ASSESSING PROGRESSIVITY AND CATASTROPHIC EFFECT OF OUT-OF-POCKET PAYMENTS FOR HEALTHCARE IN CANADA: 2010-2015

by

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ABSTRACT

Equity in healthcare is an important policy objective of the Canadian healthcare system. Out-of-pocket (OOP) expenses by Canadian households account for a substantial share of total healthcare expenditures (15%). Using data from Statistics Canada's Survey of Household Spending (SHS), this study examines the progressivity and catastrophic effect of OOP expenditures for healthcare services in Canada over the period 2010 to 2015 inclusive. The Kakwani Progressivity Index (KPI) was used to measure the progressivity of OOP payments for healthcare for each year of the study period. The catastrophic effect of OOP payments was calculated using a threshold 10% of total household consumption. The computed KPI indicated that OOP payments are a regressive source of healthcare funding in Canada and the regressivity of OOP payments has increased over the study period. This indicates that the distribution of OOP expenses in Canada is not equitable and the contribution of households from their total consumption to healthcare as OOP payments decreases as their consumption increase. Furthermore, the results suggested that 5-7% of Canadian households face catastrophic OOP healthcare payments. Proportion of households with catastrophic OOP healthcare payments was higher in rural areas compared with urban areas over the study period. Policies to enhance financial risk protection among low-income and rural households are required to improve equity in healthcare financing in Canada.

LIST OF ABBREVIATIONS USED

WHO	World Health Organization
ATP	Ability-to-Pay
ATN	According-to-Need
OOP	Out-of-Pocket Payments
CHA	Canada Health Act
CIHI	Canadian Institute of Health Information
KPI	Kakwani Progressivity Index
OLS	Ordinary Least Squares
SHS	Survey of Household Spending
GDP	Gross Domestic Product
OECD	Organization of Economic Cooperation & Development
LMICs	Low- and Middle-Income Countries
OOPHE	Out-of-Pocket Healthcare Expenditures

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CHAPTER 1   INTRODUCTION

1.1 Motivation

Equity is widely regarded as an important policy objective in both developed and developing countries (Culyer & Wagstaff, 1993; McLachlan & Maynard, 1982; Mooney, 2003; O'Donnell et al., 2008), and the equitable distribution of healthcare financing and utilization is an important political objective of many governments throughout the world (Wagstaff et al., 1992; Wagstaff, van Doorslaer, & Paci, 1989). Nonetheless, countries at all stages of development experience the prominent issue of equity in healthcare (Molla & Chi, 2017).

There are different philosophies toward equity in healthcare systems in different countries around the world. The World Health Organization (WHO) (2010) states that equity in healthcare includes equitable financing through fair prepayment and protection against catastrophic payments, and equitable access to healthcare services. One of the more universal principles of equity in healthcare is the idea that healthcare system payments should be financed according to ability-to-pay (ATP), rather than according to risk of illness, and distributed according to need (ATN) (Wagstaff et al., 1992). Based on these two principles, equity in the healthcare context can be reviewed from two perspectives: equity in healthcare utilization and equity in healthcare financing.

Equity in healthcare financial contribution and protection against financial losses is a common challenge for healthcare systems (WHO, 2000, 2010). Health systems are typically financed through four sources: general taxation, social insurance, private insurance and out-of-pocket (OOP) payments. General taxation and social insurance are state financing methods, whereas private insurance and OOP payments are the responsibility of the users. Of course, regardless of the payer, residents are the users of these healthcare services. Health service users typically access full pre-payment or subsidized health services through state-sponsored financing methods (Wagstaff et al., 1992; Wagstaff & van Doorslaer, 2000). The unpredictable nature of healthcare needs contributes to the global challenge of equity in healthcare financial contribution and protection against catastrophic payments, especially when the burden of payment falls onto users of differing ATP (Murray et al., 2000; Wagstaff & van Doorslaer, 2000).

There are two primary ways in which OOP payments for healthcare can be unfair for households. First, households can incur large OOP expenses (for instance, prescription drug costs for cancer treatment) at the point of care that are not covered under any insurance or pre-payment scheme. Second, health system financing can impose payments that are regressive (i.e., the contribution of households/individuals from their income to OOP payments decrease as their incomes increase) in nature (Wagstaff & van Doorslaer, 2000). In other words, households with a low-level ATP pay proportionately more OOP than households that are more well off financially (WHO, 2010). Minimizing OOP payments and relying mostly on insurance or pre-payment schemes, while featuring progressive or proportionate payments, with respect to income, through a tax-based healthcare financing system can lead to equitable and effective financing of a health

system (WHO, 2000, 2010). Therefore, equity in terms of healthcare financing, for the purpose of this thesis, is defined as the alignment and extent to which payments for healthcare are related to ATP, and the protection against catastrophic medical expenses (O'Donnell et al., 2008; Wagstaff & van Doorslaer, 2000). Furthermore, the establishment and operationalization of equity should be viewed as a state responsibility both in principle and as an outcome of a publicly funded healthcare system.

Equity in healthcare financing is an important policy objective in Canada. Although not named explicitly in legislation, healthcare equity is a vital component of the Canadian universal healthcare system. The federal and provincial governments have different responsibilities in the equitable financing and delivery of healthcare. Sections 91 and 92 of the *Constitution Act, 1867* divides the legislative powers of the federal and provincial governments respectively (Government of Canada, 1867; Romanow, 2002). Notably, the provincial governments are responsible "the establishment, maintenance, and management of hospitals…" and "generally all matters of a merely local or private nature in the province", which the courts have interpreted to mean the oversight of healthcare in the province (Government of Canada, 1867; Romanow, 2002). Although health is the primary responsibility of the provinces, the federal government influences health policy and contributes to the financing of "medically necessary" healthcare services through the *Canada Health Act* [CHA]. The CHA states that the primary objective of federal healthcare policy in the country is "… *to facilitate reasonable access to health services without financial or other barriers*" (Government of Canada, 1985, p. 5). The federal government provides the provinces with cash transfers should they follow the program criteria outlined in the CHA; this fiscal arrangement is also the primary function of the

CHA (Government of Canada, 1985; Romanow, 2002), which will explained further below. The five CHA program criteria are: universality, public administration, comprehensiveness, portability and accessibility (Government of Canada, 1985). Through the criteria of 'universality' and 'accessibility', the CHA created the legal basis for equity in healthcare for all citizens and permanent residents in Canada, regardless of province of residence. Notwithstanding the CHA principles enforced by the federal government, there is the potential for interprovincial variations in the equity of healthcare financing because of the individual responsibilities of provincial governments to deliver services inside Medicare and regulate those services outside of Medicare coverage (Allin, 2008; Marchildon & Allin, 2016; Martin et al., 2018). Canada's healthcare system is based on the principle that healthcare should be financed according to ATP and should be utilized based on need (Allin, 2008; McGrail, 2007; Romanow, 2002), although differences in interprovincial health service management and federal-provincial government powers form the basis by which healthcare inequities are considered. OOP payments, the subject of this thesis, are a method of funding those services that fall outside of publicly insured healthcare services (Martin et al., 2018).

The significant contribution of OOP payments in the Canadian healthcare system represents a troubling problem for Canadians. The Canadian Institute of Health Information (CIHI) found that healthcare expenditure contributions from the public and private sectors (healthcare expenditures by households and private insurance companies) in Canada have remained relatively stable since the 1990s, with the public-sector contributing around 70% of total annual health expenditures and the rest by the private-sector (CIHI, 2016). OOP spending by Canadian households represents the largest portion

of private healthcare expenditures and accounted for 14.2% of total healthcare expenditure in 2015 (CIHI, 2016). Although the relative contribution of private spending from total healthcare expenditures has remained stable in Canada, OOP healthcare expenditures (OOPHE) have increased over time. The increasing incidence of OOPHE can place undue financial barriers on Canadian families, especially when these payments become catastrophic in nature. Financial barriers and lack of financial protection from catastrophic OOP can lead to cost-related non-adherence of medically necessary services and interventions (Law et al., 2012). OOPHE have been found to represent a heavy burden to low-income Canadians, and this burden can lead to decreased utilization of healthcare services and needed pharmaceutical drugs (Allin, 2008; Law et al., 2012; Lee & Morgan, 2017). Cost-related non-adherence to prescription medications is a tangible example of the prominent public health issue of inequity in Canadian healthcare financing brought on by OOP payments (Law et al., 2012; Lee & Morgan, 2017).

Although equity is considered an important policy objective of the Canadian healthcare system, relatively few empirical studies (e.g. Caldbick et al., 2015; McLeod et al., 2011; Sanmartin et al., 2014) have examined equity in healthcare financing in Canada. Specifically, the extent to which healthcare in Canada is financed according to ATP is unknown and the degree of progressivity of OOPHE in Canada has not been explored in Canada. Furthermore, the catastrophic effect of OOPHE in Canada has not been investigated extensively. This thesis feature two novel and pressing investigations to fill these identified gaps in the Canadian healthcare literature. First, it assesses the equity of healthcare financing in Canada by analyzing the progressivity of OOPHE in Canada over the period from 2010 to 2015. Second, it examines catastrophic OOP payments made by

Canadians for healthcare. Analyzing equity in healthcare financing in Canada can provide an important policy and system evaluation to policy-makers and inform the vital decisions to improve equity in healthcare financing in Canada.

1.2 Equity and the Canadian Healthcare System

The current health system in Canada is highly decentralized. The federal government has limited, but significant authority to set policy and regulations on some national healthcare standards; however, it is the provincial governments that have the primary responsibility to determine how healthcare services are delivered in their respective jurisdictions (Marchildon & Allin, 2016; Martin et al., 2018). Although these powers are exclusively provincial, the federal government influences health policy and service provision throughout the country by providing the provinces with federal cash transfers on the condition they follow five conditions set out in the CHA (Government of Canada, 1985; Romanow, 2002). Through this agreement, Canada achieves a loose form of a 'single universal healthcare system' although that is not technically correct. The reality is that Canada has a national health insurance program that is achieved through the interconnecting of 13 independent provincial and territorial healthcare systems. This decentralization has considerable effects on the goal of equity in healthcare financing for federal and provincial policy-makers. The federal and provincial governments are viewed as constitutionally equal entities with their own exclusive powers, and as such, the federal governance of a national healthcare system is an inherent issue to the Canadian political landscape. Moreover, services that fall outside of the scope of Medicare, and the extent to which provincial governments are responsible covering these services (as opposed to the user) pose issues of health equity. Medically necessary hospital and physician services

covered under public health insurance support the objectives of fairness because of universal coverage (Marchildon & Allin, 2016; Martin et al., 2018). However, there are many health services that are not covered under public insurance that threaten equity of healthcare financing in Canada (Allin, 2008; Law et al., 2013; Marchildon & Allin, 2016; Martin et al., 2018).

To understand the insurance coverage under the Canadian healthcare system, it is important to understand "universality" in the Canadian context. Indeed, Bump (2015) highlights the fact that although the idea of universal healthcare is embraced in many countries throughout the world, there are still broad questions and lacking detail on the concept itself and how these countries can effectively achieve it. The WHO states that universality should be defined, with respect to each unique healthcare system, through three dimensions: 1) the population (i.e. who is covered?); 2) the services (i.e. which services are covered?); and 3) the direct cost coverage (i.e. proportion of the costs covered) (2000). Figure 1.1 demonstrates this three-dimensional model of measuring universality in a health system. As can be seen, every health system can have a unique degree of universality in terms of its population, services and direct costs (Marchildon, 2014; World Health Organization, 2000).
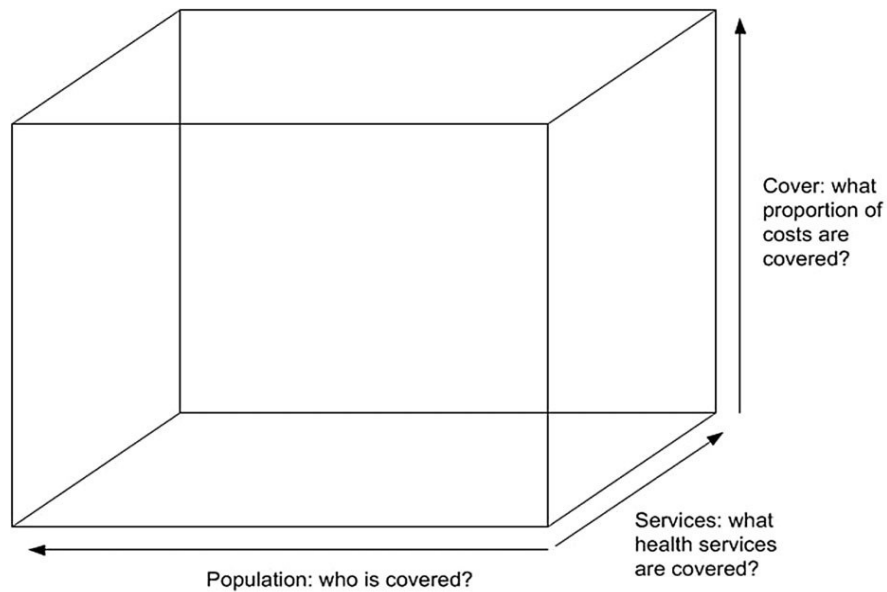
Figure 1.1   Three-dimensional model of universality of a healthcare system. Source: Marchildon (2014) and WHO (2000).

Consider the three-dimensional model above as it relates to Canada's universal healthcare (i.e., Medicare) system. Canada's system fairs rather well in terms of the population covered and what proportion of costs are covered. The principle of 'universality' in the CHA ensures that each provincial/territorial health system covers all citizens and permanent residents on uniform terms and conditions (Government of Canada, 1985). In other words, all residents (except for visitors, tourists and some special populations) are insured for the services offered in their respective province/territory (Government of Canada, 1985). The second dimension of the model examines what health services are covered under Medicare. In Canada, medically necessary hospital and physician services are covered for all insured persons on a pre-paid basis, or in other words, they are free at the point of care (Government of Canada, 1985; Marchildon & Allin, 2016). Notwithstanding the wide scope of hospital and physician services, there are still many important healthcare services left outside of the insured scope. Although each

province/territory has full discretion to cover any range of services they deem fit, there is some consistency of coverage across the provinces (Allin, 2008). For example, some provinces cover similar populations for a select number of prescription drugs, although there is currently no coordinated national pharmacare plan (Allin, 2008; McLeod et al., 2011). The final dimension of universality refers to what proportion of direct costs are covered. There is full-financial coverage for hospital and physician services in Canada. Canada's Medicare can best be described as 'narrow' (because of its coverage is limited to hospital and physician services), and 'deep' (because of the comprehensive full-financial coverage that is free at the point of care) (Marchildon, 2014). Overall, the narrow coverage of Canada's Medicare system means there are several types of important healthcare services left uncovered, and the burden of financing these services falls on the individual users of these services. Thus, OOP payments play an important role in the Canadian healthcare financing and equitable health system financing.

1.3 Objectives and Contributions of This Thesis

The purpose of this thesis is to assess equity in OOP payments for healthcare in Canada. The specific investigations of this thesis are:

To measure the progressivity of OOPHE in Canada: Specifically, using data from the national Survey of Household Spending (SHS) from 2010 to 2015, this study aims to provide one of the first empirical analyses of healthcare financing distribution in Canada. Progressivity of OOP payments will be measured for Canada as whole, across different provinces, and between urban and rural Canadian households.

To measure catastrophic OOPHE by Canadians: Specifically, using data from SHS, this study aims to assess catastrophic OOPHE from 2010 to 2015 inclusive. The proportion of households with catastrophic payments will be measured for Canada as whole, across different provinces, and between urban and rural Canadian households.

This thesis seeks to provide one of the first comprehensive analyses of equity in healthcare financing and catastrophic effects of OOPHE in Canada over time. Since the financing of Canada's healthcare system is shared by the federal and provincial governments, the results of this paper will provide valuable information to both federal and provincial policy-makers on enhanced financial protection and promote equity in healthcare financing in Canada. Although equity in healthcare is a main political objective in Canada (Law et al., 2013; Martin et al., 2018), to date, a limited number of empirical studies have analyzed the progressivity of healthcare financing in a given country over time. Most empirical works on equity in healthcare financing or utilization focus on specific points in time (see Amaya-Lara, 2016; Hajizadeh & Nghiem, 2011; McLeod et al., 2011; van Doorslaer et al., 2008), however this study analyzes how equity in healthcare financing in Canada changes over time. The analysis of healthcare equity over time allows for observations and the emergence of patterns in healthcare financing that otherwise would not be possible to distinguish.

1.4 Organization of The Study

This study consists of 6 chapters. Chapter 2 reviews the empirical work on equity in OOPHE. Chapter 3 explains the methods used in the literature and the current study. Chapter 4 examines the progressivity of OOPHE in Canada and answer the first research

objective highlighted above. Chapter 5 examines the catastrophic OOPHE made by

Canadians, which is the second main objective of this thesis. Finally, Chapter 6 discusses

the findings of both investigations and concludes the study.

CHAPTER 2   LITERATURE REVIEW

The purpose of this chapter is to review the empirical literature on equity in OOPHE. The first section will review literature and important empirical findings relating to the progressivity of OOPHE, which will help provide the theoretical basis for the study that assesses the progressivity of healthcare financing in Canada (Chapter 4). The second section of this chapter will review and explain key empirical work and their associated findings relating to catastrophic OOPHE. This section is related to the study on the assessment of catastrophic OOPHE faced by Canadians (Chapter 5).

2.1 Empirical Work on Progressivity of Out-Of-Pocket Healthcare Payments

There has been considerable attention given to the empirical analysis of equity in healthcare financing in the past few decades. These empirical studies on equity in healthcare financing tend to focus on the extent to which healthcare is financed in accordance with ATP (O'Donnell et al., 2008). Table 2.1 reports a summary of the empirical work on the progressivity of healthcare financing and, more specifically, OOPHE. As can be seen, many of the studies conducted on this subject have been undertaken in Asian and OECD countries. Most of the empirical findings indicate that OOP payments are a regressive source of healthcare financing.

Table 2.1. Summary of empirical work on progressivity of OOP payments for healthcare.

Authors	Countries of Study	Financing Sources Investigated	Main Results
Holahan & Zedlewski (1992)	United States	Employer and employee contributions to health insurance, private nongroup health insurance purchases, OOP expenses, Medicaid benefits, uncompensated care, tax benefits due to the exemption of employer-paid health benefits, and taxes paid to finance Medicare, Medicaid, and the health benefit tax exclusion.	This paper assesses the distribution of healthcare spending and financing in the United States. The results indicate that the distribution of financing is regressive despite households in higher income deciles spending proportionately more in health spending than those from the lowest income decile.
Wagstaff et al. (1992)	10 OECD Countries	Direct taxes, indirect taxes, social insurance, private insurance, OOP payments.	Direct Taxes: Progressive Indirect Taxes: Mainly Progressive Social Insurance: Mainly Regressive Private Insurance: Mainly Regressive OOP Payments: Especially Regressive
(Rasell et al. (1994)	United States	OOP spending, insurance premiums, and federal, state and local taxes.	OOP Payments: Regressive
Wagstaff et al. (1999)	12 OECD Countries	Direct taxes, indirect taxes, social insurance, private insurance, direct payments.	Direct Taxes: Generally Progressive Indirect Taxes: Generally Progressive Social Insurance: Generally Progressive Private Insurance: Regressive Direct Payments: Regressive
Yu et al. (2006)	Malaysia	OOP payments.	OOP Payments: Mildly Progressive

Table 2.1. Continued.

Authors	Countries of Study	Financing Sources Investigated	Main Results
Yu et al. (2008)	Malaysia	Direct taxes, indirect taxes, contributions to Employee Provident Fund and Social Security Organization, private insurance and OOP payments.	Direct Taxes: Progressive Indirect Taxes: Regressive Contributions to Employee Provident Fund and Social Security Organization: Progressive Private Insurance: Progressive OOP Payments: Progressive
O'Donnell et al. (2008)	13 Asian Countries	Direct taxes, indirect taxes, social insurance, private insurance, direct payments.	Direct Taxes: Progressive Indirect Taxes: Progressive Social Insurance: Generally Progressive Private Insurance: Generally Progressive Direct Payments: Generally Regressive
Hajizadeh and Connelly (2010)	Iran	Private health insurance premiums and consumer co-payments.	Private Health Insurance Premiums: Regressive Consumer Co-Payments: Progressive
Hajizadeh et al. (2014)	Australia	General taxation, Medicare Levy payments, Medicare Levy Surcharge payments and direct consumer payments.	General Taxation: Progressive Medicare Levy Payments: Progressive Medicare Levy Surcharge Payments: Progressive Direct Healthcare Payments: Regressive
Molla and Chi (2017)	Bangladesh	OOP payments, private insurance, social insurance, and general tax.	OOP Payments: Regressive Private Insurance: Regressive Social Insurance: Regressive General Tax: Regressive
De Mello-Sampayo and De Sousa-Vale (2014)	30 OECD Countries	Not Applicable	This study examined the relationship between health expenditure and health financing. The results suggest that when healthcare expenditure is controlled by government, it becomes independent of individual income, which promotes equity in financing at the individual level.

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There are four typical sources of healthcare financing across OECD countries *viz.*, taxes, private insurance premiums, social insurance contributions and out-of-pocket payments. The mix of these financing sources varies across countries (Hajizadeh & Connelly, 2010; Wagstaff et al., 1992, 1999; Yu et al., 2008). Tax-financed healthcare systems (such as in Denmark, Finland, Ireland and the United Kingdom) tend to be proportional or progressive, whereas social insurance and private systems (such as in Switzerland and the United States) are regressive (Wagstaff et al., 1992, 1999). In most countries, OOPHE are systematically regressive. Portugal and Sweden, both with tax-based healthcare financing systems, were found to be regressive; notable exceptions to the trends mentioned above (Wagstaff et al., 1992, 1999). Further analysis of the US healthcare system financing (e.g. Holahan & Zedlewski, 1992; Rasell et al., 1994) has reinforced the finding that private healthcare systems tend to be regressive in nature. The primary method of measuring the progressivity of a health system overall and its component sources is the Kakwani Progressivity Index (KPI),[1] which is explained further in chapter 3.

There have been several recent investigations of equity in healthcare financing for various Asian countries. Yu et al. (2006, 2008) examined the equity in healthcare financing and progressivity of OOPHE in Malaysia. The authors found that direct taxes, private insurance premiums and OOP payments were progressive, and that indirect taxes were regressive. The finding that OOP payments are progressive is contrary to Wagstaff et al. (1992) and most other investigations that report the opposite. The authors note that the most well-off citizens make greater relative payments through all five financing methods

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[1] It is important to note that the progressivity of individual financing sources of the same health system can be measured using the KPI, and the weighted average of the KPI for these sources can be used to measure the overall progressivity of a healthcare system (Wagstaff et al., 1992).

(direct taxes, social insurance, private insurance premium, indirect taxes and OOP payments) than the poor, which may have skewed the results towards progressivity. O'Donnell et al. (2008) investigated healthcare financing in 13 different Asian territories with economies spanning the entire range of development. They found that direct taxation is the most progressive form of healthcare financing and this is especially true in low-income economies. Hajizadeh and Connelly (2010) also provided the first empirical analyses of healthcare financing in Iran. The findings confirmed that rich households contribute more to healthcare financing, relative to ATP, than poor households in Iran. Molla and Chi (2017) reaffirm the impact and burden of inequitable financing of healthcare in their analysis of Bangladesh's health system. The authors note that financing is concentrated among the poor and that all sources of financing were regressive. The observed effects are mostly due to the system's reliance on OOPHE.

Additional empirical work has analyzed equity-related concerns in OECD countries. A paper by Hajizadeh et al. (2014) examined equity in healthcare financing in Australia. The authors reported that general taxation, Medicare Levy payments and Medicare Levy Surcharge payments were progressive over the period between 1973 and 2010. Over the same period, direct payments were found to be regressive.

Some studies, although they do not directly examine equity in healthcare financing, have analyzed the economic relationship between healthcare expenditure and the various determinants of health-related expenditure in OECD countries. De Mello-Sampayo and De Sousa-Vale (2014) examined healthcare expenditures in 30 OECD countries from 1990 to 2009. The study found that healthcare expenditure becomes independent of an individual's (or household's) income when it is mainly financed by the government

through a public financing scheme, when you control for the typically large dependency rates in young and elderly citizens and technological advances. In other words, tax-based public financing schemes for healthcare tend to shift the dependency of healthcare expenditures away from an individual's income, which is a component of progressivity.

Overall, studies that have directly investigated equity in healthcare financing indicated that systems with direct taxation as the principle financing method tend to be progressive, and systems that rely on OOPHE tend to be regressive in nature. In addition, although OOP payments were found to be proportional or regressive in high-income countries, these payments were found to be progressive in low and middle-income countries (LMICs) (e.g. Hajizadeh & Connelly, 2010; Yu et al., 2008). This may be because more well-off individuals spend relatively more and receive relatively more healthcare in LMICs.

2.2 Empirical Work on Catastrophic Out-Of-Pocket Payments for Healthcare

Although some secondary analyses of catastrophic OOPHE were included in some of the studies discussed above, this section highlights noteworthy empirical work mainly concerning the catastrophic OOPHE.

Table 2.2 summarizes the empirical work on catastrophic OOPHE. Much of the empirical work on catastrophic payments has focused on Asian countries where OOP payments are a major source of healthcare financing in a number of the Asian countries studied. Although the OOP payments play less of a role in system financing in OECD countries, there are some studies that focused on the catastrophic payments of OOP payments in these countries.

Table 2.2. Empirical work on catastrophic OOP payments for healthcare.

Authors	Countries of Study	Financing Sources Investigated	Main Results
Wagstaff and van Doorslaer (2003)	Vietnam	OOP payments	This paper presents work on two different thresholds for measuring catastrophic OOP payments and associated indices for measuring the intensity of catastrophe in Vietnam between 1993 and 1998. The authors found that catastrophic OOP payments diminished across the study period in terms of incidence and intensity, and that any identified poverty impact of OOP payments was primarily due to poor people becoming even poorer.
van Doorslaer et al. (2007)	13 Asian Jurisdictions	Catastrophic Payments	This paper estimated the distribution and intensity of OOP payments for healthcare in 14 Asian jurisdictions that account for 81% of the population. The results showed that Bangladesh, China, India, Nepal and Vietnam use OOP payments as the principle means of healthcare financing and have the highest incidence of catastrophic payments. In most low- and middle-income countries, the most well-off households spend proportionately more total household resources on healthcare, reflecting the poorer household's inability to finance healthcare services at all.
Somkotra and Lagrada (2008)	Thailand	OOP payments	This study sought to examine household OOP payments for healthcare and to measure financial catastrophe and impoverishing payments made by Thailand household. OOP payments for healthcare as a share of living standards showed a decreasing trend over the study period. The incidence and intensity of catastrophic payments decline over the study period.
McLeod et al. (2011)	Canada	OOP payments for prescription drugs.	This paper examined the financial burden of household OOP payments for prescription drugs in Canada using data from the 2006 Survey of Household Spending. The results showed senior, social assistance and general population households had relatively small household budget share dedicated to prescription drugs, however a small number of households overall suffered catastrophic levels of financial burden.
Hajizadeh and Nghiem (2011)	Iran	OOP payments	This study assessed inequality and determinants of OOP payments and catastrophic expenditure for hospital services using data from the 2003 Utilization of Health Services Survey in Iran. The results suggest that catastrophic expenditure primarily affects lower income households, and other factors such as admission to private hospital, length of stay, and others, increase the likelihood of incurring catastrophic payments.
Law et al. (2013)	Canada	Private payments	This paper assessed the recent growth in private payments made by Canadian households for healthcare using Survey of Household Spending data from 1998 to 2009. The results showed a 37% increase ($1523 per household) in private health spending over the study period, with most private spending coming from private insurance premiums, dental services, and prescription drugs.

Table 2.2. Continued.

Authors	Countries of Study	Financing Sources Investigated	Main Results
Atanasova et al. (2013)	Bulgaria	OOP payments	This paper assessed the scale of OOP payments for healthcare in Bulgaria using survey data from 2010 and 2011. The authors found that the majority of Bulgarian households (75.7% in 2010, 84% in 2011) experienced OOP payments for healthcare and these payments were especially burdensome for lower income families.
Lee and Shaw (2014)	South Korea	OOP payments	The paper explored the impact of OOP payments for healthcare on healthcare utilization and resulting financial burden for South Korea in 2007, 2008, and 2009. The results found that OOP payments primarily affect those in the lowest income quintiles, and that these OOP payments negatively affect healthcare quality while increasing household financial burden.
Onah and Govender (2014)	Nigeria	OOP payments	This study investigated the influence of gender on OOP payments and subsequent healthcare utilization. The results demonstrated that female-headed households have higher cost burdens associated from seeking medical care, however both genders rely on OOP as a primary means to finance healthcare and suffer burden as a result.
Sanmartin et al. (2014)	Canada	OOP payments	This study investigates trends in OOP healthcare expenditure by household income using data from the Survey of Household Spending from 1997 to 2009. The results found that the percentage of after-tax household income spend on healthcare was approximately twice as high for lower income households than higher income households. OOP healthcare expenditures increased for all income quintiles over the study period, especially in lower income quintiles.
Caldbick et al. (2015)	Canada	OOP payments	This study examined the burden of OOP payments for prescription drug expenses in Canada. The results revealed that 1.1% of all Canadian households exceeded catastrophic thresholds for drug budget share, and that lower income Canadians are most likely to experience disproportionate levels of burden from OOP prescription drug expenditures.
Grigorakis et al. (2016)	Greece	OOP payments, social insurance.	This paper examined the social insurance's risk pooling schemes and catastrophic impact of OOP payments for healthcare. The results show that OOP payments have a slightly positive impact on social insurance funding, but the authors postulate that this is because social health funding was cut considerably by the government to limit fiscal deficits.
Amaya-Lara (2016)	Columbia	OOP payments	This study explored the incidence and determinants of catastrophic OOP payments for healthcare in Columbia in 2011. The results showed that 9.6% of Columbian household had some catastrophic expenditure, higher than other surrounding countries.

OOPHE and the burden of catastrophic payments for healthcare have received substantial attention in recent years, and these empirical works have featured countries from all parts of the world, including Europe, Asia and South America (e.g. Amaya-Lara, 2016; Atanasova et al., 2013; Grigorakis et al., 2016; Hajizadeh & Nghiem, 2011; Lee & Shaw, 2014; Onah & Govender, 2014; Wagstaff & van Doorslaer, 2003). Many of these empirical studies use data from cross-sectional national surveys of household or citizen expenditure to measure catastrophic payments for healthcare. These studies often use data from one year or a small set of non-consecutive years for comparison (see Amaya-Lara, 2016; Hajizadeh & Nghiem, 2011; McLeod et al., 2011; Tomini et al., 2013; Wagstaff & van Doorslaer, 2003).

There is no consensus among researchers on a single universal definition of 'catastrophic' OOP payments that motivate policy responses from governments or cause distress at the individual or household level (Amaya-Lara, 2016; Tomini et al., 2013). In fact, several studies on catastrophic payments for healthcare have used various definitions of catastrophic thresholds. For example, Wagstaff and van Doorslaer (2003) examined the fairness of healthcare payments in Vietnam using two different threshold approaches: one involved the proportion of pre-payment income and the other used ATP (or non-food expenditure). The authors found that, in both methods of catastrophe measurement, the intensity and incidence of catastrophic OOPHE was reduced between 1993 and 1998. Importantly, the authors contend that this finding may be due to the poor people of Vietnam becoming even poorer, and overall income equality being the major source of impoverishment, as opposed to hospital and inpatient expenditures being the driving force. The use of different threshold approaches in Wagstaff and van Doorslaer's (2003)

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work provides a degree of robustness to the findings. A single conservative threshold may underestimate the prevalence and distribution of catastrophic health expenditures (McLeod et al., 2011). Similarly, Tomini et al. (2013) utilized multiple thresholds to test the sensitivity of their findings in their analysis of catastrophic and impoverishing effects of OOPHE in Albania. The authors used thresholds of 5-25% of total household expenditures and 5-40% of non-food household expenditures.

Some studies have examined catastrophic and impoverishing healthcare spending in OECD and high-income countries. Recently, Wagstaff and colleagues (2017a, 2017b) published two extensive empirical reviews on catastrophic and impoverishing healthcare spending in as many as 133 countries at all stages of development. The authors reported that high-income countries tended to have lower proportions of catastrophic payments affecting their residents than LMICs (Wagstaff et al., 2017a). Furthermore, of those affected households or residents in high-income countries, catastrophic OOPHE is very rarely impoverishing, whereas in LMICs, catastrophic OOPHE can also be impoverishing (Wagstaff et al., 2017b).

Pharmaceutical drugs represent a substantial proportion of OOPHE and this is true for many OECD countries. Indeed, many European countries including Germany, the United Kingdom, Spain, and Portugal all had substantial proportions of OOP pharmaceutical expenditure (Quintal & Lopes, 2016). However, many European countries have enacted progressive cost-sharing policies in their respective jurisdictions that seek to protect less well-off families and households from excessive or catastrophic levels of OOP pharmaceutical expenditure (Carone, Schwierz, & Xavier, 2012).

There are several studies that have examined financial burden and catastrophic payments for healthcare by Canadian households. OOP health-related payments per capita increased from $278 in 1988 to $868 in 2014, a 4.5% annual growth rate (CIHI, 2016). Like other OECD countries, one of the largest and most publicly criticized potential contributors to total OOPHE in Canada is prescription drug costs. Although many Canadians across the country are covered under private health insurance through their employment, there is a gap of citizens who remain uncovered for these services because of their low-paying, temporary or seasonal employment status, retirement, or unemployment (Marchildon & Allin, 2016). As indicated above, this gap represents a considerable burden on those who are forced to pay for health services OOP. Approximately 10% of Canadians who receive a prescription have cost-related non-adherence, and this effect is amplified for the uninsured and low-income Canadians (Law et al., 2012). The impact of not holding prescription drug coverage (i.e. the threat of OOPHE) disproportionately affects lower-income Canadians (Marchildon & Allin, 2016).

Some studies specifically have focused on catastrophic OOP payments for pharmaceutical drugs. Caldbick et al. (2015) examined the burden of OOP pharmaceutical drug expenses in Canada using the 2009 Survey of Household Spending. Pharmaceutical drugs account for a large proportion of OOP payments that are catastrophic in nature (Caldbick et al., 2015; McLeod et al., 2011). The authors used 3%, 6% and 9% of total household expenditure as the drug budget share and burden measurement thresholds for the study; 3% represented medium burden, 6% was high burden and 9% was catastrophic. They found that 8.2, 2.6 and 1.1% of the households sampled exceeded the catastrophic thresholds 3, 6 and 9%, respectively. Consistent with other studies, their results indicated

there exists an inverse relationship between the burden of OOP pharmaceutical drug expenditure and household income. In other words, low-income Canadians are most likely experiencing disproportionate financial burden and they remain more vulnerable than middle and high-income Canadians. Similar results were observed by McLeod et al. (2011) in their study on financial burden of household OOP expenditures for prescription drugs. The authors defined catastrophic drug expenditures as a drug budget share of 10% or more, and stratified the Canadian population into three sub-populations: senior households, those households receiving social assistance, and general population households. The results demonstrated relatively small financial burden for prescription drug expenditures, with no appreciable interprovincial variation. Both McLeod et al. (2011) and Caldbick et al. (2015) acknowledged the limitation that some low-income households that were surveyed about spending may have forgone purchasing needed prescription drugs to purchase other necessities. Therefore, the results of both studies are conservative estimates of catastrophic drug expenditures because of cost-related nonadherence amongst Canadians.

Law et al. (2013) recently examined private healthcare payments among Canadian households. In 2010, private payments for healthcare (private health insurance premiums and OOP payments) in Canada were the third highest among OECD countries, despite our universal healthcare system (Law et al., 2013). With this sentiment in mind, the authors used Statistics Canada's SHS data from 1998 to 2009 to assess the incidence and intensity of growth in private spending across the study period. To our knowledge, this is one of the few studies to examine growth in private payments for healthcare in Canada using a time-series analysis of multiple, consecutive years of cross-sectional data. Using 10% of

annual after-tax income as the catastrophic threshold, the authors found that private healthcare spending increased by 56% across the study period to 5.2% of the population and an average of $1523 per household. Admittedly, the authors do not comment on the consequences of the identified burden of private healthcare expenditures on Canadian households. Further research and comment on the negative consequences and effects on lifestyle for Canadians is warranted to fully understand the burden of catastrophic OOPHE.

In a similar study, Sanmartin and colleagues (2014) examined trends in OOP expenditures for healthcare services and products in Canada from 1997 to 2009. The authors aimed to find whether associated growth in OOP expenditures differs by household income quintiles. The results indicated that OOPHE increased for households in all income quintiles over the study period, however households in the lowest income quintile saw the greatest relative increase. This study assessed average household OOP expenditures by household income quintile and used a percentage threshold of 5% of total household after-tax income as a representation of "burden". Although the methods accomplish the aim of the study, the use of income quintiles limits the study's interpretation of the findings. For example, the results indicate that 37% of the lowest income quintile households had OOPHE greater than 5% of total household income. It is impossible for the reader to interpret what proportion of that 37% belong to the bottom half (lowest 10% of the population) of that quintile. Ranking individual households by income instead of forming arbitrary income groups can improve the applicability and usefulness of the results. Additionally, the use of 5% of total household after-tax spending as a threshold to demonstrate "burden" proves useful in the study, but difficult in

application. The reader of this study may have difficulty comparing the findings of

"burden" in this study to others that have chosen to measure "catastrophic" levels of

OOPHE. Sanmartin et al.'s (2014) study, and others like it, could have confirmed their

results by providing multiple levels and definitions of "burden" and catastrophic"

expenditure to allow their readers to interpret the results for themselves (O'Donnell, et al.,

2008; WHO, 2000).

Overall, these studies demonstrate that those households affected by catastrophic OOPHE

tend to be low-income households, and naturally, this can pose a particularly heavy

socioeconomic burden for these households to bear. In Canada, pharmaceutical drugs

represent a major component of OOPHE because of their inconsistent coverage across

provinces. Like other OECD countries in Europe, Canada lacks comprehensive financial

protection for catastrophic OOPHE, and this is profoundly exhibited in lower-income

Canadian households.

CHAPTER 3   METHODS

The purpose of this chapter is to review the methods of measurement and assessment of equity of healthcare finance across the literature. First, methods for assessing progressivity/regressivity of healthcare payments will be reviewed and explained. This will provide the methodological basis for the investigation in Chapter 4: Measuring the progressivity of OOPHE in Canada. Second, methods for measuring catastrophic OOPHE will be reviewed. This will provide methodological foundation for the second study presented in Chapter 5: Assessment of catastrophic OPPHE in Canada.

3.1 Measurement of Progressivity of Healthcare Financing

Equity in healthcare financing has received considerable attention over the last three decades. Over this time, researchers have used many different methods to measure equity in healthcare in different countries. Earlier research (e.g. Hurst, 1985) has used simplistic methods of analysis including basic tabulations of income groups in absolute amounts. This tabulation method in absolute values (instead of proportion of income) rendered it impossible to assess progressivity (Wagstaff & van Doorslaer, 2000). Other studies (e.g. Cantor, 1988) calculated equity of health financing system in terms of percentage of income spent on healthcare payments. Although these studies' findings are easier to interpret, one cannot use these results to make comparisons across jurisdictions or countries, or across time. In other words, one cannot assess whether one country's healthcare system is more progressive/regressive than another country by using simplistic methods (Wagstaff & van Doorslaer, 2000). More recent works examine progressivity of healthcare financing through techniques originally found in public economics literature,

which allow for comparability across different jurisdictions and time. This idea was first

popularized in two ground-breaking studies by Wagstaff and colleagues (1992, 1989).

The authors compared equity in the finance of healthcare between several nations using

Kakwani Progressivity Index (KPI) (1977), which is the most commonly used index to

assess progressivity in healthcare finance in the current literature.

3.1.1　The Kakwani Progressivity Index

The KPI was introduced and used to measure the overall progressivity of a tax or

financing scheme by Kakwani (1977). The KPI is used primarily to examine the extent to

which a tax system departs from proportionality (Wagstaff et al., 1992). As a summary

measure of inequality, the KPI can be used to examine changes in progressivity over time.

A tax system is said to be proportional if any given individual pays the same proportion

of their income in tax payments than all other individuals of that population. In other

words, a proportional tax system means members of the taxed population pay taxes

according to their respective ATP and regardless of their individual incomes (O'Donnell

et al., 2008). Assessing departure from proportionality in health system financing is

accomplished by comparing shares of healthcare payments made by proportions of the

population ranked by ATP with their respective individual share of ATP (O'Donnell et

al., 2008). Departure from proportionality can be either progressive or regressive. A

healthcare financing system is defined as progressive (regressive) if better-off individuals

pay proportionately more (less) of their before-tax income towards healthcare payments

than do poorer individuals (O'Donnell et al., 2008; Wagstaff et al., 1992). Importantly,

the KPI can be used to measure the progressivity of individual sources of healthcare

system financing. Additionally, the overall progressivity can be measured by using a

weighted average of all individual indices (Wagstaff et al., 1992). It is therefore possible, for example, to have an overall progressive health system that is comprised of more individually regressive sources of financing than individually progressive sources of financing. This is because the individual sources use weights that are proportional to their contribution of total system financing (Wagstaff et al., 1992).

Cumulative % of Income and Healthcare Payments

100

Concentration curve, $g_h(p)$

Lorenz curve, $g_y(p)$

0

100

Cumulative % of Population Ranked by Income
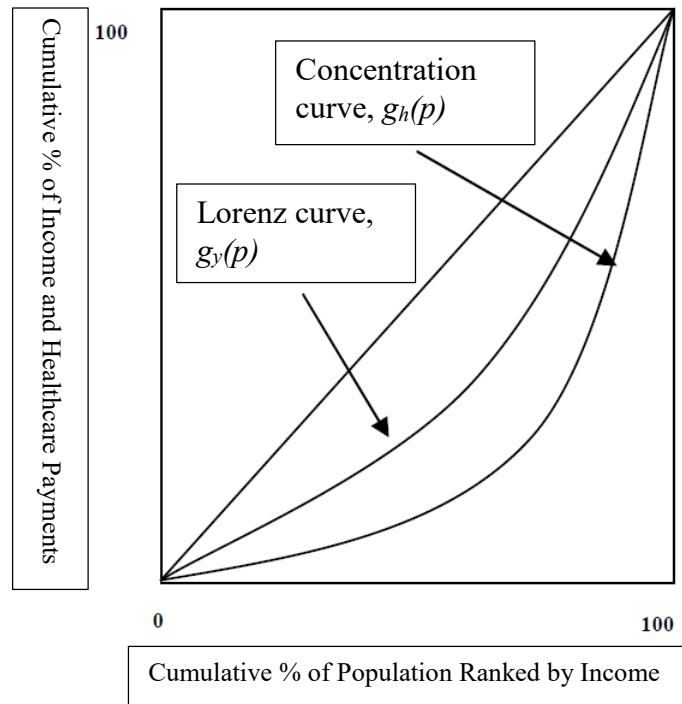
Figure 3.1   The Kakwani Progressivity Index

The KPI is comprised of two curves: the Lorenz curve for pre-tax income and the concentration curve for healthcare payments (see Figure 3.1). The Lorenz curve represents the cumulative percentage of income earned by the population of households ranked in ascending order of pre-tax income. The Lorenz curve is demonstrated in the figure below as $g_y(p)$. Conversely, the concentration curve for health payments represents the cumulative percentage of health payments by households ranked in ascending order of

pre-tax income, the same order as the Lorenz curve (O'Donnell et al., 2008; Wagstaff et al., 1992). The concentration curve enables us to provide statements such as "20% of health system financing was derived from the poorest 10% of the population" (Hajizadeh & Connelly, 2010). The concentration curve is shown in the figure below as $g_h(p)$.

The most common way to assess departures from proportionality and their relation to the ATP distribution is Lorenz curve dominance (O'Donnell et al., 2008). If payments for healthcare in a system are imposed in perfect proportion to income (i.e. healthcare payments increase [decrease] proportionately with increases [decreases] in income), the Lorenz curve and health payments concentration curve will overlap and the system is said to be proportional (O'Donnell et al., 2008; Wagstaff & van Doorslaer, 2000). If household payments for healthcare rise disproportionately with income, the concentration curve lies outside of the Lorenz curve. Conversely, if household payments for healthcare decrease disproportionately with income, the concentration curve lies inside of the Lorenz curve (O'Donnell et al., 2008; Wagstaff & van Doorslaer, 2000).

The degree of progressivity is directly related to the calculated area between the Lorenz and healthcare payment concentration curves. More specifically, it is calculated as twice the area between the concentration curve for healthcare payment and the Lorenz curve for income (O'Donnell et al., 2008). Therefore, the KPI is defined as:

$$KPI = C_h - G_y, \qquad\qquad (1)$$

where C_h is the health payments concentration index and G_y is the Gini coefficient for pre-tax income (Gerdtham & Sundberg, 1998; Wagstaff et al., 1992).

The Gini coefficient is defined as twice the area between the Lorenz curve for income and the line of perfect equality (i.e. the diagonal line in Figure 3.1). The Gini coefficient ranges between 0 to +1, where +1 means the entire income of a society is concentrated in the hands of the most well-off individual in the society. The concentration index (C) is used specifically to measure inequality in health outcomes (e.g. OOPHE). It is calculated by taking twice the area between the concentration curve for health payments and the line of perfect equality (Hajizadeh & Connelly, 2010; Hajizadeh et al., 2014). The line of perfect equality represents a scenario in which each household of the population, ranked by income, contributes equally to healthcare financing. The C ranges between -1 to +1, where -1 (+1) means the entire system's financing is funded by the poorest (richest) member of the population (Lambert, 1993). The value of zero indicates that all individuals in the population contribute equally to healthcare system. The values for KPI range from -2 (where $-2 = -1 - Gy$) to +1 (where $+1 = 1 - Gy$). If a system is progressive, the KPI is positive (e.g. Figure 2.1). In contrast, if the system is regressive, the value of the KPI is negative. The value of zero indicates that health payments are proportional to income and the system is considered proportional (Lambert, 1993; Wagstaff et al., 1992).

The following "convenient regression" equation can be used to calculate the C_h and G_y (Kakwani et al., 1997):

$$2\sigma_r^2 \left(\frac{h_i}{\mu} \right) = \alpha + \beta r_i + \varepsilon_i. \tag{2}$$

Where h_i is the healthcare spending of individual/household i, μ is the mean of healthcare spending for total population and σ_r^2 is the variance of the fractional rank, r_i. The ordinary least squares (OLS) estimate of β is an estimate of C (O'Donnell et al., 2008).

The KPI can also be measured using the following single-step equation:

$$2\sigma_r^2 \left[\frac{h_i}{\mu} - \frac{y_i}{\eta}\right] = \alpha + \delta r_i + u_i, \tag{3}$$

where y_i is the income of individual/household i, and η is its mean, and the OLS estimate of δ is the KPI (O'Donnell et al., 2008).

3.2 Measurement of Catastrophic Payments for Out-Of-Pocket Healthcare Expenditures

Fairness in healthcare finance also involves the idea that households should be protected against catastrophic OOP medical expenses (WHO, 2000). In fact, equity between high and low-income populations, specifically protection against financial losses, is a common challenge for universal healthcare systems (Murray et al., 2000). OOP payments play prominent roles in various countries (Wagstaff et al., 1992, 1999), including Canada. Canada's Medicare system covers "medically necessary" hospital and physician services, and notwithstanding the many services covered under this directive, there are prominent and otherwise necessary healthcare services not covered by any public insurance scheme (Marchildon & Allin, 2016; Martin et al., 2018; Morgan et al., 2015; Morgan & Lee, 2017). The most notable types of healthcare services excluded from Medicare coverage are prescription drugs, dental services, eyecare services, and non-physician services such as out-patient rehabilitation (Hajizadeh, 2017; Law et al., 2013; McLeod et al., 2011;

Morgan et al., 2015). OOPHE have continued to grow in Canada in recent years. Since the 1990's, approximately 30% of annual Canadian healthcare spending has been private, with the remaining proportion attributed to the public sector (CIHI, 2016). OOP spending represents the largest portion of private healthcare expenditures, accounting for 14.2% of total healthcare expenditure in 2015 (CIHI, 2016). Although the private-sector contribution proportion has remained stable, OOPHE have incrementally increased over time to the level seen today (CIHI, 2016).

It is important to operationally define "catastrophic" to appropriately measure and compare OOPHE with other empirical studies. The two principle components of catastrophic payments are total household OOPHE and some measure of household ATP, typically income, expenditure, or consumption (O'Donnell et al., 2008). Household income, expenditure, and consumption are all common measures that operationalize the construct of ATP (O'Donnell et al., 2008). Catastrophic medical spending is typically defined as exceeding a certain fraction of household ATP (or proxy thereof) in a given period, usually one year. This approach allows for approximation of the disruptive effect of health expenditures on material living standards, specifically because large household expenditures on health must be at the expense of other goods and services (O'Donnell et al., 2008).

Catastrophic payments can be defined in relation to health payment budget share. This method is used extensively in the literature. It is appropriate for researchers to include multiple definitions for catastrophic payments and let the readers interpret the findings for themselves; this promotes responsible academic transparency (O'Donnell et al., 2008). When total expenditure is used at the comparator, 10 percent is the common threshold for

catastrophic payments (Wagstaff & van Doorslaer, 2003). The WHO researchers and others have used 40% of non-food expenditures (i.e. "capacity to pay") on healthcare as a threshold (Mataria et al., 2010; Xu et al., 2003). A consensus on a common or universal definition of catastrophic payments for healthcare has not been reached in the literature. There are a few prominent reasons for this. First, there are large differences in the organizational structure of healthcare systems across countries, including their respective methods for financing their systems. Many countries use different combinations of direct or indirect taxes, social insurance, private insurance, user fees and other OOP payments to finance health for their citizens. Second, countries across the development spectrum have varying levels of financial resources to finance healthcare. Catastrophic payment measurements can sometimes be difficult to apply to countries from different levels of development (Amaya-Lara, 2016; O'Donnell et al., 2008; Tomini et al., 2013). Studies have included thresholds ranging from 3% of household budget share to 40% of capacity to pay (see Amaya-Lara, 2016; Caldbick et al., 2015; Mataria et al., 2010; McLeod et al., 2011; Tomini et al., 2013; Wagstaff & van Doorslaer, 2003; Xu et al., 2003).

CHAPTER 4   ASSESSING PROGRESSIVITY OF OUT-OF-POCKET PAYMENTS FOR HEALTHCARE IN CANADA: 2010-2015

This chapter measures the progressivity of OOPHE in Canada from 2010 to 2015. The chapter is organized as follows: Section 4.1 introduces healthcare financing system in Canada, Section 4.2 describes the data and variables used in the study, Section 4.3 describes the methodology and statistical analysis, Section 4.4 presents the results, and Section 4.5 concludes the chapter.

4.1   Introduction

Although not named explicitly in legislation, this principle of healthcare equity is an important component of the Canadian universal healthcare system. The CHA states that the primary objective of healthcare policy in the country is "… to facilitate reasonable access to health services without financial or other barriers" (Government of Canada, 1985, p. 5). It is worth noting that although Canada's health system is built on the principle of equity of financing and utilization, and for all citizens to have access on the same terms and conditions (Government of Canada, 1985; Romanow, 2002), the current health system is highly decentralized. Indeed, the federal government has limited, but significant authority to set policy and regulation on some national healthcare standards; however, it is the provincial governments that have the primary responsibility to determine how healthcare services are delivered in their respective jurisdictions (Marchildon & Allin, 2016). Through an agreement governed by the CHA, Canada

achieves a loose form of a 'single universal healthcare system', this is a national public health insurance program achieved through the interconnecting of 13 independent provincial and territorial healthcare systems.

The current governance of Canadian health system provides both the provincial and federal governments with different responsibilities regarding the financing and delivery of care. The federal government is responsible for the monitoring and enforcement of the CHA, the exclusive delivery and financing of health services for special populations, including Indigenous peoples, military personnel, and prisoners of federal jails and correctional facilities (Romanow, 2002). The provincial governments are responsible for the delivery of healthcare services and the remuneration of their providers in their respective jurisdictions, and they have enacted legislation to address such responsibilities. Provincial governments are responsible for the negotiation of fee schedules for physician remuneration with provincial medical associations, and the determination of which services are "medically necessary" and therefore covered through public insurance (Romanow, 2002).

Canada's universal healthcare system (or Medicare) can be described through three factors: the population it covers, the services it covers, and the proportion of costs covered (WHO, 2010). First, in terms of population coverage, all residents of Canada (except for visitors, tourists, and those who receive healthcare through the federal government) are insured for the services offered in their respective provinces or territories (Government of Canada, 1985). Second, Medicare covers all medically necessary hospital and physician services for all insured persons. The scope of medical necessity, and thus which services are covered, is determined by each provincial government independently.

Notwithstanding the extensive amount of health services covered under the umbrella of hospital and physician services, there are still many important health services that remain uncovered. Finally, Medicare offers full financial coverage at the point of care to all insured persons (Marchildon, 2014). Overall, Canadian Medicare covers a relatively small proportion of healthcare services, but offers comprehensive financial coverage to those insured (Marchildon, 2014). The responsibility to finance healthcare services that are left outside the scope of Medicare falls to the users of those services through private payments, including OOP expenditures and private insurance (Marchildon, 2014; Marchildon & Allin, 2016; Romanow, 2002). The private financing of necessary healthcare services represents the greatest opportunity for the inequitable distribution of healthcare financing, especially for those Canadian households with limited ATP (Marchildon, 2014; Marchildon & Allin, 2016; Martin et al., 2018).

Unfairness and inequitable distribution of health system contributions represents a troubling problem for Canadians. CIHI found that healthcare expenditure contributions from the public and private sectors (healthcare expenditures by households and private insurance companies) in Canada represent around 70% and 30% of total annual health expenditures respectively (CIHI, 2016). OOP spending by Canadian households represents the largest portion of private healthcare expenditures and accounted for 14.2% of total healthcare expenditure in 2015 (CIHI, 2016). Private expenditures mostly cover services that are not covered by the public insurance, such as pharmaceutical drugs, dental care, eyecare, and non-physician services such as out-patient physiotherapy or chiropractic care (Hajizadeh, 2017).

Notwithstanding the benefit of Canada's universal healthcare system, it is unclear how equitable OOPHE are for Canadians. Although equity in healthcare is considered an important policy objective, relatively few empirical studies have examined equity in healthcare financing in Canada. More specifically, the extent to which healthcare in Canada is financed according to ATP is unknown. Thus, this chapter measures the extent of progressivity OOPHE in Canada and across its provinces over the period between 2010 and 2015.

4.2   Data

The confidential master files of the SHS conducted by Statistics Canada were used to measure the progressivity of OOPHE in Canada. The SHS is an active annual survey that obtains detailed information about household spending and is collected annually in the 10 Canadian provinces. The SHS typically collects information on the amounts of food, transportation, clothing, shelter, healthcare and other expenditures to better understand household spending in Canada. Statistics Canada uses a stratified two-stage sampling design for the SHS, where the first stage is a sample of geographic clusters and the next are a sample of the dwellings within each cluster (Statistics Canada, 2017). Data from the SHS for the purposes of this analysis was available from 1998 to 2015, however there have been some changes to the SHS that affect its comparability over time. Specifically, starting from the SHS 2010, an interview and expense diary were introduced to collect household expenditures. These changes to the collection methodology limit their comparability to versions before 2009 (Government of Canada, 2009). In fact, Statistics Canada cautions users of these data about the comparability regarding the dataset break

(Statistics Canada, 2012)[2]. In response to this break in the dataset, many otherwise usable

years of SHS data were omitted from this analysis. Specifically, the datasets from 1998-

2009 were not used because of the changes in SHS data collection starting in 2010. The

datasets from 2010-2015 were used to analyze trends in the progressivity of OOPHE in

this chapter. These years are the most recent, available iterations of the SHS after the

change in survey methodology. Table 4.1 shows the number of observations from each

SHS across the study period.

Table 4.1. Number of households sampled in each SHS in Canada from 2010 to 2015.

Year of Survey	Sample size (number of households)
2010	9,062
2011	7,661
2012	3,828
2013	4,048
2014	3,758
2015	5,010
Total	33,367

The SHS provides household-level information on private healthcare spending through

both private insurance premiums and direct OOPHE. Payments for private insurance

premiums were excluded from this study. The target population of the SHS is the

population of Canada's 10 provinces and excludes residents of institutions and members

of the Canadian Forces, as well as those living on Indian reserves (Statistics Canada,

2017), overall collection exclusions account for 2.5% of the population. Total household

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[2] Separate sensitivity analyses were conducted with the data from 1998 to 2009 to verify this comparability caution. The two sets of data, before and after the dataset break were verified as incompatible. These calculations are included in Appendix 1.

current consumption and direct OOPHE were provided by the SHS. Observations with missing values in any of these variables were excluded in the calculations. All analyses were performed in STATA (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.).

4.3   Methods

The assessment of progressivity of OOPHE is based in the principle that healthcare payments should be distributed according to ATP. This study used the Kakwani Progressivity Index (KPI) to measure the extent to which OOPHE are related to a given household's ATP.

Household consumption from the SHS was used as a proxy for ATP in the estimation of the KPIs reported in this chapter. This is because the income of households is more volatile than their consumption; although household income can vary, household consumption tends to remain steady over time (Hajizadeh et al., 2014; O'Donnell et al., 2008). In addition, the income of households tend to be under-reported in surveys, whereas household consumption tends to be reported more precisely (Deaton & Grosh, 2000; Xu et al., 2003). The direct OOPHE, which exclude other private expenditure such as private insurance payments, were used in the estimation of KPIs.

Household consumption and healthcare expenditure have been equivalized to take into account differences in household size, ensuring proper comparison (Hajizadeh et al., 2014; O'Donnell et al., 2008). There is no universally accepted method for determining equivalence scales. Thus, similar to the OECD publications (e.g., OECD, 2008, 2011), the square root scale, which divides household consumption/ direct OOPHE by the square

root of household size, was used to equalize household consumption/ direct OOPHE. The KPIs were calculated for the total sample, by each individual province, and by urban and rural residential regions. Rural residential regions were defined as population centres with less than 30,000 people, and all other regions with lower population density. Urban residential regions were defined as population centres with 30,000 people or more (Statistics Canada, 2017). All analyses utilized a sample weight provided by Statistics Canada to ensure that the results are representative of the Canadian population.

To measure statistically significant trends in the KPIs over time, the following time-series regression analysis was used:

$$KPI_t = \alpha_0 + \alpha_1 t_t, \qquad\qquad (1)$$

where KPI_t is KPI at time t, t_t indicates time t and α_1 is the coefficient on time-series analysis. Should this coefficient be statistically significant, a positive value indicates an increasing trend in progressivity over time, whereas a negative value indicates a decreasing trend.

4.4   Results

4.4.1   Progressivity Analysis for Total Sample

Table 4.2 reports the Gini coefficients, the *Cs* and the KPIs for OOPHE in Canada from 2010 to 2015. According to the table, there are negligible differences and no discernable trend between for the Gini coefficients, while the *Cs* show a slight decreasing trend (Trend coefficient=-0.011, P-value: 0.005). The KPI is negative in all years of the survey, indicating regressivity of OOPHE throughout the study period. The time-series regression

results indicated that there was a statistically significant decrease in the KPI (i.e. increase in regressivity) from 2010 to 2015 (Trend coefficient=-0.0174, P-value: 0.036). It is worth nothing that the largest difference in KPIs came between the 2014 and 2015 survey years.

Table 4.2. The Gini coefficients, Cs, and KPIs for OOP healthcare payments in Canada from 2010 to 2015.

Survey Year	Gini Coefficients (95% CI)	Concentration Indices (95% CI)	Kakwani Progressivity Indices (95% CI)
2010	0.399 (0.393 to 0.405)	0.281 (0.300 to 0.262)	-0.118 (-0.082 to -0.154)
2011	0.388 (0.383 to 0.393)	0.261 (0.279 to 0.243)	-0.127 (-0.092 to -0.162)
2012	0.395 (0.387 to 0.403)	0.259 (0.285 to 0.233)	-0.136 (-0.092 to -0.180)
2013	0.396 (0.388 to 0.404)	0.258 (0.295 to 0.221)	-0.138 (-0.057 to -0.219)
2014	0.389 (0.381 to 0.397)	0.239 (0.267 to 0.211)	-0.151 (-0.106 to -0.196)
2015	0.442 (0.433 to 0.451)	0.217 (0.241 to 0.193)	-0.225 (-0.179 to -0.271)
Trend coefficients (P-value)	0.006 (0.230)	-0.011 (0.005)	-0.0174 (0.036)

Note: CI=confidence interval

Figure 4.1 reports the KPIs for OOPHE in Canada. As mentioned, the KPIs, relative to 2010 as a base index, demonstrated a significant decrease over time. These findings indicated that the regressivity of OOPHE became increasingly more regressive from 2010 to 2015. This decreasing trend began as marginal annual decreases and grew in absolute size through the end of the study period, including the largest decrease being observed between the 2014 and 2015 survey years.
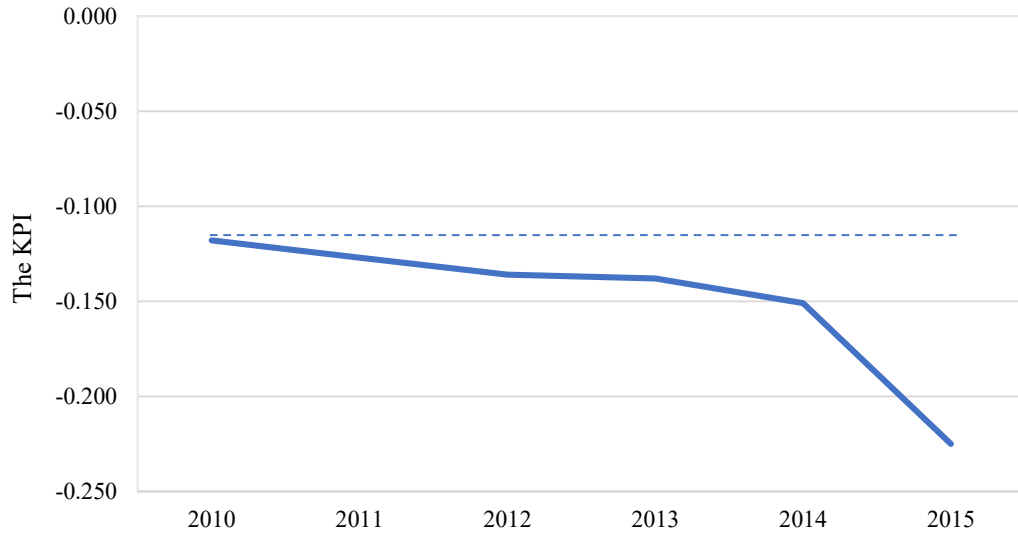
Figure 4.1.   The KPIs for OOPHE in Canada from 2010 to 2015.

4.4.2   Progressivity Analysis by Province

Table 4.3 reports the KPIs for OOPHE from 2010 to 2015 by province. As reported in the

table, every KPI was negative, suggesting that OOPHE were a regressive source of

healthcare financing in all provinces from 2010 to 2015. The provinces Newfoundland

and Labrador, Prince Edward Island, Saskatchewan, Manitoba and Nova Scotia had the

lowest average KPIs for the study period, indicating the higher levels of regressivity

compared to the other provinces. Conversely, Alberta, Ontario, Quebec, and British

Columbia had the highest average KPIs for the study period, indicating lower levels of

regressivity. The time trend analyses indicated that there were no discernable trends in

regressivity for all provinces. Figure 4.2 illustrates the trends in the KPIs over time across

the 10 provinces.
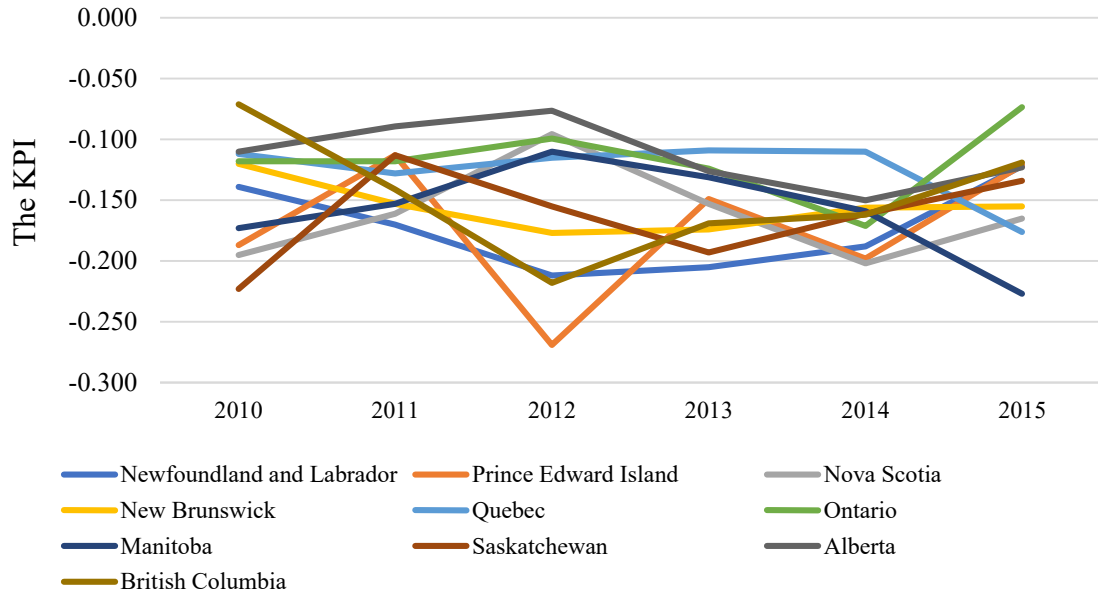
Figure 4.2. The KPIs for OOPHE in Canada by province from 2010 to 2015.

Table 4.3.   The KPIs (95% CI) for OOPHE by Canadian province from 2010 to 2015.

Survey Year	NL	PE	NS	NB	QC
2010	-0.139 (-0.087 to -0.191)	-0.187 (-0.11 to -0.264)	-0.195 (-0.141 to -0.249)	-0.120 (-0.05 to -0.190)	-0.112 (-0.062 to -0.162)
2011	-0.170 (-0.116 to -0.224)	-0.113 (-0.019 to -0.207)	-0.161 (-0.087 to -0.235)	-0.153 (-0.08 to -0.226)	-0.128 (-0.072 to -0.184)
2012	-0.212 (-0.131 to -0.293)	-0.269 (-0.135 to -0.403)	-0.096 (0.040 to -0.231)	-0.177 (-0.098 to -0.256)	-0.115 (-0.043 to -0.187)
2013	-0.205 (-0.112 to -0.298)	-0.149 (0.067 to -0.365)	-0.153 (-0.071 to -0.235)	-0.174 (-0.066 to -0.282)	-0.109 (-0.042 to -0.176)
2014	-0.188 (-0.092 to -0.284)	-0.198 (-0.105 to -0.291)	-0.202 (-0.099 to -0.305)	-0.156 (-0.063 to -0.249)	-0.110 (-0.039 to -0.181)
2015	-0.122 (0.011 to -0.255)	-0.121 (0.026 to -0.268)	-0.165 (-0.081 to -0.249)	-0.155 (-0.077 to -0.233)	-0.176 (-0.123 to -0.229)
Trend coefficients (P-value)	-0.001 (0.916)	0.006 (0.734)	-0.001 (0.936)	-0.005 (0.341)	-0.007 (0.273)

| Survey Year	ON	MB	SK	AB	BC
2010	-0.118 (-0.049 to -0.187)	-0.173 (-0.112 to -0.234)	-0.223 (-0.147 to -0.299)	-0.110 (0.011 to -0.231)	-0.071 (0.030 to -0.173)
2011	-0.118 (-0.043 to -0.193)	-0.153 (-0.08 to -0.226)	-0.113 (-0.015 to -0.211)	-0.089 (-0.013 to -0.166)	-0.141 (-0.062 to -0.220)
2012	-0.099 (-0.001 to -0.198)	-0.110 (-0.021 to -0.199)	-0.155 (-0.05 to -0.260)	-0.077 (0.051 to -0.204)	-0.218 (-0.105 to -0.331)
2013	-0.124 (0.051 to -0.299)	-0.131 (-0.05 to -0.212)	-0.193 (-0.09 to -0.296)	-0.126 (-0.014 to -0.238)	-0.169 (-0.048 to -0.290)
2014	-0.171 (-0.073 to -0.269)	-0.159 (-0.018 to -0.300)	-0.161 (-0.079 to -0.243)	-0.150 (-0.067 to -0.233)	-0.162 (-0.034 to -0.290)
2015	-0.074 (0.038 to -0.185)	-0.227 (-0.154 to -0.300)	-0.134 (-0.031 to -0.237)	-0.123 (-0.022 to -0.224)	-0.119 (-0.025 to -0.213)
Trend coefficients (P-value)	0.001 (0.910)	-0.009 (0.417)	0.008 (0.492)	-0.008 (0.209)	-0.002 (0.6)

Note: Note: NL=Newfoundland, PE=Prince Edward Island, NS=Nova Scotia, NB=New Brunswick, QC=Quebec, ON=Ontario, MB=Manitoba, SK=Saskatchewan, AB=Alberta, BC=British Columbia; CI=confidence interval

4.4.3 Progressivity Analysis by Urban and Rural Regions

Table 4.4. reports the Gini coefficients, the *Cs*, and the KPIs for OOPHE from 2010 to 2015 by urban and rural regions of the country. Figure 4.3 illustrates the KPI trends for both the urban and rural populations during the same period. According to the table, the KPIs are negative for every year of the study in both urban and rural regions, indicating regressivity of OOPHE from 2010 to 2015 regardless of urban or rural residential location. The average KPI was lower for rural regions than urban regions from 2010 to 2015. This means that OOPHE in rural areas were more regressive on average than in urban areas. The KPI trends for both urban (Trend coefficient=-0.004, P-value=0.284) and rural (Trend coefficient=-0.002, P-value=0.896) regions do not suggest statistically significant change in the KPI values over the study period.
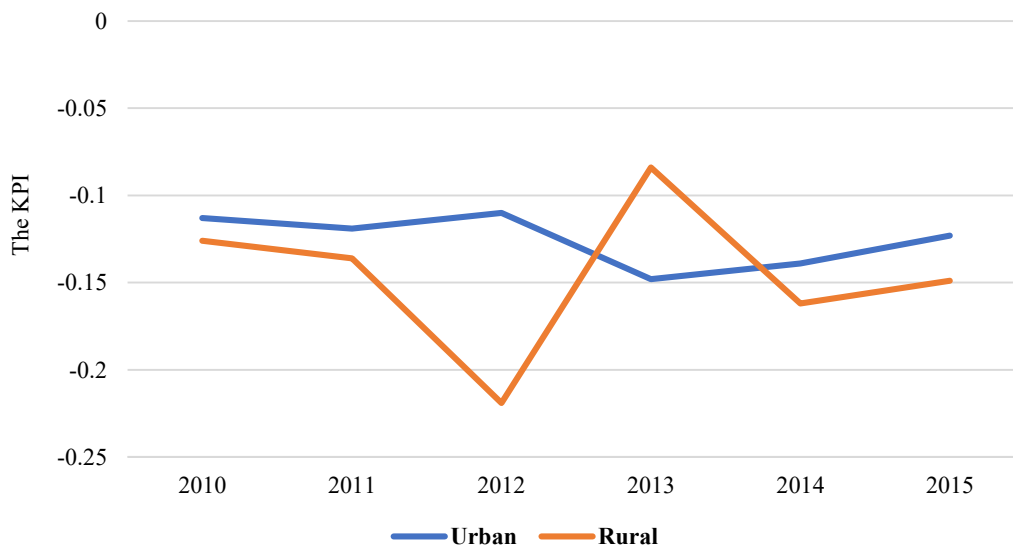
Figure 4.3.   The KPIs for OOPHE in Canada by urban and rural regions from 2010 to 2015.

Table 4.4. The Gini coefficients, Cs, and KPIs for OOPHE in Canada from 2010 to 2015 by urban and rural regions.

Survey Year	Gini Coefficients (95% CI)	Concentration Index (95% CI)	KPI (95% CI)
Urban			
2010	0.396 (0.403 to 0.389)	0.283 (0.307 to 0.259)	-0.113 (-0.073 to -0.153)
2011	0.39 (0.396 to 0.384)	0.271 (0.293 to 0.249)	-0.119 (-0.076 to -0.162)
2012	0.392 (0.402 to 0.382)	0.283 (0.316 to 0.25)	-0.11 (-0.06 to -0.16)
2013	0.393 (0.403 to 0.383)	0.245 (0.276 to 0.214)	-0.148 (-0.097 to -0.199)
2014	0.393 (0.403 to 0.383)	0.254 (0.29 to 0.218)	-0.139 (-0.084 to -0.194)
2015	0.387 (0.394 to 0.38)	0.264 (0.293 to 0.235)	-0.123 (-0.067 to -0.179)
Trend coefficients (P-value)	-0.001 (0.197)	-0.005 (0.173)	-0.004 (0.284)
Rural			
2010	0.399 (0.408 to 0.39)	0.273 (0.306 to 0.24)	-0.126 (-0.043 to -0.209)
2011	0.377 (0.384 to 0.37)	0.242 (0.273 to 0.211)	-0.136 (-0.082 to -0.19)
2012	0.402 (0.413 to 0.391)	0.183 (0.226 to 0.14)	-0.219 (-0.127 to -0.311)
2013	0.403 (0.419 to 0.387)	0.319 (0.412 to 0.226)	-0.084 (0.21 to -0.378)
2014	0.367 (0.378 to 0.356)	0.204 (0.245 to 0.163)	-0.162 (-0.088 to -0.236)
2015	0.411 (0.423 to 0.399)	0.262 (0.299 to 0.225)	-0.149 (-0.081 to -0.217)
Trend coefficients (P-value)	0.001 (0.856)	-0.01 (0.946)	-0.002 (0.896)

4.5   Concluding Remarks

This study aimed to measure the progressivity of OOPHE in Canada from 2010 to 2015.

Progressivity was measured for the total sample, by province, and by urban/rural

residential location. The total sample results indicated that OOPHE were regressive in

Canada from 2010 to 2015. This finding is consistent with other investigations of similar

OECD countries, which found that OOP payments tend to be regressive for jurisdictions

with high-income economies (Hajizadeh et al., 2014; O'Donnell et al., 2008; Wagstaff et al., 1992, 1999). There was a statistically significant decrease in the KPIs over time.

The provincial analyses indicated that OOPHE were regressive source of funding in all provinces over the period studied. The provinces of Newfoundland and Labrador, Prince Edward Island, Saskatchewan, Manitoba and Nova Scotia were found to have the lowest average KPIs for the study period, whereas Alberta, Ontario, Quebec, and British Columbia have the highest average KPIs. According to the 2011 Canadian Census, Ontario, Quebec, Alberta, and British Columbia have the highest urban proportions of their respective populations compared to the other provinces (Statistics Canada, 2011). Although OOP payments were found to be regressive in all provinces throughout the study period, these four provinces that had the highest urban population proportions also had the lowest levels of regressivity. Conversely, Saskatchewan, Newfoundland, and Prince Edward Island, which had the highest levels of regressivity of OOPHE, had comparatively lower urban population proportions.

The urban and rural analyses demonstrated that OOPHE were regressive in urban and rural residential regions, indicating that OOPHE were regressive in Canada regardless of urban or rural residential location. The average KPI was lower for rural regions than urban regions for the study period, indicating higher regressivity for OOPHE for rural households than urban households. The time trends analysis suggested that there are no significant changes in regressivity over time in rural and urban areas. Rural households tend to have poorer social determinants of health and socio-economic indicators than their urban counterparts (Ontario Ministry of Health and Long-Term Care, 2011; Romanow,

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2002), and these differences could account for the different levels of regressivity for OOPHE for urban and rural regions of Canada.

Although this study found a statistically significant change in the regressivity over time for the total sample, it did not find any significant changes for any of the stratified analyses. Since the estimated values of KPI in the stratified samples did not indicate any changes in the progressivity of OOPHE, it may be that between-group (across the provinces and rural vs urban) variations in OOPHE contributed to the increasing trend in the regressivity of OOPHE in Canada as whole. In other words, the proportional contribution of residents of poor provinces (or rural areas) for the overall OOPHE may have increased over time. This, in turn, led to the overall decrease in the regressivity of the OOPHE in Canada.

CHAPTER 5 ASSESSING CATASTROPHIC OUT-OF-POCKET PAYMENTS FOR HEALTHCARE IN CANADA: 2010-2015

This chapter assesses catastrophic OOPHE made by Canadian households from 2010 to 2015. The chapter is organized as follows: Section 5.1 introduces the issue, Section 5.2 describes the data and variables used in the study, Section 5.3 describes the methods, Section 5.4 presents the results, and Section 5.5 concludes the chapter.

5.1 Introduction

The equitable distribution of healthcare is an important political objective of many governments throughout the world (Wagstaff et al., 1989, 1992). Fairness in healthcare financial contribution, specifically protection against financial losses, is a common challenge for universal healthcare systems (WHO, 2000, 2010). The unpredictable nature of household OOPHE contributes to this universal challenge (Murray et al., 2000; Wagstaff & van Doorslaer, 2000).

Healthcare payments can be unfair should households incur large OOP expenses (for instance, prescription drug costs for cancer treatment) at the point of care that are not covered under any insurance or pre-payment scheme. Households with a low-level ATP are less like likely to be covered by private insurance than households that are more well off financially (WHO, 2010), and are more likely to suffer devastating OOP payments as a result. Minimizing OOP payments and relying mostly on insurance or pre-payment schemes, while featuring progressive or proportionate payments, with respect to income,

through a tax-based healthcare financing system can lead to equitable and effective

financing of a health system (WHO, 2000, 2010).

Inequitable distribution of healthcare finance contributions represents a troubling problem

for Canadians. The Canadian Institute of Health Information (CIHI) found that healthcare

expenditure contributions from the public and private sectors (i.e., healthcare

expenditures by households and private insurance companies) represent around a 70-30%

split of total annual health expenditures respectively (CIHI, 2016). OOP spending by

Canadian households represents the largest portion of private healthcare expenditures and

accounted for 14.2% of total healthcare expenditure in 2015 (CIHI, 2016).

Notwithstanding the benefit of Canada's universal healthcare system, it is unclear what

kinds of OOPHE become catastrophic and which Canadians are most affected. Although

equity is considered an important policy objective of the Canadian healthcare system,

relatively few empirical studies have examined equity in healthcare financing in Canada.

More specifically, the incidence of catastrophic OOPHE in Canada has not been explored

in great detail. The purpose of this study is to measure the catastrophic OOPHE by

Canadians and assess which Canadians are incurring these catastrophic payments for

healthcare.

5.2   Data

The annual SHS datasets from 2010 to 2015 were used to investigate the incidence of

catastrophic OOPHE in Canada. Table 4.1 in Chapter 4 shows the number of households

surveyed across the study period. The overall sample consists of 33,367 Canadian

households over 6 years. A time-trend analysis was performed similar to the one completed in Chapter 4.

The SHS is an active survey that obtains detailed information about household spending and is collected annually in the 10 Canadian provinces. The SHS typically collects information across many categories of household expenditures including food, transportation, clothing, shelter, healthcare and other expenditures to better understand the spending habits of Canadian households. The variables total household current consumption and direct OOPHE were provided by the SHS. Observations with missing values in any of these variables were excluded in the calculations. Budget share was calculated as the total household OOPHE divided by the total household current consumption. All analyses were performed in STATA (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.)

5.3   Methods

A consensus on a common or universal definition of catastrophic payments for healthcare has not been reached in the literature. Studies have included thresholds ranging from 3% of household budget share to 40% of capacity to pay (see Amaya-Lara, 2016; Caldbick et al., 2015; Mataria et al., 2010; McLeod et al., 2011; Tomini et al., 2013; Wagstaff & van Doorslaer, 2003; Xu et al., 2003). The WHO researchers and others have used 40% of non-food expenditures (i.e. "capacity to pay") on healthcare as a threshold (Mataria et al., 2010; Xu et al., 2003), other studies used 10% budget share as a threshold for catastrophic payments (Wagstaff & van Doorslaer, 2003). Canadian studies that have undertaken investigations into equity in healthcare and pharmaceutical financing tend to use

thresholds between 3% and 10% of household budget share. Furthermore, Statistics Canada and other government agencies typically use 5% of household disposable income as a threshold representing burden of OOP expenditures (Health Canada, 2011; Sanmartin et al., 2014).

Although previous studies defined catastrophic health expenditure in different ways, it is generally accepted that 10% of household consumption is the most accurate indicator of catastrophic burden in households among developed countries (O'Donnell et al., 2008; Wagstaff & van Doorslaer, 2003).

This study used budget share of health payments as a definition for catastrophic level of OOPHE. Specifically, "catastrophic" OOPE are when an individual household's budget share exceeds a predetermined threshold. This study defined a catastrophic level of financial burden as when household OOPHE reached 10 % of total current household consumption. This threshold was deemed to be most representative of Canada's economy as a high-income. The proportion of households that exceeded this threshold was calculated and the average household OOPHE for these household was computed. Household consumption and household OOPHE have been equivalized to take into account differences in household size, ensuring proper comparison (Hajizadeh et al., 2014; O'Donnell et al., 2008). Similar to the OECD publications (e.g., OECD, 2008, 2011), the square root scale was used to equivalize household consumption and household OOPHE.

Descriptive statistical analyses were performed to estimate the incidence of catastrophic OOPHE in Canada as whole, by province and by urban/rural region. The catastrophic

OOPHE were decomposed by type of catastrophic OOP payments: eyecare,

pharmaceutical drugs, dental goods and services, physician services, non-physician

services, and all other healthcare goods and services. All analyses utilized a sample

weight provided by Statistics Canada to ensure that the results are representative of the

respective population in Canada.

5.4   Results

5.4.1   Out-of-Pocket Health Expenditures for Canadians

Table 5.1 reports the mean equivalized OOPHE for the total and urban and rural

populations from 2010 to 2015. The time trend coefficients were also included in the

table.

Table 5.1.   Mean equivalized OOPHE (C$) for total sample, urban and rural
households in Canada from 2010-2015

Survey Year	Canada	Urban	Rural
	Mean (SD)	Mean (SD)	Mean (SD)
2010	2928 (4625)	2981 (4688)	2750 (4404)
2011	2826 (3928)	2734 (3809)	3172 (4335)
2012	2767 (3900)	2778 (3993)	2730 (3572)
2013	2891 (5819)	2680 (3773)	3621 (10051)
2014	2669 (3956)	2647 (4143)	2737 (3311)
2015	2887 (4143)	2884 (4225)	2896 (3818)
Trend coefficients (P-value)	-15.771 (0.555)	-24.115 (0.490)	9.029 (0.929)

Note: SD=Standard Deviation

As reported in Table 5.1, the mean equivalized OOPHE for the total sample and urban

households dropped slightly over the first two years (from $2928 in 2010 to $2767 in 2012

for the total sample and from $2981 in 2010 to $2778 in 2012 for urban households) before

rising and leveling off over the reminder of the study period ($2887 in 2015 for the total

sample, $2884 in 2015 for urban households). On average, the mean equivalized OOPHE for rural households was higher than the urban or total sample populations from 2010 to 2015; rural households rose only slightly over the same period (from $2750 to $2896). The trend analyses did not suggest significant trend in mean OOPHE in Canada and in urban and rural regions separately over the study period.

Table 5.2 reports the mean equivalized OOPHE for each province from 2010 to 2015, with the associated time trend coefficients results.

Table 5.2.   Mean equivalized OOPHE (C$) by province in Canada from 2010 to 2015.

Survey Year	NL	PE	NS	NB	QC
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
2010	2133 (2719)	2254 (2635)	2198 (2767)	2453 (4146)	2921 (3647)
2011	2148 (2429)	2601 (2888)	2557 (3822)	2325 (3400)	2582 (3063)
2012	1955 (2289)	2319 (2567)	2123 (2976)	2551 (3359)	2652 (3390)
2013	2323 (3015)	2589 (3618)	2406 (3026)	2156 (2910)	2740 (3429)
2014	1970 (2398)	2238 (2317)	1885 (2367)	2063 (2739)	2433 (3122)
2015	2163 (3795)	2163 (2425)	2299 (3020)	2157 (2875)	2803 (3031)
Trend coefficients (P-value)	-0.457 (0.991)	-36.357 (0.481)	-35.086 (0.590)	-76.029 (0.090)	-27.114 (0.570)
Survey Year	ON	MB	SK	AB	BC
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
2010	2731 (4168)	2569 (3461)	2714 (3980)	3283 (5526)	3704 (7020)
2011	2925 (4123)	2662 (3679)	2810 (4680)	2934 (4297)	3256 (4664)
2012	2701 (3627)	2375 (2888)	2507 (3332)	3073 (5678)	3408 (4477)
2013	3087 (8331)	2444 (3403)	2315 (3079)	2844 (3905)	3280 (4432)
2014	2589 (3478)	2829 (4232)	2733 (3245)	3183 (3913)	3274 (6569)
2015	2766 (4365)	2507 (3469)	3145 (4538)	3313 (4750)	3461 (5258)
Trend coefficients (P-value)	-12.771 (0.800)	7.429 (0.873)	49.486 (0.525)	19.086 (0.721)	-36.826 (0.430)

Note: NL=Newfoundland, PE=Prince Edward Island, NS=Nova Scotia, NB=New Brunswick, QC=Quebec, ON=Ontario, MB=Manitoba, SK=Saskatchewan, AB=Alberta, BC=British Columbia; SD=Standard Deviation

As reported in Table 5.2, the results did not indicate significant trends in mean

equivalized OOPHE for any specific province over the study period. In general, mean

OOPHE grow in the provinces as one moves from east to west across the country, with

British Columbia ($3461 in 2015) and Alberta ($3313 in 2015) having the highest mean

equivalized OOPHE and Newfoundland ($2163 in 2015) generally having the lowest.

5.4.2   Incidence of Catastrophic Out-of-Pocket Health Expenditures in Canada

Table 5.3 reports the proportion of households reaching the catastrophic threshold of 10%

of total current household consumption in Canada and by urban and rural regions from

2010 to 2015. Time trend coefficients were reported on the bottom of the table.

Table 5.3.   Proportion of households reaching the 10% catastrophic level of OOPHE
in Canada from 2010 to 2015.

Survey Year	Canada	Urban	Rural
	Proportion (SD)	**Proportion (SD)**	**Proportion (SD)**
2010	0.07 (0.26)	0.07 (0.25)	0.09 (0.28)
2011	0.07 (0.25)	0.06 (0.23)	0.10 (0.30)
2012	0.05 (0.22)	0.05 (0.21)	0.07 (0.26)
2013	0.06 (0.24)	0.06 (0.23)	0.08 (0.27)
2014	0.06 (0.24)	0.06 (0.23)	0.07 (0.26)
2015	0.06 (0.25)	0.06 (0.23)	0.09 (0.29)
Trend coefficients (P-value)	-0.001 (0.508)	-0.001 (0.554)	-0.002 (0.568)

From the table, there were no considerable changes in proportions of households with

catastrophic OOPHE for any of the three highlighted populations throughout the study

period. These results indicated that 5-7% of Canadian households affected by catastrophic

OOPHE over the study period. The proportion of households affected by catastrophic

OOPHE was higher in rural households (7-10%) than urban households (5-7%) over the period studied. The time series regression results did not suggest a significant trend in the incidence of catastrophic OOPHE in Canada from 2010 to 2015. These trends are demonstrated visually in Figure 5.1 below. The figure shows there is a substantial difference between the proportion of rural households affected by catastrophic OOPHE compared to the other study populations.
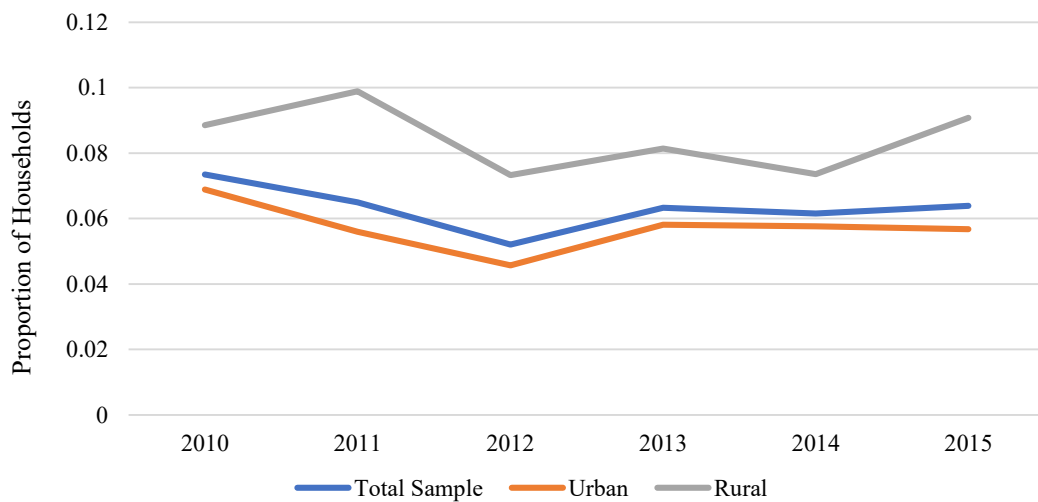
Figure 5.1.　Proportion of households that reached the 10% catastrophic OOPHE threshold for Canada, urban, and rural populations from 2010 to 2015.

Table 5.4 reports the proportion of households reaching the 10% catastrophic threshold by province for 2010 to 2015. There are no considerable changes in the proportion of household face catastrophic OOPHE in any of the provinces over the study period. As one moves from east to west across the country, the proportion of households affected by catastrophic OOPHE generally increases, with Newfoundland having the lowest and British Columbia being the highest.

Table 5.4. Proportion of households that reached the 10% catastrophic OOPHE threshold in Canada by province from 2010 to 2015.

Survey Year	NL Proportion (SD)	PE Proportion (SD)	NS Proportion (SD)	NB Proportion (SD)	QC Proportion (SD)
2010	0.06 (0.23)	0.08 (0.27)	0.05 (0.23)	0.07 (0.26)	0.08 (0.28)
2011	0.05 (0.22)	0.09 (0.28)	0.08 (0.27)	0.07 (0.25)	0.08 (0.26)
2012	0.05 (0.21)	0.04 (0.19)	0.03 (0.18)	0.07 (0.26)	0.07 (0.26)
2013	0.05 (0.23)	0.09 (0.29)	0.07 (0.26)	0.08 (0.27)	0.07 (0.25)
2014	0.03 (0.18)	0.04 (0.19)	0.06 (0.24)	0.05 (0.22)	0.06 (0.23)
2015	0.05 (0.22)	0.04 (0.21)	0.06 (0.24)	0.05 (0.21)	0.09 (0.29)
Trend coefficients	-0.002	-0.007	0.000	-0.005	-0.001
(P-value)	(0.439)	(0.244)	(0.991)	(0.175)	(0.802)

Survey Year	ON Proportion (SD)	MB Proportion (SD)	SK Proportion (SD)	AB Proportion (SD)	BC Proportion (SD)
2010	0.06 (0.23)	0.09 (0.29)	0.1 (0.31)	0.06 (0.24)	0.11 (0.31)
2011	0.05 (0.22)	0.09 (0.29)	0.06 (0.25)	0.05 (0.21)	0.09 (0.29)
2012	0.03 (0.16)	0.05 (0.22)	0.05 (0.23)	0.05 (0.22)	0.08 (0.27)
2013	0.05 (0.22)	0.05 (0.21)	0.07 (0.26)	0.03 (0.18)	0.11 (0.31)
2014	0.06 (0.23)	0.07 (0.26)	0.07 (0.26)	0.06 (0.24)	0.09 (0.29)
2015	0.05 (0.21)	0.07 (0.25)	0.06 (0.24)	0.05 (0.22)	0.08 (0.27)
Trend coefficients	0.000	-0.005	-0.005	-0.001	-0.003
(P-value)	(0.998)	(0.373)	(0.29)	(0.733)	(0.358)

Note: NL=Newfoundland, PE=Prince Edward Island, NS=Nova Scotia, NB=New Brunswick, QC=Quebec, ON=Ontario, MB=Manitoba, SK=Saskatchewan, AB=Alberta, BC=British Columbia; SD=Standard Deviation

Figure 5.2 illustrates the proportion of households that had catastrophic OOPHE broken down by Province from 2010 to 2015. There are a number of small fluctuations over the study period, however there were no significant trends identified in any of the provinces. The highest proportion of households that suffered catastrophic OOPHE during the study period was 11% for British Columbia in 2013. The lowest proportion was 3% in Newfoundland in 2014.
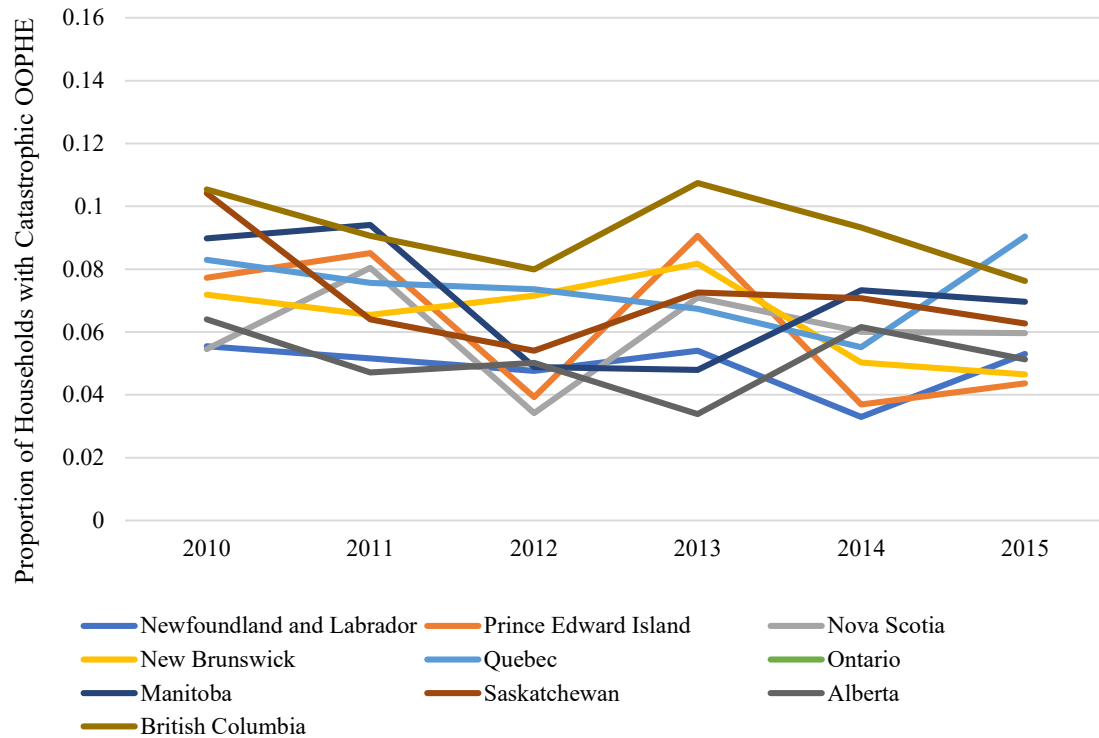
Figure 5.2. Proportion of households that reached the 10% catastrophic OOPHE threshold by province from 2010 to 2015.

5.4.4   Decomposition of Catastrophic Out-of-Pocket Healthcare Expenditures

Table 5.5 reports the mean equivalized catastrophic OOPHE for six different types of OOPHE from 2010 to 2015, and the associated time trend coefficients results. Pharmaceutical drugs and dental services were consistently the highest contributors to the mean equivalized catastrophic OOPHE categories across the study period, whereas OOP physician services was consistently the lowest category contributing to the mean equivalized catastrophic OOPHE. There were no statistically significant changes in the contribution of any of the OOP payment categories over time.

Table 5.5. Mean equivalized catastrophic OOPHE (C$) by payment type in Canada from 2010 to 2015.

Survey Year	Eyecare	Pharmaceutical Drugs	Dental	Physician	Non-physician	Other
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
2010	422 (883)	4082 (5738)	1277 (2616)	114 (815)	612 (2099)	660 (3498)
2011	374 (760)	3763 (3896)	1489 (3324)	185 (1196)	436 (1338)	643 (2524)
2012	341 (631)	3335 (3792)	1687 (2633)	307 (1734)	626 (2432)	766 (3313)
2013	700 (1787)	5973 (18091)	1374 (1854)	109 (590)	351 (1562)	910 (3917)
2014	707 (1535)	3194 (3099)	1635 (2818)	114 (677)	735 (4827)	447 (3283)
2015	645 (1064)	3025 (3059)	1623 (2903)	258 (1653)	586 (1847)	748 (3818)
Trend coefficients (P-value)	70.657 (0.070)	-124.40 (0.684)	53 (0.200)	8.826 (0.712)	14.057 (0.721)	-0.114 (0.998)

Figure 5.3 demonstrates the proportion of mean catastrophic OOPHE by healthcare OOP payment type for the years 2010 to 2015. From the figure, it is clear that Pharmaceutical drugs and dental services represent the largest proportions of mean catastrophic OOPHE. Specifically, pharmaceutical drugs represented 44-63% and dental services represented between 15-24% of total mean equivalized catastrophic OOPHE from 2010 to 2015 respectively.
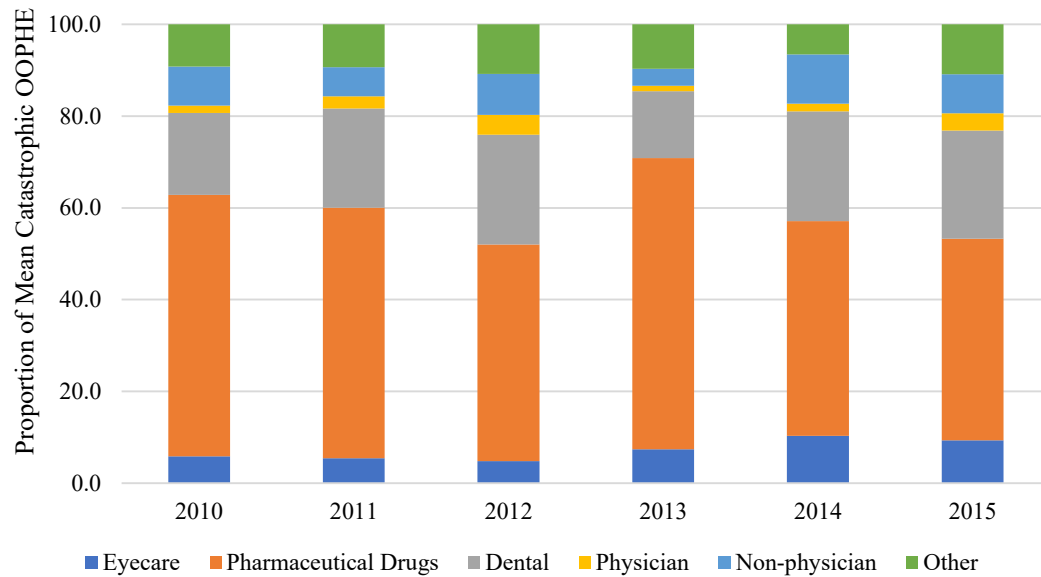
Figure 5.3.   Proportion of mean equivalized catastrophic OOPHE (%) by healthcare payment type in Canada from 2010 to 2015.

Figures 5.4 and 5.5 highlight the proportion of mean equivalized OOPHE by OOP healthcare payment type for urban and rural regions respectively. Eyecare (12-16%), dental (22-25%), and non-physician services (8-10%) represented higher proportions of mean equivalized OOPHE in urban households than rural households. The contribution of pharmaceutical drugs to mean OOPHE was proportionately higher in in rural households (54-68%) than urban households (45-52%). There was no discernable difference between urban and rural households in the physician and other OOP categories.
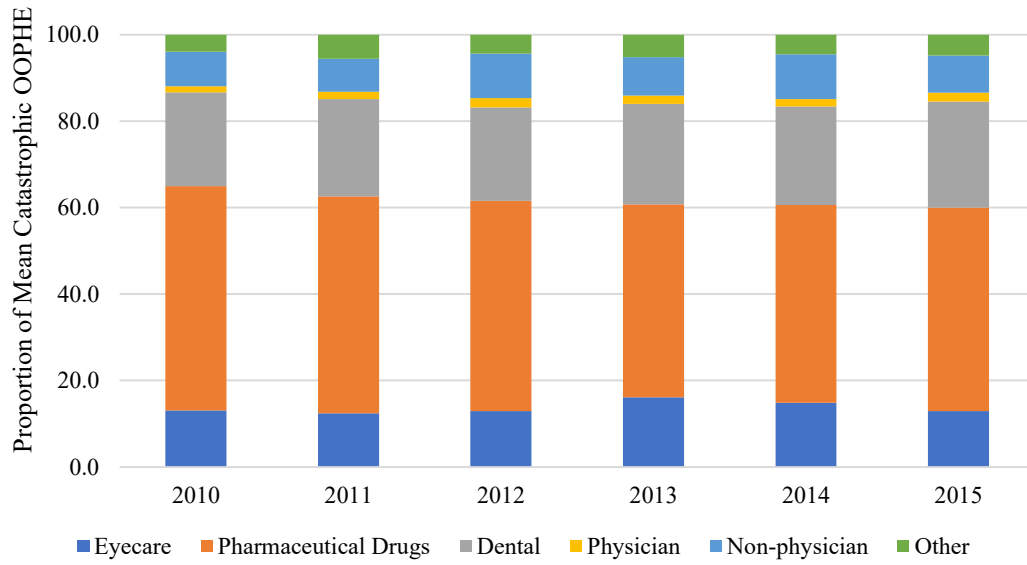
Figure 5.4. Proportion of mean equivalized catastrophic OOPHE (%) by healthcare payment type for urban households in Canada from 2010 to 2015.
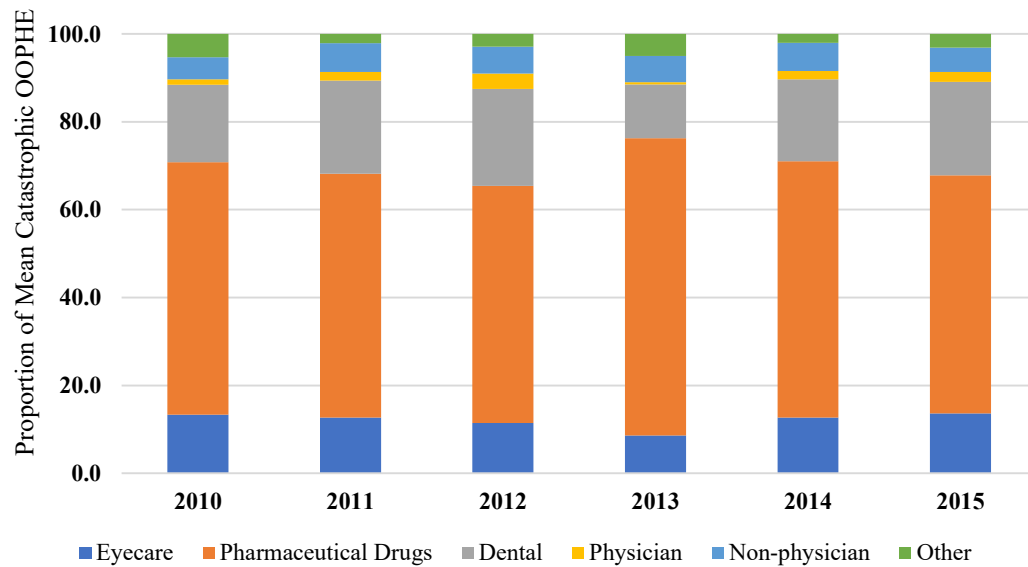

Figure 5.5. Proportion of mean equivalized catastrophic OOPHE (%) by healthcare payment type for rural households in Canada from 2010 to 2015.

5.5   Concluding Remarks

This study assessed catastrophic OOPHE (as measured by reaching the 10% of household total household current consumption) made by Canadians from 2010 to 2015. Catastrophic OOPHE were measured for Canada as whole, by province, by urban/rural residential location. The catastrophic OOPHE also decomposed by type of catastrophic OOP payments.

The results suggested that the mean OOPHE dropped slightly over the first two years before rising and leveling off over the reminder of the study period. There was no significant trend in mean OOPHE from 2010 to 2015. These findings are not generally consistent with other investigations of OOPHE in Canada, which found that OOPHE increased from 1997 to 2009 (Sanmartin et al., 2014). There were also no significant trends in mean OOPHE for any specific province over the study period. Approximately, mean OOPHE grow in the provinces as one moves from east to west across the country, with British Columbia and Alberta having the highest mean OOPHE and Newfoundland having the lowest. There were also no significant trends in mean OOPHE in urban and rural regions over the study period.

The proportion of households that incurred catastrophic OOPHE was 5-7% in Canada as whole, 5-7% for urban households, and 7-10% for rural households. The proportion of households affected by catastrophic OOPHE was higher for rural households than urban households. These findings are generally expected given the differences between urban and rural households in terms of socioeconomic and social determinants of health (Ontario Ministry of Health and Long-Term Care [OMHLTC], 2011; Romanow, 2002).

Rural households tend to have lower average household income and ultimately lower abilities to afford healthcare services not covered by public insurance (OMHLTC, 2011). Poorer health status, poorer health behaviours, and decreased utilization of healthcare services are all associated more strongly with rural households than their urban counterparts (Sibley & Weiner, 2011). These factors can lead to lower health status in rural compared to urban households, which ultimately lead to higher healthcare need in rural areas. The higher utilization of healthcare services when coupled with a reduced ability to finance these services can lead to catastrophic OOPHE.

Pharmaceutical drugs (44-63%) and dental services (15-24%) were the most prominent categories that contributed to the mean equivalized catastrophic OOPHE in Canada. Eyecare, dental, and non-physician services contributed more to the mean catastrophic OOPHE among urban households than rural households. Pharmaceutical drugs were contributed proportionately more to the mean catastrophic OOPHE in rural households (54-68%) than urban households (45-52%).

As mentioned in the methods Section, Canadian studies used thresholds of 3-10% household budget share to examine catastrophic healthcare and pharmaceutical drug payments. This study used the generally accepted threshold of 10% of the current household consumption (budget share) in the developed countries to assess the catastrophic OOPHE. Additional analyses were also conducted using thresholds of 3% and 5% of total current household consumption. These results are reported in Appendix 2. Using the 5% threshold suggest that 18-22% of Canadian households incurring catastrophic OOPHE between 2010 and 2015. When the lowers threshold of 3% was used 34-38% of Canadian households faced catastrophic OOPHE. The different thresholds

provided qualitatively the same trend results as the main threshold of 10%. In other words, neither the 3% threshold (Trend coefficient=-0.003, P-value=0.448) nor the 5% threshold (Trend coefficient=-0.005, P-value=0.118) did not highlight any significant change in the proportion of catastrophic OOPHE over the study period.

CHAPTER 6   DISCUSSION AND CONCLUSIONS

This thesis contains two cross-sectional analyses of equity in healthcare financing, with particular regard for OOPHE made by Canadians. The first empirical analysis assessed the progressivity of OOPHE by Canadian households from 2010 to 2015, while the second analysis examined mean OOPHE and proportion of households affected by catastrophic OOPHE by Canadians over the same period. This chapter discusses and concludes the results of these two empirical studies.

The results from the first empirical analysis of progressivity of OOPHE indicated that OOPHE were regressive in Canada from 2010 to 2015. In other words, more well-off Canadians pay proportionately less than their less well-off counterparts in OOP payments to finance their respective healthcare needs. Contrary to Canada's healthcare financing mandate, Canadian households do not finance healthcare through OOP payments based on their ATP. From 2010 to 2015, the regressivity increased significantly in Canada. The finding of regressivity across the study period is consistent with other investigations of similar OECD countries, which found that OOP payments tend to be regressive for jurisdictions with high-income economies (Hajizadeh et al., 2014; O'Donnell et al., 2008; Wagstaff et al., 1992, 1999). OOPHE in Canada from 2010 to 2015 (-0.118 to -0.225) were found to be more regressive than direct payments for healthcare in Australia in 2003-04 (-0.0975) and 2009-10 (-0.0535) (Hajizadeh et al., 2014). OOPHE in Canada were also more regressive than total OOP payments in Portugal in 2010-11 (-0.074) (Quintal & Lopes, 2016), but not quite as regressive as in Kenya in 2006-07 (-0.31) (Munge & Briggs, 2014). Although analyses of progressivity of healthcare financing in other OECD countries is now dated in comparison, the regressivity of OOPHE in Canada

were found to be generally similar to those levels found in Denmark, Finland, France, Netherlands, Sweden, and Switzerland (Wagstaff et al., 1999). Comparison between these findings should be taken with caution because of the differences in study dates. With consistently regressive OOPHE and significant growth in regressivity in recent years, these findings are concerning. The WHO (2000, 2010) has reported that OOPHE act as a barrier to accessing different types of healthcare. These findings suggest that care that falls outside of "medically necessary" hospital and physician services is inequitably financed by lower income Canadian households compared to more well-off households. Access to prescription drugs, dental care, and eyecare will reasonably be affected by those Canadians who cannot afford these services.

When analyzed by provinces, the results indicated that OOPHE were regressive in every province for every year of the study period. In other words, OOPHE were regressive in Canada regardless of province. Prince Edward Island, Newfoundland and Labrador, Saskatchewan, and Nova Scotia had the lowest average KPIs (and therefore highest average regressivity) for the study period, indicating the higher levels of regressivity compared to the other provinces. Conversely, Alberta, Ontario, Quebec, and British Columbia showed the highest average KPIs (and therefore lowest average regressivity) amongst the provinces. There were no statistically significant trends in the regressivity of OOPHE for all provinces over the study period. The relatively close values of regressivity across the individual provinces is an interesting finding in its own right. Provinces have full discretion to enact public policy regarding coverage of healthcare goods and services outside of those covered under Medicare (Law et al., 2013). For example, in the absence of a national pharmacare plan, a province may choose to cover a certain sub-population

for certain drugs. Daw and Morgan (2012) conducted a national review of provincial pharmacare policies and found coverage for seniors to be varied across the provinces, while several provinces enacted age-irrelevant catastrophic income-based coverage. It appears that regardless of individual discretion of enact equitable public policy or the creation of income-based coverage, OOPHE remains regressive in every province.

OOPHE were found to be regressive source of funding in Canada regardless of urban and rural residential location from 2010 to 2015. The average KPI was lower for rural regions than urban regions for the study period, indicating higher regressivity for OOPHE for rural households than urban households. Interestingly, the four provinces that had the lowest (highest) levels of regressivity were also the provinces that have the highest (lowest) urban populations proportions. It is possible that higher proportion of rural residents in these provinces could have a negative effect on the progressivity of OOPHE in these provinces because rural households tend to have poorer social determinants of health and socio-economic indicators than their urban counterparts (OMHLTC, 2011; Romanow, 2002).

Since the estimated values of KPI in the provincial and urban/rural samples did not indicate any significant changes in the progressivity of OOPHE, it may be that between-group (across the provinces and rural vs urban) variations in OOPHE contributed to the finding of an increasing trend in the regressivity of OOPHE in Canada as whole, but not in individual provinces or urban/rural regions. Taken together, the results suggest that the proportional contribution of residents of poor provinces (or rural areas) may be increasing in comparison to the more well-off provinces.

The second empirical study examined catastrophic OOPHE made by Canadians from 2010 to 2015. This study found that the mean OOPHE dropped slightly over the first two years before rising and leveling off over the reminder of the study period. There was no significant trend in mean OOPHE over the study period. These findings are not generally consistent with other investigations of OOPHE in Canada, which found that OOPHE increased from 1997 to 2009 (Sanmartin et al., 2014) and growth in private payments for healthcare was mainly driven from dental services and pharmaceutical drugs (Law et al., 2013).

Although there were no significant trends in the mean OOPHE for any specific province over the study period, the results highlighted a variation in the mean OOPHE across provinces with British Columbia and Alberta having the highest mean equivalized OOPHE and Newfoundland having the lowest. Using a threshold of 10% of current total household consumption as an indication of catastrophic healthcare spending the study suggested that 5-7% of households in Canada faced catastrophic OOPHE over the study period. There was no significant trend in the proportion of households affected by catastrophic OOPHE over the study period.

Although both urban and rural households suffer very similar levels of mean catastrophic OOPHE from 2010 to 2015, rural households were found to have a consistently higher proportion of households affected by catastrophic OOPHE than urban households. Rural Canadian households tend to have lower total household income and any OOPHE would therefore represent a higher proportion of a given rural household's disposable income (Caldbick et al., 2015; Sanmartin et al., 2014). The results also suggested a variation in the proportion of households affected by catastrophic OOPHE across provinces. The

highest proportion of households that suffered catastrophic OOPHE during the study period was 11% for British Columbia in 2013. The lowest proportion was 3% in Newfoundland in 2014.

The decomposition of mean catastrophic OOPHE were into six different categories of healthcare OOP payment showed that pharmaceutical drugs and dental services represented the largest proportion of the mean OOPHE for Canadian households compared to the other categories. The contribution of eyecare, dental, and non-physician services to the mean OOPHE were higher in urban than rural households. Conversely, the contribution of pharmaceutical drugs to the mean OOPHE were higher for rural households than urban households. These findings are also consistent with previous empirical studies that have highlighted the burden of pharmaceutical drugs and dental services to Canadian households in the form of catastrophic OOPHE (Caldbick et al., 2015; Law et al., 2013; McLeod et al., 2011). Pharmaceutical drug coverage is a major source of public scrutiny among politicians and policy makers in Canada. Prescription drugs are inconsistently covered under patchworks of public insurance coverage that, as the current study and others have shown, represent a major source of inequity of healthcare financing that disproportionately affects those Canadians from poorer households (Caldbick et al., 2015; Law et al., 2013; McLeod et al., 2011). Although different provinces have individually attempted to extend coverage to certain subpopulations within their jurisdictions (Caldbick et al., 2015; McLeod et al., 2011), catastrophic OOPHE related to pharmaceutical drugs expenses have continued to rise.

The results of this study have important implications for policymakers at the federal and provincial levels. The regressivity of OOPHE at the national and provincial levels provide

evidence in support of policy reform that enhances financial risk protection for Canadians. Since catastrophic OOPHE primarily affect low-income and rural Canadian households, policies to enhance risk protection among these specific population (e.g. the expansion of government-subsidized health insurance for non-Medicare services) are required to improve equity in healthcare financing in Canada.

The empirical studies in this thesis have certain limitations. First, both empirical chapters utilized six years of data from the SHS because the data before 2010 is not comparable to the recent available SHSs. The trend analyses findings would have been more robust if there were more comparable SHSs. Second, the Canadian territories (Yukon, Northwest Territories, and Nunavut) were excluded from the SHS 2010 to 2014, thus the two studies in this thesis do not examine progressivity and catastrophic payments of OOPHE in the territories. The results of this thesis can be expanded to the territories in the future studies as the SHS began to collect information from the Canadian territories starting from SHS 2015. Third, it is worth restating that this study focused on OOPHE only. Future, studies could be expanded to look at the equity in other healthcare funding sources such as health insurance, general tax payments and etc.

This thesis contributes one piece of evidence to a growing body of literature on healthcare equity in Canada. Since equity in healthcare financing is one part of this body of literature, this study should be combined with studies on equity in healthcare utilization for the country and individual provinces in order to provide a complete picture of equity in healthcare in Canada.

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APPENDIX 1 – The Gini Coefficients, Cs, and KPIs for OOPHE from 1998 to 2015

Survey Year	Gini Coefficients (SE)		Concentration Indices (SE)		Kakwani Progressivity Indices (SE)	
1998	0.4120	(-0.0019)	0.3250	(-0.00685)	-0.086	(-0.0129)
1999	0.4090	(-0.00157)	0.3370	(-0.00675)	-0.073	(-0.0152)
2000	0.4140	(-0.00194)	0.3110	(-0.00649)	-0.103	(-0.0111)
2001	0.4150	(-0.00193)	0.3190	(-0.00624)	-0.096	(-0.0115)
2002	0.4170	(-0.002)	0.3380	(-0.00814)	-0.079	(-0.0172)
2003	0.4210	(-0.00175)	0.3340	(-0.0066)	-0.087	(-0.0134)
2004	0.4250	(-0.00212)	0.3360	(-0.00677)	-0.089	(-0.0137)
2005	0.4210	(-0.00193)	0.3310	(-0.00676)	-0.090	(-0.0121)
2006	0.4270	(-0.00211)	0.3490	(-0.00748)	-0.078	(-0.0139)
2007	0.4190	(-0.00208)	0.3170	(-0.00668)	-0.102	(-0.0115)
2008	0.4230	(-0.00293)	0.3390	(-0.0114)	-0.084	(-0.0245)
2009	0.4200	(-0.00255)	0.3410	(-0.00861)	-0.080	(-0.0168)
2010	0.3990	(-0.00285)	0.2810	(-0.00984)	-0.118	(-0.0183)
2011	0.3880	(-0.00256)	0.2610	(-0.00933)	-0.127	(-0.0181)
2012	0.3950	(-0.00386)	0.2590	(-0.0133)	-0.136	(-0.0226)
2013	0.3960	(-0.00426)	0.2580	(-0.0191)	-0.138	(-0.0414)
2014	0.3890	(-0.004)	0.2390	(-0.0144)	-0.151	(-0.0231)
2015	0.4420	(-0.00454)	0.2170	(-0.0122)	-0.225	(-0.0237)
Trend coefficients					Coefficients	P-value
1998 to 2009					0.0001	0.905
2010 to 2015					-0.0174	0.036

Note: SE=Standard Error

APPENDIX 2 – Catastrophic OOPHE analyses for the 5% and 3% of total current household consumption thresholds

Survey Year	Proportion of Households Reaching 10% Catastrophic Threshold	Proportion of Households Reaching 5% Catastrophic Threshold	Proportion of Households Reaching 3% Catastrophic Threshold
2010	0.073	0.222	0.384
2011	0.065	0.205	0.372
2012	0.052	0.179	0.368
2013	0.063	0.198	0.359
2014	0.062	0.202	0.343
2015	0.064	0.200	0.367
Trend coefficients (P-value)	-0.001 (0.508)	-0.003 (0.448)	-0.005 (0.118)