fetal development.

Empirically, the relationship between prenatal smoking and child outcomes is endogenous due to omitted variables (e.g. family background). However, the effect on birthweight is consistent across studies including controlled experiments with animals (Ernst et al 2001; Gilman et al 2008). It is a leading cause of low birthweight; infants born to mothers who smoked during pregnancy are more than twice as likely to be of low birthweight (Almond et al 2005; Lien and Evans 2005). In this context, birthweight is an output in the production of infant health, a factor of which is prenatal smoking. At the same time, birthweight proxies the health endowment and thus is an input in the production of 'health human capital' (Almond et al 2005). For instance, low birthweight is associated with morbidity, behavioural problems and cognitive impairment in children (McCormick et al 1992; Matte et al 2001; Taylor et al 2000). Moreover it has a negative and significant effect on educational attainment, employment and health in later-life (Currie and Hyson 1999; Behrman and Rosenzweig 2004; Case et al 2005). This persists when controlling for unobserved factors that influence birthweight and later-life outcomes, such as family background and genetics. These findings are consistent with the 'fetal origins hypothesis', which infers that uterine conditions manifest in health and socio-economic status (Almond and Currie 2011). Similarly, Heckman (2007) posits that investments in human capital are persistent; capabilities produced at one stage of the

lifecycle reinforce those attained at later stages and enhance the productivity of subsequent investments.

In addition to challenges faced by the affected individuals, there are profound implications for their families and society. For example, the average hospital cost of a low birthweight infant is 11 times higher than that of one in the normal range (i.e. above 2,500 grams) – $12,354 compared to $1,084 in 2006 dollars (Canadian Institute for Health Information 2009). This estimate pertains to 'typical' low birthweight infants (i.e. those who are treated in the hospital in which they are born and then discharged). It does not include cases in which infants are transferred between hospitals, long-term stays or deaths. Likewise it does not include the cost of caring for mothers of low birthweight infants. And, in addition to this initial cost, follow-up care may be necessary and expensive (e.g. physician visits, hospital re-admissions, out-of-pocket spending). Caregivers also face productivity losses and non-pecuniary costs such as stress and guilt.

The consequences of prenatal smoking are persistent and costly, but are preventable. Thus, it is important to identify characteristics of women who are most likely to engage in this behaviour, focusing on those that are amenable to policy. Evidence is lacking in a Canadian context except a few studies that advocate the importance of age, family structure and socio-economic status. They also find co-existing conditions such as poor health, not having a regular physician and lack of prenatal care (Cui et al 2014; Lange et al 2015; Al-Sahab et al 2010). Note that these are correlates of prenatal smoking, not necessarily causes. For example, unobserved factors may influence both socio-economic status and health behaviour (e.g. family background, time preference).

Many of the above-mentioned characteristics are pervasive among Aboriginal peoples in Canada.[70] For example, they tend to be younger and of lower socio-economic status relative to the non-Aboriginal population (Statistics Canada 2013-a; Burton et al 2015). They are also more likely to be in poor health and underserved by the health system (National Collaborating Centre for Aboriginal Health 2013). Thus, it is important to

[70] There are three Aboriginal groups: First Nations; Métis; and Inuit. In this chapter, I make comparisons between Aboriginal and non-Aboriginal women, where the former includes the three groups. However, there are considerable differences between and within groups in terms of history, language, culture and other dimensions.

distinguish between Aboriginal and non-Aboriginal women in studies of prenatal smoking. This is further justified by a high smoking rate among Aboriginal peoples – 39 percent, which is almost double that of the non-Aboriginal population (Physicians for a Smoke-Free Canada 2013). It is interesting to note that tobacco is an important part of First Nations culture with ceremonial and medicinal uses, and Elders claim that recreational use is disrespectful to this tradition (Health Canada 2014).

To my knowledge, there is only one study that compares prenatal smoking among Aboriginal and non-Aboriginal women in Canada.[71] Heaman and Chalmers (2005) find that 61 percent of Aboriginal women smoke during pregnancy compared to 26 percent of the non-Aboriginal population, with no correlates that are specific to the former. However, this study is limited to women in Winnipeg, Manitoba and cannot be generalized to the Canadian population more broadly. For example, more than half of Aboriginal peoples live in rural and remote communities (Ministerial Advisory Council on Rural Health 2002).

Thus, it is important to better understand differences between Aboriginal and non-Aboriginal women as prenatal smoking may perpetuate existing inequalities between these groups. In this chapter, I characterize women who are most likely to engage in this risky behaviour, with the goal of informing culturally-appropriate interventions. Specifically, I use nationally representative data to examine the prevalence and correlates of prenatal smoking among Aboriginal and non-Aboriginal women, respectively. Then, I use Blinder-Oaxaca decompositions to show how group differences in relevant characteristics and size/strength of the associations contribute to group differences in this risky behaviour. For example, Aboriginal women tend to have lower socio-economic status, which is a correlate of prenatal smoking. Thus, I determine how much of a difference it would make if Aboriginal and non-Aboriginal women had the same socio-economic status. The latter is amenable to policy (e.g. education, income).

In addition to prenatal smoking, I consider exposure to second-hand smoke. It contains the same chemicals and carcinogens that are inhaled by smokers. It is just as harmful to

[71] However, there is evidence that Aboriginal women are more likely to smoke during pregnancy in the United States and Australia (Tong et al 2013; Li et al 2011).

fetal development, with profound implications for the affected individuals, their families and society (Health Canada 2011). Finally, as an extension to the main analysis, I consider the frequency with which women smoke during pregnancy since risks increase with the number of cigarettes.[72]

4.2 Data

I use cross-sectional microdata from the CCHS, an objective of which is to enable health research on small populations through large sample sizes. This is important for studying Aboriginal peoples, who comprise only four percent of the Canadian population (Statistics Canada 2008-a). Moreover the same questions are asked of Aboriginal and non-Aboriginal respondents, which enable direct comparisons between these groups. A further advantage of the CCHS is that, unlike many other population-level surveys, it includes Northern Canada except very small, remote communities in Nunavut. The North has a relatively large Aboriginal population, ranging from 25 percent in Yukon to 85 percent in Nunavut (Statistics Canada 2008-a). And, prenatal smoking and exposure to second-hand smoke are believed to be especially problematic in the region (Cui et al 2014; Lange et al 2015; Al-Sahab et al 2010).

The CCHS includes private households in all provinces/territories except full-time members of the military, institutional residents, those on Crown land and First Nations reserves.[73] It covers 98 percent of the Canadian population aged 12 and older (Statistics Canada 2005). And, response rates are approximately 80 percent in each of the three cycles used in this chapter (Statistics Canada n.d.-b; Statistics Canada 2005; Statistics Canada 2006).

The CCHS was conducted every two years from 2001 to 2007 and annually thereafter. I pool three cross-sections of the CCHS master files: Cycles 1.1 (2001); 2.1 (2003); and 3.1 (2005). In later cycles, questions about prenatal smoking and exposure to second-hand smoke are part of an optional module.[74] I scale sampling weights to sum to one

[72] Unfortunately, I do not have information about the timing of exposure.
[73] Thus, for the purposes of this chapter, the Aboriginal population is exclusive of First Nations women living on reserve.
[74] Health regions select optional modules to address local priorities. Since Cycle 3.1 (2005), optional modules have been coordinated at the provincial/territorial-level.

within each cycle since they are representative of the same population and sample size varies across cycles.

My sample includes Canadian women aged 15 to 55 who have given birth within five years of the survey. The dependent variables are binary and defined as: (1) whether a woman smoked during pregnancy; and (2) whether she was regularly exposed to second-hand smoke. I drop proxy interviews given the sensitive nature of the dependent variables. Also, women who had a stillbirth are not asked this line of questioning in the CCHS. The estimating sample includes 17,997 women, 1,187 of whom are Aboriginal.

4.3 Descriptive Statistics

As shown in Figure 4.1, there are marked differences in prenatal smoking and exposure to second-hand smoke across study groups.[75] I find that 42.4 percent of Aboriginal women smoke during pregnancy compared to 14.9 percent of the non-Aboriginal population. Likewise a relatively large proportion of Aboriginal women are regularly exposed to second-hand smoke (i.e. 39.5 versus 17.1 percent). Appendix Figures C.1A and C.1B indicate that, among the Aboriginal population, Inuit women are more likely to smoke during pregnancy (i.e. 59.5 percent) compared to 37.5 and 36.8 percent of First Nations and Métis women, respectively.[76] On the other hand, there is little variation in exposure to second-hand smoke. Appendix Figures C.1A and C.1B exclude Cycle 2.1 (2003) because it does not specify whether Aboriginal women are First Nations, Métis or Inuit. Moreover not all Aboriginal women report this information in Cycles 1.1 (2001) and 3.1 (2005). Given these exclusions and small samples, I make comparisons between Aboriginal and non-Aboriginal women, where the former includes First Nations, Métis and Inuit women.

Table 4.1 contains means of selected covariates by study group (i.e. potential correlates of prenatal smoking and exposure to second-hand smoke). First, Aboriginal women are relatively young at the time of childbirth. Age at childbirth is calculated as a woman's age minus the difference between the survey and birth years; it ranges from 14 to 51.

[75] Standard error bars represent uncertainty due to sampling.
[76] This is consistent with Loppie Reading and Wien (2009), who report that 37 percent of First Nations women living on reserve smoke during pregnancy. Recall these women are not included in the CCHS.

Aboriginal women are also more likely to be single (i.e. separated, divorced, widowed or never married) – 41.6 versus 12.2 percent. This coincides with evidence that lone-parent families are relatively common in the North and among Aboriginal children in Southern Canada (Burton et al 2015).

Table 4.1 also indicates that Aboriginal women have lower socio-economic status. For example, 28.6 percent have less than high school education compared to 9.2 percent of non-Aboriginal women. Likewise post-secondary education is less common among Aboriginal women (i.e. 37.1 versus 65.7 percent). Finally, household income is considerably lower among this group; they earn $14,335 less per year, on average. Income is before taxes and after transfers. As described below, I make adjustments for inflation, economies of scale in consumption and higher cost of living in Northern Canada.

On balance, there are striking differences between Aboriginal and non-Aboriginal women in terms of prenatal smoking and exposure to second-hand smoke, as well as selected covariates. In what follows, I examine correlates in a regression framework (i.e. for the full sample and by study group). Then, I use Blinder-Oaxaca decompositions to show how group differences in relevant characteristics and size/strength of the associations contribute to group differences in these risky behaviours. For example, Figure 4.1 indicates that prevalence of prenatal smoking is higher among Aboriginal women, while Table 4.1 shows they have lower education and income. I determine whether socio-economic status is a correlate of prenatal smoking and how much of a difference it would make if Aboriginal and non-Aboriginal women had the same education and income.

4.4 Methodology

4.4.1 Regression Analysis

I examine correlates by estimating a linear probability model for each dependent variable using a pooled sample of Aboriginal and non-Aboriginal women with a group dummy variable, as well as a separate sample for each study group. I consider several demographic, socio-economic, geographic and temporal characteristics. They reflect a woman's situation at the time of the survey, while dependent variables pertain to the

prenatal period. However, I do not expect this lapse of zero to five years to affect the results. For example, income is persistent for families with children, especially at the bottom and top of the distribution (Burton et al 2014). Likewise inter-provincial migration among families with young children is relatively uncommon (Chen et al 2015).

In terms of demographic characteristics, I include four dummy variables for age at childbirth relative to the base category of 25 to 29 year olds.[77] I also control for whether a woman is single, as opposed to married or in a common-law relationship.[78] And, as indicators of socio-economic status, I include dummy variables for education (i.e. less than high school and post-secondary compared to high school), as well as the natural logarithm of household income. Income is before taxes and after transfers. I make adjustments for: (1) inflation; (2) economies of scale in consumption; and (3) higher cost of living in Northern versus Southern Canada. First, I deflate income to real 2006 dollars using the all-items Consumer Price Index by province/territory (Statistics Canada n.d.-c). Then, based on the 'Luxembourg Income Study' equivalence scale, I divide by the square root of household size to account for economies of scale in consumption. Finally, I divide Northern incomes by 1.46 to reflect lower purchasing power in the region (Daley et al 2015).

To account for the local environment, I include unemployment rate in the birth year and its quadratic.[79] Unemployment rates are annual averages by province/territory (Statistics Canada n.d.-e; Statistics Canada n.d.-f). I also include dummy variables for rural versus urban residence and province/territory relative to Ontario. Finally, I control for time on two levels: (1) birth year, which reflects norms in the prenatal period, ranging from 1996 to 2005 compared to 1995; and (2) survey cycle, which may reveal later trends in reporting prenatal behaviour (i.e. zero to five years post-partum).

[77] Results are robust to using a woman's age at the time of the survey.
[78] Also related to the family environment, I include a dummy variable to indicate the presence of other young children. This may reflect awareness of the risks associated with prenatal smoking, contact with the health system and/or learning from experience. Point estimates are small, negative and statistically significant. Interactions with the Aboriginal dummy variable are statistically insignificant. Results are available upon request.
[79] Results are robust to averaging unemployment rate in the birth year and one year prior. This is important for women whose prenatal period spans two calendar years.

4.4.2 Blinder-Oaxaca Decompositions

Based on the regression analysis, I use Blinder-Oaxaca decompositions to show how group differences in relevant characteristics and size/strength of the associations contribute to group differences in prenatal smoking and exposure to second-hand smoke (Blinder 1973; Oaxaca 1973). This technique is often used to study economic discrimination such as wage gaps by gender, race, age and other dimensions. Following Jann (2008), I decompose the mean difference in each dependent variable between Aboriginal and non-Aboriginal women.[80]

$$Difference = E[Y_A] - E[Y_{NA}] \quad [4.1]$$

$E[Y_A]$ and $E[Y_{NA}]$ denote the expected values of the dependent variable for Aboriginal and non-Aboriginal women, respectively.

The Blinder-Oaxaca decomposition is based on the assumption that Y is linearly related to X, which is the vector of covariates described above. It includes a constant. β consists of parameters to be estimated and ε is the error term.

$$Y = \beta X + \varepsilon \quad [4.2]$$

Combining Equations 4.1 and 4.2, the mean difference in the dependent variable across groups is:

$$Difference = E[\beta_A X_A + \varepsilon_A] - E[\beta_{NA} X_{NA} + \varepsilon_{NA}] = E[X_A]\beta_A - E[X_{NA}]\beta_{NA} \quad [4.3]$$

Rearranging the predicted values, the mean difference in the dependent variable between Aboriginal and non-Aboriginal women can be decomposed into three components.[81] The 'endowments' component reflects group differences in relevant characteristics. It measures the expected reduction in the dependent variable for Aboriginal women if they had the same characteristics as non-Aboriginal women. The 'coefficients' component

[80] Other methods, such as recentered influence function regressions, can be used to decompose differences in other distributional statistics (Fortin et al 2011).

[81] Alternatively, it can be decomposed into two components – 'explained' and 'unexplained'. These are comparable to endowments and coefficients, respectively. The latter reflects economic discrimination (i.e. different returns to productive characteristics across groups). A non-discriminatory vector of parameter estimates, $\hat{\beta}^*$, is used as the benchmark. It may be obtained by estimating Equation 4.2 for the full sample with a group dummy variable (Neumark 1988; Jann 2008).

reflects group differences in size/strength of the associations between correlates and prenatal behaviour, as well as differences in unobserved characteristics. The 'interaction' component reflects concurrent differences in endowments and coefficients. A positive interaction indicates that size/strength is greater for characteristics in which women have lower means, and vice versa.

$$Difference = \underbrace{\hat{\beta}_A(\bar{X}_A - \bar{X}_{NA})}_{\text{Endowments}} + \underbrace{\bar{X}_A(\hat{\beta}_A - \hat{\beta}_{NA})}_{\text{Coefficients}} + \underbrace{(\bar{X}_A - \bar{X}_{NA})(\hat{\beta}_{NA} - \hat{\beta}_A)}_{\text{Interaction}} \quad [4.4]$$

$\bar{X}_A$ and $\bar{X}_{NA}$ are group means. $\hat{\beta}_A$ and $\hat{\beta}_{NA}$ denote size/strength of the associations between correlates and prenatal behaviour for Aboriginal and non-Aboriginal women, respectively. They are obtained by estimating Equation 4.2 with a separate sample for each study group (i.e. as in Section 4.4.1). I use OLS with robust standard errors despite having binary dependent variables for ease of interpretation and because the Blinder-Oaxaca decomposition is theorized in this context. Note that decompositions are invariant to the choice of a base for categorical covariates. For each set, estimates equal the average from a series of decompositions in which categories are successively omitted (Yun 2005).

4.5 Findings

4.5.1 Regression Analysis

Tables 4.2 and 4.3 contain estimates of the linear probability model for smoking and exposure to second-hand smoke, respectively. They are given for the full sample, as well as by study group. Note that results are robust to clustering standard errors by province/territory. I use the wild cluster bootstrap method to account for the small number of clusters (Cameron and Miller 2015). Moreover sign and statistical significance of probit estimates are comparable to those obtained via OLS. These results are available upon request.

As shown in the first column of Table 4.2, Aboriginal women are more likely to smoke during pregnancy (i.e. the point estimate is 0.16 or 42.7 percent of a standard deviation). The same is true for young women compared to the base category of 25 to 29 year olds,

while older women are less likely to smoke during pregnancy. Moreover the probability of smoking is higher for single women compared to those who are married or in a common-law relationship (i.e. the point estimate is 0.13 or 37.1 percent of a standard deviation).

Socio-economic status is also important. Relative to graduates, those with less than high school education are more likely to smoke during pregnancy. The opposite is true for women with post-secondary education. Similarly, the probability of smoking declines as income rises.

Finally, there is variation by rural versus urban residence and across provinces/territories. For example, women in Atlantic Canada, Quebec, the Prairies and Northern Canada are more likely to smoke during pregnancy compared to those in Ontario. As shown in the first column of Table 4.3, results are generally similar for exposure to second-hand smoke except the probability is lower among women in British Columbia. And, it declines from 2001 onward relative to 1995.

The remaining columns of Tables 4.2 and 4.3 contain estimates of the linear probability model for smoking and exposure to second-hand smoke by study group. Results for non-Aboriginal women are similar to those for the full sample. However, among Aboriginal women, correlates of prenatal smoking are limited to age at childbirth, education and province/territory. Notably, young Aboriginal women are less likely to smoke during pregnancy compared with 25 to 29 year olds (i.e. the point estimate is -0.16 or 32.4 percent of a standard deviation). Moreover the probability of smoking is lower among Aboriginal women in Quebec and British Columbia relative to Ontario. Correlates of exposure to second-hand smoke among Aboriginal women are limited to age at childbirth, marital status and education.

On balance, I find that age at childbirth, marital status, education, income and geography are important correlates of prenatal smoking and exposure to second-hand smoke. This is consistent with other Canadian studies (Cui et al 2014; Lange et al 2015; Al-Sahab et al 2010). However, unlike the findings of Heaman and Chalmers (2005), some correlates

are specific to Aboriginal women, including age at childbirth and education.[82] Yet, there are notable differences in size/strength of the associations across groups, in addition to differences in relevant characteristics (i.e. refer to Section 4.3). Thus, I use Blinder-Oaxaca decompositions to how this affects prenatal behaviour. For example, Aboriginal women have lower education, which is a correlate of prenatal smoking. I determine how much of a difference it would make if Aboriginal and non-Aboriginal women had the same education.

4.5.2 Blinder-Oaxaca Decompositions

Results are presented in Table 4.4 and summarized in Figure 4.2. As with the regression analysis, Blinder-Oaxaca decompositions are robust to limiting the sample to vulnerable groups (i.e. young women, those with less than high school education and low income, respectively). They are also robust to dropping women who do not have a child aged five or younger. This matters to the extent that women who continue to care for their children are different from those who do not.

I find that 42.4 percent of Aboriginal women smoke during pregnancy compared to 14.9 percent of the non-Aboriginal population. The difference is large and statistically significant (i.e. 27.6 percentage points with a t-statistic of 11.5). About half of the gap is accounted for by endowments (i.e. group differences in relevant characteristics). Specifically, the prevalence of prenatal smoking among Aboriginal women would fall by 14.5 percentage points if they had the same characteristics as non-Aboriginal women. This is largely driven by education and province/territory. For example, the prevalence of prenatal smoking among Aboriginal women would fall by 5.3 percentage points if they had the same education as non-Aboriginal women. Recall from Section 4.3 that educational attainment is much lower among the former. For example, 28.6 percent have less than high school education compared to 9.2 percent of non-Aboriginal women. And, post-secondary education is less common (i.e. 37.1 versus 65.7 percent).

The 'coefficients' component is also statistically significant and accounts for the other half of the gap. Recall the 'coefficients' component reflects group differences in

[82] Recall this study is limited to women in Winnipeg, Manitoba and cannot be generalized to the Canadian population more broadly.

size/strength of the associations between correlates and prenatal behaviour, as well as differences in unobserved characteristics. The 'interaction' component is small and statistically insignificant.

As shown in the final column of Table 4.4, the difference in exposure to second-hand smoke between Aboriginal and non-Aboriginal women is also large and statistically significant (i.e. 22.4 percentage points with a t-statistic of 9.3). In this case, all components contribute to the gap. About one third is accounted for by endowments (i.e. group differences in relevant characteristics). Specifically, exposure to second-hand smoke among Aboriginal women would fall by 6.9 percentage points if they had the same characteristics as non-Aboriginal women. This is largely driven by age at childbirth, marital status, education and birth year. The 'coefficients' and 'interaction' components are also statistically significant and account for the rest of the gap.

4.6 Extension

As an extension to the main analysis, I consider the frequency with which women smoke during pregnancy. Figure 4.3 depicts the number of cigarettes per day, ranging from zero for non-smokers to 50.[83] It suggests that a hurdle model is appropriate because there are structural zeros, followed by a series of positive values (Mullahy 1986). Conceptually, a binomial probability model determines whether a zero or positive value is realized. Then, for those who cross the hurdle, positive values are governed by a zero-truncated count model. I use a single hurdle model because there are no zeros in the second component as with double hurdle models. Similarly, it is not appropriate to use a zero-inflated count model in which two processes generate zeros. This would be suitable with data in which some women do not smoke during pregnancy, while others may smoke but not always.

The hurdle model can be fit by optimizing the two components separately, although participation and amount decisions are made simultaneously (McDowell 2003). I have already examined the participation decision. Thus, I now focus to the right of the hurdle where smokers decide on the amount. Let Z equal the number of cigarettes per day. X is

[83] I aggregate the number of cigarettes into five categories to maintain respondent confidentiality.

the vector of covariates described above. It includes a constant. α consists of parameters to be estimated and μ is the error term.

$$Z = \alpha X + \mu \quad \text{if } Z > 0 \qquad [4.5]$$

I estimate Equation 4.5 using a zero-truncated negative binomial model. This is more appropriate than a zero-truncated Poisson model because the variance of Z is greater than its mean. This is confirmed by a large and statistically significant dispersion parameter in the fitted model. The estimating sample includes 3,676 women, 553 of whom are Aboriginal. Results for the full sample and by study group are given in Table 4.5. As with other models, they are robust to dropping women who do not have a child aged five or younger. Again, this matters to the extent that women who continue to care for their children are different from those who do not.

I find that Aboriginal women smoke fewer cigarettes per day, on average.[84] However, the difference in means is 0.72 with a standard error of 0.61. Similarly, the point estimate on the Aboriginal dummy variable is small and statistically insignificant.

It is also interesting to note that, while young women are more likely to smoke during pregnancy, they smoke fewer cigarettes per day compared to the base category of 25 to 29 year olds (i.e. by a factor of $e^{-0.29}$= 0.75). The opposite is true for older women. Socio-economic status is also important. For example, those with less than high school education smoke more cigarettes per day (i.e. by a factor of $e^{0.29}$= 1.3). Similarly, the amount of smoking declines as income rises.

Also for the full sample, I find that living in a rural area and higher unemployment are associated with an increase in the number of cigarettes per day. And, while women in Northern Canada are more likely to smoke during pregnancy, they smoke fewer cigarettes per day compared to those in Ontario (i.e. by a factor of $e^{-0.33}$= 0.72). Finally, the amount of smoking declines in later cycles, all else constant.

[84] Appendix Figure C.2 indicates that, among the Aboriginal population, Métis women smoke more cigarettes per day. And, while Inuit women are more likely to smoke during pregnancy (i.e. Appendix Figure C.1A), they smoke fewer cigarettes per day. Again, small and restricted samples preclude further analysis by Aboriginal group.

The remaining columns of Table 4.5 contain estimates of the zero-truncated negative binomial model for Aboriginal and non-Aboriginal women, respectively. Correlates among the latter are similar to those for the full sample except the unemployment rate and Northern dummy variable are statistically insignificant. The same is true for Aboriginal women, in addition to dummy variables for being young, having less than high school education and living in a rural area. However, the amount of smoking declines in later birth years relative to 1995.

4.7 Discussion

The consequences of prenatal smoking and exposure to second-hand smoke are persistent, with implications for health and human capital throughout the lifecycle. As a result, these risky behaviours may perpetuate existing inequalities between Aboriginal and non-Aboriginal populations. The relevant literature is lacking in a Canadian context, with only one study that compares Aboriginal and non-Aboriginal women in Winnipeg, Manitoba. Therein is the contribution of this chapter.

I use nationally representative data to examine the prevalence and correlates of prenatal smoking and exposure to second-hand smoke among Aboriginal and non-Aboriginal women, respectively. I find that 42.4 percent of Aboriginal women smoke during pregnancy compared to 14.9 percent of the non-Aboriginal population. Likewise a relatively large proportion of Aboriginal women are regularly exposed to second-hand smoke (i.e. 39.5 versus 17.1 percent). Important correlates include: marital status; income; geography; age at childbirth; and education. The latter two are particularly important for Aboriginal women. Notably, young Aboriginal women are less likely to smoke during pregnancy compared to the base category of 25 to 29 year olds. This is consistent with evidence that smoking is most common among young adults (i.e. those aged 18 to 29), despite the belief that such behaviour is largely established in adolescence (Hammond 2005).

Next, I use Blinder-Oaxaca decompositions to explain group differences in prenatal behaviour. I find that prevalence of prenatal smoking among Aboriginal women would fall by 14.5 percentage points if they had the same characteristics as non-Aboriginal

women; 5.3 percentage points are attributable to education. The rest of the gap is accounted for by the 'coefficients' component. Similarly, exposure to second-hand smoke among Aboriginal women would fall by 6.9 percentage points if they had the same characteristics as non-Aboriginal women. This is largely driven by age at childbirth, marital status, education and birth year. The 'coefficients' and 'interaction' components are also statistically significant and account for the rest of the gap.

Finally, as an extension to the main analysis, I consider the frequency with which women smoke during pregnancy. It is interesting to consider these results in conjunction with those described above (i.e. hurdle model of participation and amount decisions). I find that, while Aboriginal women are more likely to smoke during pregnancy, there is no difference in the number of cigarettes per day among those who do. Similarly, some characteristics are associated with a higher probability of smoking but to a lesser amount (e.g. being young at the time of childbirth and living in Northern Canada – for the full sample). The opposite is true among older women; they are less likely to smoke during pregnancy, but the amount is greater among those who do.

On the other hand, some characteristics are associated with a higher probability of smoking and to a greater amount (e.g. having less than high school education or low income – for the full sample and non-Aboriginal women). This implies a compounding effect. Finally, some characteristics are important for the participation decision but not the amount (e.g. marital status – for the full sample; living in British Columbia – for Aboriginal women) and vice versa (e.g. birth year – for Aboriginal women). In terms of the latter, it is interesting to note that, while the probability of smoking has not changed over time among Aboriginal women, the amount of smoking declines in later birth years relative to 1995. Perhaps they are more aware of the risks and, while they do not fully abstain, they smoke less over time.

4.7.1 Limitations

A number of limitations should be noted. First, there may be selection bias as I do not observe women who had a stillbirth. Also, there may be bias in the dependent variables. For example, women report their behaviour from zero to five years prior to the survey

(i.e. zero to five years post-partum). Moreover they may fear social stigma or repercussions, such as child welfare services. This may be especially true for Aboriginal women, among whom there is distrust toward provincial/territorial and federal governments (United Nations General Assembly 2014).

Another limitation is that I do not observe familial history of residential schooling. This 'inter-generational and collective trauma' contributes to substance abuse among Aboriginal peoples in Canada (Tait 2003). Thus, it is important to consider its association with smoking and exposure to second-hand smoke during pregnancy. Likewise Burton et al (2015) find that Aboriginal households are more likely to be crowded. It would be interesting to consider how this affects prenatal behaviour, especially exposure to second-hand smoke. Unfortunately, this information is not available in Cycle 1.1 (2001) of the CCHS.

Finally, results should be interpreted with caution due to unobserved heterogeneity. I identify correlates of prenatal behaviour, not necessarily causal factors. For example, Aboriginal women with post-secondary education are less likely to smoke during pregnancy (i.e. compared to high school graduates); however unobserved factors, such as family background and time preference, may influence both education and prenatal smoking. I could address this limitation with longitudinal data, but they do not include Northern Canada.

Similarly, in the decompositions, the 'coefficients' component reflects group differences in size/strength of the associations between correlates and prenatal behaviour, as well as differences in unobserved characteristics. The latter are probable (e.g. time preference). And, in terms of the 'endowments component', there may be systemic barriers to improving educational outcomes among Aboriginal women. These include: distrust toward provincial/territorial and federal governments, especially with respect to schooling; lack of access in rural and remote regions; curriculum that largely ignores Aboriginal culture and language.

4.8 Conclusions

Despite these limitations, I find striking differences in prenatal smoking and exposure to second-hand smoke between Aboriginal and non-Aboriginal women. This has implications for inequality of well-being in present and future terms. However, there is a role for policy, and education is a viable option. For example, the prevalence of prenatal smoking among Aboriginal women would fall by 5.3 percentage points if they had the same education as non-Aboriginal women. Again, consideration must be given to systemic barriers to improving educational outcomes among Aboriginal peoples. Moreover, non-Aboriginal women with less than high school education are more likely to smoke during pregnancy and the amount is greater among those who do (i.e. compared to graduates). This implies a compounding effect, which may be another area for policy intervention.

It is also interesting to note that, while Aboriginal women are more likely to smoke during pregnancy, there is no difference in the number of cigarettes per day among those who do. This might be interpreted favourably in terms of inequality between Aboriginal and non-Aboriginal women since risks increase with the amount of smoking. Similarly, while the probability of smoking has not changed over time among Aboriginal women, the amount of smoking declines in later birth years relative to 1995.

In addition to addressing the above-mentioned limitations, future work should continue to examine differences between First Nations, Métis and Inuit women. Data permitting, it is also important to consider the timing of exposure since smoking in the third trimester is most harmful to fetal development. Finally, it would be interesting to evaluate the effect of smoking bans on prenatal behaviour. For example, public-place smoking bans were implemented with variation across communities, time and level of protection (Carpenter et al 2011). Likewise smoke-free car laws were enacted by province/territory and time, starting with Nova Scotia in 2008 (Nguyen 2013). Although outside the scope of this chapter, such policies may explain differences in prenatal smoking and exposure to second-hand smoke across regions and time.

Table 4.1
Means of Selected Covariates

	Aboriginal		Non-Aboriginal		Difference		
Age at Childbirth 14 to 19, Percent	13.92	(1.83)	3.17	(0.17)	10.75	(1.84)	***
Age at Childbirth 20 to 24, Percent	30.68	(2.33)	14.92	(0.37)	15.75	(2.36)	***
Age at Childbirth 25 to 29, Percent	27.85	(2.05)	30.76	(0.49)	-2.91	(2.11)	
Age at Childbirth 30 to 34, Percent	16.36	(1.89)	32.82	(0.51)	-16.45	(1.96)	***
Age at Childbirth 35 and Older, Percent	11.19	(1.75)	18.34	(0.47)	-7.14	(1.81)	***
Single, Percent	41.62	(2.45)	12.25	(0.32)	29.37	(2.47)	***
Less than High School Education, Percent	28.61	(2.14)	9.22	(0.32)	19.39	(2.17)	***
High School Education, Percent	34.26	(2.45)	25.06	(0.47)	9.20	(2.50)	***
Post-Secondary Education, Percent	37.12	(2.41)	65.72	(0.52)	-28.60	(2.46)	***
Real Equivalent Income, 2006 Dollars	21,730	(866.19)	36,065	(302.78)	-14,335	(917.26)	***
Rural, Percent	26.89	(2.00)	17.24	(0.36)	9.65	(2.03)	***
Number of Observations	1,187		16,810		17,997		

Standard errors are reported in parentheses. *** indicates that the difference between Aboriginal and non-Aboriginal women is statistically significant at the one percent-level.

Table 4.2
Linear Probability Models, Smoking

	Full Sample			Aboriginal			Non-Aboriginal		
Mean (Standard Deviation)	0.156	(0.363)		0.424	(0.494)		0.149	(0.356)	
Aboriginal	0.155	(0.026)	***	…			…		
Age at Childbirth 14 to 19	0.057	(0.026)	**	-0.160	(0.072)	**	0.077	(0.027)	***
Age at Childbirth 20 to 24	0.052	(0.012)	***	-0.063	(0.058)		0.055	(0.013)	***
Age at Childbirth 30 to 34	-0.017	(0.008)	**	-0.145	(0.067)	**	-0.013	(0.009)	
Age at Childbirth 35 and Older	-0.022	(0.010)	**	-0.085	(0.082)		-0.020	(0.010)	*
Single	0.129	(0.014)	***	0.054	(0.048)		0.132	(0.014)	***
Less than High School Education	0.129	(0.018)	***	0.103	(0.061)	*	0.130	(0.019)	***
Post-Secondary Education	-0.089	(0.009)	***	-0.115	(0.053)	**	-0.087	(0.010)	***
Log of Real Equivalent Income	-0.014	(0.004)	***	-0.023	(0.024)		-0.014	(0.004)	***
Unemployment Rate	-0.010	(0.017)		0.016	(0.067)		-0.013	(0.017)	
Unemployment Rate-Squared	0.000	(0.001)		0.000	(0.003)		0.001	(0.001)	
Rural	0.043	(0.010)	***	0.057	(0.047)		0.043	(0.010)	***
Atlantic	0.055	(0.027)	**	-0.142	(0.128)		0.062	(0.028)	**
Quebec	0.083	(0.019)	***	-0.248	(0.116)	**	0.089	(0.020)	***
Prairies	0.044	(0.017)	***	0.077	(0.083)		0.040	(0.017)	**
Alberta	0.025	(0.019)		0.113	(0.102)		0.020	(0.019)	
British Columbia	-0.008	(0.013)		-0.133	(0.079)	*	-0.002	(0.013)	
North	0.103	(0.033)	***	0.068	(0.094)		0.056	(0.035)	
Birth Year 1996	-0.001	(0.030)		-0.153	(0.192)		0.003	(0.031)	
Birth Year 1997	-0.016	(0.029)		-0.064	(0.204)		-0.015	(0.030)	
Birth Year 1998	-0.036	(0.028)		-0.048	(0.190)		-0.035	(0.029)	
Birth Year 1999	-0.006	(0.030)		0.087	(0.194)		-0.010	(0.030)	
Birth Year 2000	-0.023	(0.032)		-0.050	(0.191)		-0.025	(0.033)	
Birth Year 2001	-0.009	(0.032)		0.044	(0.199)		-0.013	(0.032)	
Birth Year 2002	-0.026	(0.031)		0.022	(0.200)		-0.029	(0.031)	
Birth Year 2003	-0.040	(0.031)		-0.094	(0.200)		-0.040	(0.032)	
Birth Year 2004	-0.035	(0.033)		-0.100	(0.212)		-0.034	(0.034)	
Birth Year 2005	-0.057	(0.036)		-0.102	(0.224)		-0.057	(0.036)	
Cycle 2.1 (2003)	0.009	(0.011)		0.002	(0.063)		0.010	(0.012)	
Cycle 3.1 (2005)	-0.003	(0.013)		0.058	(0.085)		-0.005	(0.014)	
Constant	0.362	(0.106)	***	0.615	(0.474)		0.372	(0.110)	***
R-Squared	0.115			0.121			0.104		
Number of Observations	17,997			1,187			16,810		

Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 4.3
Linear Probability Models, Exposure to Second-Hand Smoke

	Full Sample			Aboriginal			Non-Aboriginal		
Mean (Standard Deviation)	0.177	(0.382)		0.395	(0.489)		0.171	(0.377)	
Aboriginal	0.099	(0.025)	***	…			…		
Age at Childbirth 14 to 19	0.208	(0.028)	***	0.054	(0.077)		0.222	(0.030)	***
Age at Childbirth 20 to 24	0.094	(0.013)	***	-0.025	(0.054)		0.099	(0.014)	***
Age at Childbirth 30 to 34	-0.022	(0.009)	**	-0.142	(0.062)	**	-0.019	(0.009)	**
Age at Childbirth 35 and Older	-0.027	(0.011)	**	-0.096	(0.085)		-0.025	(0.011)	**
Single	0.116	(0.015)	***	0.096	(0.051)	*	0.117	(0.015)	***
Less than High School Education	0.100	(0.018)	***	0.124	(0.057)	**	0.100	(0.019)	***
Post-Secondary Education	-0.083	(0.010)	***	-0.004	(0.052)		-0.085	(0.010)	***
Log of Real Equivalent Income	-0.017	(0.005)	***	-0.027	(0.029)		-0.016	(0.005)	***
Unemployment Rate	-0.017	(0.019)		-0.102	(0.071)		-0.015	(0.019)	
Unemployment Rate-Squared	0.001	(0.001)		0.004	(0.003)		0.001	(0.001)	
Rural	0.032	(0.009)	***	0.003	(0.049)		0.032	(0.010)	***
Atlantic	0.052	(0.027)	*	0.124	(0.143)		0.048	(0.028)	*
Quebec	0.082	(0.020)	***	0.176	(0.136)		0.079	(0.021)	***
Prairies	0.037	(0.018)	**	-0.043	(0.080)		0.041	(0.019)	**
Alberta	0.017	(0.021)		0.010	(0.104)		0.016	(0.022)	
British Columbia	-0.042	(0.013)	***	-0.029	(0.075)		-0.042	(0.013)	***
North	0.042	(0.036)		0.080	(0.092)		0.090	(0.044)	**
Birth Year 1996	0.008	(0.034)		-0.050	(0.165)		0.009	(0.034)	
Birth Year 1997	-0.018	(0.032)		0.080	(0.177)		-0.020	(0.032)	
Birth Year 1998	-0.032	(0.031)		0.010	(0.160)		-0.032	(0.031)	
Birth Year 1999	-0.046	(0.031)		0.105	(0.164)		-0.049	(0.032)	
Birth Year 2000	-0.042	(0.035)		-0.020	(0.159)		-0.041	(0.035)	
Birth Year 2001	-0.065	(0.034)	*	-0.157	(0.167)		-0.060	(0.035)	*
Birth Year 2002	-0.071	(0.033)	**	-0.071	(0.173)		-0.071	(0.033)	**
Birth Year 2003	-0.074	(0.034)	**	-0.245	(0.170)		-0.067	(0.034)	*
Birth Year 2004	-0.081	(0.036)	**	-0.132	(0.186)		-0.077	(0.037)	**
Birth Year 2005	-0.100	(0.038)	***	-0.240	(0.204)		-0.094	(0.039)	**
Cycle 2.1 (2003)	-0.002	(0.012)		-0.083	(0.070)		0.000	(0.012)	
Cycle 3.1 (2005)	-0.009	(0.015)		0.072	(0.088)		-0.012	(0.015)	
Constant	0.485	(0.116)	***	1.205	(0.514)	**	0.466	(0.121)	***
R-Squared	0.123			0.117			0.118		
Number of Observations	17,997			1,187			16,810		

Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Table 4.4
Blinder-Oaxaca Decompositions

	Smoking			Second-Hand Smoke		
Aboriginal	0.424	(0.024)	***	0.395	(0.023)	***
Non-Aboriginal	0.149	(0.004)	***	0.171	(0.004)	***
Difference	0.276	(0.024)	***	0.224	(0.024)	***
Endowments	0.145	(0.029)	***	0.069	(0.030)	**
Age at Childbirth	0.003	(0.015)		0.032	(0.014)	**
Single	0.016	(0.014)		0.028	(0.015)	*
Education	0.053	(0.015)	***	0.025	(0.014)	*
Log of Real Equivalent Income	0.014	(0.014)		0.016	(0.017)	
Unemployment Rate	-0.005	(0.015)		0.024	(0.016)	
Rural	0.006	(0.005)		0.000	(0.005)	
Province/Territory	0.058	(0.025)	**	-0.037	(0.028)	
Birth Year	-0.001	(0.008)		-0.020	(0.009)	**
Cycle	0.002	(0.005)		0.001	(0.006)	
Coefficients	0.157	(0.025)	***	0.092	(0.024)	***
Age at Childbirth	0.012	(0.011)		0.008	(0.010)	
Single	-0.033	(0.021)		-0.009	(0.022)	
Education	0.000	(0.003)		0.002	(0.003)	
Log of Real Equivalent Income	-0.090	(0.235)		-0.099	(0.283)	
Unemployment Rate	0.164	(0.332)		-0.443	(0.353)	
Rural	0.004	(0.013)		-0.008	(0.014)	
Province/Territory	0.043	(0.024)	*	-0.024	(0.026)	
Birth Year	0.017	(0.019)		-0.006	(0.018)	
Cycle	0.002	(0.004)		0.001	(0.005)	
Constant	0.039	(0.427)		0.670	(0.485)	
Interaction	-0.026	(0.030)		0.063	(0.031)	**
Age at Childbirth	0.018	(0.016)		0.012	(0.015)	
Single	0.023	(0.015)		0.006	(0.016)	
Education	-0.003	(0.014)		0.019	(0.015)	
Log of Real Equivalent Income	-0.006	(0.014)		-0.006	(0.017)	
Unemployment Rate	0.008	(0.015)		-0.021	(0.016)	
Rural	-0.001	(0.005)		0.003	(0.005)	
Province/Territory	-0.063	(0.025)	**	0.035	(0.029)	
Birth Year	-0.001	(0.008)		0.016	(0.009)	*
Cycle	-0.002	(0.005)		-0.001	(0.006)	

Robust standard errors are reported in parentheses. Statistical significance is given by:
* ten percent; ** five percent; and *** one percent.

Table 4.5
Zero-Truncated Negative Binomial Models, Number of Cigarettes per Day

	Full Sample			Aboriginal			Non-Aboriginal		
Mean (Standard Deviation)	7.528	(6.447)		6.863	(6.648)		7.582	(6.428)	
Aboriginal	-0.008	(0.099)		…			…		
Age at Childbirth 14 to 19	-0.289	(0.082)	***	-0.198	(0.199)		-0.314	(0.082)	***
Age at Childbirth 20 to 24	-0.082	(0.053)		-0.155	(0.144)		-0.087	(0.055)	
Age at Childbirth 30 to 34	0.033	(0.062)		0.192	(0.176)		0.025	(0.065)	
Age at Childbirth 35 and Older	0.269	(0.086)	***	0.424	(0.219)	*	0.220	(0.086)	**
Single	0.026	(0.050)		-0.167	(0.136)		0.056	(0.052)	
Less than High School Education	0.286	(0.057)	***	0.076	(0.156)		0.304	(0.060)	***
Post-Secondary Education	-0.064	(0.053)		0.042	(0.175)		-0.080	(0.054)	
Log of Real Equivalent Income	-0.106	(0.034)	***	-0.219	(0.096)	**	-0.091	(0.035)	***
Unemployment Rate	0.174	(0.100)	*	0.329	(0.206)		0.146	(0.116)	
Unemployment Rate-Squared	-0.008	(0.004)	**	-0.010	(0.010)		-0.007	(0.004)	
Rural	0.089	(0.049)	*	0.050	(0.132)		0.098	(0.051)	*
Atlantic	-0.054	(0.154)		0.447	(0.508)		-0.062	(0.174)	
Quebec	0.109	(0.113)		-0.516	(0.348)		0.139	(0.131)	
Prairies	-0.016	(0.094)		-0.014	(0.229)		0.028	(0.103)	
Alberta	0.042	(0.109)		-0.003	(0.268)		0.047	(0.119)	
British Columbia	-0.021	(0.098)		-0.096	(0.244)		-0.027	(0.107)	
North	-0.329	(0.147)	**	-0.235	(0.234)		-0.190	(0.166)	
Birth Year 1996	-0.070	(0.173)		-0.374	(0.514)		-0.071	(0.183)	
Birth Year 1997	0.009	(0.162)		-0.386	(0.377)		0.014	(0.175)	
Birth Year 1998	-0.087	(0.172)		-0.642	(0.375)	*	-0.083	(0.188)	
Birth Year 1999	-0.103	(0.175)		-0.516	(0.349)		-0.108	(0.194)	
Birth Year 2000	-0.040	(0.193)		-0.678	(0.362)	*	0.047	(0.217)	
Birth Year 2001	-0.205	(0.193)		-0.512	(0.418)		-0.241	(0.213)	
Birth Year 2002	-0.175	(0.196)		-0.562	(0.402)		-0.198	(0.213)	
Birth Year 2003	-0.198	(0.204)		-0.828	(0.448)	*	-0.174	(0.220)	
Birth Year 2004	-0.236	(0.210)		-1.164	(0.458)	**	-0.194	(0.230)	
Birth Year 2005	-0.270	(0.237)		-1.389	(0.509)	***	-0.142	(0.257)	
Cycle 2.1 (2003)	-0.228	(0.059)	***	-0.421	(0.153)	***	-0.200	(0.061)	***
Cycle 3.1 (2005)	-0.219	(0.090)	**	0.110	(0.236)		-0.253	(0.092)	***
Constant	2.273	(0.688)	***	3.251	(1.380)	**	2.255	(0.776)	***
Number of Observations	3,676			553			3,123		

Robust standard errors are reported in parentheses. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Figure 4.1
Means of Smoking and Exposure to Second-Hand Smoke during Pregnancy, Percent

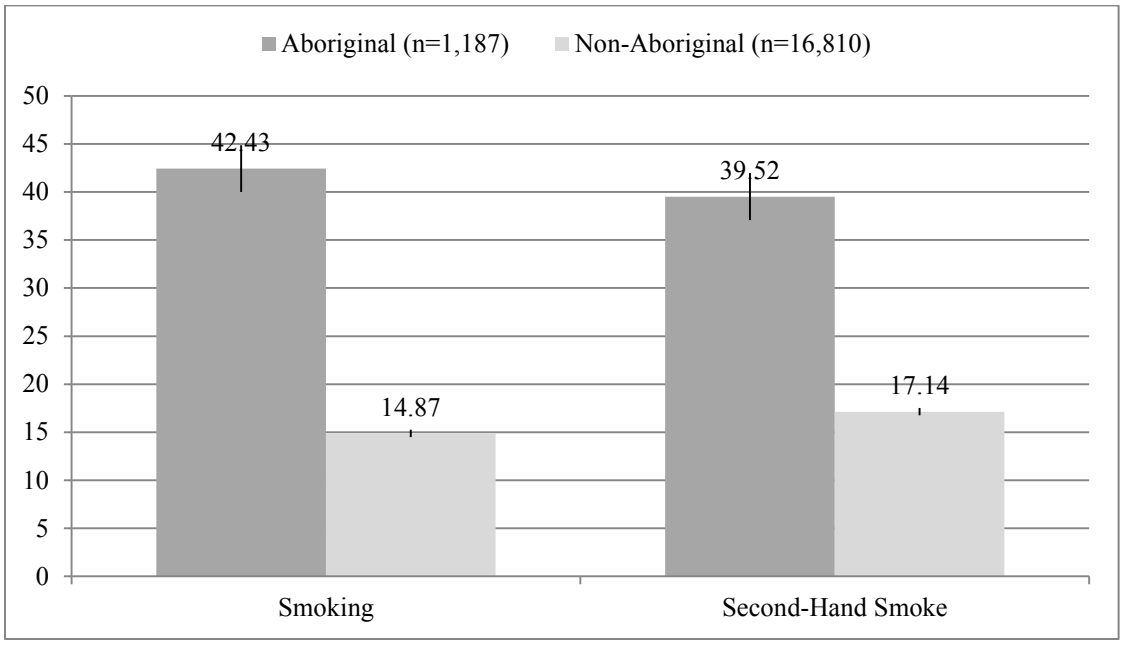


Figure 4.2
Differences in Means of Smoking and Exposure to Second-Hand Smoke during Pregnancy, Percentage Points

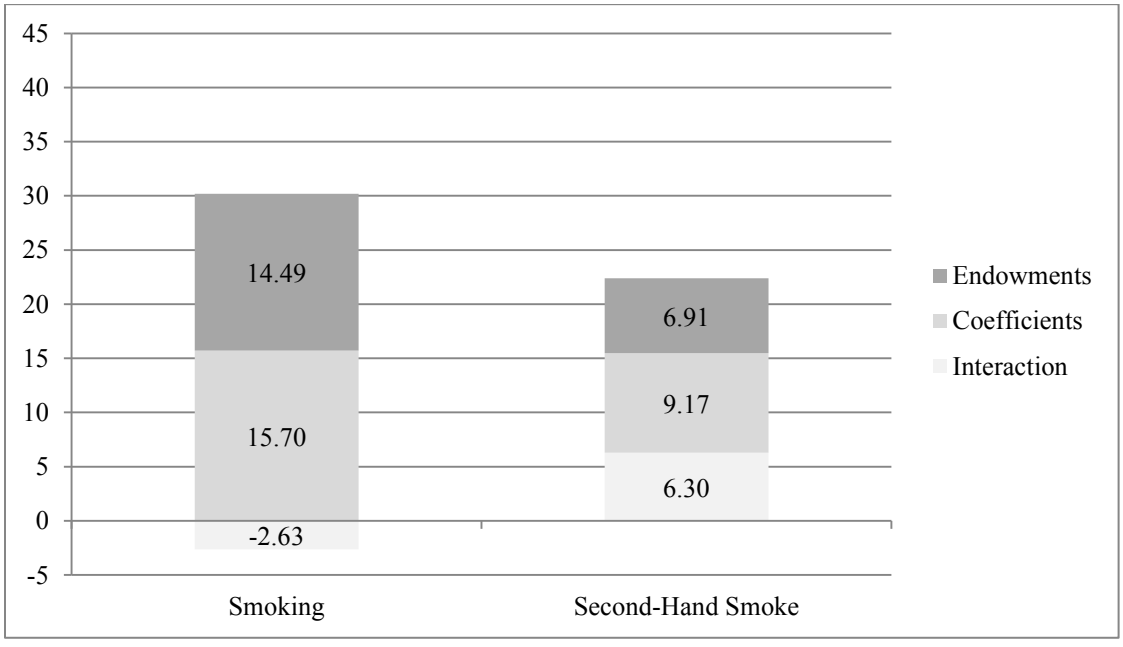
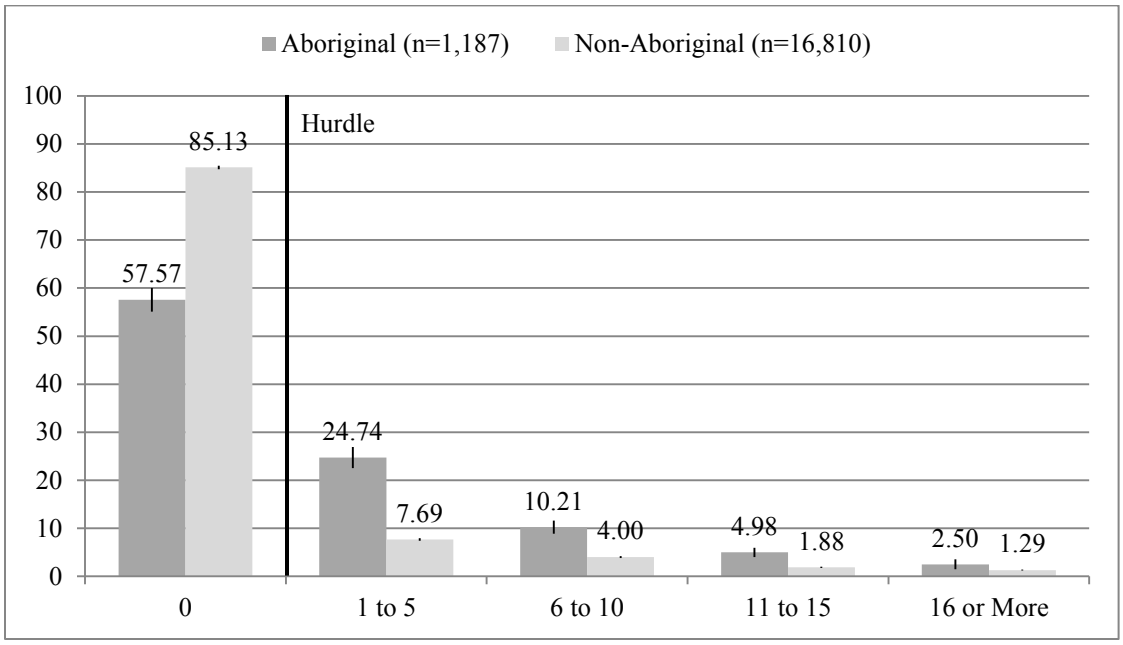


Figure 4.3
Number of Cigarettes per Day, Percent



Chapter 5
Conclusions

In this dissertation, I examine the well-being of children and families, with emphasis on vulnerable populations including Northern Canada, lone mothers and Aboriginal women. They require special attention because they tend to be different in ways that affect well-being. At the same time, they are underrepresented in the economics literature. For example, the North is a remote, sparsely populated region with a challenging climate. Transportation is costly and prices are much higher compared to the rest of the country. Yet, past studies of poverty have excluded Northern Canada due to data limitations. Even without these limitations, differences in cost of living impede comparisons across regions. In Chapter 2, my co-authors and I address this gap in the literature by providing the first direct estimates of poverty and inequality in Northern Canada compared to the rest of the country, while accounting for differences in cost of living. We find that incidence and depth of child poverty are much higher in the North. This has major implications for present and future well-being. Specifically, I provide evidence that income matters causally for health, especially among lone mothers (i.e. Chapter 3). Likewise low socio-economic status is associated poor child health (Case et al 2002; Currie and Stabile 2003; Currie and Moretti 2003), and poor child health manifests in later-life outcomes (Case and Paxson 2009; Almond 2006). Thus, inequality between Northern and Southern Canada may be perpetuated to the extent that childhood circumstance manifests throughout the lifecycle and across generations. This implies the importance of poverty research that is specific to Northern Canada and the need for policy intervention, perhaps higher child benefits for families in the region.

Similarly, as discussed in Chapter 4, inequalities between Aboriginal and non-Aboriginal populations may be perpetuated by prenatal smoking and exposure to second-hand smoke. These are preventable causes of death and illness among infants, with implications for health and human capital throughout the lifecycle. Income and education are correlates, and the latter is particularly important for Aboriginal women. For example, the prevalence of prenatal smoking among Aboriginal women would fall by more than five percentage points if they had the same education as non-Aboriginal women. Again,

there is a role for policy in reducing inequality of well-being in present and future terms. However, consideration must be given to systemic barriers to improving educational outcomes among Aboriginal peoples.

Overall, it is important to emphasize vulnerable populations to better understand their challenges and opportunities for policy intervention. This is especially true for Northern Canada and Aboriginal peoples, who are often overlooked in the economics literature. In this dissertation, I try to address this gap, at least in part. In doing so, I draw attention to issues that are not well-understood (e.g. poverty in the North, risky prenatal behaviour among Aboriginal women), as well as policy options with respect to socio-economic status and health. This is important for inequality of well-being in both present and future terms.

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Appendix A

Supplementary Material for Chapter 2

Table A.1
OLS Estimates of Engel Curves for Log Expenditure on Food, Clothing and Shelter
North and Rural South, All Families

	Coefficient	Robust Standard Error
Log Income	0.519***	0.008
North	0.183***	0.007
Household Size of Two	0.122***	0.011
Household Size of Three	0.240***	0.014
Household Size of Four	0.355***	0.014
Household Size of Five	0.405***	0.017
Household Size of Six or More	0.460***	0.021
R-Squared	0.6413	
Number of Observations	29,110	

Cycle dummy variables are included but not reported.
*** indicates a p-value of less than 0.01.

Standard Error of the Northern Equivalence Scale

From Equation 2.4, the Northern equivalence scale is:

$$\frac{Income_N}{Income_S} = e^{\frac{\delta}{1-\beta}}$$

δ and β are estimated parameters from Equation 2.1. The equivalence scale can be approximated using a Taylor series expansion.

$$\frac{Income_N}{Income_S} \equiv N \approx N_0 + \frac{N_0}{1-\beta_0}(\delta - \delta_0) + \frac{\delta_0 N_0}{(1-\beta_0)^2}(\beta - \beta_0) \quad [A.1]$$

N_0 is the scale at $\delta = \delta_0$ and $\beta = \beta_0$. Finding the variance of N yields:

$$\sigma_N^2 = E[(N - N_0)^2] \approx \frac{N_0^2}{(1-\beta_0)^2}\sigma_\delta^2 + \frac{\delta_0^2 N_0^2}{(1-\beta_0)^4}\sigma_\beta^2 + \frac{2\delta_0 N_0^2}{(1-\beta_0)^3}\sigma_{\delta\beta} \quad [A.2]$$

σ_δ^2 and σ_β^2 are the variances of the estimated parameters. $\sigma_{\delta\beta}$ is the covariance. Thus, the standard error of the equivalence scale is approximately equal to:

$$\sigma_N \approx \frac{\delta_0 N_0}{1-\beta_0}\sqrt{\frac{\sigma_\delta^2}{\delta_0^2} + \frac{\sigma_\beta^2}{(1-\beta_0)^2} + \frac{2\sigma_{\delta\beta}}{\delta_0(1-\beta_0)}} \quad [A.3]$$

Imputing the estimated parameters and equivalence scale, as well as σ_δ^2 = 0.00005, σ_β^2 = 0.00007 and $\sigma_{\delta\beta}$ = 0.00003 yields a standard error of 0.02.

Appendix B

Supplementary Material for Chapter 3

Table B.1A
Ordered Probit Estimates of TD Model, Five-Point Scales

	Mental Health	Stress	Life Satisfaction
Young Child × Post-Policy (i.e. DD estimator)	0.1061* (0.0551)	0.0310 (0.0533)	0.1486*** (0.0559)
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	-0.0760 (0.1153)	-0.2774** (0.1169)	-0.1302 (0.1101)
Pseudo R-Squared	0.0151	0.0110	0.0503
Number of Observations	26,886	26,886	26,886

Table B.1B
Marginal Effects based on Ordered Probit Estimates of TD Model, Five-Point Scales

Mental Health	Poor	Fair	Good	Very Good	Excellent
Baseline Probability	0.0062	0.0334	0.1921	0.3908	0.3775
Young Child × Post-Policy (i.e. DD estimator)	-0.0017**	-0.0068**	-0.0230*	-0.0091*	0.0407*
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	0.0015	0.0055	0.0168	0.0048	-0.0285
Stress	Not at All	Not Very	A Bit	Quite a Bit	Extremely
Baseline Probability	0.0402	0.1875	0.4839	0.2467	0.0418
Young Child × Post-Policy (i.e. DD estimator)	-0.0026	-0.0067	-0.0014	0.0078	0.0028
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	0.0301*	0.0613**	-0.0043	-0.0674**	-0.0197***
Life Satisfaction	Very Dissatisfied	Dissatisfied	Neither	Satisfied	Very Satisfied
Baseline Probability	0.0017	0.0151	0.0385	0.5152	0.4295
Young Child × Post-Policy (i.e. DD estimator)	-0.0007***	-0.0049***	-0.0098***	-0.0433***	0.0587***
Lone Mother × Young Child × Post-Policy (i.e. TD estimator)	0.0008	0.0053	0.0098	0.0344	-0.0505

I include covariates in all regressions. Robust standard errors are reported in parentheses. For marginal effects, the baseline probability is calculated at sample means with categorical variables set equal to zero. Coefficients indicate the average causal effect of the transfer on the baseline probability. Statistical significance is given by: * ten percent; ** five percent; and *** one percent.

Figure B.1A
Average Stress of Lone Mothers across Time, Data from the General Social Survey

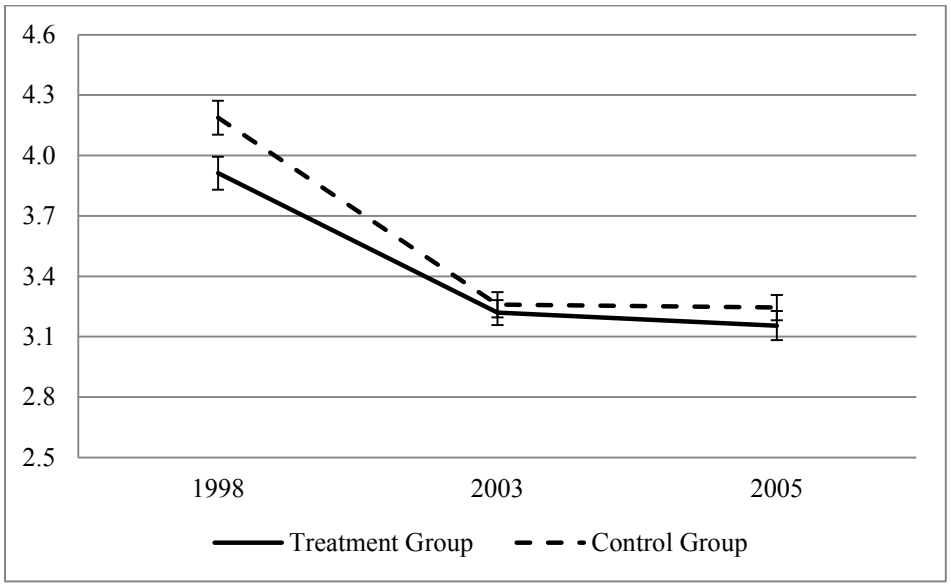
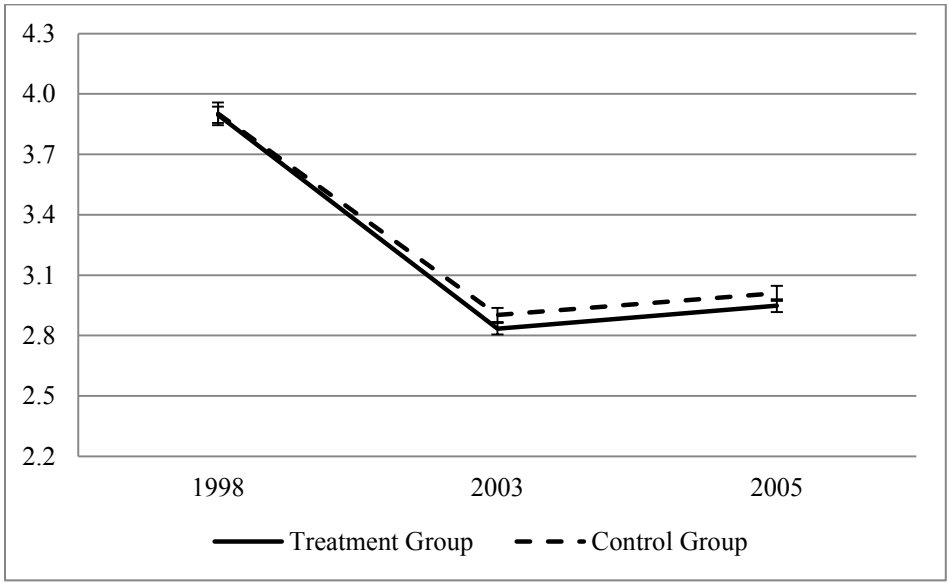


Figure B.1B
Average Stress of Married Mothers across Time, Data from the General Social Survey



Thinking about the amount of stress in your life, would you say that most days are: (1) not at all; (2) not very; (3) a bit; (4) quite a bit; or (5) extremely stressful?

Appendix C

Supplementary Material for Chapter 4

Figure C.1A
Means of Smoking during Pregnancy, Percent

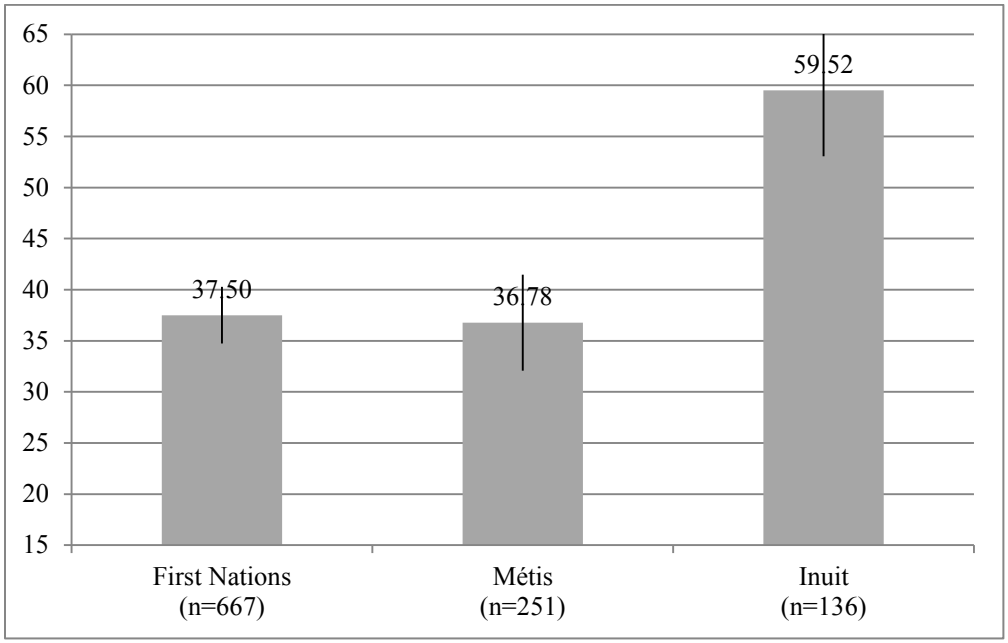


Figure C.1B
Means of Exposure to Second-Hand Smoke during Pregnancy, Percent

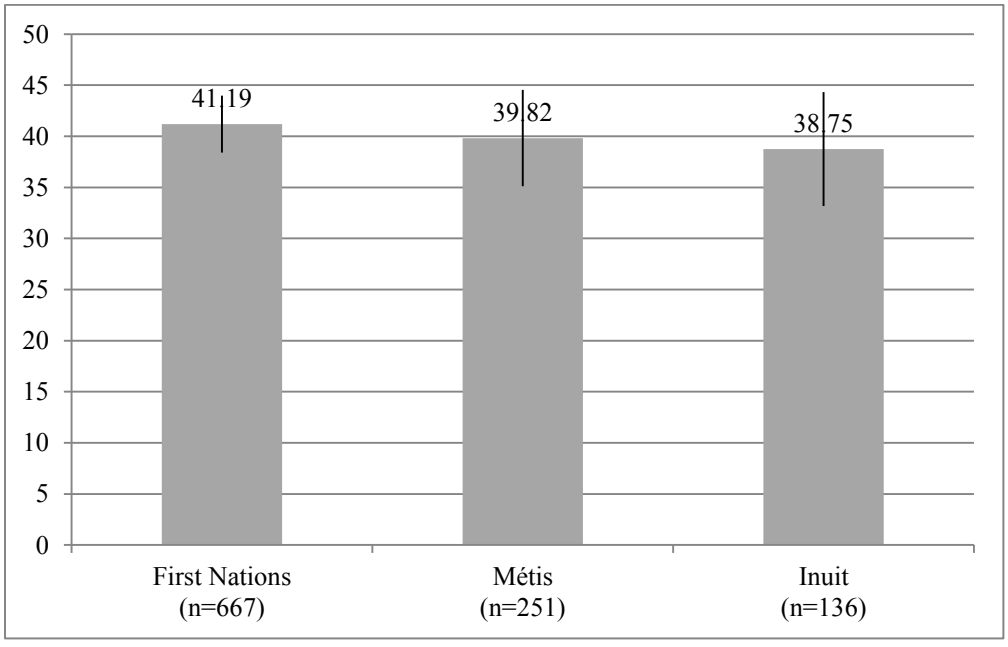
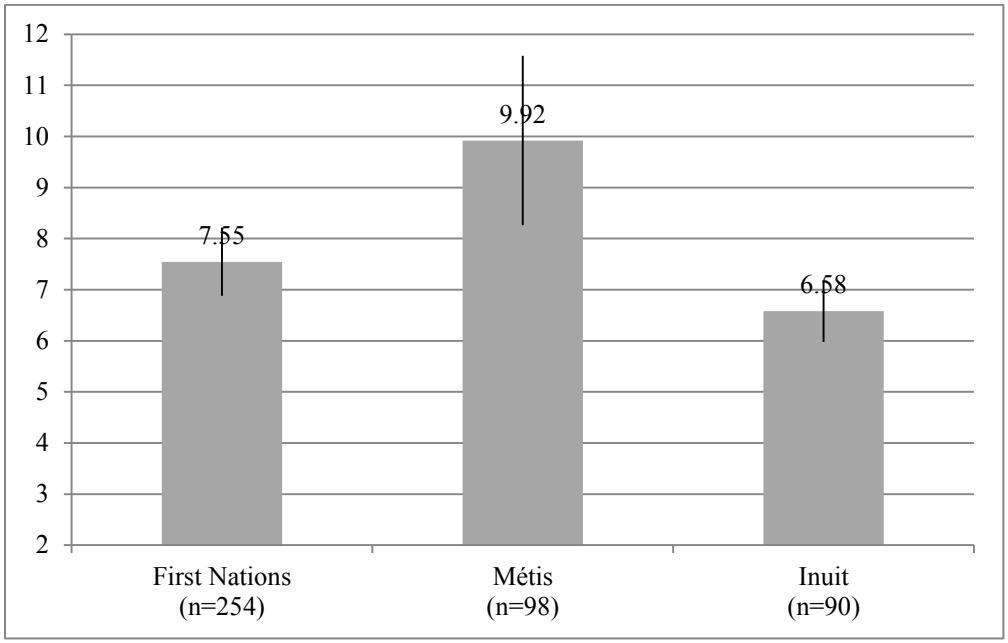


Figure C.2
Average Number of Cigarettes per Day



Appendix D

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Anderson, Lee-Ann <Lee-Ann.Anderson@tandf.co.uk>

Fri 15-Apr-2016 10:26 AM

To: Angela Daley <Angela.Daley@Dal.Ca>;

1 attachment (31 KB)

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