OUT OF POCKET EXPENDITURES ON HEALTHCARE ACROSS CANADIAN PROVINCES

by

Emmanuel Ogwal

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Abstract

Out of pocket (OOP) healthcare expenditures can be burdening for persons of low socioeconomic status. Little is known about socioeconomic, demographic, and health disparity in OOP healthcare expenditures in Canada. This thesis examines the trends of OOP healthcare expenditures during the 2004-2015 period in Canadian provinces using microdata files from the Canadian Research Data Center through the University of Northern British Columbia, and describes the association of OOP healthcare expenditures with various socioeconomic, demographic, and pre-existing health factors. It also estimates the contribution of these factors to the share of OOP healthcare expenditures to incomes. Regression results reveal that the share of OOP healthcare expenditures to incomes are negatively related to income, but positively related to old age, being married, larger household sizes, and pre-existing health conditions. Also, OOP healthcare expenditures are generally higher for female Canadians, and for persons residing in the provinces of Quebec, Alberta and New Brunswick.

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Acknowledgement and Dedication

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Declaration

This paper work has not previously been submitted, either in whole or in part for a degree at this or any other university or academic institution. To the best of my knowledge, this thesis is original and contains no materials previously published or written by any other persons except as acknowledged in the text.

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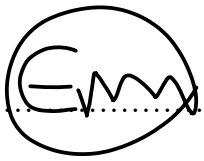
Signed……  …….. Date…August 14Th, 2020…….

Emmanuel Ogwal

Chapter One: Introduction

1.1. Out of Pocket Healthcare Expenditures

Out of pocket (OOP) healthcare expenditures can be defined in numerous ways. The following OOP healthcare expenditures definitions have been proposed by different authors. The World Health Organization (WHO) defined OOP healthcare expenditures as "direct payments made by individuals to healthcare providers at the time of service use" (World Health Organization [WHO], 2018, Health financing section, para.1). The Organization for Economic Cooperation and Development (OECD) defined OOP healthcare expenditures as "expenditures borne directly by a patient where neither public nor private (policyholder's share coverage) insurance cover the full cost of the health good or service" (Organization for Economic Cooperation and Development [OECD], 2017, p.92).

Various components of OOP healthcare expenditures have been identified by previous researchers. According to WHO (2018), private healthcare insurance plan payments or direct expenditures for private health insurance premiums may be included in the calculation of OOP healthcare expenditures as these are expenditure contributions from OOP. Such payments include: deductibles, co-pays and co-insurance. Sanmartin et al. (2014) identified the three major components of OOP healthcare expenditures in Canada during the 1997-2009 period to be direct expenditures on dental care; direct expenditures on prescription medication and drugs; and direct expenditures on insurance premiums. They found that these three components collectively made up about 60% of all out of pocket healthcare expenditures (Sanmartin et al., 2014).

For the purpose of this thesis, the calculation of OOP healthcare expenditures included direct expenditures for optometric care, prescription medicines and other pharmaceutical products, dental care, and direct expenditures for insurance premiums.

Out of pocket healthcare expenditures have increased over time (Sanmartin et al., 2014). Per capita OOP healthcare expenditures increased from $278 in 1988 to over $900 in 2017 (Canadian Institute for Health Information [CIHI], 2017). Overall, OOP healthcare expenditure accounts for 30% of total healthcare spending in Canada (Sanmartin et al., 2014).

A study on the trend of OOP expenditures on healthcare services found that

> In 2009, the percentage of after-tax household income spent on health care among low-income households (5.7%) was nearly twice that of high-income households (2.6%). Approximately 40% of households in the two lowest income quintiles spent more than 5% of their total after-tax income on health care services and products, compared with 14% of households in the highest income quintile. The increase in spending between 1997 and 2009 was greatest for households in the lowest income quintile (63%) (Sanmartin et al., 2014, p.1).

Reports on amounts, proportions, and trends of OOP healthcare expenditures can be useful at various levels of the economy (CIHI, 2017). Information on the per capita OOP healthcare expenditures can be useful in many ways to households, healthcare workers and policy makers (WHO, 2018). Information on OOP healthcare payments can be used to inform the development of policies that could improve healthcare equity and access in Canada (Tamblyn et al., 2018). For example, in a study of patients in Quebec with uncomplicated hypertension, Tamblyn et al. (2018) found that providing physicians with OOP healthcare expenditure information could help enhance the cost-effectiveness of administering prescription medication to patients. The study was prompted by a concern over the adverse effects of heightened OOP healthcare expenditures across Quebec. Besides provincial differences, the severity of per capita OOP healthcare expenditures also differs across nations.

Past studies suggest that the prevalence of OOP healthcare expenditures vary by nations (WHO, 2018; OECD, 2017; Benatar & Brown, 2018; Baird, 2016). The WHO (2018) reported that there is a strong reliance on OOP expenditures on healthcare services worldwide and the amount paid and incidence and factors associated with these OOP healthcare expenditures differ from one nation to another, from one economic area to another, and across ideological boundaries. According to the evidence from WHO, OOP expenditures on healthcare goods and services are very common in nations relying on user-fees and co-payments to raise revenues for healthcare funding to rationalize the use of healthcare services, and to improve efficiency and quality of care. However, it pointed out that OOP healthcare expenditures were less prevalent in countries that were less reliant on user-fees and co-payments for their healthcare services financing WHO (2018). For nations with a higher prevalence of OOP healthcare expenditures, a multitude of problems have been registered.

Numerous problems have been associated with OOP healthcare expenditures (WHO, 2018, Buigut et al., 2015; Lee & Morgan, 2017; Schoen & Doty, 2004; Schoen et al., 2007). One of the main problems associated with OOP expenditures on healthcare according to WHO (2018) is that the unregulated or under-regulated direct care charges create a barrier to access the required medical care needs. Suppliers of certain healthcare goods and services, when under-regulated, may overprice their products, hence making these products unaffordable to the low-income earners, and barring healthcare access. This, in turn, may result in heavy demands on the public sector by healthcare consumers for financial protection in times of need for healthcare service. The WHO also stated that a common challenge with OOP healthcare expenditure is the implementation of exclusion and inclusion mechanisms for care service beneficiaries. The

challenges accruing from OOP healthcare expenditures have prompted a number of healthcare financing policies (WHO, 2018; CIHI, 2017).

Policies have been suggested for solving the problems created by OOP healthcare expenditures. For instance, according to the WHO (2018), the following were suggested as ways of dealing with the challenges created by OOP expenditures on healthcare services. Policy reforms on healthcare financing targeted at reducing OOP healthcare expenditures, which include:

- Abolishing or removing user fees in public healthcare facilities
- Exempting certain healthcare services, for example, maternal and child care services from fees and delivering them to the patients free of charge and/or at significantly lowered and subsidized rates of service charges

Policies for OOP healthcare expenditures have further led to the classifications of OOP healthcare expenditures into two main forms: catastrophic healthcare expenditure (CHE) and high cost healthcare expenditure as described below. Both CHE and high cost healthcare financing are severe forms of OOP healthcare expenditures.

1.2. Catastrophic Healthcare Expenditures

The CHE is a direct healthcare cost that exceeds 10% of individual total expenditure on all goods and services in any given year (O'Donnell et al., 2008). This approach is known as the "expenditure approach" to measuring CHE. Stated differently, CHE refers to the OOP healthcare expenditures that place a significant burden on the proportion of people who spend a given amount of money in excess of a reasonable percentage of their income (WHO, 2018). The latter approach may be termed as "income approach" to measuring CHE. CHE reduces healthcare access and equity across the world (WHO, 2018). Past research shows that CHE, varies among

the countries, and tends to be much more prevalent in poorer nations compared to the rich ones (O'Donnell et al, 2008). Although rare in most developed countries, some residents of developed nations still face CHE (OECD, 2017). In North America for instance, the United States of America (USA) has one of the most recognizable CHE burdens created by flaws in its healthcare financing policies (OECD, 2017). While not so common in Canada due to a publicly supported healthcare system, Canadians suffering from chronic conditions that require longer-term expensive medical prescriptions and treatment often face tradeoffs when it comes to balancing their expenses amongst their daily household needs and a more recurrent CHE (Figueiredo et al., 2013). The severity of CHE also prompts the need for specific policies for addressing the burden of OOP healthcare payment.

Policy improvement around healthcare financing can help address the burden of CHE. A study in Mexico reported that healthcare reforms that target financial protection could help alleviate the burden of OOP healthcare expenditures (Knaul et al., 2006). It recognized the health insurance program "Seguro Popular" (meaning Popular Health Insurance) as a break-through for many Mexicans who were formerly faced with extremely burdening OOP healthcare expenditures. Policies such as increased financial protection through subsidized care for children, the elderly and the disabled, have therefore been proposed (OECD, 2017; WHO, 2018).

1.3. High Cost Healthcare Expenditures

The high cost OOP healthcare expenditures, is considered to be an extremely large amount of spending that usually exceeds a predetermined annual OOP healthcare expenditure amount. At any given time, an individual may incur a very high cost on medical care accruing from an adverse event such as road accident and acid burns (Wyszewianski, 1986).To differentiate between a financially catastrophic and high cost OOP healthcare payments,

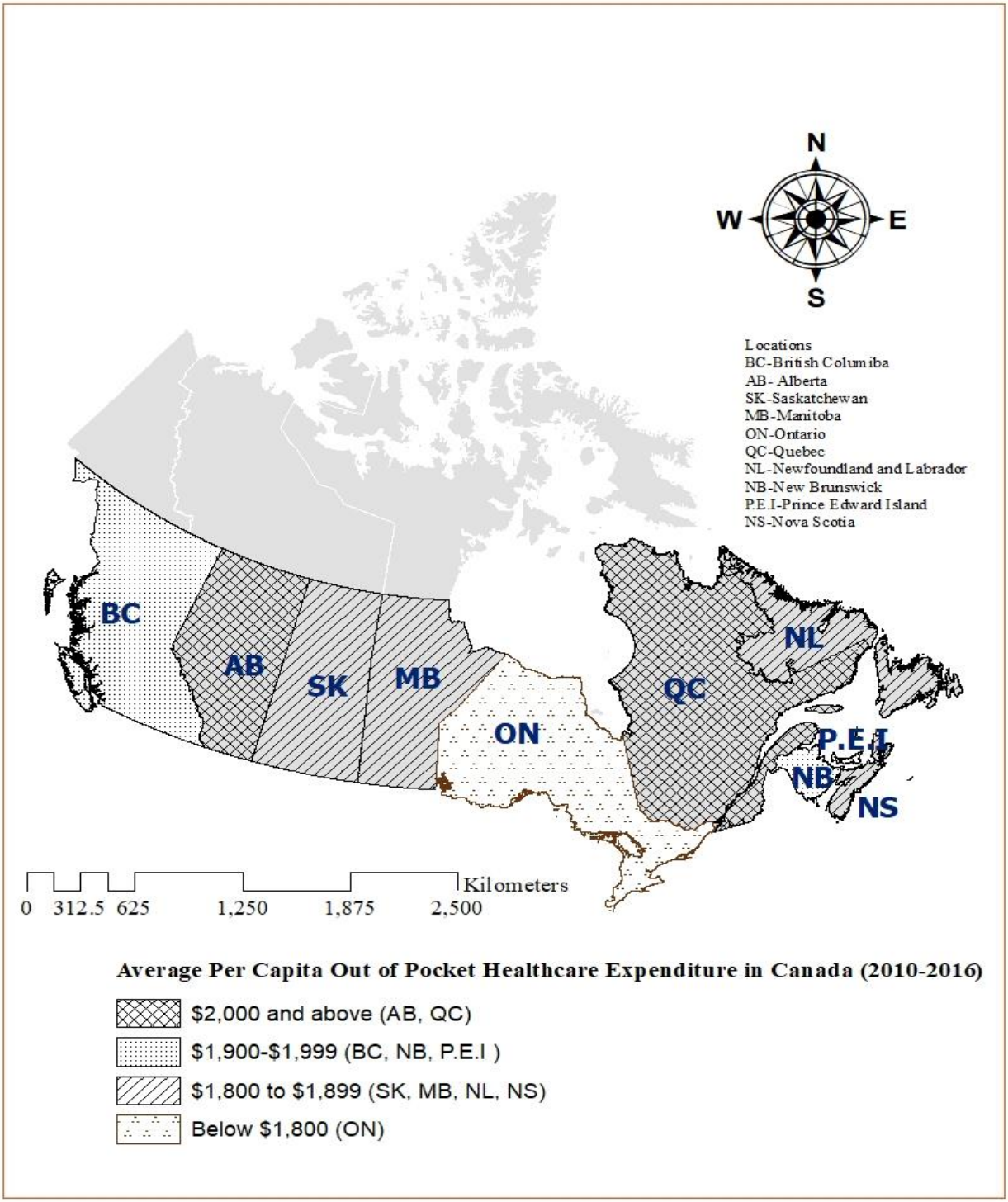
Wyszewianski (1986) stated that CHE exceeds a certain threshold of yearly household earning (for instance 15%). However, a high cost healthcare payment is a payment that surpasses a predetermined amount such as $10,000 in one year irrespective of the source of earnings, and the amount of household earnings (Wyszewianski, 1986).

1.4. Out of Pocket Healthcare Expenditures in Canada

In Canada, limited information is known about OOP healthcare payments since Canada's healthcare system is predominantly publicly financed. Despite the existence of a publicly financed healthcare system, 30% of Canada's healthcare products and services are paid for by consumers from OOP (CIHI, 2017). These privately afforded healthcare goods and services include but are not limited to the following: optometric care or eye care; dental care; medical prescriptions; and private insurance premiums including co-pays, co-insurance and deductibles. Paying for healthcare services from OOP can place a financial burden on the cost bearer. The burden of OOP healthcare payment on people suffering from long term chronic illnesses often goes unchecked, and these groups of people, are more than likely to suffer the long-term burden of CHE and high cost healthcare, leaving them with very little to no disposable income to afford their daily livelihood (WHO, 2018).

Figure1 shows average per capita OOP healthcare payments in Canada by province. The figure is based on the author's estimations using data provided by Statistics Canada (2017). As indicated in Figure 1, per capita OOP healthcare expenditures were highest in Alberta and Quebec compared to the rest of Canada. The lowest recorded per capita OOP healthcare cost was recorded in the province of Ontario. More specifically, Alberta and Quebec residents incurred at least $2,000 OOP per capita, whereas Ontario residents incurred less than $1,800 OOP healthcare expenditure per capita between 2010 and 2016.

Figure 1. Grouped Average Per Capita Canadian Provincial Out of Pocket Healthcare Payments Between 2010 to 2016

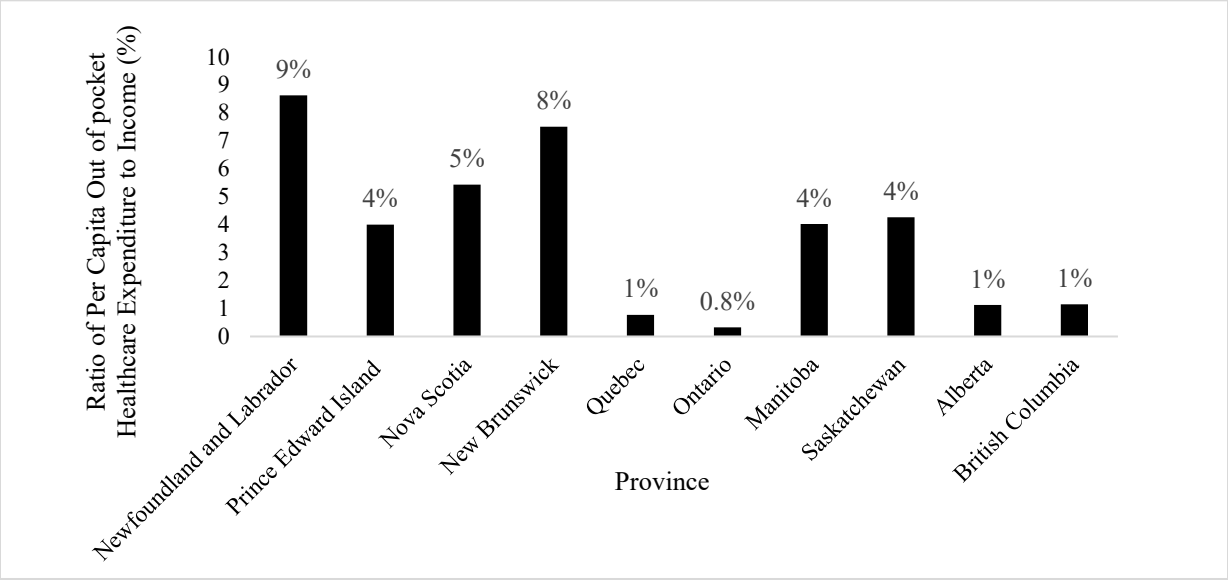


Source of data: " Survey of Household Spending Public Use Microdata" by Statistics Canada, 2017, retrieved from https://www150.statcan.gc.ca/n1/en/catalogue/62M0004X

Notes: All dollar values in the figure are provided in 2004 Canadian Dollars. (All values are average/aggregate per capita averagd between the years 2010 and 2016).

Figure 2 shows the estimated average share of OOP spending on healthcare goods and services to income across the Canadian provinces based on publicly available statistical tables. As seen in this figure, the share of per capita OOP healthcare expenditures to incomes was highest in Newfoundland and Labrador (about 9%), New Brunswick (8%) and Nova Scotia (5%). The share of per capita OOP healthcare expenditures was lowest in the province of Ontario (about 0.8%). Prince Edward Island, Manitoba and Saskatchewan has similar shares of OOP healthcare expenditures to incomes (4%). The share of OOP healthcare expenditure to income in Prince Edward Island is attributable to reduction in healthcare subsidies in the province (Alan et al., 2002).

Figure 2. Share of Provincial Amounts of Per Capita Out of Pocket Healthcare Expenditures to Incomes in Canada Between 2010 and 2016.



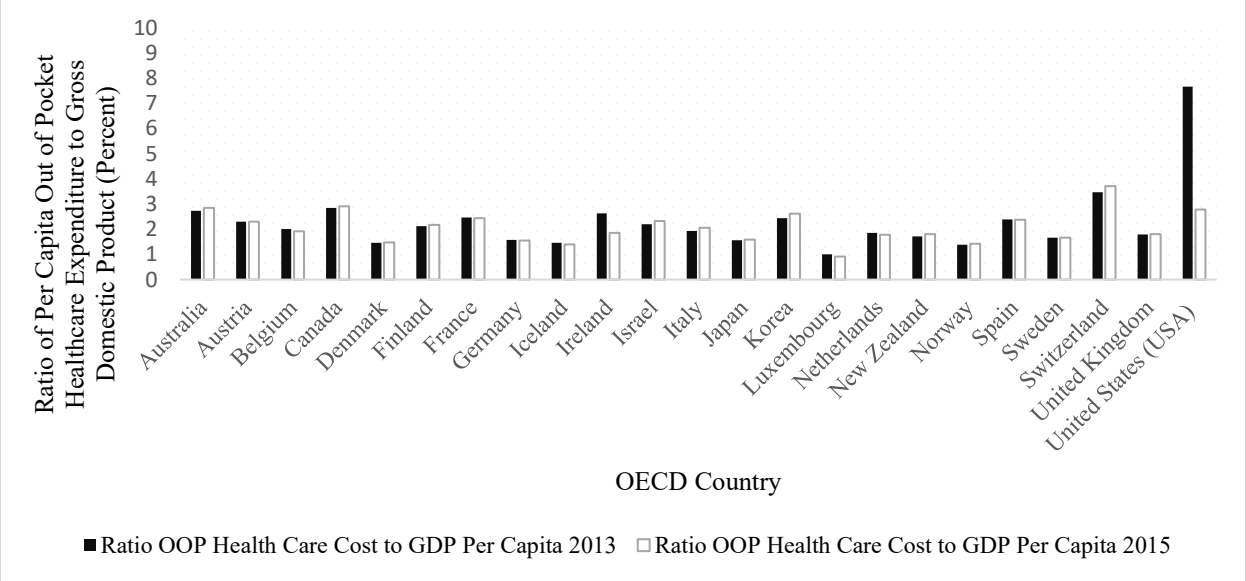
Source: " Survey of Household Spending Public Use Microdata" by Statistics Canada, 2017, retrieved from https://www150.statcan.gc.ca/n1/en/catalogue/62M0004X

1.5. Out of Pocket Healthcare Expenditures in the OECD Countries

Since health policies and systems in countries are different, the pattern of OOP healthcare payments may vary from one country to another. Some OECD nations have universal healthcare systems while others do not. Also, countries vary in their mix of both private and public

healthcare financing. Figure 3 shows the share OOP healthcare expenditure to income for selected OECD countries in 2015. The data used to develop these figures were obtained from the OECD website (OECD, 2019). Among the selected OECD nations, the United States had the highest share (7.65%) of OOP healthcare expenditure to gross domestic product (GDP) in 2015. On the other hand, Luxembourg had the lowest share of OOP healthcare expenditure to GDP in 2015 (0.9%). The difference in the ratio of OOP healthcare expenditures to GDP in the United States in 2015 as compared to that of 2013 can be explained by the introduction of Obamacare or the Patient Protection and Affordable Care Act (PPACA) which allowed the US to inject $3.2 trillion in healthcare funding on the economy (Martin et al., 2016).

Figure 3. Share of Average Per Capita Out of Pocket Healthcare Expenditure to GDP in Selected OECD Countries



Source: "Health expenditure indicators" by OECD, 2019, retrieved from https://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics/system-of-health-accounts-health-expenditure-by-function_data-00349-en and www.oecd-ilibrary.org: https://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics/system-of-health-accounts-health-expenditure-by-function_data-00349-en

1.6. Why Study Out of Pocket Healthcare Expenditures in Canada

Several gaps in knowledge exist regarding OOP healthcare expenditures in Canada. First, while OOP payments on healthcare have been described at a national level, little is known about

provincial variations in OOP healthcare expenditures. Second, further research is needed to identify various factors that affect OOP expenditures on healthcare. Third, there is limited information on the proportion and burden of CHE by gender and province. Hence, the purpose of this research is to provide a more recent and detailed picture of the OOP healthcare expenditures in Canada and across the provinces, and identify the demographic, socioeconomic, and physical and functional health factors affecting OOP payments on healthcare in Canada.

1.7. Problem Statement and Research Questions

Studies that have looked at OOP healthcare expenditures have suggested that perhaps OOP healthcare expenditures are disadvantageous for the low-income households and people in the lower socioeconomic status, but they have not provided adequate empirical evidence to link overpayment for healthcare goods and services from OOP to poor socioeconomic, demographic, and physical and functional health statuses (OECD, 2019; O'Lynnger et al., 2015; CIHI, 2018). Some studies have examined particular components of OOP healthcare expenditures and CHE across demographic, socioeconomic and physical and functional healthcare settings (CIHI, 2017; Dewa et al., 2005; Coombes et al., 2004). However, particular gaps in knowledge exist regarding socioeconomic, demographic and health factors that influence total OOP healthcare expenditures, variations of OOP healthcare expenditures by province and across age groups. Little is known about the influence of gender on per capita OOP healthcare expenditure in Canada. The information on the share of CHE, a high cost form of OOP healthcare in Canada, is also limited.

The aim of this thesis is to provide a better descriptive picture of OOP healthcare expenditure in Canada and identify the socioeconomic, demographic and physical and functional health factors

contributing to OOP healthcare payments across the provinces. Specifically, the work described in this thesis was guided by the following two main research questions:

(a) What are the trends of OOP healthcare expenditures across Canada, and how are OOP healthcare expenditures associated with demographic, socioeconomic and pre-existing health conditions?

(b) What are the most significant socioeconomic, demographic and physical and functional health factors affecting OOP healthcare expenditures in Canada?

Chapter two: Literature Review

2.1. Introduction

In this chapter, peer reviewed literature related to trends and predictors of out of pocket (OOP) healthcare expenditures in Canada were reviewed. Descriptive assessments of OOP healthcare expenditures such as averages, share of OOP healthcare expenditures by province, age and sex were reviewed. Literature related to predictors of OOP healthcare expenditures was reviewed by socioeconomic, demographic and pre-existing physical and functional health factors using the matrix method (Garrad, 2011). Stages involved in the review of the literature included literature search, database selection, search strategies (Table 1 and Table 2), literature selection criteria and outcomes (inclusion and exclusion), and literature analysis. The literature review focused on published peer reviewed research works, government publications as well as credible international organization publications by looking at their objectives, methodologies, theoretical basis, empirical and non-empirical evidence provided, and their conclusions.

2.2. Literature Search

2.2.1. Database Selection. Existing literature was selected through a search of electronic databases. EconLit, PubMed Central (NCBI), Science direct, BMC Health Services Database, Canadian Institute of Health Information (CIHI) research database, Statistics Canada (StatCan) research database, Organization of Economic Corporation and Development (OECD) database, and World Health Organization (WHO) database were chosen for this review. The search databases above were included based on their contents' relevancy to the thesis topic.

2.2.2. Search Strategies. The three major concepts used in the search strategy were out-of-pocket healthcare costs, predictors of out-of-pocket healthcare costs, and catastrophic healthcare costs. Literature search strategies were created for each database based on these three concepts. These strategies involved various combinations of keywords (Table 1) and subject

headings (Table 2) which resulted in identifying 19 articles. Subject headings and keywords were available for PubMed (NCBI), BMC Health Services Database, CIHI, StatCan, OECD, and WHO. Subsequently, additional internet literature search was conducted on Google Scholar in order to find new studies or any that might have been missed in the original search. This additional search identified 12 additional articles, which were added to the previously identified 19 articles from the original search.

Table 1. Keyword Search Used for the Selected Databases

Key Concept	Keyword (s)
Out of pocket Healthcare Costs	Out of Pocket Healthcare Costs OR Costs of Healthcare Payments from Out of Pocket OR Privately Sponsored Healthcare Services in Canada OR Privately Sponsored Healthcare
Catastrophic Healthcare Costs	Catastrophic Healthcare Costs in Canada OR Impoverishing Healthcare Costs in OECD Nations OR High Out of Pocket Healthcare Costs in Canada OR High Out of Pocket Healthcare Costs in OECD Nations
Healthcare Access and Equity[1]	Healthcare Access in Canada and Healthcare Equity in Canada Implications of Out of Pocket Healthcare Costs on Healthcare Access and Equity in Canada

Notes: StatsCan = Statistics Canada; CIHI= Canadian Institute of Health Information; WHO = World Health Organization.

[1] Although the original keyword search used for the selected databases in Table 1 consisted of "Out of pocket Healthcare Costs', "Catastrophic Healthcare Costs", and "Healthcare Access and Equity", the thesis focussed only on articles that addressed Out of Pocket Healthcare Costs and Catastrophic Healthcare Costs.

Table 2. Text and Subject Heading Search Used for PubMed (NCBI), BMC (HSD), CIHI, StatsCan, OECD, and WHO

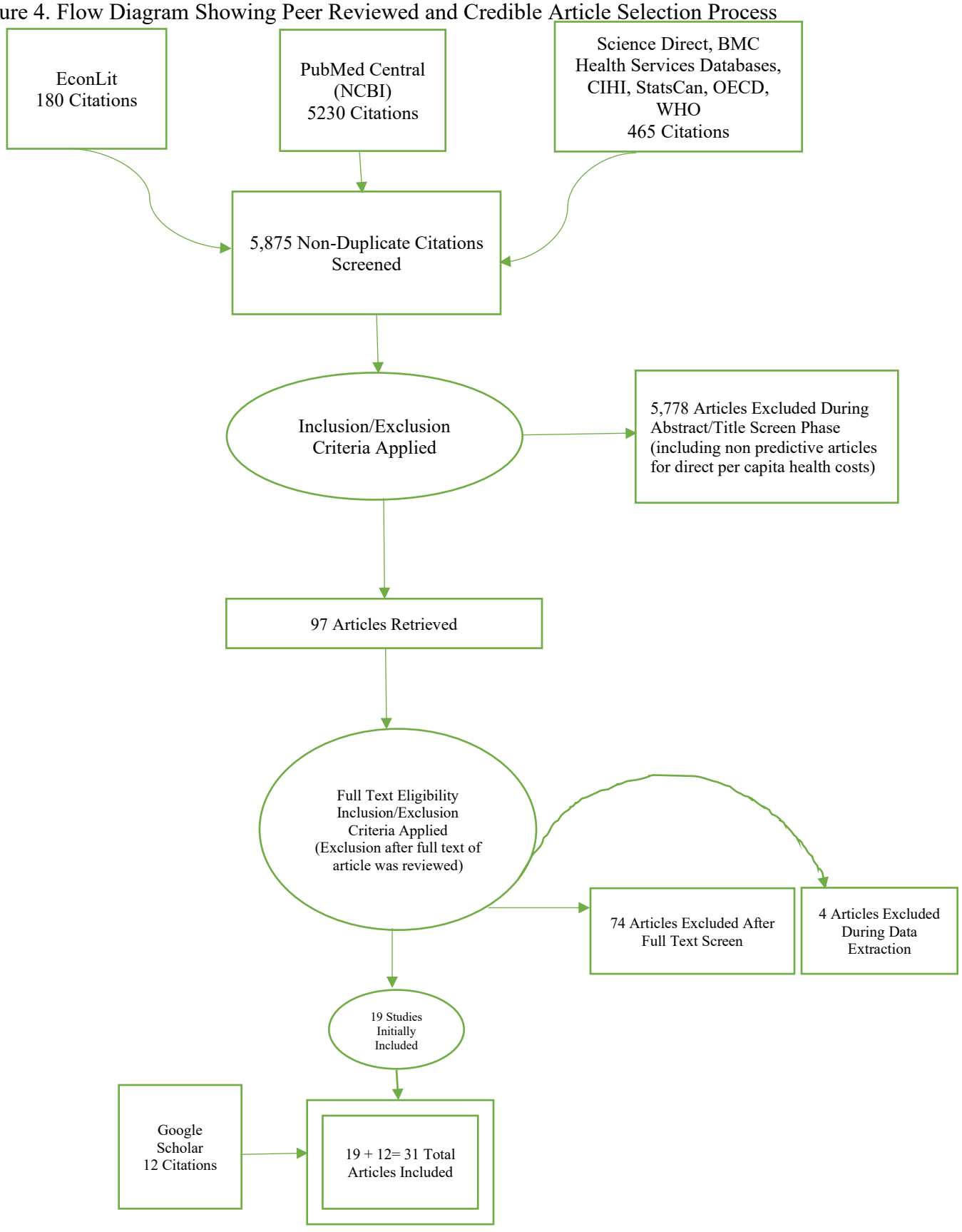
	Database		
Key Concept	**EconLit**	**PubMed Central (NCBI)**	**Science direct, BMC Health Services Database, CIHI, StatsCan, OECD, WHO**
Out of pocket Healthcare Costs	Out of pocket healthcare costs	Burden of out of pocket expenses on healthcare	Out of pocket Healthcare Costs
	OR Determinants of Out of Pocket Health Costs	OR Healthcare Out of Pocket Expenses	Trends in Out of Pocket Costs of Healthcare
	Health Costs		Health Spending from out of pocket
Catastrophic Healthcare Costs	Catastrophic Healthcare Costs	Financial Burden of out of pocket healthcare costs	Impoverishing healthcare costs
	OR Catastrophic Health Costs	OR burdening out of pocket health costs	Affordability of health payments
	OR Impoverishing Health Costs	OR High out of pocket health costs	Health payments and poverty
	OR Health Costs		
Healthcare Access and Equity[2]	Healthcare Access and Equity	Barriers to Accessing Healthcare	Costs and healthcare equity
	OR Health Inequities and	Financial Burden of out of pocket healthcare costs	Healthcare access
	Inaccessibility		

[2] Although the original text and subject heading search used for the selected databases in Table 2 consisted of "Out of pocket Healthcare Costs', "Catastrophic Healthcare Costs", and "Healthcare Access and Equity", the thesis focussed only on articles that addressed Out of Pocket Healthcare Costs and Catastrophic Healthcare Costs.

2.3. Literature Inclusion, Exclusion Criteria, and Search Outcomes

The reviewed literature excluded studies (5,778 articles) that did not address OOP healthcare expenditures. It also excluded studies (74 articles) whose content did not meet full-text eligibility for inclusion into this thesis. Full-text eligibility was assessed on the basis of thorough reading and analysis of the abstracts, methodologies, and results of peer reviewed published articles, government publications and international organization publications. The literature also finally excluded studies (4 articles) that were not eligible to be included in the thesis during the data extraction phase of article inclusion. The data extraction phase involved thoroughly analyzing published literature based on sources of their data, study findings and characteristics used in the analyses of their studies. If the dataset sources included in the articles were not primarily focused on OOP healthcare expenditures in Canada, and/or another country of similar economic status, these studies were also excluded from the review resulting into a total of 19 retrieved articles. As mentioned earlier, 12 additional articles were also identified from the subsequent internet search of Google Scholar database. Therefore, in total 31 articles were chosen and reviewed. The final article inclusion involved only articles that focused on the trends of OOP healthcare expenditures across Canada, and how OOP healthcare expenditures are associated with demographic, socioeconomic and pre-existing physical and functional health conditions, as well as predictors of OOP healthcare expenditures were reviewed. Figure 4 provides an overview of the search process and literature selection. It also shows the additional (12) article selection conducted in Google Scholar.

Figure 4. Flow Diagram Showing Peer Reviewed and Credible Article Selection Process



2.4. Literature Analysis

2.4.1. Attributes of Included Studies. Of the 31 included studies, the earliest study was published in 1999 (Smith, 1999) and the most recent study was published in 2019 (OECD, 2019). Individual country studies showed that six studies were conducted in the United States (O'Lynnger, et al., 2015; Kotlarz et al., 2009; O'Donnell et al., 2008; Smith,1999; White et al., 2016; Paez et al., 2009), one study was conducted in Australia (Carpenter et al., 2015), and 19 studies were carried out in Canada (Coombes et al., 2004; Dewa et al., 2005; Luffman, 2005; Quiñonez & Grootendorst, 2011; Law et al., 2012; Hennessy et al., 2016; Sanmartin et al., 2014; CIHI, 2017; De Oliveira et al., 2014; Duncan et al., 2013; Gladman et al., 2016; Tran et al., 2018; Forget et al., 2008; CIHI, 2018; Law et al., 2013; Philips, 2016; Kobelt, 2006; Rosella et al., 2014; Longo et al., 2006) . Internationally, there were three (3) studies across the OECD nations (OECD, 2019; OECD, 2017; O'Lynnger et al., 2015). And finally, one study was conducted in Kenya (Buigut et al., 2015).

The international studies focussed on the patterns of out-of-pocket (OOP) healthcare costs and publicly financed healthcare expenditures. However, analyses in these studies were not categorized by provinces (OECD, 2019; OECD, 2017; O'Lynnger et al., 2015). Therefore, this literature review was mostly based on general patterns and associated factors for out-of-pocket healthcare expenses, many of which were being carried out in Canada. All the selected studies were critically read and article details were extracted and summarized chronologically based on the analyses of the article results using the Matrix Method of literature review (Garrard, 2011) (see Appendix 3). The themes in this study include OOP healthcare costs, catastrophic healthcare costs as well as associated factors for OOP healthcare costs.

2.5. A General Summary of Studies Conducted Around the Topic of the Thesis

Of the 31 reviewed articles, two studies (n=2/31) revealed that there has been a general increase in OOP healthcare payments at all household levels of income between 1997 and 2009 (Sanmartin et al., 2014; CIHI, 2018). A few of the reviewed studies (n=3/31) done in Canada explicitly discussed person-level attributes as associated risk factors for out-of-pocket healthcare costs (Law et al., 2012; Rosella et al., 2014; Forget et al., 2008, Duncan et al., 2013; CIHI, 2017; Philips, 2016; Coombes et al., 2004; CIHI, 2018). A few studies mentioned the problems associated with OOP healthcare expenditures (Clarke, 2016; Law et al., 2012). One article explicitly associated out-of-pocket healthcare costs to healthcare access limitation in Canada (Law et al., 2012) which is one of the identified OOP healthcare expenditure-related problem. Clarke et al. (2016) stated that high OOP healthcare expenditures inhibits and/or reduces timely access to needed medical care services. Similarly, Law et al. (2012) reported that roughly 1 in 10 (10%) Canadians receiving a prescription medication registered a cost related nonadherence to prescription medication which poses as another limitation to care access from OOP costs of care. Problems associated with OOP such as the ones discussed above consequently gave rise to a search for OOP healthcare expenditure remedial policies. A few of the studies reviewed (n=2/31) suggested policies for addressing out-of-pocket healthcare cost related care inaccessibility and inequity (Quiñonez & Grootendorst, 2011; Forget et al., 2008). For instance, upon finding out that the costliest 10 percent of Canadians were mostly in their expensive healthcare age bracket, Forget et al. (2008) advised that policies that make this 10 percent of Canadians able to access the medical care that they need could help bridge the gap in healthcare access and equity among various Canadian healthcare users.

2.6. Trends in Out of Pocket Healthcare Expenditures

Previous studies have shown that OOP healthcare expenditures have been increasing over the past years (Luffman, 2005; Sanmartin et al., 2014; Bodenheimer, 2005). Luffman (2005) stated that OOP healthcare expenditures were anticipated to rise in the following years. Luffman reported that in 2002, 60% of Canadian households reported paying for prescription medication from OOP totalling to $3billion. She attributed her assessment to increasing prescription drug expenditures attributable to the introduction of new medicines. She stated that these new prescription medicines could be more expensive than the previously existing ones in the Canadian market (Luffman, 2005). This study was limited by a focus on only one component of OOP healthcare expenditures. Luffman's study only focussed on prescription medicine expenditures, which limited the scope of her study. In addition to Luffman's study, Sanmartin et al. (2014) studied the trends of OOP healthcare expenditures in Canada between 1997 and 2009. They found that OOP healthcare expenditures increased by 2.9% yearly in Canada between 1998 and 2009. Although both Sanmartin et al. (2014) and Luffman (2005) showed an increasing trend in OOP healthcare expenditures, the study by Sanmartin et al. (2014) may have been, however, subject to recall bias since their study used the survey of household spending (SHS) data that relied solely on self-reported information. In another study, Bodenheimer (2005) assessed high and rising expenditures of OOP healthcare services in the United States (US). By reviewing the literature, he attributed rising OOP healthcare expenditures to factors outside of the healthcare system. The factors that Bodenheimer proposed were advancement in medical technology, the increasing market power of certain healthcare providers, and a lack of a free healthcare market system. The study provided an example of the 60% increase in the price of cholecystectomy due to technological advancement in the US. Additionally, the study by Bodenheimer (2005) relates

to the study by Ali et al. (2013) which sees OOP healthcare expenditures from a non socioeconomic and health perspective. Despite the fact that Bodenheimer's study supported the positive trend in OOP healthcare expenditures previously observed by Luffman (2005) and Sanmartin et al. (2014), the study also lacked empirical depth and evidence to support its claims. Besides the trends and the descriptive characteristics of OOP healthcare expenditures in Canada, this literature review also covered predictors of OOP healthcare expenditures which are discussed in the following content below.

2.7. Predictors of Out of Pocket Healthcare Expenditures

2.7.1. Socio-economic Factors. A number of socioeconomic characteristics have been shown to influence OOP healthcare expenditures. The socioeconomic factors that were most studied in the prediction of OOP healthcare expenditures in peer reviewed articles include income level, education level, and employment status. In the following sub section, a detailed review of the literature on the influence of these select socioeconomic factors is provided. The review has been provided in the chronological order of income, education level, and employment status.

2.7.1.1. Income. A number of studies have investigated the influence of income on OOP healthcare expenditures. The studies provided information on particular OOP health expenditure components and how they were influenced by income. Of the 31 reviewed articles, less than half (n=12/31) of the studies revealed that incomes play a role in predicting OOP healthcare costs (Sanmartin et al., 2014; White et al., 2016; Quiñonez & Grootendorst, 2011; Smith, 1999; Coombes et al., 2004; Dewa et al., 2005; Luffman, 2005; Law et al., 2012; Hennessy et al., 2016; CIHI, 2017; De Oliveira et al., 2014; Carpenter, 2015). In all the 12 articles studied that looked at incomes, income had a negative effect on per capita OOP healthcare expenditure (Sanmartin et

al., 2014; White et al., 2016; Quiñonez & Grootendorst, 2011; Smith, 1999; Coombes et al., 2004; Dewa et al., 2005; Luffman, 2005; Law et al., 2012; Hennessy et al., 2016; CIHI, 2017; De Oliveira et al., 2014; Carpenter, 2015). Detailed discussions of these studies are explained as follows.

An earlier study among the 12 articles had revealed that incomes and OOP healthcare costs are inversely associated with each other (Smith, 1999). Similar to Smith's finding, a study in the United States (US) using a multilevel analysis of healthcare access by transgender adults revealed that being in the low-income bracket substantially increased one's OOP healthcare costs (White et al., 2016). Additionally, a study in Canada suggested that healthcare financing could be accountable for the inverse relationship between incomes and per capita OOP healthcare spending (Coombes et al., 2004). To support the finding shared by Smith (1999), Coombes et al. (2004) and White et al. (2016), Coombes et al. (2004) used simulation to model the burden of OOP prescription medication cost that Canadians would face in 2003 if Canada adopted the prevailing provincial pharmacare models. They found that a 25% co-payment on a household prescription medication cost of $12,000 would put substantial financial burden on any low-income family. Additionally, Coombes et al. (2004) suggested that tax-financed pharmacare models could be a reason for the negative influence of incomes on OOP healthcare costs. In their study, they stated that "comprehensive, tax-financed pharmacare models that limit out-of-pocket expenditures to a given percentage of income, such as those found in British Columbia, Saskatchewan, Manitoba and Ontario, provide the greatest protection against catastrophic prescription drug costs" (Coombes et al., 2004, p.13). The study by Coombes et al. (2004) imply that when the costs of healthcare are partially covered by provincial pharmacare systems, and when high income earners receive employment healthcare coverages through the prevailing

provincial healthcare policies, high income Canadians end up eventually paying less in average OOP healthcare expenditures compared with their low-income counterparts. This study was, however, limited to OOP expenditures on prescription medication, and did not account for structural variations in Canada's provinces. Similarly, Dewa et al. (2005) used a population based national mental health survey of 33,000 Canadians to describe the factors associated with the purchase of health insurance, a component of OOP healthcare expenditure. They found that low-income Canadians were not likely to purchase health insurance by paying from OOP, which contrasts the findings of previous three authors (Smith, 1999; Coombes et al., 2004; White et al., 2016) when health insurance is used as a component of OOP healthcare expenditure. The study by Dewa et al. (2005) was also limited in scope as it only focussed on the insurance component of OOP healthcare expenditures. Furthermore, Luffman (2005) found that low-income Canadian households (when compared with high income households) whose main source of incomes came from government transfer payments spent more on prescription medications from OOP (expected average OOP prescription medication expenditures $389 more than those Canadian households whose incomes came from other sources such as wages from employment and business ownerships). The study by Luffman supported findings from the studies by Smith (1999), White et al. (2016), and Coombes et al. (2004). However, Luffman's study also used prescription medicines as the only measure of OOP healthcare expenditure, which again limited her scope of study on predictors of OOP healthcare costs.

Another study that examined the relationship between income and per capita OOP healthcare spending showed that OOP health payments varied by income groups, such that individuals in the higher income quintiles paid less OOP healthcare costs than their counterparts in the lower income quintiles (Quiñonez & Grootendorst, 2011). Quiñonez and Grootendorst

(2011) found out that low and middle-income Canadians are often the group most affected by OOP healthcare costs. They found that the middle-income and the low-income class Canadians are the most sensitive to the slight changes in dental care costs in Canada compared to their high-income counterparts (Quiñonez & Grootendorst, 2011). For instance, the study posited that healthcare financing lowers OOP healthcare payments which can be beneficial to low income persons who appear to be most responsive to changes in direct healthcare costs (Quiñonez & Grootendorst, 2011). Quiñonez and Grootendorst (2011) also emphasized the inverse relationship between per capita OOP healthcare costs and income through healthcare insurance option. Their study, however, lacked empirical explicitness, and only focussed on dental care expenditures as a sub-component of OOP healthcare expenditures in Canada. This limitation to Quiñonez and Grootendorst's study was also similar to the limitations found in the other authors' findings (Dewa et al., 2005; Luffman, 2005) whose studies focussed on only prescription medicines and insurance costs respectively. In another related study, Law et al. (2012) examined a survey of 5,732 Canadians using logistic regression to evaluate the influence of incomes on OOP prescription medication expenditures and adherence to treatment. They found that low-income Canadians were more likely to report paying higher OOP prescription expenditures (Odds Ratio=3.29, 95% Confidence Interval: 2.03-5.33). Again, this study focussed only on the prescription medication cost component of OOP healthcare expenditures. Furthermore, Carpenter et al. (2015) reported that persons with lower incomes incurred higher OOP healthcare expenditures and often reported the inability to afford healthcare services from OOP. Carpenter and colleagues' work supported the studies by Smith (1999), White et al. (2016), and Coombes et al. (2004). However, their study did not include other expenditures from OOP such as expenditures for time off work and payment for transport. The study by Carpenter et al. (2015)

did not provide adequate empirical evidence to support its results just as was seen in the works of Dewa et al. (2005) and Luffman (2005).

In another similar finding, Hennessy et al. (2016) found that one-third (1/3) of Canada's prescription medications were paid for from OOP. Among these, they found that low income Canadians whose incomes were less than $30,000 per year spent at least more than 5% of their after-tax incomes on prescription medication from OOP compared with less than 5% of after-tax income spent on prescription medication among high income Canadians. The finding by Hennessey et al. (2016) supported findings from Smith (1999), White et al. (2016), Coombes et al. (2004), Luffman (2005) and Carpenter et al. (2015). Hennessy and colleague's study was however limited by a small sample size (11% of participants could not accurately state their OOP prescription medication expenditures). In another related study, Sanmartin et al. (2014) and CIHI (2017) studied the trend of OOP healthcare expenditures between 1997 and 2009 using the survey of household spending (SHS) dataset. They found that in 2009, household OOP prescription medication expenditure was highest ($388) in the second-lowest income quintile relative to $296 in the highest income quintile. They also found that prescription medication and orthodontal care expenditures rose nearly 60% for Canadian households in the lowest income quintile. These investigations were prone to recall bias since the information in the SHS datasets is self-reported. Similarly, a study that examined OOP healthcare expenditures among prostate cancer patients in Ontario found that the OOP share of medical treatment expenditures was as high as 10% among low income subjects (De Oliveira et al., 2014). This study sheds light on the burden that OOP healthcare expenditures can have on persons suffering from chronic pre-existing conditions, as well as persons with low incomes. Therefore, it was also limited to persons affected by medical conditions as opposed to Canada's general population. The articles

that reviewed the influence of income on the OOP healthcare expenditures were numerous. They provided a good insight into how income affects OOP healthcare expenditures. However, these articles were limited by a focus on a particular component of OOP such as prescription costs, dental care costs, and insurance costs. Besides income, education also affects OOP healthcare expenditures and the way it does so are examined below.

2.7.1.2. Education Level. A few studies (n=3/31) have linked education to the OOP healthcare expenditures (Dewa et al., 2005; Kotlarz et al., 2009, Duncan et al., 2013). A study posited that educational attainment influences the ability and willingness to purchase health insurance premiums from OOP (Dewa et al., 2005). According to Dewa et al. (2005), Canadians with a high school diploma were more likely to purchase health insurance from OOP (57.5% versus 53.5% Canadians without a high school diploma). Similarly, Duncan et al. (2013) found that education and OOP healthcare expenditures were correlated. Duncan et al. (2013) reached this finding by carrying out a social experimental research. Their empirical finding showed that education was correlated with OOP healthcare costs in Alberta. Furthermore, Kotlarz et al. (2009) revealed that having only a less than high school education increased females' (OR=8.2, p-value=0.004) and reduced males' (OR=0.8, p-value=0.05) likelihood of paying for medical insurance from OOP compared to having a high school diploma. Consequently, when a male and female Canadian possessed less than a high school education, their affinity and ability to pay for health insurance from OOP differed (Kotlarz et al., 2009). Kotlarz et al. (2009) additionally revealed that having above high school diploma significantly increased both females' (OR=1.9, p-value<1%) and males' (OR=1.7, p-value<1%) likelihood of paying for medical insurance from OOP compared to having a high school diploma. The study by Kotlarz et al. (2009) supported the finding by Dewa et al. (2005) up to when a Canadian held at least a high school diploma. It

as well supported the finding by Duncan et al. (2013). Therefore education, according to past studies, had a positive effect on per capita OOP healthcare costs among males and females when Canadians held at least a high school diploma (Kotlarz et al., 2009; Dewa et al., 2005). A limitation of the above studies (Dewa et al., 2005; Kotlarz et al., 2009; Duncan et al., 2013) on the influence of education on OOP healthcare expenditures is that they only studied health insurance expenditures and other specific components of OOP healthcare expenditures. They also did not look at the other levels of education in detail. Besides, education and income, employment status as a socioeconomic factor also affects OOP healthcare expenditures in the ways reviewed below.

2.7.1.3. Employment Status. Of the reviewed articles, less than a quarter (n=6/31) examined the influence of employment on the per capita out-of-pocket healthcare expenditures (Duncan et al., 2013; Shooshtari, Roger & Fast, 2013; Dewa et al., 2005; Luffman, 2005; Smith, 1999; Gladman, 2014). Duncan et al. (2013) and Shooshtari et al. (2013) revealed that out-of-pocket (OOP) healthcare costs decreased with full-time employment status in Alberta. Alberta residents with full time permanent employment were more likely to pay less in total OOP healthcare costs than their part-time counter-parts (Duncan et al., 2013; Shooshtari, Roger & Fast, 2013). Similarly, while exploring the variability of prescription drugs coverage in Canada's provinces, and while using data from population-based national health and mental healthcare survey of 33,000 Canadians, Dewa et al. (2005) showed that total prescription drugs OOP healthcare expenditures were affected by type of employment. For instance, they revealed that employer sponsored prescription drugs coverages can sometimes come with full time high paying job hence making the employed liable to paying less in prescription drugs costs (Dewa et al., 2005). In a related study, Luffman (2005) stressed that the type of employment also affected

the form of insurance coverage which often significantly affected how much Ontarians spent on prescription drugs-she wrote for instance that public servants and automobile company employees were most likely to receive all sorts of other non-wage coverages which in most cases included prescription drugs. Besides type of employment, job control also affects OOP healthcare payments and its consequences. For instance, Smith's review of literature concludes that low job control was associated with chronic medical conditions such as coronary heart disease, which consequently contributed to high OOP healthcare expenditures among persons with such medical conditions (Smith, 1999). In another study, Gladman et al. (2014) found that employment (job) status was substantial in driving up OOP healthcare costs among Canadians suffering from amyotrophic lateral sclerosis. Their study showed that Canadians who lost a job during the diagnosis of amyotrophic lateral sclerosis incurred an average total out of pocket cost of $10,198 (95% C.I.= $6,132 – $14,264) compared to those who retired at diagnosis [$34,379 (95% C.I.=$10,390 – $58,368)]. Their finding on the influence of employment status on out of pocket healthcare cost was however not statistically significant (p-value=0.19>5%). Gladman and colleagues' study was limited by a small sample of Ontario residents and the fact that it was a cross-sectional study even though they provided a substantial insight into how employment status affects OOP healthcare expenditures per capita. Besides employment status, a socioeconomic factor, demographic factors have also played a substantial role in influencing how much Canadians paid for healthcare goods and services from OOP which can be discussed below.

2.7.2. Demographic Factors. The demographic factors that were examined in the review of literature include age, marital status, household size and province of residence. The demographic factors were assessed for their influence on OOP healthcare costs in Canada and in

countries with similar socioeconomic setting. The literatures on demographic factors were assessed in the following sub section in the order of age, sex, marital status, household size, and province of residence. Among all the demographic factors studied below, age seemed to have carried a heavier weight in literature. Details can be seen below.

2.7.2.1. Age. Studies found that age had a positive influence on OOP healthcare expenditures. Of the reviewed articles, more than a quarter (n=9/31) articles examined age as a predictor for out-of-pocket (OOP) healthcare costs (Duncan et al., 2013; Carpenter et al., 2015; Kotlarz et al., 2009; Luffman, 2005; Smith, 1999; Coombes et al., 2004, p.13; Forget et al., 2008, e149; Tran et al., 2018, p1-p10; Dewa et al., 2005). One study found that the differences in age of healthcare users play a big role in how much a person pays for healthcare services from out-of-pocket (OOP) (Tran et al., 2018, p1-p10). Tran et al. (2018) argue that due to the presence of many senior Canadians residing in Alberta, OOP healthcare costs in Alberta are increased due to the high demand on old age-related treatments. Similarly, in a non-empirical study, age had been shown to cause variation in OOP healthcare costs (Duncan et al., 2013). Contrary to a popular finding, a study by Duncan et al. (2013) found that being a person of age 65 years and older was associated (average odds ratio, AOR=0.429, P-value<5%) with a lower probability of OOP healthcare spending in Canada. However, when they adjusted their analyses for gender, this relationship became insubstantial (male-AOR=0.38, p-value>5%; female-AOR=0.628, p-value>5%). Furthermore, a study by Kotlarz et al. (2009) show that belonging to a young age group (18 to 34 years) decreased per person OOP healthcare costs among young American females (OR=0.9, p-value<1%) and males (OR=0.8, p-value<1%) living with Osteoarthritis (OA) compared to American OA patients in the 35 to 49 years old age bracket. Kotlarz and colleague's claim support the claim by Coombes et al. (2004). Coombes et al. (2004) used a

simulation model involving 4, 860 household which investigated the burden of prescription drug costs and found out that age had a positive association with per person OOP healthcare costs in Canada.

In other related studies, high OOP healthcare expenditures were likely to be observed among older persons (Smith, 1999; Dewa et al., 2005). For example, Smith (1999) found that OOP healthcare expenditures were substantially high among US citizens older than 70 years of age ($1,530 for persons older than 70 with a severe disease onset compared to persons in other age brackets). Similarly, Forget et al. (2008) reported that the most medically expensive 10% of Canadians were always in their costly healthcare age bracket. By using Markov modelling, Forget et al. (2008) reported that OOP healthcare expenditures vary across different age brackets and that increases in OOP healthcare expenditures remained atypical until the age of 75 years among Canadians. The study by Forget et al. (2008) supports the findings in the works of Smith (1999), Luffman (2005), and Dewa et al. (2005) which associated old age and high OOP healthcare expenditures. In a related study that was conducted outside of North America, Carpenter et al. (2015) reported that the chance of incurring higher OOP healthcare expenditures was extremely high among Australians who were 50 years or older which resonates with the findings from Smith (1999), Forget et al. (2008), Dewa et al. (2005), and Duncan et al. (2013). The studies reviewed above were however limited by a focus on a specific group of persons (Forget et al., 2008) or a particular component of OOP healthcare expenditure only (Smith,1999; Dewa et al., 2005) even though they associated old age with high OOP healthcare expenditures. Other than age, sex also plays a substantial role in influencing OOP healthcare expenditures in Canada. The influences of sex on OOP healthcare expenditures as discovered by previous authors are discussed as follows.

2.7.2.2. Sex. One of the reviewed articles examined the influence of sex on the variations of OOP healthcare expenditures (Forget et al., 2008). The study by Forget et al. (2008) estimated the variations accruing to OOP healthcare costs from person level attributes including sex in Manitoba, and found out that female Canadians incurred an average of $89,741 over a lifetime in OOP hospital and physician costs, 40% more than the $64,091 average care costs incurred by men. This implied that on average, females were likely to incur higher OOP healthcare expenditures compared to males (Forget et al, 2008). This study also corresponds with findings from Fast et al. (1999). The limitation to this study was that it was entirely non-empirical and the effects of gender on OOP healthcare costs was not statistically isolated from the influence of all other factors affecting the OOP healthcare expenditures. Their study also only looked at the OOP healthcare expenditures in Manitoba as opposed to Canada-wide OOP healthcare expenditures. Other than sex, another demographic factor, marital status was reviewed for its influence on OOP healthcare expenditures in the following ways.

2.7.2.3. Marital Status. Studies examined the influence of marital status on OOP healthcare expenditures. For instance, Dewa et al. (2005) found that married Canadians were more likely to purchase healthcare insurance from OOP compared to their unmarried counterparts (68% versus 56.9%). In relation to OOP healthcare expenditures, their study had a limited focus on only one component of OOP healthcare expenditure, health insurance premiums. On the other hand, and in contrast to Dewa and colleague's finding, Duncan et al. (2013) reported that being separated, divorced, widowed (single status because of death of spouse) or single, when compared with being in common law/married state, had no statistical significance (AOR=0.851, p-value>5%) on the OOP healthcare expenditure amount spent per capita. The studies by Dewa et al. (2005) and Duncan et al. (2013) made substantial contribution

to the literature surrounding the influence of sex on OOP healthcare expenditures. Both of these studies were however, limited by the small sample sizes of the datasets used in the analyses of their research and were in most cases focussed on a specific OOP healthcare expenditure component such as insurance premiums. Another demographic factor besides sex that was studied was household size, whose details of influence on OOP healthcare expenditures are discussed in the following sub section.

2.7.2.4. Household Size. In the reviewed literature, no study explicitly examined the influence of household size on OOP healthcare expenditures. For example, multi-family households and senior households with children were excluded from a study that used simulation to assess Canada's OOP healthcare expenditures by provincial pharmacare plans (Coombes et al., 2004). Additionally, family size or household size has been rarely examined in the studies of OOP healthcare expenditures and in most cases were excluded (Duncan et al., 2013; O'Lynnger et al. 2015; CIHI, 2018). When incorporated into a study, marital status, number of children, and/or the number of persons with a chronic medical condition in a home were often used as proxies (Duncan et al., 2013). Besides household size, provincial locations have also been reportedly influencing OOP healthcare expenditures as will be discussed below.

2.7.2.5. Province of Residence. Studies have acknowledged the variations in provincial pharmacare policies and their influence on OOP healthcare expenditures in Canada. Less than a quarter (n=5/31) of the reviewed articles examined the associations between Canada's provinces and per person OOP healthcare expenditure (CIHI, 2017; Dewa et al., 2005; Law et al., 2013; Coombes et al., 2004; Luffman, 2005; Tran et al., 2016). CIHI (2017) found that Alberta, Newfoundland and Labrador, Quebec and British Columbia registered the highest OOP healthcare costs in 2017. Dewa et al. (2005) did not explicitly examine the provincial OOP

healthcare expenditures although they examined the cost of prescription medication at the provincial level. They asserted that the costs of prescription medicine fluctuate with the provinces in Canada (Dewa et al., 2005), which resonates with the findings of CIHI (2017) at least when the prescription medication costs (as a component of OOP healthcare expenditures) are considered. In terms of the catastrophic form of OOP healthcare expenditures, Law et al. (2013) found that residing in British Columbia and the Atlantic provinces was associated with increased odds of spending more than 10% of Canadian household's after-tax incomes on OOP healthcare goods and services, which also resonates with the finding from the work of CIHI (2017).

In a related empirical study, Coombes et al. (2004) used simulation and found that if every provincial pharmacare model was implemented as designed, the Ontario pharmacare model would yield the highest protection against high OOP prescription medicine expenditures compared to all other 9 Canadian provincial pharmacare models. Specifically, they found that no Canadian would have to spend more than 4 percent of their household earnings on prescription medication if the Ontario pharmacare model was adopted. Their empirical findings showed that no Canadian household with persons over 65 years paid more than 1.9% of their annual income on prescription medication in 2003. Their empirical finding also showed higher statistics for Quebec and Alberta where more than a quarter (36.1% and 38.7%, respectively) of the households paid more than 1.9% of their annual after-tax incomes on prescription medication respectively. A similar pattern was also observed among Canadians who were below 65 years of age in Ontario, Alberta and Quebec (Coombes et al., 2004). This study was however limited by the inability of simulation modelling to capture the structural differences in Canada's provinces. The high OOP healthcare costs in Alberta may be attributable to the presence of more persons

aged over the age of 65 receiving old age-related treatments, declining oil prices in an oil rich economy, and from a reduction in public healthcare coverage (CIHI, 2017; Tran et al., 2018, p1-p10). Similarly, by using Tobit regression model, Luffman (2005) assessed Canada's OOP healthcare expenditures by household attributes. She reported that Canadian families residing in Alberta, British Columbia, and Quebec spent on average lower shares of their incomes on prescribed medications ($321, $335, and $354, respectively) compared to those residing in the Atlantic provinces ($403) and Manitoba ($370). Her finding was partly contrary to empirical findings by Coombes et al. (2004). Luffman (2005) however found that the share of Canadian households spending more than 3% of their after-tax income on prescription medication was higher in Prince Edward Island (10.4%), Saskatchewan (15.9%) and lower in Ontario (4%) and British Columbia (4%). As a limitation to their study, the study by Luffman (2005) was also constrained by the focus on the OOP expenditures on prescribed medicines only. Besides demographic and socioeconomic factors already discussed above, health factors also play a role in influencing OOP healthcare expenditures. Such influences from the latter are described as follows.

2.7.3. Health Factors. Studies have associated higher OOP healthcare expenditures with pre-existing medical conditions (Kotlarz et al., 2009; Rosella et al., 2014; Paez et al., 2009; De Oliveira et al., 2014; Philips, 2016; Longo et al., 2006; Kobelt et al., 2006). Major pre-existing medical conditions that affect OOP healthcare expenditures in Canada include diabetes, osteoarthritis (OA), and cancer (Philips, 2016). Elsewhere, Kotlarz et al. (2009) reviewed various literature to assess the relationship between OA and OOP healthcare expenditures in the US. They found that OA increased OOP healthcare expenditures among patients by $1,379 per patient attributing to the severity of the disease. Furthermore, using a two-part regression to

investigate time and OOP healthcare expenditures among cancer survivors in Canada, having a urinary tract infection substantially increased OOP healthcare expenditures among the subjects (De Oliveira et al., 2014). In a similar study, increased disease activity and decreased physical health function among ankylosing spondylitis (AS) patients in Alberta, Ontario, British Columbia, and Manitoba increased OOP healthcare expenditures from $1,000 (at low disease severity and moderate physical health decline) to over $5,000 per patient (at high disease severity and high physical health decline) per patient (Kobelt et al., 2006). Additionally, increased disease activity damages the status of health and similarly, another study showed that "poor self-rated health (vs. good) was associated with a 26-fold increase in Odds of becoming a top 1% high cost health user (vs. bottom 50% user) [95% CI: (18.9, 36.9)]" (Rosella et al., 2014, p.1). In a related study, Paez et al. (2009) reported an increase in the OOP healthcare costs when a chronic disease condition is present in their study subjects. They reported "an increase in OOP healthcare costs from 32.4 percent to 63.1 percent in persons with at least one chronic condition" (Paez et al., 2009, ep4). Also, in Eastern Canada, Longo et al. (2006) found increased OOP healthcare costs among Ontario cancer patients in advanced stage of the disease. The above findings suggest that disease conditions can have an increasing effect on per capita OOP healthcare expenditures depending on the disease severity and the general health of a person. The above studies did not consider the influence of mental health conditions and functional health conditions on OOP healthcare expenditures in Canada, which prompts further investigations. The previous sections of this thesis discussed the previous authors' findings on predictors of OOP healthcare expenditures. In the following section, the literature gaps in the above reviewed literatures were revisited, summarized and the contributions of this thesis were consequently discussed as follows.

2.8. Contribution of the Thesis

The above reviewed literature contributed substantial information for the assessment of OOP healthcare expenditures. The studies, however, had certain limitations. The most common limitation among the reviewed studies was the focus on an individual component of the OOP healthcare expenditures such as prescribed medication expenditures, health insurance premiums, and dental care expenditures rather than providing investigation on the sum of all these OOP healthcare expenditure components. Some of the reviewed literature only studied disease specific OOP healthcare expenditures (such as OOP healthcare expenditures related to cancer treatment and dental care treatment) as opposed to studying the aggregate of OOP healthcare expenditures irrespective of disease conditions. In the event that a reviewed study investigated catastrophic OOP healthcare expenditure, the cut-off thresholds for the ratio of OOP healthcare expenditures to income were set to either 3% or 5% but not 10%. Also, the ratio of OOP healthcare expenditure to income was common as a measure of catastrophic OOP healthcare expenditure as opposed to the budgetary share measure (ratio of OOP healthcare expenditures to total per capita expenditures).

To fill some of the gaps in the existing literature on OOP healthcare expenditures, this thesis provides an assessment of the total OOP healthcare expenditures estimated as a sum of all the components of OOP (OOP healthcare expenditures for eye care, dental care, prescribed medications, and insurance premiums) to provide a better picture of OOP healthcare expenditures in Canada. These assessments will also be done by province and irrespective of pre-existing disease conditions among Canadians. The thesis will also provide an assessment of OOP healthcare expenditures by self-reported functional health (activity limitation status) and physical ability (whether a Canadian reported being able or unable to perform certain physical tasks such

as bending, climbing, etc). This thesis will also add to the literature of OOP healthcare expenditures by assessing the catastrophic healthcare expenditures as budgetary shares (at more than 10% expenditure threshold) rather than using the commonly used OOP healthcare expenditures to income ratios. The latter is insensitive to a person's ability to afford healthcare services from OOP (O'Donnell et al., 2008).

Chapter Three: Research Methods

3.1. The Dataset

To conduct this study, the author obtained the survey of household spending (SHS) data in Fall 2018 from Statistics Canada through the Canadian Research Data Center Network (CRDCN). Statistics Canada collects the SHS data using information from the Canada Revenue Agency (CRA) tax forms, telephone interviews and through the use of diaries. The SHS data is usually annually collected by Statistics Canada. The following statement describes the role of the CRDCN:

> The Canadian Research Data Centre Network (CRDCN) is a partnership between a consortium of Canadian universities and Statistics Canada, through its Research Data Centre Program, to provide university, government and other approved researchers ready access to a vast array of social, economic and health confidential microdata in secure computer facilities located on university campuses across the country

(Canadian Research Data Center Network [CRDCN], 2019, About the CRDCN section, para.1).

The dataset consisted of SHS cycles from 2004 through 2015. The SHS cycles for the years 1998 to 2003 were excluded due to the absence of bootstrap weights. The total number of respondents included in sample datasets for the survey cycles 2004 through 2015 was 112,940 people. This sample was weighted after truncation for records containing negative incomes and assessed to represent Canada's population. Records for residents of the three Canadian territories (Yukon Territories, Northwest Territories and Nunavut) were excluded from the study since their descriptive attributes could not pass the CRDCN data release requirement.

Table 3 provides detailed sample sizes of included respondents in this study. SHS datasets between 2004 and 2010 were larger than those between 2011 and 2015. After truncation, 2013 registered the smallest size of SHS respondents.

Table 3. Sample Sizes of Survey of Household Spending Data Used in the Study by Category of Spending

Year (Cycle)	Full sample size (Out of Pocket Healthcare Expenditures)	Catastrophic Healthcare Expenditures Sub-Sample
2004	14,154	648(4.60%)
2005	15,222	690(4.50%)
2006	14,635	713(4.9%)
2007	13,940	1,731(12.40%)
2008	10,811	529(4.90%)
2009	10,811	564(5.20%)
2010	9,062	677(7.50%)
2011	7,661	540(7.00%)
2012	3,828	250(6.50%)
2013	4,048	269(6.60%)
2014	3,758	251(6.50%)
2015	5,010	325(6.50%)
Total People (observations)	112,940	7,187(6.40%)

Notes: The table above shows samples of the SHS cycles for the years 2004-2015, and CHE subsamples for years 2004-2015. Share of sample respondents incurring catastrophic health expenditures (CHE) are shown on the right column of the table

Sample respondents included in the CHE category were calculated by sorting out respondents whose OOP healthcare expenditures exceeded 10% of the respondent's total annual expenditure. Respondents whose healthcare expenses did not exceed 10% of their total expenditure in any given survey year were truncated as part of data cleaning and validation for producing subsamples for the CHE group. The SHS dataset provides a wide range of detailed information on demographic, socioeconomic, physical and functional and circumstantial health profiles of each household and household representative persons in Canada. The SHS dataset

contains information on gender, age, household representative's educational level, employment status and duration, spending information on a wide range of commodities including healthcare, self reported functional and physical health statuses, province of residence, the Central Metropolitan Area (CMA) of residence, among other variables such as housing and dwelling conditions and family size. In summary, the SHS data contains information on the following: families, households and housing; household characteristics; household spending and savings; housing and dwelling characteristics; income; and pensions, spending and wealth (Statistics Canada, 2019).

3.1.1. Rationale for Choosing 10 Percent Threshold for Catastrophic Healthcare Expenditures

It has been advised that the use of a 10% healthcare budgetary share threshold is warranted when total household expenditure is used in measuring CHE (O'Donnell et al., 2008). For instance, previous researchers also acknowledged this threshold through the following statement:

> When total expenditure is used as the denominator, the most common threshold that has been used is 10 percent, with the rationale that this represents an approximate threshold at which the household is forced to sacrifice other basic needs, sell productive assets, incur debt, or become impoverished (O'Donnell et al., 2008, p.205).

3.2. Methodology

Descriptive analyses such as weighted means, medians, proportions were computed to examine the OOP healthcare expenditures in Canada and across the provinces and their association with the demographic and socioeconomic factors. Also, weighted regressions were carried out to find out predictors of per capita OOP healthcare expenditures in Canada. Tabulated and graphical outputs from the descriptive and regressions were produced and reported. Descriptive analyses are further discussed as below.

3.2.1. *Descriptive Analyses*

As an initial step to the analysis, the author performed descriptive analyses of the SHS data by grouping the individual respondents' OOP healthcare expenditures and CHE by selected demographic, socio-economic, circumstantial and self reported health profiles. These analyses computed: the amounts of OOP healthcare expenditures by gender, year, province and income; CHE amounts by province and gender, and by year. Descriptive analyses were also conducted for the components of OOP healthcare expenditures such as private insurance premiums, dental care expenditures, eye care expenditures, and prescription drugs. These analyses were done by year, and by province. The descriptive analysis also sheds light on the location attributes of respondents by providing average per person estimates of OOP healthcare expenditures and CHE so as to identify which provinces incurred the high amounts of both CHE and total OOP healthcare expenditures, and what they have in common.

The calculation of OOP healthcare expenditures was done by adding the direct expenditures of healthcare to the private health insurance premiums plans. The private health insurance premium plans comprised co-payments, co-insurance and deductibles meanwhile the direct expenditures included the expenditures of prescription drugs, expenditures of eye-care and dental care expenditures. Catastrophic healthcare expenditure was computed per year by estimating healthcare expenditure estimates of respondents whose healthcare spending exceeded 10% of their total spending in any given survey year. The author used the expenditure approach for calculating the estimates of CHE in Canada for the survey years 2004 through 2015. The approach to measuring CHE by using total household representative person's spending as a denominator can be defined in accordance with health payments budgetary share (O'Donnell et

al., 2008). According to O'Donnell et al. (2008), three approaches can be used for measuring CHE: the income, expenditure, and consumption approaches.

In this study, the author chose to use the expenditure approach as opposed to using the income approach because the medical care payments-to-income ratio does not differentiate between the means of financing healthcare. As O'Donnell et al (2008) argues:

> Say one household has savings and finances healthcare from their savings, whereas the other has no savings and must cut back on current consumption to pay for healthcare. This difference is not reflected in the ratio of health payments to income, which is the same for both households (O'Donnell, et al., 2008, p.204).

Another reason why the author chose to use this approach is that it has hardly been explored by economists in the calculation of CHE. The use of the expenditure approach will provide new information in the area of health payments budgetary share in Canada and across provinces. Percentage shares of CHE were also calculated for each provinces, year and gender to provide detailed patterns of the two healthcare payments burden indicators.

The descriptive analyses described above are intended to address the following research questions: (1) What are the amounts, proportions, and percentage changes of OOP healthcare expenditures and CHE across Canada's provinces? and The question on (2) the relationship between socioeconomic, demographic and physical and functional health factors for OOP healthcare costs and OOP healthcare expenditures. The descriptive analyses were also done to provide further clues into possible predictors of OOP healthcare expenditures. Statistics such as means and trends were computed at this stage of analysis. These statistics provided covariates that were to be used for further analytical assessment in the thesis.

3.2.2. Cross-sectional Regression Analyses. The relationship between per capita OOP healthcare spending and selected socio-economic, demographic and health factors were examined using weighted (bootstrapped) cross-sectional regression analyses. The cross-sectional regressions were run for each gender separately. The SHS datasets included different respondents in different years in every province and so the formation of a panel data was not possible In the absence of panel data, three regressions were estimated for the beginning year (2004), the middle year (2009), and the final year (2015) of the study period to capture any potential changes in the relationships over time. Regressions that incorporated specific age groups were also run to investigate age-group specific effects on OOP healthcare expenditures.

The selection of specific covariates was guided by the strength of correlations between the covariates and OOP healthcare expenditures. Only covariates with significant associations observed from the correlation matrices were included in the regression analyses. Dummy variables for categorical factors such as: employment status, marital status, province of residence, education level, self-reported physical health, self-reported functional health, and sex were constructed to facilitate multiple linear regressions with dummies (See Appendix 5).

Model Functional Form and Specification. Two log-linear models were designed. The models focussed on estimating the share of household representative person's OOP healthcare expenditures to income as a function of the socioeconomic, demographic and health factors. The following models were defined:

Model 1: Model 1 provided estimates for the predictors of the share of OOP healthcare expenditures to incomes (S) when age was considered as a continuous variable. This model was designed to capture the general influence of socioeconomic, demographic and self-reported

physical and health factors on OOP healthcare expenditures in Canada. Model 1 was run three times for the SHS cycles 2004, 2009 and 2015, and separately for each gender.

$$\boldsymbol{Log(S) = \beta_0 + \beta_1 Log(x_1) + \beta_2 Log(x_2) + \beta_3 Log(x_3) + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + U} \quad \textbf{(1)}$$

Where S is the share OOP healthcare expenditures to income, x_1, x_2 and x_3 represent the continuous variables of income, household size, and age. And variables x_4 to x_9 are dummy variables for the categorical variables including education level, employment status, marital status, province of residence, self-reported functional health, and self-reported physical and mental health. U is the random error term.

Model 2: Model 2 provided estimates for the predictors of the ratio of OOP healthcare expenditures to incomes when age was categorized into 3 groups ((below 19 years, 20 to 34 years, 35 to 64 years, Above 65 years). Model 2 was also run three times for the SHS cycles 2004, 2009, and 2015, but for both genders combined.

$$\boldsymbol{Log(S) = \beta_0 + \beta_1 Log(x_1) + \beta_2 Log(x_2) + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \beta_9 x_9 + \beta_{10} x_{10} + U} \quad \textbf{(2)}$$

Where all the variables are the same as for Model 1, except that age (x_3) is now a categorical, not a continuous variable, and gender has been added as another dummy variable.

Regression Model Diagnostics Tests Results. All the regression models (Models 1 and 2 for each of the 2004, 2009 and 2015) were weighted (bootstrapped) with robust standard errors, and were tested for heteroskedasticity (using the Breusch-Pagan Heteroscedasticity test). None of

the estimated models showed heteroskedasticity. Since this study was entirely cross-sectional, there was no need to test for the problem of autocorrelation.

Chapter Four: Results

4.1. Descriptive Results

4.1.1. Out of Pocket Healthcare Expenditures and Catastrophic Healthcare Expenditures in Canada

The dataset consisted of 112,940 individuals who responded to the survey of household spending (SHS) between 2004 and 2015; with 7,187 people (6.4%) reporting catastrophic healthcare expenditure (CHE) and 105,753 people (93.6%) reporting Non-CHE between 2004 and 2015. Table 4 reports the median and mean per capita OOP healthcare expenditures.

Table 4. Median and Mean Out of Pocket Healthcare Expenditures in Canada (2004-2015)

Year	Weighted median Per Capita OOP healthcare expenditures (2004 Canadian Dollars)	Weighted mean Per Capita OOP healthcare expenditures (2004 Canadian Dollars)
2004	$650.00	$1466.25
2005	$655.32	$1529.30
2006	$674.41	$1600.74
2007	$696.39	$1632.83
2008	$697.71	$1721.04
2009	$679.41	$1672.86
2010	$848.92	$1858.67
2011	$831.98	$1831.76
2012	$800.27	$1827.94
2013	$822.39	$1941.46
2014	$780.52	$1870.82
2015	$914.61	$2009.31

Notes: Dollars values are expressed in constant 2004 Canadian dollars
All monetary values are weighted to represent Canada's population spending per capita

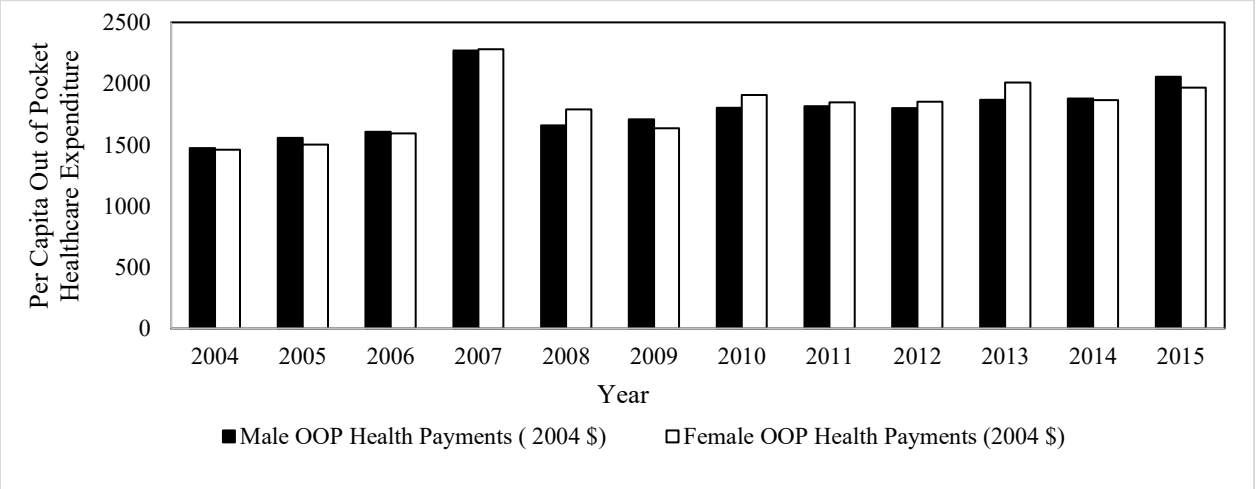
The large difference between the median and mean per capita OOP health expenditures indicates a highly skewed distribution of expenditures. High cost and CHE by a minority may explain such skewness. The next section of this chapter provides a description of demographic,

socio-economic, and physical and functional health profiles of Canadians in relation to out of pocket (OOP) healthcare expenditures.

4.1.2. *Out of Pocket Healthcare Payments and Catastrophic Health Expenditures by Demographic Profile*

Gender and OOP Healthcare Expenditures in Canada. Figure 5 shows the trend of OOP healthcare expenditures by gender. Between 2004 and 2015, females paid higher OOP healthcare expenditures than males on average ($1,809.06 versus $1,791.01). The highest OOP healthcare expenditures for both males and females were incurred in 2007 ($2,055.74 and $1,965.91, respectively). The lowest OOP healthcare expenditures incurred for both males ($1,472.06) and females ($1,460.45) were incurred in 2004 ($1,472.06 and $1,460.45, respectively).

Figure 5. The Distribution of Canada's Out of Pocket Healthcare Expenditures by Gender Between 2004 And 2015

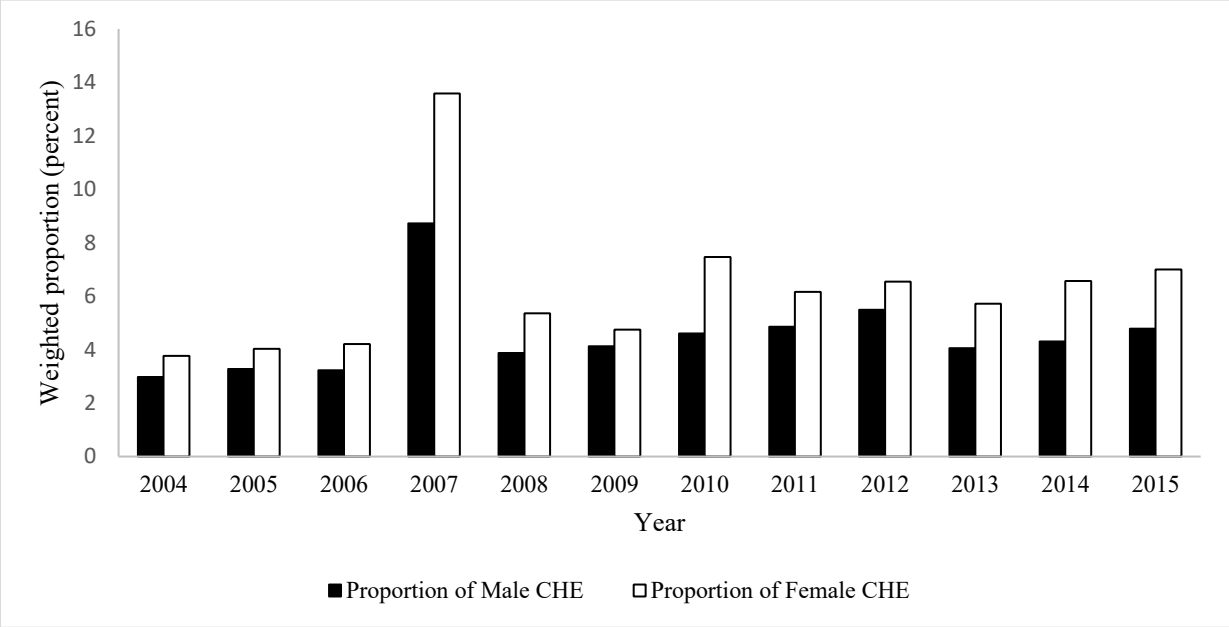


Notes: All monetary spending are provided in 2004 Constant Canadian Dollars
All monetary values are weighted to represent Canada's population spending per capita on healthcare

As Figure 5 shows, there was no significant difference in the per capita OOP healthcare expenditures between males and females.

Gender and CHE in Canada. Unlike the per capita OOP healthcare expenditures, there was a marked disparity in CHE incurred by males and females. The proportion of women who incurred CHE in Canada was clearly higher than that of men. The highest proportion of persons with CHE happened in 2007. (8.72% of males, and 13.59% of females). Notwithstanding this jump in the proportion of those with CHE, there has been a gradual increase in the proportion of males and females incurring CHE during the 2004-2015 period. As Figure 6 shows, these proportions have almost doubled in 2015 compared to 2004.

Figure 6. Proportion of Canadians Who Incurred Catastrophic Healthcare Expenditures between 2004 and 2015 by Gender

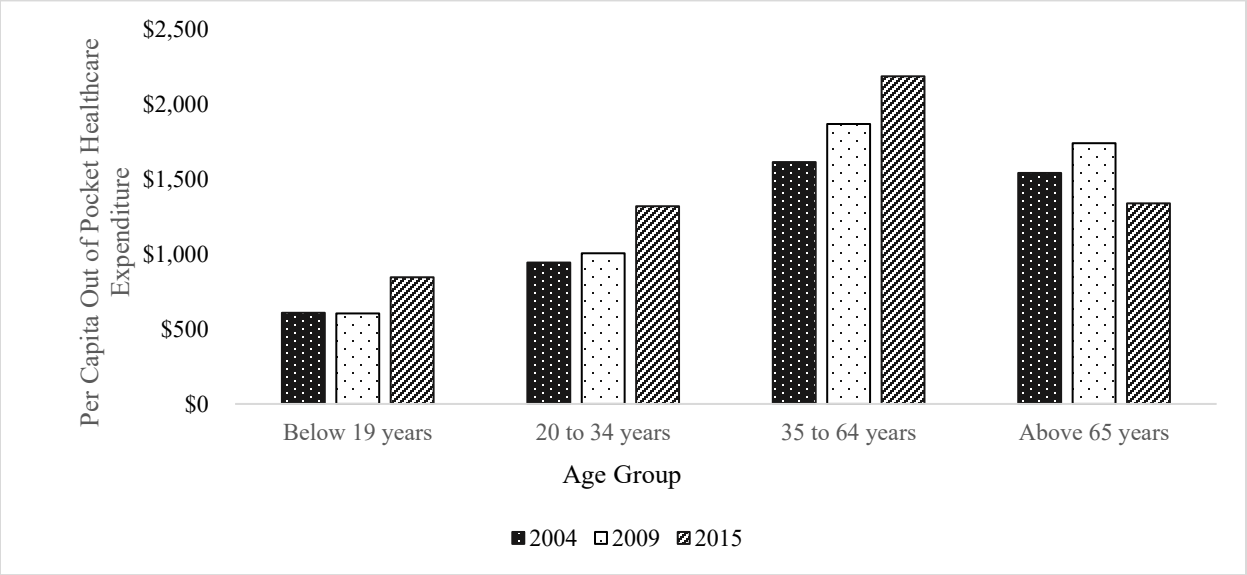


Note: All proportions are weighted to represent the share of Canada's population per capita OOP healthcare expenditure.

OOP Healthcare Expenditures by Age Groups. Out of pocket healthcare expenditures varied with age groups in Canada. Figure 7 below shows the trend in average OOP healthcare expenditures by age groups in Canada between 2004 and 2015. There was an increase in average per capita OOP healthcare expenditures paid by all age groups in the country over time, except for the expenditure by those 65 and older which shows a decline in 2015. It is noticeable that

Canadians between the ages of 35 to 64 years and those older than 65 years have been collectively paying the highest amount of money for healthcare goods and services from OOP compared to those below 19 years of age.

Figure 7. Average Out of Pocket Healthcare Expenditures by Age Group (2004-2015)



Notes: All monetary values are provided in constant 2004 Canadian Dollars
All monetary values are weighted to represent Canada's population out of pocket spending per capita on healthcare goods and services

To provide a detailed account of the OOP healthcare expenditures by age groups across Canada, weighted average amounts of provincial per capita OOP healthcare expenditures were assessed for those below and above 65 years (See Table 5). Although there are no distinct patterns in OOP healthcare expenditures between the two age groups and across the provinces over the years, such expenditures tend to be generally higher for older people and in western provinces. Ontario shows consistently lower OOP healthcare expenditures even when compared to the smaller Maritime provinces.

Table 5. Distribution of Weighted Average Out of Pocket Healthcare Expenditures by Age Group and Province (2004-2015)

Province	Above 65 Years (2004)	Below 65 years (2004)	Above 65 years (2009)	Below 65 Years (2009)	Above 65 Years (2015)	Below 65 Years (2015)
Newfoundland and Labrador	$1,356	$1,397	$1,526	$1,636	$1,588	$2,087
Prince Edward Island	$1,583	$1,670	$1,944	$1,672	$1,850	$1,876
Nova Scotia	$1,461	$1,483	$1,611	$1,528	$1,958	$1,944
New Brunswick	$1,639	$1,523	$2,562	$1,880	$2,090	$1,775
Quebec	$1,632	$1,433	$1,668	$1,775	$2,257	$2,302
Ontario	$1,317	$1,395	$1,488	$1,502	$1,974	$1,656
Manitoba	$1,477	$1,389	$2,455	$1,581	$2,283	$1,771
Saskatchewan	$1,347	$1,584	$2,072	$1,447	$2,442	$1,997
Alberta	$1,533	$1,630	$1,913	$1,910	$2,004	$2,343
British Columbia	$1,552	$1,596	$2,133	$1,703	$2,737	$1,957

Notes: All monetary values are weighted to represent Canada's population out of pocket health expenditure per capita for years 2004 through 2015. All monetary values are provided in 2004 Canadian Dollars

4.1.3. Components of Out of Pocket Healthcare Expenditures in Canada

Table 6 provides a detailed overview of the components of OOP healthcare expenditures in Canada between 2004 and 2015. The three major components of OOP healthcare expenditures are: prescription medicines (prescribed drugs and other pharmaceutical products); insurance premiums (supplementary private health insurance premiums plans, separate policy dental plans premiums and premiums for accident and disability insurance); and dental care (dental services and orthodontic and periodontal procedures). Eye care expenditures and direct expenditures for all other medical care goods and services made up the rest of OOP healthcare expenditures. "Other expenditures" listed as a component of OOP healthcare spending refers to spending related to travel expenditures, accommodation expenditures, and expenditures related to the management of side effects of prescription medication. For instance, in 2015, insurance

premiums, prescription drugs, and dental care costs made up the top three largest components of per person OOP healthcare expenditures in Canada.

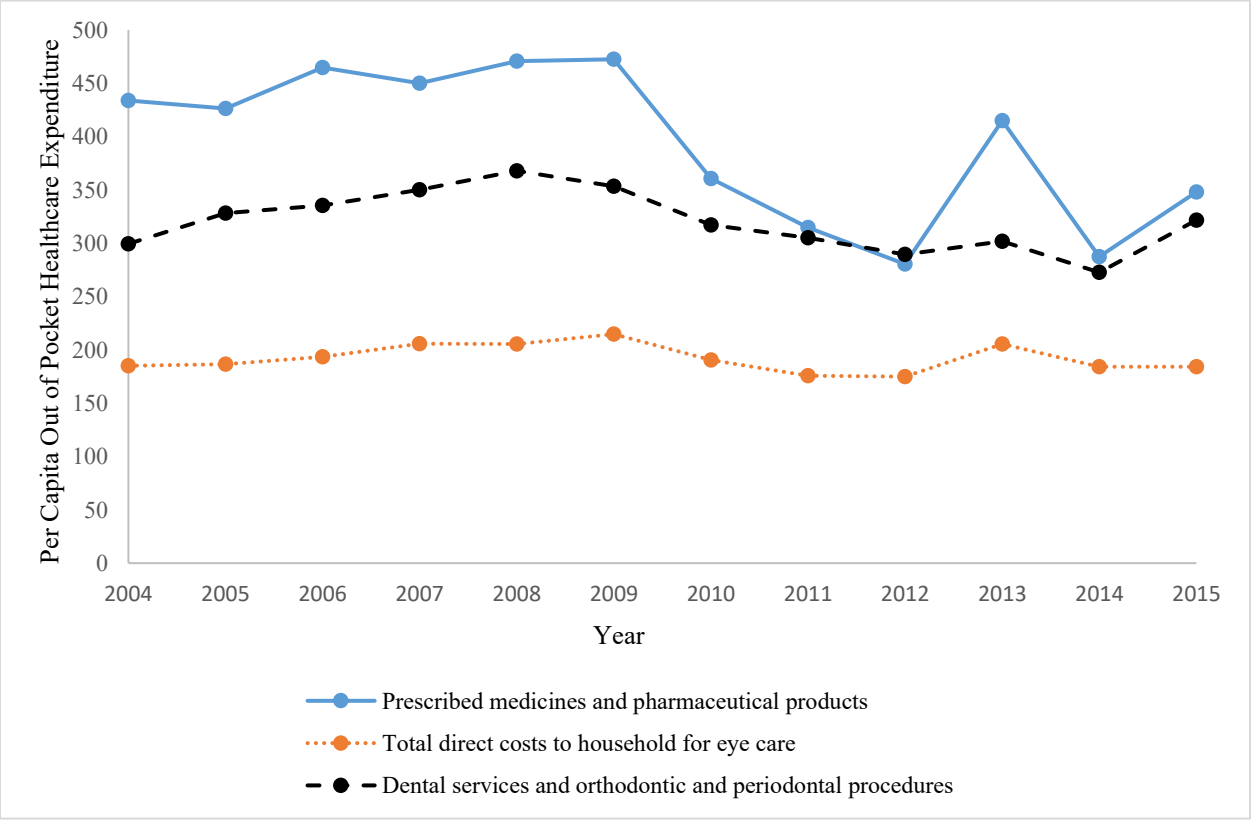
Table 6. Distribution of Per Capita Out of Pocket Healthcare Expenditures by Category (2004-2015)

Year	Prescribed medicines and pharmaceutical products	Total direct expenditures to household for eye care	Dental services and orthodontic and periodontal procedures	Private health insurance plan premiums (supplementary)	Dental plan premiums (separate policy)	Premiums for accident and disability insurance	Other Expenditures	Total
2004	$433.66	$184.91	$299.26	$249.86	$26.62	$81.02	$190.92	$1,466.25
2005	$426.40	$186.67	$328.10	$263.36	$29.24	$85.26	$210.34	$1,529.37
2006	$464.71	$193.34	$335.24	$246.40	$34.16	$99.64	$227.17	$1,600.67
2007	$449.95	$205.72	$349.96	$279.24	$32.41	$99.97	$215.63	$1,632.88
2008	$470.70	$205.33	$367.86	$269.28	$34.03	$89.04	$284.86	$1,721.09
2009	$472.45	$214.72	$353.34	$289.03	$32.09	$107.96	$203.24	$1,672.81
2010	$360.58	$190.39	$316.95	$251.11	$29.20	$93.54	$616.88	$1,858.64
2011	$314.58	$175.88	$304.98	$284.84	$47.83	$99.76	$603.96	$1,831.82
2012	$280.41	$174.88	$289.54	$302.69	$56.08	$108.16	$616.10	$1,827.86
2013	$415.02	$205.54	$301.73	$292.17	$35.91	$109.22	$581.85	$1,941.45
2014	$287.45	$184.14	$272.65	$440.86	$38.49	$123.38	$523.88	$1,870.86
2015	$347.93	$184.21	$321.61	$471.52	$44.40	$115.35	$524.30	$2,009.32

Notes: All monetary spending are valued in 2004 Constant Canadian Dollars, all monetary values are weighted averages,
Others-include all other direct payments made for healthcare goods and services such as: non-prescribed medicines; and payments for counseling services

Results from non-insurance related OOP healthcare expenditures components are provided in Figure 8. Figure 8 shows the trend in the major categories of per capita OOP healthcare expenditures from 2004 to 2015. From 2004 to 2015, there have been observable variations in all the major categories of per capita OOP healthcare spending in Canada with peak expenditure recorded between 2007 and 2009. Total direct expenditures to households for eye care made up the most inexpensive OOP healthcare cost category, followed by dental services and orthodontic and periodontal procedures. Prescription medicines and pharmaceutical products made up the largest share of OOP healthcare expenditures between 2004 and 2015. The expenditures on dental care and eye care have been more stable than on prescription drugs after 2009.

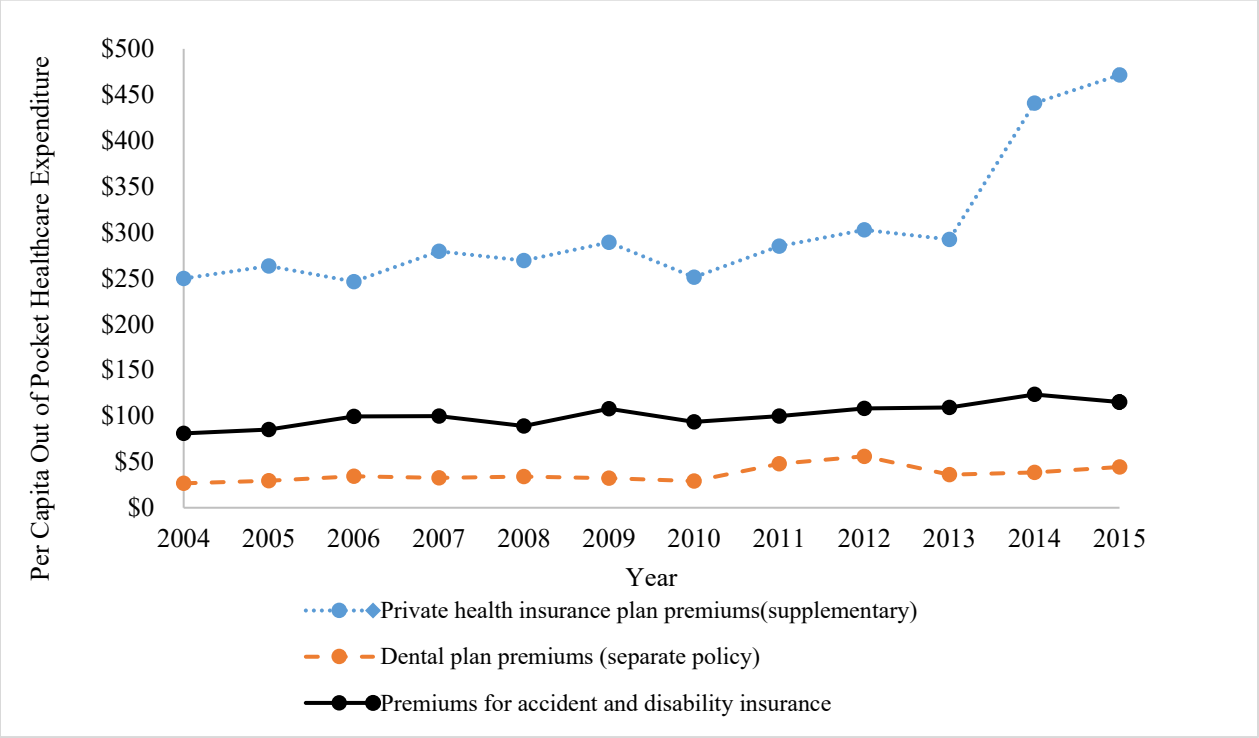
Figure 8. Out of Pocket Healthcare Expenditures in Canada by Category (2004-2015)



Notes: All monetary values are reported in 2004 Canadian Dollars
All monetary values are weighted to represent Canada's population OOP healthcare expenditure per capita.

Direct payments for insurance premiums are reported separately below. Figure 9 shows the distribution of OOP healthcare spending by supplementary private health insurance plans, separate dental insurance plans, and premiums for accidents and disability insurance in Canada. Insurance expenditures estimates were provided for years 2004 through 2015. Private health insurance plan premiums were highest throughout the survey years 2004 through 2015 with a sharp rise since 2013. Separate dental plan premiums were the lowest registered OOP healthcare payments among the out of pocket insurance registered in Canada between 2004 through 2015.

Figure 9. Per Capita Out of Pocket Expenditure on Extended Healthcare Insurance in Canada (2004-2015)



Notes: All monetary values are reported in 2004 Canadian Dollars
All monetary values are weighted to represent Canada's population expenditure per capita.

4.1.4. Share of Out of Pocket Healthcare Expenditures by Category

To get a better sense of the relative sizes of the OOP healthcare expenditures components, Table 7 shows the real share of specific categories of OOP healthcare expenditures out of total expenditures. Prescribed medicines received the highest share of OOP Payments until

2009. After 2009, other expenditures and health insurance premiums have taken over and represent larger shares, which has been helped by declining shares of prescribed medicines, dental services and eye care expenditures.

Table 7: Shares of Out of Pocket Healthcare Expenditures Components in Canada (2004-2015)

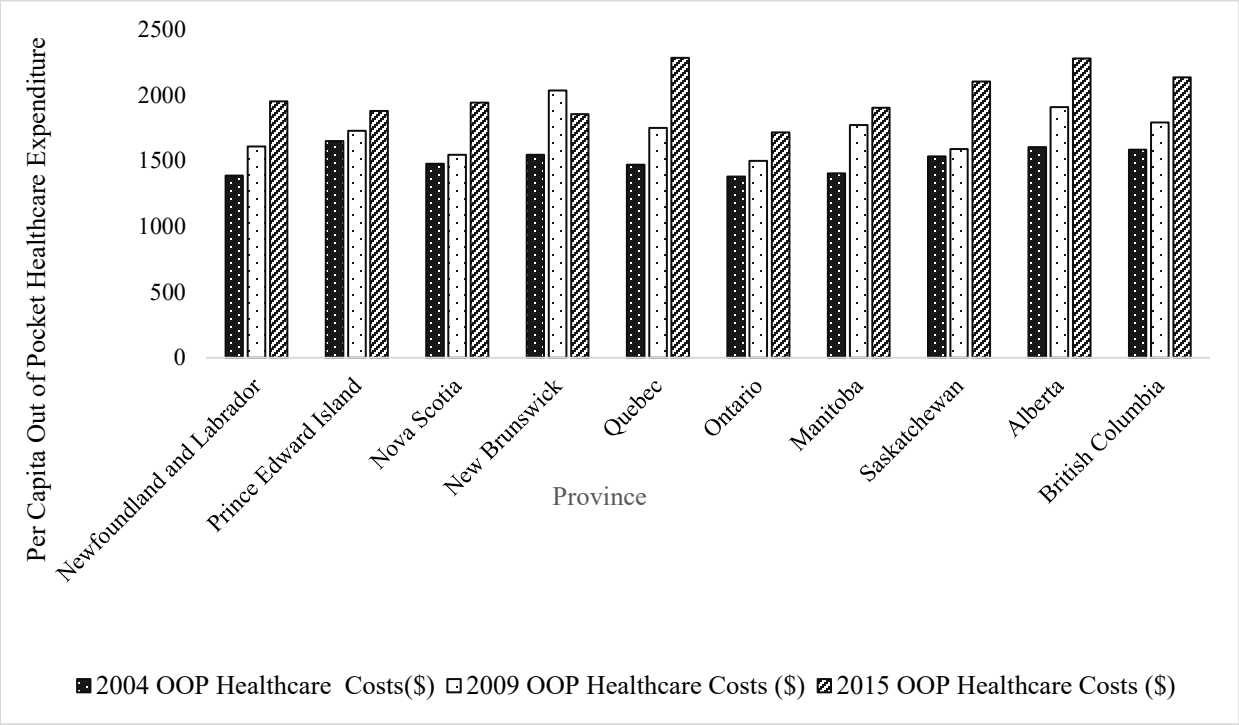
Year	Prescribed Medicines	Insurance Premium Plans	Dental Services	Eye Care	All Others
2004	29.58%	24.38%	20.41%	12.61%	13.02%
2005	27.88%	24.71%	21.45%	12.21%	13.75%
2006	29.03%	23.75%	20.94%	12.08%	14.19%
2007	27.56%	25.21%	21.43%	12.60%	13.21%
2008	27.35%	22.80%	21.37%	11.93%	16.55%
2009	28.24%	25.65%	21.12%	12.84%	12.15%
2010	19.40%	20.11%	17.05%	10.24%	33.19%
2011	17.17%	23.61%	16.65%	9.60%	32.97%
2012	15.34%	25.55%	15.84%	9.57%	33.71%
2013	21.38%	22.53%	15.54%	10.59%	29.97%
2014	15.36%	32.22%	14.57%	9.84%	28.00%
2015	17.32%	31.42%	16.01%	9.17%	26.09%

Notes: All percentage points are weighted proportions of the total amounts of OOP healthcare expenditures. All percentages are real shares of Canadian OOP healthcare expenditures between 2004 and 2015.

4.1.5. Out of Pocket Healthcare Expenditures in Canada by Province

In this section, provincial estimates of per capita out of pocket healthcare expenditures are provided. Figure 10 below shows the weighted average OOP healthcare expenditures in Canada by province for the years 2004, 2009 and 2015. The provincial per capita OOP healthcare expenditure has been trending upward between 2004 and 2015. The OOP expenditures are higher in Quebec and Alberta, and lowest in Ontario.

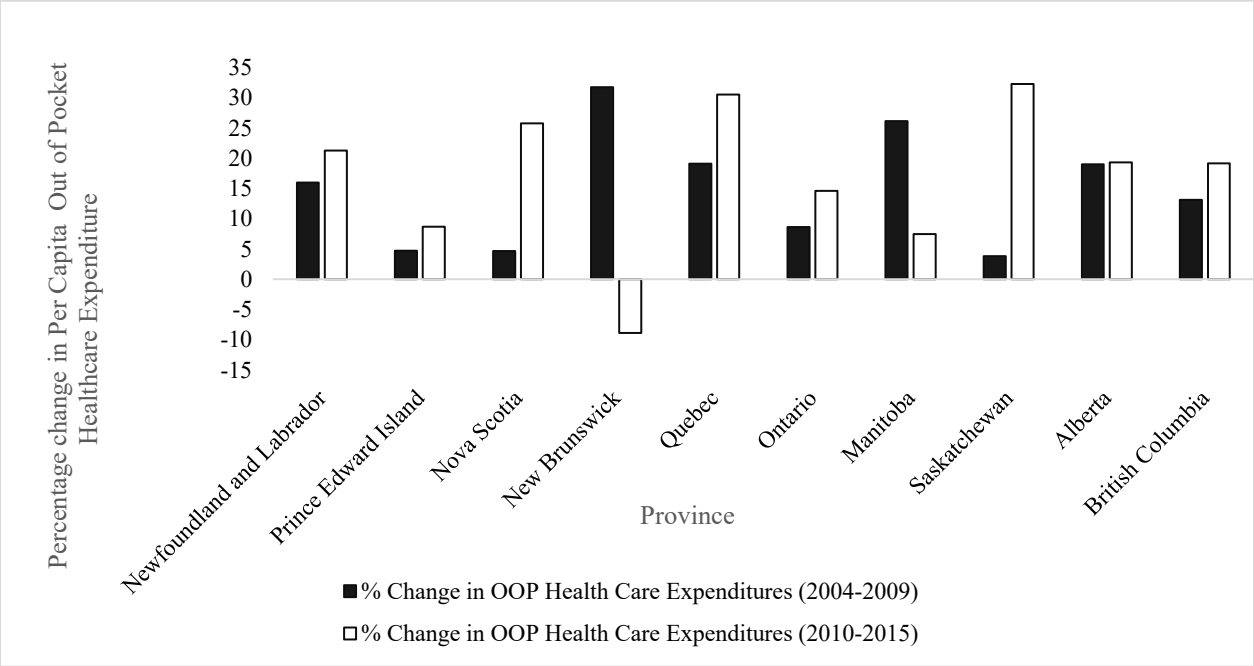
Figure 10. Out of Pocket Healthcare Expenditures by Province (2004, 2009 and 2015)



Notes: Monetary values are in 2004 Canadian Dollars
Monetary values are weighted to represent Canada's population out of pocket spending per capita.

Real changes in per capita OOP healthcare expenditures were calculated. Figure 11 shows the growth of real per capita provincial OOP healthcare expenditures during the 2004-2009 and 2010-2015 periods. During the 2004-2009 period, New Brunswick and Manitoba registered higher real growth rates in their per capita OOP healthcare expenditures, whereas Saskatchewan, Nova Scotia and Prince Edward Island had the lowest growth. The growth rates in OOP expenditures for various provinces during 2004-2009 are quite different from those during the 2010-2015 period. In the later period, Saskatchewan, Quebec, and Nova Scotia had the highest real growth rates in their per capita OOP healthcare expenditures. On the other hand, the growth rate was negative for New Brunswick, with Manitoba and Prince Edward Island showing small growth rates.

Figure 11. Growth of Provincial Per Capita Out of Pocket Healthcare Expenditures During 2004-2009 and 2010-2015



Notes: Proportions on the table capture real changes in per capita OOP healthcare spending in Canada between 2004 and 2015. The black shading for each province represents the percentage change in per capita OOP healthcare expenditures between year 2004 and 2009. Whereas the white shading represents the percentage change in per capita OOP healthcare spending between the year 2010 and 2015.

4.1.6. Out of Pocket Healthcare Payments and Income Across Provinces

Table 8 shows weighted average per capita income and the share of OOP healthcare spending to per capita income by province in 2015. The ratio of OOP healthcare spending to income was the highest for Quebec, and the lowest for Ontario.

Table 8. Weighted Average Out of Pocket Healthcare Expenditures and Ratio of Out of Pocket Healthcare Expenditures to Per Capita Income in Canada (2015)

Province	Weighted Average Income	Ratio of OOP Healthcare Expenditures to Income
British Columbia	$36,646.30	5.83%
Alberta	$55,283.49	4.12%
Saskatchewan	$44,447.14	4.74%
Manitoba	$36,494.74	5.22%
Ontario	$42,655.42	4.03%
Quebec	$36,395.93	6.28%
Nova Scotia	$34,788.27	5.59%
New Brunswick	$33,479.39	5.54%
Prince Edward Island	$31,047.86	**6.05%**
Newfoundland and Labrador	$38,906.77	5.02%

Notes: All monetary values on tables are in Canadian Dollars. % Percentage
All monetary values in the table are weighted to represent Canada's population share of per capita income and OOP healthcare spending.

4.1.7. Catastrophic Healthcare Expenditures by Province

Table 9 shows the amounts of per capita catastrophic healthcare expenditure (CHE) in 2015 and changes in CHE since 2004. Higher CHE amounts occurred in British Columbia, Alberta and Newfoundland and Labrador, and lower CHE amounts were registered in Nova Scotia and Quebec in 2015. Since 2004, the proportion of people with CHE has increased by more than half in British Columbia, Saskatchewan, and Quebec. The lowest increase in the proportion of people with CHE occurred in Ontario.

Table 9. Catastrophic Healthcare Expenditures in 2015 and Growth in the Proportion of People with Catastrophic Healthcare Expenditures Since 2004

Province	Average Weighted Catastrophic Healthcare Cost (2015)	Percentage Change in Catastrophic Healthcare Expenditures since 2004
British Columbia	$7,585.09	57.70%
Alberta	$7,721.68	49.30%
Saskatchewan	$5,498.57	53.50%
Manitoba	$5,239.49	40.70%
Ontario	$5,554.45	1.40%
Quebec	$4,995.58	55.10%
Nova Scotia	$4,265.40	23.60%
New Brunswick	$5,285.35	31.00%
Prince Edward Island	$5,376.31	48.40%
Newfoundland and Labrador	$6,090.27	41.60%

Notes: All monetary expenditures on the table are provided in 2004 Canadian Dollars
Percentages are real changes in the proportion of Canadians who incurred CHE between 2004 and 2015

4.2. Regression Results

4.2.1. Estimation Results for Model 1. To further explore the relationship between socio-economic and demographic factors with out of pocket (OOP) healthcare expenditures, multiple regression models were estimated using the 2004-2015 survey of household spending (SHS) data cycles. The SHS data cycles were truncated and re-sampled for male and female respondents' socio-economic and demographic characteristics. OOP healthcare payments were regressed on socioeconomic and demographic and health variables. Three different sets of regressions were carried out for 2004, 2009 and 2015 SHS cycles.

Diagnostic tests for heteroscedasticity and multicollinearity were conducted on the weighted regressions. The problems of heteroskedastic errors and multicollinear variables in all the regression analyses in this chapter were ruled out, and/or minimized. Regression outputs have been weighted as per Statistics Canada's SHS output release requirement so that regression results were representative of Canada's population per capita OOP healthcare expenditure.

Model 1 shows the influence of socioeconomic, demographic, and physical and health factors on the share of OOP healthcare expenditures to income. As stated before, age is treated as a continuous variable in this model. The estimation results are provided in Tables 10a to 10c.

Table 10a. Logarithmic Regression Results for Each Gender (2004, 2009, 2015)

Dependent variable	**Log Ratio of OOP Healthcare Expenditure to Income**	2004		2009		2015	
		Male	Female	Male	Female	Male	Female
	Covariates	**(R^2=29.2%)**	**(R^2=40%)**	**(R^2=29.5%)**	**(R^2=38.3%)**	**(R^2=42.6%)**	**(R^2=39%)**
Socioeconomic factors	**Income (Log)**	-0.63(0.04)**	-0.83(0.034)**	-0.70(0.05)**	-0.77(0.04)**	-0.86(0.05)**	-0.84(0.06)**
	Education						
	No degrees, certificates or diplomas (R)						
	Secondary (high) school diploma or equivalent	1.13(0.53)**	0.28(0.58)	0.08(0.09)	-0.46(0.52)	-0.13(0.52)	-0.13(0.33)
	Trade/vocational certificate	1.24(0.52)**	0.25(0.60)	0.24(0.4)	0.40(0.40)	-0.22(0.51)	-0.41(0.25)
	Apprenticeship certificate	0.93(0.56)*	0.38(0.61)	0.27(0.09)**	0.59(0.09)**	-0.24(0.53)	-0.21(0.28)
	Community college, CEGEP or nursing school diploma	1.28(0.52)**	0.55(0.58)	0.31(0.13)**	0.66(0.14)**	-0.25(0.52)	-0.30(0.26)
	University certificate or diploma below Bachelor's	1.40(0.53)**	0.51(0.59)	0.28(0.10)**	0.62(0.11)**	0.05(0.52)	-0.07(0.29)
	Bachelor's degree (B.A., B.Sc., B.Ed.)	1.35(0.52)**	0.60(0.58)	0.34(0.11)**	0.64(0.12)**	0.15(0.64)	-0.55(0.59)
	University degree, certificate or diploma above a Bachelor's	1.48(0.53)**	0.63(0.29)	-0.16(0.41)	0.84(0.29)**	-0.49(0.51)	-0.60(0.24)**
	Employment						
	Work full time (R)						
	Worked part time	-0.11(0.07)	0.044(0.06)	0.06(0.08)	0.050(0.07)		
	Did not work	0.04(0.09)	-0.07(0.08)	-0.044(0.11)	0.02(0.09)		

Notes: (**) indicates significance at 5%; (*) indicates significance at 10%; (R) denotes the reference category;
The numbers in the brackets are standard errors.
Employment status data were not available in the 2015 SHS cycle.

Table 10b. Logarithmic Regression Results for Each Gender (2004, 2009, 2015) Continued…

Dependent variable	**Log Ratio of OOP Healthcare Expenditure to Income**	2004		2009		2015	
		Male	Female	Male	Female	Male	Female
	Covariates	**(R^2=29.2%)**	**(R^2=40%)**	**(R^2=29.5%)**	**(R^2=38.3%)**	**(R^2=42.6%)**	**(R^2=39%)**
Demographic factors	**Age (Log)**	0.80(0.11)*	1.01(0.10)*	0.99(0.12)*	1.10(0.11)*	0.76(0.15)*	0.75(0.21)*
	Marital status						
	Married spouse of a household member (R)						
	Common-law spouse of a household member	0.08(0.08)	0.04(0.08)	0.05(0.08)	0.09(0.10)	0.06(0.12)	-0.062(0.11)
	Single (Never married)	-0.57(0.10)**	-0.39(0.09)**	-0.37(0.12)**	-0.54(0.010)**	-0.38(0.16)*	-0.34(0.14)**
	Other (separated, divorced or widowed)	-0.56(0.09)**	-0.47(0.07)**	-0.41(0.10)**	-0.61(0.07)**		
	Other marital statuses					Male	Female
	Widowed					-0.4(0.20)*	-0.3(0.14)**
	Separated					-0.44(0.28)	-0.28(0.19)
	Divorced					-0.64(0.26)**	-0.4(0.16)**
	Household size (Log)	0.40(0.06)**	0.39(0.06)**	0.50(0.08)**	0.40(0.07)**	0.26(0.13)*	0.35(0.13)**
	Province of residence						
	Newfoundland and Labrador (R)						
	Prince Edward Island	0.279(0.10)**	0.20(0.09)**	0.15(0.10)	0.15(0.09)	0.23(0.24)	0.002(0.13)
	Nova Scotia	0.11(0.08)	0.07(0.07)	0.15(0.09)*	-0.005(0.08)	0.15(0.10)	0.05(0.11)
	New Brunswick	0.12(0.08)	0.18(0.07)**	0.25(0.08)**	0.30(0.08)**	0.01(0.09)	0.17(0.10)*
	Quebec	0.09(0.08)	0.15(0.07)**	0.21(0.08)**	0.15(0.09)*	0.28(0.09)**	0.32(0.09)
	Ontario	-0.35(0.09)**	-0.20(0.08)**	-0.28(0.09)**	-0.30(0.08)**	-0.30(0.11)**	-0.29(0.13)**
	Manitoba	-0.005(0.08)	0.0005(0.08)	0.14(0.10)	0.30(0.09)**	0.14(0.10)	0.10(0.10)
	Saskatchewan	0.11(0.08)	0.17(0.07)**	0.06(0.08)	0.18(0.08)**	0.09(0.11)	0.24(0.11)
	Alberta	-0.042(0.09)	0.13(0.07)*	0.06(0.10)	0.15(0.09)	0.05(0.11)	0.16(0.13)
	British Columbia	0.02(0.08)	0.12(0.07)	0.006(0.09)	0.017(0.09)	-0.04(0.11)	0.11(0.11)

Notes: (**) indicates significance at 5%; (*) indicates significance at 10%; (R) denotes the reference category;
The numbers in the brackets are standard errors. Other marital statuses data were not available in the 2004 and 2009 SHS cycle.

Table 10c. Logarithmic Regression Results for Each Gender (2004, 2009, 2015) Continued…

Dependent variable	**Log Ratio of OOP Healthcare Expenditure to Income**	2004		2009		2015	
		Male	Female	Male	Female	Male	Female
	Covariates	**(R^2=29.2%)**	**(R^2=40%)**	**(R^2=29.5%)**	**(R^2=38.3%)**	**(R^2=42.6%)**	**(R^2=39%)**
Health Factors	**Self-reported functional health**						
	Yes, sometimes (Disability walking talking, bending etc) (R)						
	Yes, often (Disability walking talking, bending etc)	0.19(0.12)*	-0.002(0.11)	-0.21(0.14)	-0.06(0.10)		
	No (Disability walking talking, bending etc)	-0.016(0.10)	-0.25(0.10)**	-0.11(0.11)	-0.16(0.09)**		
	Self-reported physical and mental health						
	yes, sometimes (R)						
	Yes, often (Activity limitation, mental or physical limitation)	0.17(0.12)	0.15(0.11)	0.10(0.14)	0.08(0.13)		
	No (Activity limitation, mental or physical limitation)	-0.10(0.10)	0.12(0.10)	-0.25(0.11)**	-0.15(0.09)*		
	Regression Constant	-1.54(0.74)**	0.73(0.75)	-0.28(0.69)	0.11(0.55)	3.15(0.92)*	2.96(1.18)**

Notes: (**) indicates significance at 5%; (*) indicates significance at 10%; (R) denotes the reference category;
The numbers in the brackets are standard errors. Health factors data were not available in the 2015 SHS cycle.

Socioeconomic Factors. As shown in Table 10a, socioeconomic factors such as income, education and employment were important in explaining the variations in the shares of OOP healthcare expenditures to incomes. The results from socioeconomic factors are provided in the order of income, education level, and employment status. The influence of income, education and employment on OOP healthcare expenditures are discussed below.

Income. The results show a negative and statistically significant relationship between income and the ratio of OOP healthcare expenditures to income. More specifically, for a 10% increase in per capita income, the ratio of OOP healthcare expenditures to income decreased by 6.2% for males and 8.2% for females in 2004. Similar results were obtained in 2009 and 2015, although the effects were somewhat stronger in 2015 for both males and females.

Education Level. The influence of education on the share of OOP healthcare expenditures to incomes varied among males and females, although the effect is generally positive. In 2004, education did not appear to have any impact on the ratio of OOP healthcare expenditures to income for females (all p-values were greater than 5%). However, there was a consistent positive relation between the share of OOP healthcare expenditures to income and education among males. For instance, there was a 2-fold increase (209.6%, p-value=0.032) in the share of OOP healthcare expenditure to income for a male with high school education, 1.5-fold increase (153.5%, p-value=0.098) among those with apprenticeship certificate, a more than 2.5-fold increase (285.7%, p-value=0.01) among males with bachelor degrees, and a more than 3-fold increase (339.3%, p-value=0.005) among those with above a bachelor degree. In 2009, however, the ratio of OOP expenditures to income was positively related to education for both males and females in general. The magnitudes of the effects were smaller than those in 2004 for males. Interestingly, no statistically significant relationship between the ratio of OOP

expenditures and education was observed for either gender in 2015, except for a negative relation for males with a bachelor degree or higher.

Employment Status. For both 2004 and 2009, employment status had no significant influence on the share of OOP healthcare expenditures to income (all p-values greater than 5%).

Demographic Factors

Age. Age was positively associated with the ratio of OOP healthcare expenditures to income. However, the positive effect of age on the ratio was different between males and females. In 2004, increasing age by one year was associated with a 7.9% increase (p-value=0.0001) in the share of OOP healthcare expenditure to income for males versus a 10.1% (p-value=0.0001) for females. In 2009, the effects were 9.9% (p-value=0.00002) and 11.1% (p-value=0.00002) increase for males and females, respectively. In 2015, the effect of aging was smaller (7.5%) and similar for both males and females.

Marital Status. All else being equal, marital status had a varied influence on the share of OOP healthcare expenditures to incomes. In 2004, being single was associated with 76.8% (p-value=0.000001) and 47.8% (p-value=0.000001) decreases in the share of OOP healthcare expenditures to income among males and females, respectively. Among both males and females who were separated, divorced and widowed, the decreases were 75.1% (p-value=0.00002) and 60% (p-value=0.00002) for males and females, respectively. In 2009, such decreases for single males and single females were 44.8% (p-value=0.00001) and 71.6% (p-value=0.00001), respectively. For both males and females who were separated, divorced and widowed, the reductions were 50.7% (p-value=0.001) and 84% (p-value=0.000002) in that order. In 2015, single males and single females saw a decrease of 46.2% (p-value=0.000001) and 40.5% (p-value=0.017), respectively, in their ratio of OOP healthcare expenditures to income. Both males

and females who were widowed saw a decrease of 49.2% (p-value=0.088) and 35% (p-value=0.025), respectively, in their share of OOP healthcare expenditures to incomes. Spousal separation had no effect on the ratio of OOP healthcare expenditures to income for either gender. But for divorced males and divorced females the reductions were 89.6% (p-value=0.015) and a 49.2% (p-value=0.027) in that order.

Household Size. The share of OOP healthcare expenditures to income was higher in households with larger household sizes, compared to that in households with smaller household sizes. In 2004, an increase in the number of household members increased the share of OOP healthcare expenditures to income by 3.8% (p-value=0.0000001) for both males and females. In 2009, the increase due to larger household size was somewhat higher (4.9%, p-value=0.00001) for males, but remained the same for females. In 2015, the increases were smaller compared to 2004 and 2009, and higher for females than males (2.5%, p-value=0.052 vs. 3.4%, p-value=0.008).

Province of Residence. The results here for the following provinces were described in comparison to the province of Newfoundland and Labrador**.** The results coefficients for all other Canadian provinces (Prince Edward Island, Nova Scotia New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia) were compared to the coefficients of the share of OOP healthcare expenditures to incomes in the province of Newfoundland and Labrador. There were observed differences in the influence of provinces on the ratio of OOP healthcare expenditures to incomes in Canada. Such influence was more visible among the females. In 2004, residing in Prince Edward Island was associated with an increase of 32.2% (p-value=0.007) and 22.1% (p-value=0.023) in the share of OOP healthcare expenditures to income among males and females respectively compared to Newfoundland and Labrador. In contrast,

residing in Ontario was associated with a decrease of 41.9% (p-value=0.000001) and 22.1% (p-value=0.008) in the share of OOP healthcare expenditure to income for males and females, respectively. In 2009, females residing in the provinces of New Brunswick, Quebec, Saskatchewan and Alberta showed higher expenditure ratios compared to other provinces. However, as in 2004, those residing in Ontario showed decreases of 32.3% (p-value=0.001) and 35% (p-value=0.013) in the ratio of OOP healthcare expenditures to income for males and females, respectively. This pattern of reduced expenditure ratio for residents of Ontario was observed in 2015 as well. The only other provinces showing some effect were New Brunswick, where a positive effect was observed for females, and Quebec, where a positive effect was observed for females.

Self-reported Physical and Functional Health Factors

Self-reported Functional Health Status. In 2004, men indicating they had often some functional disability had their ratio of OOP healthcare expenditures to income increased by 20.9% (p-value=0.096). In the same year, women who reported no pre-existing functional health condition had their ratio of OOP healthcare expenditures to income reduced by 28.4% (p-value=0.071). The decrease in the share of OOP healthcare expenditures to incomes was not substantial among male Canadians in 2004. In 2009, the absence of a pre-existing functional health condition meant a 17.4% (p-value=0.08) decrease in the ratio of OOP healthcare expenditures to income among females.

Self-reported Physical and Mental Health Status. The absence of pre-existing physical and mental health conditions led to a decreased ratio of OOP healthcare expenditures to income. In comparison to having a mild form of a pre-existing physical health condition, absence of a pre-existing physical and mental health condition was associated with a 28.4% (p-value=0.018)

and 16.2% (p-value=0.08) decrease in the ratio of OOP healthcare expenditures to income for males and females, respectively,

4.2.2. Estimation Results for Model 2

Model 2 shows regression with combined male and female SHS datasets and specific age groups. The purpose of the regression (Model 2) was to investigate the influence of specific age groups on the ratio of OOP healthcare expenditures to income among other factors. The estimation results for Model 2 are reported in Tables 11a to 11c.

Table 11a. Logarithmic Regression Results for Age Groups (2004, 2009, 2015)

Dependent variable	**Log Ratio of OOP Healthcare Expenditure to Income**	**2004**	**2009**	**2015**
		Male and Female	Male and Female	Male and Female
	Covariates	**(R2=36.68%)**	**(R2=33.60%)**	**(R2=40.43%)**
Socioeconomic factors	**Income (Log)**	-0.73(0.03)**	-0.73(0.03)**	-0.85(0.04)**
	Education			
	No degrees, certificates or diplomas (R)			
	Secondary (high) school diploma or equivalent	0.72(0.33)**	0.28(0l07)**	-0.46(0.36)
	Trade/vocational certificate	0.78(0.33)**	0.33(0.21)**	-0.36(0.37)
	Apprenticeship certificate	0.58(0.38)	0.39(0.07)*	-0.23(0.37)
	Community college, CEGEP or nursing school diploma	0.94(0.33)**	0.46(0.10)**	-0.31(0.36)
	University certificate or diploma below Bachelor's	0.97(0.33)**	0.41(0.08)**	-0.03(0.37)
	Bachelor's degree (B.A., B.Sc., B.Ed.)	0.99(0.33)**	0.46(0.08)**	-0.05(0.55)
	University degree, certificate or diploma above a Bachelor's	1.08(0.34)**	0.22(0.31)	-0.54(0.35)
	Employment			
	Work full time (R)			
	Worked part time	-0.04(0.04)	0.05(0.05)	
	Did not work	0.03(0.07)	0.02(0.08)	

Notes: (**) indicates significance at 5%; (*) indicates significance at 10%; (R) denotes the reference category;
The numbers in the brackets are standard errors. Employment status data were not available in the 2015 SHS cycle.

Table 11b. Logarithmic Regression Results for Age Groups (2004, 2009, 2015) Continued…

Dependent variable	Log Ratio of OOP Healthcare Expenditure to Income	2004	2009	2015
		Male and Female	Male and Female	Male and Female
	Covariates	**(R2=36.68%)**	**(R2=33.60%)**	**(R2=40.43%)**
Demographic factors	**Age group**			
	Below 19 years (R)			
	20 to 34 years	-0.14(0.31)	0.003(0.32)	-0.33(0.54)
	35 to 64 years	0.22(0.31)	0.44(0.32)	0.12(0.53)
	Above 65years	0.58(0.32)*	0.82(0.33)**	0.32(0.54)
	Gender			
	Male (R)			
	Female	0.28(0.04)**	0.22(0.04)**	0.04(0.06)
	Marital status			
	Married spouse of a household member (R)			
	Common-law spouse of a household member	-0.06(0.06)	-0.02(0.06)	-0.04(0.08)
	Single (Never married)	-0.67(0.06)**	-0.6(0.08)**	-0.5(0.15)**
	Other (separated, divorced or widowed)	-0.55(0.05)**	-0.56(0.06)**	
	Other marital statuses for 2015			
	Widowed			-0.33(0.12)**
	Separated			-0.38(0.15)**
	Divorced			-0.46(0.11)**
	Household size (Log)	0.33(0.04)**	0.37(0.05)**	0.23(0.09)**
	Province of residence			
	Newfoundland and Labrador (R)			
	Prince Edward Island	0.23(0.07)**	0.17(0.07)**	0.08(0.12)
	Nova Scotia	0.09(0.06)	0.08(0.06)	0.11(0.07)
	New Brunswick	0.17(0.06)**	0.28(0.06)**	0.10(0.07)
	Quebec	0.16(0.06)**	0.21(0.07)**	0.32(0.06)**
	Ontario	-0.27(0.06)**	-0.28(0.06)**	-0.27(0.08)**
	Manitoba	0.02(0.06)	0.22(0.06)**	0.12(0.1)*
	Saskatchewan	0.15(0.06)**	0.11(0.1)*	0.18(0.08)**
	Alberta	0.05(0.06)	0.10(0.07)	0.099(0.08)
	British Columbia	0.08(0.06)	0.01(0.07)	0.05(0.08)

Notes: (**) indicates significance at 5%; (*) indicates significance at 10%; (R) denotes the reference category. The numbers in the brackets are standard errors.

Table 11c. Logarithmic Regression Results for Age Groups (2004, 2009, 2015) Continued…

Dependent variable	Log Ratio of OOP Healthcare Expenditure to Income	2004	2009	2015
		Male and Female	Male and Female	Male and Female
	Covariates	**(R2=36.68%)**	**(R2=33.60%)**	**(R2=40.43%)**
Physio-functional Health Factors	**Self-reported functional health**			
	Yes, sometimes (Disability walking talking, bending etc) (R)			
	Yes, often (Disability walking talking, bending etc)	0.09(0.08)	-0.12(0.09)	
	No (Disability walking talking, bending etc)	-0.15(0.07)	-0.17(0.07)**	
	Self-reported physical and mental health			
	yes, sometimes (R)			
	Yes, often (Activity limitation, mental or physical limitation)	0.17(0.09)**	0.002(0.10)	
	No (Activity limitation, mental or physical limitation)	-0.005(0.07)	-0.22(0.07)**	
	Regression Constant	2.85(0.50)**	3.47(0.45)**	5.93(0.71)**

Notes: (**) indicates significance at 5%; (*) indicates significance at 10%; (R) denotes the reference category. The numbers in the brackets are standard errors. Health factors data were not available in the 2015 SHS cycle.

Socioeconomic Factors

Income. As in Model 1, the relationship between income and the ratio of OOP healthcare expenditures to income was negative. For a 10% increase in per capita income, the ratio of OOP healthcare expenditures to incomes decreased by 7.2% (p-value=0.00001) in 2004, 7.4% (p-value=0.00001) in 2009, and 8.4% (p-value=0.00002) in 2015.

Education Level. The influence of education on the ratio of OOP healthcare expenditures to incomes was positive, although it varied between 2004 and 2015. In 2004 and 2009 all categories of education were positively related to the ratio of healthcare expenditures to income. The positive effects of education on this ratio generally increased with the level of education. For example, the ratio increased by 134% (p-value=0.004), for those with a high school diploma,

169% (p-value=0.003), for those with a Bachelor degree, and 194% (p-value=0.001) for those above bachelor degree holders. The effects of education on the ratio of OOP healthcare expenditures to income were similar in 2009 but smaller in magnitude. For 2015, no statistically significant effect for education was observed.

Employment Status. As was the case in Model 1, no statistically significant relationship between employment status and the ratio of OOP healthcare expenditures to income was observed (See Table 11a).

Demographic Factors

Age Groups. The estimation results in Model 2 reveal the pronounced effect of older age on the ratio of OOP healthcare Expenditures to income. Being older than 65years of age was associated with increases of 78.6% (p-value=0.07) and 127%, (p-value=0.01) in the ratio of OOP healthcare expenditures to income in 2004 and 2009, respectively. Older age did not appear to have any impact on the ratio of OOP healthcare expenditure to income in 2015.

Gender. Results from regression in Model 2 revealed that there was substantial influence of gender on the ratio of OOP healthcare expenditure to income in 2004 and 2009. In comparison to male Canadians, being a female Canadian increased the ratio of OOP healthcare expenditure to income by 32.2% (p-value=0.00001) in 2004 and 24.6% (p-value=0.00001) in 2009. In 2015, the influence of female gender on the share of OOP healthcare expenditure to income was positive but not statistically significant (p-value>5%).

Marital Status. In 2004, both males and females who were single and those categorized as separated, divorced or widowed had lower ratios of OOP healthcare expenditures to income, compared with married Canadians. For both males and females who were single, the reduction was 95.4% (p-value=0.00001) and for both males and females who were separated, divorced or

widowed, the reduction was 73.3% (p-value=0.00002), when compared with married Canadians. Similar results were found for 2009, where the reductions were 82.2% (p-value=0.000002) and 75.1% (p-value=0.000002), respectively. In 2015, the effects of each of the separated, divorced and widowed categories were estimated separately, and the estimated reductions in the ratio of OOP healthcare expenditures to income were 39.1% (p-value=0.013), 46.2%(p-value=0.0001) and 58.4%(p-value=0.0001), respectively, when compared with married Canadians.

Household Size. The share of OOP healthcare expenditures to income was higher in households with larger household sizes, compared to that in households with smaller household sizes. All else being constant, a 10% increase in household size increased the ratio of OOP healthcare expenditure to income by 39.1% (p-value=0.000001), 44.8% (p-value=0.000001), and 25.9% (p-value=0.007) in 2004, 2009, and 2015 respectively.

Province of Residence. The results here for the following provinces were described in comparison to the province of Newfoundland and Labrador**.** The results coefficients for all other Canadian provinces (Prince Edward Island, Nova Scotia New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia) were compared to the coefficients of Newfoundland and Labrador. There were observed differences in the influence of provinces on the share of OOP healthcare expenditures to incomes in Canada. In 2004, the ratios of OOP healthcare expenditures to income were higher by 25.9% (p-value=0.001), 18.5% (p-value=0.005), 17.4% (p-value=0.008), and 16.2% (p-value= 0.01) in the provinces of Prince Edward Island, New Brunswick, Quebec, and Saskatchewan, respectively, compared to Newfoundland and Labrador. On the other hand, the residents in the province of Ontario had reduced ratios of 31% (p-value=0.000001). Similar results were observed in 2009. In 2015, only the three provinces of Quebec, Manitoba and Saskatchewan showed increased ratios of OOP

healthcare expenditures to income, and Ontario consistently showed a reduced ratio, again, compared to Newfoundland and Labrador (See Table 11b).

Self-reported Health Status

Self-reported Functional Health Status. In 2009, the absence of a pre-existing functional health condition led to an 18.5% (p-value=0.016) decrease in the ratio of OOP healthcare expenditures to income among Canadians, compared to Canadians with mild cases of functional health conditions. In 2004 however, this influence was not substantial.

Self-reported Physical and Mental Health Status. The absence of pre-existing physical health conditions led to a decreased ratio of OOP healthcare expenditures to income. In 2004, those who reported often having a physical health condition had an increase of 18.5% (p-value=0.001) in the ratio of OOP healthcare expenditures to income. In 2009, the absence of a pre-existing physical health condition led to a 24.6% (p-value=0.001) decrease in the ratio of OOP healthcare expenditures to incomes, compared to those who sometimes had physical health conditions.

Chapter Five: Discussion

5.1. Discussion of Descriptive Results

Descriptive analysis yielded surprising results about the mean and median estimates of average per capita OOP healthcare expenditures. Mean estimates for OOP healthcare expenditures were substantially larger than median estimates (Table 4). This was probably due to the presence of severe forms of OOP healthcare expenditures such as catastrophic and high cost OOP healthcare expenditures (Wyszewianski, 1986; O'Donnell et al., 2008; Caldbick et al., 2015) among some Canadians. There were substantial increases in both estimates (mean and median) of average per capita OOP healthcare expenditures in Canada between 2007 and 2010 (Table 4). This occurred when Canada was experiencing the 2007/2009 economic recession that started in the US. Between 2004 and 2015, there was a general increase in the trend of per OOP healthcare expenditures among both male and female Canadians (Figure 5). The general increase in share of OOP healthcare expenditures among females had also been observed in previous literature (CIHI, 2017; Sanmartin et al., 2014; Rustgi et al., 2009; Cylus et al., 2010; Millar, 1997). Increases in OOP healthcare expenditures were however disproportionately larger among low income Canadians and female Canadians as was previously reported by Sanmartin et al. (2014). The disproportionately larger shares of OOP healthcare expenditures among female Canadians as opposed to a finding by Adisa (2015) could have been attributed to the generally higher demand for healthcare goods and services among the female group compared to male Canadians (Hennessy et al., 2016; Forget et al., 2008; Shooshtari et al., 2017). Infrequent circumstantial factors such as pregnancy among female Canadians might have led to an increase in OOP healthcare expenditures in this group especially at their reproductive ages of life (Forget et al., 2008). In a further comparison of OOP healthcare expenditures by gender, the share of

both male and female Canadians who incurred a more severe form of OOP healthcare expenditure, CHE, between 2004 and 2015 was largest in 2007 (Figure 6), which could also be attributed to the 2007/2009 economic recession. This finding suggests that economic recessions could be responsible for a sudden increase in OOP healthcare expenditures.

The descriptive assessment of OOP healthcare expenditures by age groups yielded the highest average expenditures among Canadians in the 35 to 64 years age group (Figure 7). This could be attributed to the onset and prevalence of new and current chronic medical conditions. The second most expensive health age group was observed among Canadians who were above 65 years of age (Figure 7). This could be attributable to the fair pharmacare policies in certain Canadian provincial jurisdictions despite the anecdotally high prevalence of chronic pre-existing medical conditions among this population. Healthcare financing policies have been reported to shape the direction and the prices of healthcare among various Canadian age groups (Coombes et al., 2004; Luffman, 2005). OOP healthcare expenditures were lowest for Canadians who were younger than 19 years of age. This could be attributed to the generally low prevalence of pre-existing medical conditions among Canadians in this age group. Canadians in this age group may also be less likely to purchase prescription medication, purchase health insurance and dental care services as these expenditures are more likely to be covered by their parents or guardians.

Descriptive assessment yielded three large components of OOP healthcare expenditures. Prescription drug expenditures, dental care expenditures and insurance premiums made up the largest components of OOP healthcare expenditures among Canadians between 2004 and 2015 (Table 6, Table 7, Figure 8, Figure 9). Somewhat similar findings were reported by Sanmartin et al. (2014), Bonu et al. (2009), Gupta et al. (2018) and Banegas and Yabroff (2013), for a different estimation period. The reason why prescription drugs and premiums were highest could

be attributable to the healthcare policies such as the medical services plan, and the inevitable need for prescription medications during times of need for care (Sanmartin et al., 2014).

There were variations in the trend of provincial estimates of OOP healthcare expenditures (Figure 10, Figure 11). OOP healthcare expenditures were substantially higher in Alberta and Quebec between 2004 and 2015. This finding is similar to the finding of Coombes et al. (2004) even though the latter researchers only used the prescription drug component of OOP healthcare expenditures to define OOP healthcare expenditures in their study. The OOP healthcare expenditures were however much lower in Ontario, just as it was found in the work of Luffman (2005). Although the latter study used a different measure of the ratio of OOP healthcare expenditures to income, the implications of the study are similar with the findings in this thesis. The reason for the increased OOP healthcare expenditures in Alberta could be attributable to the declining prices for oil in an oil-rich economy, inadequate provincial government healthcare financing, and a change in the general population health, as was first pointed out in previous research by Tran et al. (2018). Findings by Coombes et al. (2004) suggest that the low amounts of OOP healthcare expenditures in Ontario could be attributed to the fact that the Ontario pharmacare model is the best healthcare financing model in Canada.

5.2. Discussion of Regression Results

Regression analysis revealed that several factors affect the amount of OOP healthcare expenditures across Canada (Model 1 and Model 2). There was socioeconomic, demographic and physical and functional health influence on the ratio of OOP healthcare expenditures to income (Model 1 and Model 2). The socioeconomic assessment revealed a negative effect of income on OOP healthcare expenditures. High income Canadians incurred lower ratios of OOP healthcare expenditures to incomes compared to low income Canadians. In other words, OOP health expenditures are regressive. Such effect was more pronounced for female Canadians. This may

be due to the varied ability to afford health insurance coverage and employer-supported health insurance coverages that tend to be more prevalent among high income Canadians. This finding is consistent with findings from the work of Sanmartin et al. (2014) and Chaudhuri and Roy (2008) that showed decreasing OOP healthcare expenditures with increasing income quintiles.

In most cases, education seemed to increase the ratio of OOP healthcare expenditures to incomes between 2004 and 2015. In general, the increase in the ratio of OOP healthcare expenditures to income associated with increasing education was higher for males. This finding suggests that males could be purchasing more healthcare with higher levels of education. The effect of employment status on the ratio of OOP healthcare expenditure to incomes was of no statistical significance (Model 1 and Model 2). It is possible that the potential effects of employment status on OOP healthcare expenditures are captured in the income variable.

A number of demographic factors were also responsible for the variations in the ratio of OOP healthcare expenditures to income. The ratio of OOP healthcare expenditures to income was consistently higher among older Canadians (Model 1). Other researchers have found a similar influence of age on OOP healthcare expenditures (Coombes et al., 2004; Smith, 1999; Dewa et al., 2005; Luffman, 2005). When age was categorized, however, the influence of age on the ratio of OOP healthcare expenditures to incomes was only statistically significant among Canadians who were above 65 years of age (Model 2). These findings are similar to the findings by Forget et al. (2008) and Coombes et al. (2004). The key difference in the finding of this thesis and that of Coombes et al. (2004) is that the latter study used simulation based on prescription medicine expenditures, whereas the results in this thesis are based on real data. In comparison to married Canadians, persons who were either single, divorced, separated or widowed incurred lower shares of OOP healthcare expenditures. The reduced ratios of OOP healthcare

expenditures to income were, however, unequally distributed among single male and single female Canadians. The share of OOP healthcare expenditures among single male Canadians fell sharper compared to that among single female Canadians between 2004 and 2015. There were also lower reported ratios of OOP healthcare expenditures to income among separated, divorced, and widowed Canadians in comparison to Canadians who were married. Canadians with larger household sizes incurred substantially higher shares of OOP healthcare expenditures to incomes between 2004 and 2015.

OOP healthcare expenditures varied across the province. Estimates of the ratios of OOP healthcare expenditures were noticeably higher in Alberta, New Brunswick, Saskatchewan and Quebec (Model 1 and Model 2), which corresponds to findings from Sibley and Glazier (2009). The province of Ontario was associated with substantially lower shares of OOP healthcare expenditures to incomes compared with provinces of Alberta, Quebec, New Brunswick and Saskatchewan. This may be attributed to variations in the structure of health insurance and regulatory and coverage differences as related to pharmaceuticals.

Self-reported physical and functional health factors affected the ratios of OOP healthcare expenditures to income negatively. Relative to less frequent reporting of pre-existing functional health conditions, more often reporting of the presence of functional health conditions such as persistent difficulty in bending, standing, carrying, and walking was associated with a substantial increase in the ratios of OOP healthcare expenditures to income in a few cases. A similar finding has been reported in the work of Stewart (2004) who reported increased OOP healthcare expenditures among geriatric patients in poor health. Relative to occasional reporting of pre-existing functional health conditions, absence of functional health conditions was associated with

a substantial decrease in the ratios of OOP healthcare expenditures to income (Model 1 and Model 2) in the estimations for 2004, 2009 and 2015.

5.3. Limitations of the Study

Even though this research uses data from the CRDCN, there are challenges associated with this database. First of all, the 1998, 1999, 2000, 2001, 2002, and 2003 SHS data cycles did not have bootstrap weights and hence they were excluded from this study. The second data related challenge was the presence of negative income values in the data set, which had to be truncated. The third challenge was the inconsistencies of certain variables such as functional health status, activity limitation and disability statuses, and employment status which varied across the survey cycles. A deliberate effort was therefore made to pool the regression results with as much caution as possible. The fourth data related challenge was that the formats of the datasets varied by year, and therefore, extra caution had to be taken to run uniform and/or similar regressions over the years for comparison purposes. More specifically, between 2004 and 2009, the datasets were larger with more respondents whose information were collected as "interview" data, whereas after 2009, a two-part mode of data collection was introduced by Statistics Canada which fragmented the SHS survey outputs in "interview" and "diary" data files leading to smaller sample sizes.

Another limitation of this study is related to the discretionary exclusion of Canadian territories such as the Yukon Territories, Northwest Territories and Nunavut due to the fact that descriptive assessment of OOP healthcare expenditures by demographic and socioeconomic indicators did not meet the CRDCN's cell number size requirements. The variable naming in the SHS 2004/2015 cycles was also inconsistent. For instance, education and marital statuses' categorical coding was not consistent over the 12 years between 2004 and 2015. This limited the

consistent regression power of such variables over the 12 years as data pooling showed clustered inconsistent variable names over the years.

Yet another issue with the data was that the SHS information was collected at the household representative level, and so the findings of this research were informed on the basis of the recorded opinion of the household representative members. The household representatives, therefore, provided, proxy information on the OOP healthcare spending patterns. Had there been data points on each member of the household, the results of this research could have yield more detailed information on average per capita OOP healthcare spending and CHE in Canada.

A further challenge was the structure of the SHS microdata that did not allow the application of panel regression analyses, and hence limiting the longitudinal interpretation of results from the study. The study could therefore not address the influences caused by the changing structural differences in Canada's provinces as well as the influence of time on OOP healthcare expenditures in Canada. For instance, if the dataset structure had allowed it, a random effects panel data regression analysis could be run for the SHS cycles 2004 through 2015 to provide a better picture of the long term socioeconomic, demographic and health predictors of OOP healthcare expenditures in Canada.

While examining healthcare access and equity was one of the original focuses of this work, it was subsequently removed. Therefore, while this concept was included in the literature search, the findings in this area were not included in the final thesis. Finally, the absence of the microdata files on healthcare access and equitable distribution of health services from the SHS made it impossible for this thesis to address the effects of OOP healthcare expenditures on healthcare access and equity in Canada.

Chapter Six: Conclusion

6.1. Conclusion

Per capita out of pocket (OOP) healthcare expenditures is on the rise in Canada. The rise in per capita OOP healthcare expenditures has been higher for females compared to males. Between 2007 and 2009, per capita OOP healthcare expenditures were highest for both Canadian males and females. The 2007/2009 financial crisis and its following recession may have accelerated the rise in per capita OOP healthcare expenditures in Canada in 2007. Provincially, Ontario had the lowest per capita OOP healthcare expenditures while Alberta and Quebec had the highest OOP healthcare expenditures per capita between 2004 and 2015. Catastrophic healthcare expenditures (CHE) were also higher among females compared to males, and the share of both males and females incurring CHE was highest in 2007. The sharp rise in CHE in 2007 was also due to the economic recession of 2007, which started in the United States.

Socioeconomic, demographic and physical and functional health factors predicted the amounts of per capita OOP healthcare expenditures paid by Canadians. Income had a negative effect on per capita OOP healthcare expenditures in Canada between 2004 and 2015. More specifically, those with lower income had higher ratios of OOP healthcare expenditures to income. In general, education had a positive influence on per capita OOP healthcare expenditures in the order of increased education levels. More education generally meant more OOP healthcare payments relative to income. Being older than 65 years old was associated with higher OOP healthcare expenditures. A larger household size was associated with increased ratios of OOP healthcare expenditure to income. Those who were single and separated, divorced or widowed had reduced relative OOP healthcare expenditures to incomes. Finally, having a pre-existing physical and functional health condition was associated with higher ratios of OOP healthcare payments to income.

6.2. Recommendations for Future Research

There are numerous research projects that could be the area of further research if one can overcome the aforementioned limitations associated with this study. To better predict the factors affecting OOP healthcare expenditures in Canada, factors other than socioeconomic, demographic, and physical and functional health factors would also need to be included. Factors such as: the degree of technological advancement in medical technologies, the degree of competition in the market of healthcare service providers; and the degree of market power held by major healthcare service providers as these factors were also pointed out to be influencers of the per capita OOP healthcare expenditures globally (Bodenheimer, 2005). To better assess the implications of OOP healthcare expenditures on care access and equity in Canada, the use of variables in addition to direct care expenditures, such as type of care, distance to the location of a healthcare facility from home, ethnicity of respondent, and a healthcare user's source of health news among other factors are warranted for future researchers in a similar field. Because factors other than OOP healthcare expenditures could also be affecting equity and access to healthcare in Canada (WHO, 2018; Clarke, 2016). Comparing factors in Canada and factors in other nations with similar healthcare financing policies would provide a better view of the relative position of Canada's OOP healthcare expenditures and CHE in the world.

In addition, further research on the OOP healthcare expenditures and CHE in the three Canadian territories would provide a more comprehensive view of both OOP healthcare expenditures and CHE. To be more specific, and since the Yukon territories had respondents' numbers that did not meet the CRDCN vetting policies, an isolated study focussed on the Northwest Territories, the Yukon Territories and Nunavut would provide a better view of OOP healthcare spending patterns in the territorial regions of Canada. Similarly, and if possible, a

panel data design by Statistics Canada around the household spending survey (SHS) data, one that follows spending patterns of the same subjects over the years would make feasible the use of Random Effects (RE) modelling techniques on the SHS data which would provide a more direct longitudinal view of the influence of factors affecting the OOP healthcare expenditures in Canada. Additionally, the provision of additional information on individual-level attributes such as immigration status, race and/or ethnicity, drug use, extended gender categories (such as when an individual is a lesbian, gay, bisexual, transgender, queer, etc), and type of care received at the time of the SHS survey would be useful in providing a detailed examination of OOP healthcare expenditures on healthcare and their implications for access to and equity in healthcare in Canada. Lastly, merging the Canadian survey data on healthcare access and equity could help advance this area of research and shed light on the effects of OOP healthcare expenditures on healthcare access and equity.

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Appendices

Appendix 1: CHE and Non-CHE Proportions in Canada (2004-2015)

Year	Proportion CHE (Male) %	Proportion CHE (Female)%	Proportion Non-CHE (Male)%	Proportion Non-CHE (Female)%
2004	2.98172	3.77458	97.01828	96.22542
2005	3.28053	4.02728	96.71947	95.97272
2006	3.2317	4.21466	96.7683	95.78534
2007	8.71712	13.5873	91.28288	86.4127
2008	3.86613	5.37539	96.13387	94.62461
2009	4.13411	4.74593	95.86589	95.25407
2010	4.59941	7.46532	95.40059	92.53468
2011	4.85731	6.16096	95.14269	93.83904
2012	5.48854	6.54018	94.51146	93.45982
2013	4.06429	5.71564	95.93571	94.28436
2014	4.31257	6.57196	95.68743	93.42804
2015	4.79304	6.99672	95.20696	93.00328

Note: Weighted proportions (%) to of catastrophic healthcare expenditures and non-catastrophic healthcare expenditures

Appendix 2. Weighted Out of Pocket Healthcare Expenditures by Canadian Age Groups (2004-2015)

Age group	**Weighted Average OOP Healthcare Expenditures**		
	2004	2009	2015
Below 19 years	$608.26	$657.82	$1,016.96
20 to 34 years	$943.94	$1,096.79	$1,584.61
35 to 64 years	$1,616.48	$2,036.38	$2,626.31
65 ++ years	$1,542.75	$1,898.54	$2,609.62

Note: Out of pocket healthcare expenditures are provided in 2004 Canadian Dollars

Appendix 3. Summary of Studies Associated with Out of Pocket Healthcare Expenditures

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Fast et al., 1999	Examined the hidden community care costs associated with Long term care facilities	US Data	Descriptive Analysis/Taxonomy	Evidence shows that OOP Healthcare payments are the biggest shocks to the stock of wealth in the USA Poor health drains wealth through OOP healthcare costs Person level attributes are responsible for per capita OOP health costs in Canada
Smith (1999)	To study effects of health on wealth		Empirical	OOP healthcare costs rise with age Health conditions increase OOP healthcare costs
Coombes et al. (2004)	Computed private household prescription drug burden	4,860 Canadian household types	Qualitative/descriptive	Significant variations in private household financial burdens due to prescription drugs coverage plans from various provincial pharmacare systems "Comprehensive tax-financed pharmacare models such as those in BC, Saskatchewan, Manitoba, and Ontario provide the greatest protection against catastrophic prescription drugs expenditures"
Dewa et al. (2005)	Explored variability of prescription drug coverage in Canada	33,000 Canadians	Descriptive Analysis	Government approved insurance coverage only work for people with severe and chronic health conditions

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Luffman (2005)	Explores out of pocket healthcare expenditures by Canadian household characteristics	Microdata Files (Canada)	Tobit Regression	Residential status, age, (presence of a senior significantly raises household spending on prescription drugs ($460 compared with $275)
Bodenheimer (2005)	Assessed the high and rising expenditures of healthcare	Several peer reviewed articles studied	Rigorous review of literature	Advances in medical technologies have increased out of pocket healthcare expenditures, some high healthcare expenditures are due to factors that external to the healthcare system Increasing market power of certain healthcare providers, lack of a free market in the healthcare system,
Kobelt et al. (2006)	Investigated OOP healthcare payments among the chronically ill	AK patients in Canada	Descriptive	Patients with severe illness incur more OOP healthcare costs
Longo et al. (2006)	Investigated the financial burden of Cancer Treatments in Ontario	282 Ontario Cancer Patients	Logistic Regression	16.5% of the sampled patients mentioned cancer expenditures burden significant Overall cancer treatment in Ontario was found to be burdening

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Forget et al. (2008)	Estimated the differences in healthcare expenditures covered under the Canada Health Act		Markov Modelling	Costliest 10% of the Canadians were mostly in their healthcare expensive age bracket Policies that make this 10% of Canadians insurable should be advised Average cost of providing healthcare increase with age, but vary within every age/sex cohort. Variation does not disappear over the course of the lifetime of a patient Relationship between out-of-pocket healthcare expenditures only become apparent (typical) after the age of 75. Catastrophic health payments vary with age and sex as an individual grows old. There is a gradual and a rapidly increasing per capita health cost as an individual age Sociodemographic factors do not affect healthcare expenditures in a linear way Being old and being a woman was associated with a higher out of pocket healthcare cost
Kotlarz et al. (2009)	Studied the relationship between Osteoarthritis (OA) and Out of Pocket Healthcare expenditures in the United States			OA significantly affected healthcare expenditures in the USA OA increased OOP health expenditures by $1,379 and insurer spending by $4,833 among women per year Among men, OA increased OOP expenditures by $694 per annum OA increased total yearly US medical expenditures by $185.5billion accounting for two-third
Paez et al. (2009)	Health conditions and OOP healthcare costs	2005 MEPS Data		Prevalence analysis High OOP healthcare costs for the chronically ill
Garrad (2011)	Matrix method of literature review	Not applicable	Reviewed literature	Matrix method follows a review of literature in ascending order of years, helped organize the thesis literature review section

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Quiñonez & Grootendorst (2011)	Assessed influence of changes in dental care financing options on dental care access in Canada			Variation in third party funding are connected to a family's ability to afford dental care Low- and middle-income households appear to be most sensitive to dental financing options "How people have historically spent money on dental care highlights gaps in Canadian dental care policy" Some external factors may also affect one's dental care expenses
Law et al. (2012)	Effects of expenditures on adherence to prescription medications in Canada	survey of 5732 Canadians	logistic regression to evaluate the association between cost-related nonadherence and a series of demographic and socioeconomic variables	9.6% of Canadians reported cost-related non-adherence to prescriptions
Ali et al. (2013)	Assessed ethnicity, intellectual disability and healthcare access in the United Kingdom	29 patients (14 patient and carer dyads, and carer) were audio-taped interviewed)	Qualitative/Audio Interview	Ethnic belonging and socioeconomic attributes of patients with intellectual disability contributed to limited healthcare accessibility in the United Kingdom
Duncan et al. (2013)	Examining the main sources of care giving costs to healthcare givers in Alberta	A substantial number of caregivers incurred costs	Cross-sectional	78% of subjects reported spending<$500/month from OOP 3.1% of subjects spent>$2,000/month from OOP

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Law et al. (2013)	OOP and PHIPs assessment	163,081 respondents to SHS	calculated inflation-adjusted per-household OOP on healthcare services	Canadian households spent $19.8 billion collectively from OOP in 2009
Rosella et al. (2014)	Socio-economic and sociodemographic features among high cost healthcare users in Ontario	Participants of 3 cycles of Canadian Community Health Survey	Multinomial Regression	old age, having multiple Chronic health conditions, and self-reporting poor status of health increased care expenditures for users of healthcare "Poor self-rated health (vs. good) was associated with a 26-fold increase in Odds of becoming a top 1% high cost health user (vs. bottom 50% user) [95% CI: (18.9, 36.9)]"
Sanmartin et al. (2014)	To study trends in OOP healthcare expenditures	SHS	Descriptive Analysis	Private expenses on medical care rose by 2.9% (1998 to 2009)
De Oliveira et al. (2014)	Examined OOP healthcare expenditures	prostate cancer patients	Descriptive	Share of OOP healthcare expenditures to incomes was 10% (high)
Gladman et al. (2014)	Examined drivers of OOP healthcare costs among amyotrophic lateral sclerosis patients	Ontario ALS patients	Quantitative	OOP healthcare costs varied by state of employment
Carpenter et al. (2015)	Examined Ability to pay for health from out-of-pocket and chronic conditions	Older Australians	Logistic Regression	In Australians aged 50 and older, multimorbidity predicts inability to pay
O'Lynnger (2015)	Spinal Surgical Costs	US citizens	Literature Review ((1999 to 2009)	OOP surgical costs higher amongst adult surgical procedures

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Buigut et al. (2015)	Assessed the catastrophic healthcare expenditures in Kenya and its determinants	Kenya Slum Residents	A unique dataset on informal settlement in Kenya	Between 1.52% and 28.38% incurred catastrophic healthcare expenses in Kenya slums in 2015.Number of working adults in a household and membership in a social safety net reduced the risk of incurring catastrophic healthcare expenditures in Kenya slums
Hennessy et al. (2016)	Studied sex-adjusted increase in OOP healthcare expenditures	Canadian households with pre-existing health conditions	Descriptive	Inconclusive finding
White et al. (2016)	Healthcare access	5831 US transgender adults	Multilevel analysis	Individual attributes implied in costly access to healthcare services
Clarke (2016)	Assessed difficulty in accessing healthcare services in Canada	Non-disclosed data accessed from Statistics Canada	Descriptive	Women accessed more healthcare services compared to men in both the USA and Canada, women registered a higher probability of incurring difficulty in accessing Canada's and US healthcare compared to men Seeking specialized healthcare service is more difficult Seeking access to non-emergency care was easy for both Canadian men and women

Author	Purpose	Subjects/Dataset	Methods	Findings relevant to thesis
Philips (2016)	Explored the patchwork prescription drug coverage in Canada	Literature on surveyed Canadians	Non-empirical	Canada is still one of the OECD nations that do not adequately protect their citizens from catastrophic healthcare expenditures A national catastrophic drug insurance plan should be adopted Vulnerable Canadians include the diabetics, OA patients and Cancer patients 11% of Canadians faced the risk of high prescription drug expenditures because they lacked drug coverage 9% of Canadians had insufficient drug coverage 6% of Canadians reported that their annual prescription drug expenditures over $1,000 by 2007.
CIHI (2017)	Studied Trends of OOP healthcare costs	National Health Expenditure Data	Empirical/Descriptive	
Tran et al. (2018)	Examined costs of myocardial infarction	Albertans (in Canada)	Trend analysis	OOP total drug costs (Can$147.2 million, 21.1%)
CIHI (2018)	Health information	Canada/Health Costs/Other	General thesis topic inquiry	

Appendix 4. Monetary Deflators (CPI)

Financial Year	Inflation Deflator (CPI)	Percentage Change in Value of Canadian Dollar	Direction of change
2004 (Base year)	0.00	0.00%	No change
2005	-0.02	-2.04%	Decrease
2006	-0.04	-3.66%	Decrease
2007	-0.06	-5.89%	Decrease
2008	-0.07	-6.97%	Decrease
2009	-0.08	-8.19%	Decrease
2010	-0.10	-10.3%	Decrease
2011	-0.12	-12.31%	Decrease
2012	-0.13	-13.04%	Decrease
2013	-0.14	-14.10%	Decrease
2014	-0.15	-15.34%	Decrease
2015	-0.17	-16.68%	Decrease

Source: (Bank of Canada, 2020). (CPI=Consumer Price Index)
Source: https://www.bankofcanada.ca/rates/related/inflation-calculator/
Notes: Appendix S provides estimates for the values of deflators for the Canadian Dollar between 2004 and 2015 using 2004 as the base year.

Appendix 5. Codes Used for Generation of Dummy Variables During Statistical Analyses

Label in SHS Dataset	Code	Name
RP_INC2005	Income	Income
Age (RP_AGE)	Age	Age
Provincial region	10	Newfoundland and Labrador
	11	Prince Edward Island
	12	Nova Scotia
	13	New Brunswick
	24	Quebec
	35	Ontario
	46	Manitoba
	47	Saskatchewan
	48	Alberta
	59	British Columbia
HHSZTOT=Sizeofhhld (Household size/Familysize)	Loghhzise	Log Total Household Size
RP_SEX=rp_Sex (Sex/Gender)	sex1	Male
	sex2	Female
RPHighestEd (Education)	educ1	No degrees, certificates or diplomas
	educ2	Secondary (high) school diploma or equivalent
	educ3	Trade/vocational certificate
	educ4	Apprenticeship certificate
	educ5	Community college, CEGEP or nursing school diploma
	educ6	University certificate or diploma below Bachelor's
	educ7	Bachelor's degree (B.A., B.Sc., B.Ed.)
	educ8	University degree, certificate or diploma above a Bachelor's
RPMAR (Marital Status)	marital1	Married spouse of a household member
	marital2	Common-law spouse of a household member
	marital3	Never married (single)
	marital4	Other (separated, divorced or widowed)
Q300=AL_Q010 (Disability status)	q3001	Yes, sometimes (Disability walking talking, bending etc)
	q3002	Yes, often (Disability walking talking, bending etc)
	q3003	No (Disability walking talking, bending etc)
Q400 (Activity Limitation)	q4001	yes, sometimes (Disability walking talking, bending etc)
	q4002	Yes, often (Activity limitation, mental or physical limitation)
	q4003	No (Activity limitation, mental or physical limitation)
RPEMPST (Employment status)	emp1	Work full time
	emp2	Worked part time
	emp3	Did not work
	_cons	Constant