Sensitivity of measuring the progress in financial risk protection to varied survey instruments: A case study of Ghana

Jemima Ambamaah Catherine Sumboh

SMBJEM001

Supervised by:

Associate Professor John Ataguba*

Dr. Amarech Obse*

A dissertation submitted to the University of Cape Town in partial fulfillment of the requirement for the degree of Master of Public Health (MPH) in Health Economics

March 2021

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*Health Economics Unit, School of Public Health and Family Medicine University of Cape Town, South Africa

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily attributed to the NRF

Part 0: Preamble

Declaration

I, Jemima Ambamaah Catherine Sumboh, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is submitted for another degree in this or any other university.

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Dedication

I dedicate this dissertation to my husband, Prosper Asaana, for his unwavering and unconditional support and love; to my parents (Mr and Mrs Sumboh) who are embodiments of discipline and resilience; to my siblings Ernest, Jeff, Desmond and Thomas; and to all my family and friends. Thank you for your support and words of encouragement. We made it. Indeed, God is faithful.

Acknowledgements

I would like to express my gratitude to the Almighty God who makes the impossible possible. Thank you very much for the knowledge, good health and grace.

I would like to express my gratitude to my supervisors, Associate Professor John Ataguba and Dr. Amarech Obse, for their unflinching support, guidance and direction throughout my MPH journey. I remain grateful.

I am grateful to the staff of the Health Economics Unit of the Department of Public Health and Family Medicine. Your warm reception, support and encouragement has been invaluable throughout my MPH journey. I remain indebted to you.

I would also like to extend my gratitude to the Navrongo Health Research Center, particularly to Dr. Abraham Oduro, Dr. James Akazili, Dr. Maxwell Dalaba and Dr. Isaiah Agorinya for granting access to the In-depth Household out-of-pocket Health Expenditure (IHOPE) data for my research and for the guidance and support. God bless you immensely.

I am grateful to the National Research Foundation (NRF), the Faculty of Health Sciences and the University of Cape Town for the funding assistance that enabled me to pursue this MPH program with ease.

To my course-mates, it was wonderful meeting you. Your peculiar perspectives and experiences have helped shaped my outlook on global issues.

To my family and friends, thank you for your constant support and guidance. Cheers to greater heights.

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Abstract

Valid and reliable data on household health expenditure and other household consumption expenditure are important for monitoring the progress towards Universal Health Coverage (UHC). However, the difficulty in obtaining reliable estimates of private expenditure on health often undermine the credibility of health accounts, limit the tracking of financial resources, and make international comparisons extremely difficult. This study assessed the sensitivity of estimates of out-of-pocket health payments and catastrophic health expenditure to the choice of survey instruments.

The study used a household budget survey dataset collected in Ghana, in 2017/2018 by the Navrongo Health Research Center. The health expenditure questions were disaggregated into three different levels: Versions I, II and III containing 11, 44 and 56 health expenditure items, respectively. The number of non-health items and recall periods, however, were held constant across versions. Catastrophic health expenditure was measured as out-of-pocket health expenditure that exceeded a certain fraction of household non-food expenditure, depending on the socioeconomic group. Concentration indices were also used to determine the concentration of catastrophic health expenditure.

The mean and median household out-of-pocket health expenditure per annum ranged from US$74.11 to USD$106.49, and US$13.69 to US$20.33, respectively depending on the type of survey instrument used. Also, between 7.98% and 12.68% of households incurred catastrophic out-of-pocket health payments, depending on the survey instrument used. The findings show that estimates of out-of-pocket health spending and financial catastrophe are sensitive to the level of disaggregation of out-of-pocket health spending questions in survey instruments. The concentration indices for catastrophic headcount and overshoot were all negative across all catastrophic threshold levels and data versions implying that catastrophic health payments are concentrated among poor households.

Further research is needed, preferably validation studies, to enhance the reliability and comparability of estimates of OOP health expenditure and catastrophic health expenditure.

1. Part A: Research Proposal

1.0 Introduction

Protecting households from the financial risks associated with illness has been established as a global health priority and an integral element of Universal Health Coverage (UHC), as emphasized by its inclusion in the Sustainable Development Goals (SDGs) endorsed by the United Nations (UN) in 2015; Target 3.8 (United Nations, 2015). SDG 3.8 represents an ambitious agenda to ensure people receive the needed quality health services without any form of hardship. The growing interest in financial risk protection is partly because of its distinctive position as an interface between health systems and other dimensions of well-being (Saksena et al., 2014). The absence of financial protection can have adverse impacts on equity and can increase the risk of households slipping into the medical poverty trap via imposing restrictions to access to health care, undermining health status, deepening poverty and exacerbating health and socioeconomic inequalities (Garg and Karan, 2009; Whitehead et al., 2001; Yerramilli et al., 2018). While the expansion of health services is invaluable, expanding health care without financial protection would, therefore, fail to sustain the goal of improving population health outcomes. Stated differently, protecting households from the risks of health payments is an important health system goal because of the causal relationship between the health and non-health dimensions of well-being (Saksena et al., 2014) and also because it guarantees the right to health consistent with the values and principles of the 1978 Declaration of the Alma-Ata of "Health for All" (Development, 2004).

As part of efforts to ensure that health system reforms prioritize equity and financial protection in health, the World Health Organization (WHO) has set up two targets under SDG 3.8 that member countries should attain by the year 2030 (Boerma et al., 2014; Rahman et al., 2018; World Health Organization and World Bank Group, 2014). These targets include a minimum 80% essential health services coverage to all populations, independent of demographic factors, and a 100% financial protection from out-of-pocket (OOP) payments for health services (Boerma et al., 2014; World Health Organization and World Bank Group, 2014). Many countries, across all income levels, have already enacted major legislation and health system reforms to improve coverage to needed health care services and financial protection by reducing reliance on OOP health payments (Chu et al., 2019; Knaul et al., 2006; Lu et al., 2012; Mtei et al., 2014; Nyonator et al., 2014; Tan et al., 2014). However, there are still wide gaps in financial risk protection, resulting in the surge in demand for expertise, evidence and measures of progress to incentivize global dialogue and exchange of country experience to inform policy decisions (Boerma et al., 2014; Hsu et al., 2018).

A common measure of financial risk protection is catastrophic health expenditure (Hsu et al., 2018; Wagstaff and Doorslaer, 2003; Xu et al., 2003). Catastrophic health payments is incurred when OOP health spending exceeds a pre-determined fraction of household resources, reducing the household's available resources over a period of time at the expense of other consumption goods and services (Xu et al., 2003). In 2010, about 808 million people, representing 11.7% of the world's population, incurred catastrophic OOP payments (World Health Organization & International Bank for Reconstruction and Development, 2017). This warrants the need for health systems to protect people from the financial risks of health payments.

Catastrophic health expenditure assesses the impact of OOP health payments on the affordability and equity of health systems (Heijink et al., 2011). OOP health payments are direct payments to health care providers at the point of service use. These include cost-sharing and informal payments (both in kind and in cash) but exclude third party payments (Hsu et al., 2018; OECD, 2011). The measure of OOP is important because it is the most regressive and inequitable source of funding health care amongst others sources (pre-payment, taxes etc.) in most countries (van Doorslaer et al., 2006). However, it remains the predominant source of health financing in many countries. In 2017 for instance, about 32% of total current health expenditure (CHE) globally was attributed to OOP payments. These OOP payments as a percentage of CHE ranged from less than 10% in developed countries to more than 70% in developing countries (World Health Organization, 2020). Several studies conducted in developing countries like Ghana have further documented the distribution of OOP health payments and its adverse impact on household financial well-being and poverty across households (Akazili et al., 2017a; Chuma and Maina, 2012; Heijink et al., 2011).

Ghana currently has a population of about 29.6 million people (World Bank, 2020). The health service delivery system is pluralistic including public and private health facilities, and traditional medicine (Aikins et al., 2017). In 2003, Ghana passed a mandatory National Health Insurance (NHI) Act (Act 650 of 2003) as part of efforts towards ensuring financial risk protection (Ministry of Health, 2004). The benefit package of the NHI covers about 90% of the disease burden in the country (Jehu-Appiah et al., 2011). It is financed from a 2.5% straight NHI levy on taxable supplies, a 2.5% deduction of workers' contributions to Social Security and National Insurance Trust (SSNIT) fund per month, annual premiums paid by the informal sector amongst others (National Health Insurance Scheme, 2018; 2020a). Children below the age of 18 years, adults above 70 years, indigents and pregnant women are exempted from paying premiums (Jehu-Appiah et al., 2011; Schieber et al., 2012). All subscribers can access

health services from public and accredited private health facilities (Dixon et al., 2013). Due to the large informal sector and the weak administrative capability of the NHI Authority, NHI enrolment is voluntary (Alhassan et al., 2016) and only about 12 million people are active members of the NHIS, representing about 40% of the population (National Health Insurance, 2020b). In 2017, government health expenditure as a percentage of GDP was 18%. Revenue for the health sector was sourced from OOP health payments (40% of CHE), domestic public health expenditure (33%), external sources (14%) and other private health expenditure (12%) (World Health Organization, 2017), further confirming the premise that developing countries are largely dependent on OOP spending.

1.1 Problem Statement

Reliable data on health-specific and other household expenditure are important in exploring how countries progress towards different internationally agreed development indicators, including financial protection in health, and in facilitating the assessment of the value for money of different health interventions (INDEPTH Network, 2019). However, the difficulty in obtaining reliable estimates of private expenditure on health (household OOP spending, expenditure by firms, non-profit organizations and medical insurance schemes) often undermine the credibility of health accounts, limit the tracking of financial resources and make international comparisons extremely difficult (Rannan-Eliya, 2008, 2010). The most challenging component of private expenditure for measurement is how much households spend OOP (Rannan-Eliya, 2008, 2010). In most developing countries, private expenditure accounts for more than 45% of total CHE, whereas it is less than 30% in most developed countries (World Health Organization, 2020). However, OOP spending constitutes the largest share of private expenditure and is typically the largest source of health financing in many developing countries (Rannan-Eliya, 2008, 2010; World Health Organization, 2020). The difficulty in tracking OOP payments, therefore, raises serious concerns on the effectiveness of the indicators of financial protection, given that these indicators assess the impact of OOP payments.

In 2011, a novel version of the System of Health Accounts (SHA) was introduced to reduce the dependency on unreliable and incomparable health financing statistics (World Health Organization, 2011). The SHA approach is an “integrative approach” to estimating private expenditure by triangulating and integrating different data sources (such as providing tax returns, pharmaceutical sales databases, household surveys etc.) to generate accurate estimates (Lavado et al., 2013; Rannan-Eliya, 2010). Although this is an ideal approach to estimating

OOP spending, it is highly unrealistic in developing countries. Incomplete sources and estimation methods for components of OOP spending, often linked to the inherent tendency for people to incur OOP spending without the generation of linked, reliable and comprehensive routine data, are the major limitations to the use of SHA in developing countries (Lavado et al., 2013; Rannan-Eliya and Lorenzoni, 2010). Data Analysts and policy-makers are therefore ineluctably inclined to rely solely on household surveys which were initially undertaken to compute consumer price index, living standards and household consumption but not to measure OOP health spending (Lavado et al., 2013).

Household surveys such as Living Standard Measurement Surveys (LSMS), World Health Surveys (WHS), Household Budget Surveys (HBS), and Income and Expenditure Surveys (IES), amongst others, serve as the main sources of data on household OOP health expenditure (Heijink et al., 2011; Lu et al., 2017; Raban et al., 2013; Xu et al., 2009). In Ghana, household OOP estimates are derived from routinely available data sources such as the Ghana Living Standard Surveys and the Demographic Surveillance System, and other health-specific household surveys (Ghana Statistical Service, 2019). These surveys exert undisputable importance on the health financing system because they are the primary sources of information for evaluating health interventions and policies, and for the computation of national health accounts (Lavado et al., 2013). However, most household surveys designed to collect data on OOP spending are plagued with three key setbacks; sampling errors, biases arising from non-sampling errors and inadequate annual repetition of most household surveys (Rannan-Eliya, 2008). The biases arising from non-sampling errors are the most underrated of the three (Rannan-Eliza, 2008; 2010).

A number of studies have questioned the reliability and comparability of OOP data derived from household surveys, often linked to concerns about non-sampling errors which can be introduced at any stage of the survey; design of the survey instrument, data collection or entry of data (Heijink et al., 2011; Lu et al., 2017; Neter, 1970; Saksena et al., 2014; Raban et al., 2013; Xu et al., 2009). The design of the survey instrument for instance, mostly vary across surveys in the length of the recall period, the number of disaggregated health expenditure questions and the framing of questions in the survey questionnaire (Heijink et al., 2011; Lu et al., 2017; Lavado et al., 2013; Raban et al., 2013; Saksena et al., 2014). Additionally, there are variations within the same survey across different countries and years, potentially influencing estimates of financial protection (Lu et al., 2009). A study by Xu et al. (2009), for instance, using 50 WHS and 37 other types of surveys (particularly LSMS, HBS and IES) found out that

the WHS reported higher OOP spending compared to the other surveys. Other studies have further reported the impacts of recall periods, the number of items and the framing of questions on estimates of health expenditure (Clarke et al., 2008; Deaton and Grosh, 2000; Heijink et al., 2011; Lu et al., 2009; Lu et al., 2017; Neter and Waksberg, 1964; Raban et al., 2013).

In Ghana, research studies using data from varying household's surveys reported different estimates of OOP and financial risk protection in the country (Akazili et al., 2017a; Aryeetey et al., 2016; Kusi et al., 2015b; Kwakye et al 2017; Nguyen et al., 2011). These surveys (both all-purpose and health-specific in nature) varied greatly in recall periods (ranging from 4 weeks-mostly pertaining to outpatient services to 12 months-mostly pertaining to inpatient services), and implicitly in the number of items included in the survey questionnaire and the number of disaggregated expenditure categories. Although these surveys have been used to track the country's progress towards financial protection amidst serious concerns about measurement errors introduced during the design of survey instruments (Xu et al., 2009), no research study conducted in Ghana has assessed the implications of using different survey instruments in gauging the country's progress towards financial risk protection. Specifically, no study in Ghana has assessed the sensitivity of estimates of financial catastrophe to the level of disaggregation of OOP health expenditure questions in survey instruments. This study, therefore, intends to fill that knowledge gap.

Additionally, most of the methodological approaches used in assessing catastrophe in Ghana have relied on O'Donnell et al. (2007) and Xu et al. (2003) methodologies, without accounting for the diminishing marginal utility of income of different social-economic status as argued by Ataguba, (2012). To fill in this research gap, this study applies the Ataguba, (2012) methodology of fair indices in the measurement of catastrophic health payments.

1.2 Aims and Objectives

1.2.1 Aims

The study aims to assess the sensitivity of estimates of financial catastrophe to choice of survey instruments.

1.2.2 Objectives

1. To assess the sensitivity of estimates of out-of-pocket health spending to using different survey instruments to collect out-of-pocket health care spending.
2. To assess the sensitivity of estimates of financial catastrophe to using different survey instruments to collect out-of-pocket health care spending.

1.3 Brief Literature Review

1.3.1 Conceptual Underpinning of Measures of Financial Risk Protection

The concept of financial risk protection rests on the theoretical foundation of insurance and the economic value of reduced uncertainty or financial risk of being exposed to large health care costs (Hsu et al., 2018; Saksena et al., 2014). The theories underlying the quantity demanded of health and insurance place emphasis on understanding the adverse effects of uncertainty and its economic value (Saksena et al., 2014). Uncertainty or financial risk is an important characteristic of the demand for health care services, with important consequences on the welfare of households, not just in the short term, but also in terms of perpetuating poverty and inequity (Dercon et al., 2008; Nocetti and Smith, 2010). It has a tendency to reduce people's wellbeing and can trigger an adverse change in health-seeking behaviors. For instance, the risk that the needed health care services will be unaffordable or result in income losses or even death may cause households to give up seeking health care altogether or even plunge them into debts. The objective of financial risk protection in health is, therefore, to protect households against the financial uncertainties associated with the need to use health services and to pay for them (Saksena et al., 2014).

Public policy and interventions predominantly targeting the health financing system, are pivotal in reducing these financial risks or uncertainties on household's welfare. The emphasis is on health financing because of the profound impacts of health care resources in determining whether the needed services exist, their affordability, fairness and equity in contributions to health care services (Murray et al., 2003). The World Health Report (WHR) of 2000 marked the fundamental shift and the onset of concerted efforts at global and national levels to protect households against the financial risks associated with seeking health care under the broad term of 'fair financing' (McIntyre, 2010; Papanicolas, 2013). The concept of 'fair financing' is grounded on the premise that a fair health system guarantees contributions to health care based on the ability to pay rather than the need for health care (McIntyre, 2010). The WHR 2000, fundamentally, advocated for the move away from the reliance on OOP health expenditure and to ensure that the distribution of health care payments is in line with the distribution of household income.

A popular methodology for measuring financial risk protection in health is the catastrophic health expenditure methodology. This methodology is based on two underlying assumptions.

First, health care payments should be viewed as "involuntary, unplanned and non-discretionary". Second, "household consumption level would have increased equal to the level of consumption including health expenditures in the absence of the health shock necessitating the health spending" (Wagstaff and Doorslaer, 2003). These assumptions are constantly being criticized given that health payments are not always non-discretionary in nature and health spending financed through borrowing or dissaving will possibly overstate the extent of financial catastrophe (Wagstaff, 2008; Wagstaff and Doorslaer, 2003). Additionally, given that financial catastrophe is constructed solely based on OOP health payments reported in surveys, it ignores the possibility that poorer individuals forgo health care because they cannot afford healthcare payments and therefore report low spending (Moreno-Serra et al., 2011; O'Donnell et al., 2007). To compound this, income losses associated with illness or health 'shocks' are often not considered in the assessment of financial catastrophe (O'Donnell et al., 2007). Despite the shortcomings of the financial catastrophe methodology, it is recognized as a useful tool for assessing a country's progress towards financial risk protection.

1.3.1.1 Catastrophic Health Payments

Catastrophic health payments are defined as OOP health payments in excess of a given threshold over a given period of time (Chuma and Maina, 2012; Wagstaff, 2008; Wagstaff and Doorslaer, 2003). Catastrophic health payments are not identical to high health care costs as some low-cost, high-frequency diseases can be financially catastrophic to poor households, especially in cases where insurance coverage is inadequate or non-existent (Wyszewianski, 1986; Xu et al., 2003). The "catastrophic" label mainly points to the fact that health payments can prompt sizeable and unpredictable shocks in a household's living standards, predisposing a reduction in its basic income over a period of time at the expense of other consumption goods and services (Berki, 1986; Xu et al., 2006, 2003). The concern of catastrophic health payments is with the negative impact OOP spending can have on economic well-being, for instance, when an individual or household forgoes consumption of other necessities (e.g. food) to pay for health (Hsu et al., 2018). Catastrophic health payments are identified by comparing OOP spending to some definition of household resources and whether these exceed a predetermined threshold (Hsu et al., 2018). The selection of the threshold is arbitrary. However, the most commonly used thresholds are the 10% of total expenditure and 40% of non-food expenditure, often cited as representing the points at which OOP payments endanger the sustainability of a household's living standard (Akazili et al., 2017a).

There are two popular approaches used to define catastrophic payments (Wagstaff, 2008). The first approach defines OOP spending as catastrophic if it exceeds a pre-determined fraction of pre-payment income (O'Donnell et al., 2007; Wagstaff, 2008; Wagstaff and Doorslaer, 2003). This is also known as the budget share approach where pre-payment income is defined in relation to a household's total budget without distinguishing spending on necessitates (Hsu et al., 2018; O'Donnell et al., 2007; Wagstaff and Doorslaer, 2003). The potential problem with this approach is that the budget share may be low for poor households whose resources are mostly absorbed by spending on necessities. Households that cannot afford direct health spending are, therefore, ignored (O'Donnell et al., 2007). A partial solution to this is the second approach which defines the threshold in terms of pre-payment income less spending on food and other necessities (O'Donnell et al., 2007; Wagstaff and Doorslaer, 2003; Xu et al., 2003). The income remaining after the deduction for basic necessities is known as a household's capacity to pay (Wagstaff, 2008; Wagstaff and Doorslaer, 2003; Xu et al., 2003). In recent times, Ataguba, 2012 has suggested the need to consider the diminishing marginal utility of income of different socio-economic status when determining catastrophic health payment by including a vertical equity principle in the measurement of catastrophic health payments.

A recent study found out that only 112 countries worldwide have household surveys that would permit the computation of the indicators of financial protection in health (Saksena et al., 2014). However, empirical evidence on OOP spending and financial catastrophe using data from different household surveys varied across countries and even within the same country. For instance, two nationally representative surveys conducted in the Philippines in 2003 reported widely different estimates of OOP health expenditure (1.3% and 7.7%) making one curious about the most accurate reflection of reality (Lavado et al., 2013). Another study conducted in Rwanda showed that a survey design had a significant effect on measuring the level and trend of catastrophe, and the presence of differential item functioning in estimating financial catastrophe (Lu et al., 2017). A similar study conducted in India showed that health surveys with fewer questions generated a higher level of financial catastrophe than consumption surveys with more questions (Raban et al., 2013). Additionally, Xu et al., 2003 noted that variations in the recall periods across countries in a cross-country analysis can complicate the interpretation of the estimates of financial catastrophe. Countries such as Uganda, Kenya, USA and Ghana have measured financial catastrophe using different survey instruments (Akazili et al., 2017a; Aryeetey et al., 2016; Chuma and Maina, 2012; Waters et al., 2004; Xu et al., 2006). However, no study in these countries has assessed the sensitivity of estimates of financial risk

protection to different survey instruments. Additionally, all the studies conducted in Ghana relied on the traditional measures of catastrophe without considering the diminishing marginal utility of income of different socio-economic groups (Akazili et al., 2017a; Aryeetey et al., 2016; Kusi et al., 2015b).

1.3.2 Summary of Literature Review

A review of the literature confirms that in computing the catastrophic health expenditure, two variables are key; total household OOP payments and a measure of household resources either in the form of income, expenditure or consumption (O'Donnell et al., 2007). Household surveys, either periodic or longitudinal that contain information on household consumption or expenditure, including health-specific expenditure, can help meet the information or data requirements of this methodology. The review also shows that data from various household surveys with different OOP measuring instruments are used to track the progress towards achieving financial risk protection. However, despite the vast pool of survey data with possible biases arising from non-sampling errors, very few studies have explored the sensitivity of measuring the progress in financial risk protection to survey instruments. In addition, there has been methodological advancement in the indicators used to measure financial risk protection to account for equity in health financing. For instance, the Ataguba (2012) unlike other traditional methodologies such as Xu et al. (2003) and Wagstaff and van Doorslaer, (2003), it accounts for diminishing marginal utility of income of different socio-economic groups and thus a better reflection of vertical equity in the measures of financial catastrophe. However, this methodology has not been widely explored and used. It is worth noting that providing reliable evidence on methodological approaches to measuring financial risk protection is essential in standardizing survey instruments and indicators of financial protection that provide reliable estimates of financial risk protection. Given this backdrop, this study intends to fill the gaps in the literature by specifically;

- Examining the sensitivity of measuring the progress in financial catastrophe to the level of disaggregation of OOP spending questions in survey instruments. Very few studies in developing countries have explored the reliability and variability of data from varying survey instruments in gauging financial protection. No study in Ghana has done this analysis.

- Applying a threshold level that varies with income in the measurement of financial catastrophe. Threshold levels are a function of income distribution to account for the diminishing marginal utility of income fully. It is an improvement in the commonly used methodologies.

1.4 Methodology and Analysis

1.4.1 Data Source

This study will use secondary data from the 'In-depth Household Out-of-pocket Health Expenditure' (IHOPE) research study, particularly the household budget survey (HBS) conducted by the Navrongo Health Research Center (NHRC) from May 2017 to December 2018. The study population included all people dwelling in the Kassena-Nankana District of Northern Ghana and has an estimated population of 160,000. The basic inclusion criteria were participants should have lived in the study site for at least one year and should be a permanent and primary member of a household. Participants who did not incur any OOP payments were excluded from this study.

1.4.1.1 Brief Description of the IHOPE Household Budget Survey

To improve the measurement of OOP payments in HBS, the IHOPE study verified how detailed the number of questions on health expenditure could be to be included in household expenditure, income or budget surveys to obtain accurate and reliable estimates of OOP payments. Specifically, the HBS, a non-health focused survey, included complete modules or questions on health care utilization and expenditure at different levels of disaggregation deduced from the revised UN statistical classification of individual consumption according to purpose COICOP-2018 (United Nations, 2018) and introduced into the current version of the Ghana Living Standard Survey VI (GLSS6) - which uses the old COICOP version. The revised COICOP classification was decomposed into three different levels of disaggregation of health expenditure modules, Version I, Version II and Version III. The version I, II and III contained 11, 44 and 56 health items, respectively. Households were randomized into these three versions i.e. different households received different versions. The number of non-health items and the recall periods, however, were held constant across versions. The recall and the diary approaches were used in the measurement of expenditure. However, the incompleteness and missing data on diaries resulted in its exclusion in the final data set. The characteristics and differences in versions are further depicted in Appendix 1.

The survey employed a cross-sectional survey design and used a three-stage stratified random sampling approach to identify households. In the first stage, households were stratified based on the four enumeration areas demarcated by the Ghana Statistical Service. Households were then divided into clusters based on sub-zones. Then, households were randomly selected for each version. The sampling frame was based on the Navrongo Demographic Surveillance System (NDSS) that is operated by the NHRC and the sample size was 1101 households for each version. The data collection instrument was a structured pre-tested questionnaire, developed based on the literature review and the Ghana national household and health survey. The questions centered on detailed consumption and health expenditure and socio-demographic characteristics. Data were collected face-to-face at the household level using a tablet. Health expenditure and utilization data were collected from each individual of the household including multiple visits to a health facility, subject to the defined recall periods.

1.4.2 Data Analysis

Data analysis will be conducted using Stata 15. The Ataguba, (2012) methodology of fair indices for measuring catastrophic health payments will be employed in measuring financial risk protection across these three versions i.e. the three data sets. A detailed description of this methodology is provided below.

Given that households were randomized into the three different versions, it is important to examine the possibility that any differences in estimates of catastrophic health expenditure are attributed to the survey instrument. The mean and confidence interval will be estimated for the age of the study participants, household size, household income and household OOP spending. Additionally, an unpaired t-test will be performed to explore the likely role of chance in explaining the differences in these parameters across the three difference versions.

The description of the variables to be used for the analysis is depicted in Appendix 3. Data analysis will be conducted at the household level.

1.4.2.1 Measure of Living Standard

Total household non-food expenditure will be used to measure a households capacity to pay. A household's capacity to pay is defined as effective income remaining after basic food needs have been met (Xu et al., 2003). Often, household consumption expenditure is the preferred measure for living standard when compared to income in this context based on underlying

theoretical and practical justifications. Theoretically, consumption expenditure is more stable over time as compared to income since households can either borrow or save in periods of income fluctuations. Practically, it is very difficult obtaining accurate income data mainly due to under-reporting of income as compared to consumption data in settings with a large informal sector. Consumption expenditure is less prone to measurement errors as compared to income (Deaton and Zaidi, 1999). Despite these advantages over income, consumption expenditures may overstate the living standards of a household due to borrowing and sale of assets. Additionally, the differences in prices across times and areas necessitate complex calculations and assumptions in adjusting for home-produced goods, and housing and consumer durables (Howe et al., 2009). Notwithstanding these shortcomings, in LMIC settings, consumption expenditure is more appropriate in measuring living standards than income given the large informal sector (Deaton and Zaidi, 1999). The aggregate non-food consumption variable will be used to measure a household's capacity to pay.

1.4.2.2 Out of Pocket Health Payments

In this study, OOP health payments are defined as direct health care payments made at the point of service use, excluding prepayment for health services either in the form of taxes or insurance premiums or contributions and where applicable, health insurance reimbursements (Organisation mondiale de la santé and Groupe de la Banque mondiale, 2015; World Health Organization, 2010). OOP health payments include payments for consultations, medical or investigative procedures, medicines and other supplies, and for laboratory tests (World Health Organization, 2010). This variable captures all preventive, curative, rehabilitative and palliative health care payments for either inpatient or outpatient health services.

To ensure consistency, the sampling design and household consumption and health expenditure estimates will be adjusted based on appropriate survey weights. The data on household expenditure will be annualized across the three data sets.

1.4.2.3 Measuring the Catastrophic Effects of Out-of-Pocket Health Payments

The generalised methodology proposed by Ataguba (2012) was used in estimating catastrophic health payments. Per this methodology, OOP health payments are defined as catastrophic if they exceed a predetermined threshold, z% of their household income, but with z% increasing with income. Thus, z is a rank dependent threshold such that financial catastrophe is a function of where the individual or household sits in the income distribution range (Ataguba, 2012). The

rank-dependent threshold is defined using an inequality aversion parameter (y). When the value of y decreases, the weight on those at the upper end of the income distribution increases. Thus low-income households face a lower threshold level than high income households. When the value of y=1, households across the entire income distribution face the same threshold, consistent with traditional methodologies (for e.g. Wagstaff and van Doorslaer, 2003; Xu et al., 2003) used in assessing financial catastrophic. The Ataguba (2012) generalised methodology is grounded on the premise that measures of catastrophic health payments should incorporate a vertical equity principle in health finance and thus the thresholds used should be a function of the income distribution because, small OOP health payments can be more devastating to poorer households as compared to richer households (Wagstaff and van Doorslaer, 2003). Using a fixed threshold level as argued by Ataguba (2012) does not provide an adequate quantification of the incidence of financial catastrophe between poor and non-poor households.

If z_{cat} is the initial (fixed) threshold level of household non-food expenditure, then the rank-dependent threshold is computed as:

$z'_{cat} = \omega(p;y) \times z_{cat}$ .....eq (1)

where $z'_{cat}$is the rank dependent threshold, y is the inequality aversion parameter, p is the percentile or rank in which as household is located, and $\omega(p;y) = y(1-p)^{y-1}$ for y Ɛ (0,1]. Based on the recommendation of Ataguba (2012), this study uses y=0.8 and the initial thresholds of 25, 30, 35 and 40 percent of total household non-food expenditure. This study only considered infrequent non-food consumption expenditure since the dataset does not have complete information on food expenditure, limiting the computation of financial catastrophe using the total household expenditure approach. A detailed description of this methodology is provided elsewhere (Ataguba, 2012).

This paper implements the three indices for financial catastrophe using the rank-dependent thresholds. These include the rank-dependent catastrophic headcount, payment gap and mean positive gap. These indices are computed as follows:

Let O_i' represent the rank-dependent catastrophic overshoot such that $O_i' = \max(0, (T_i/R) - z_{cat})$. In this case, R is defined as the household income measured in terms of non-food expenditure and T_i as the household total OOP health spending. Then The rank-dependent overshoot

measures the aggregate or average amount by which OOP health payments exceed the threshold (z'_{cat}). $E_i' = 1(O_i' > 0)$ is defined as a measure which indicates whether a household exceeds a rank-dependent threshold, then $E_i' = 1$ when $O_i' > 0$ and zero when otherwise. Thus, the rank-dependent catastrophic headcount is computed as:

$H'_{cat} = N^{-1} (\sum_{i=1}^{N} E_i') = \mu'_{E'}$ ..... eq (2)

where $\mu'_{E'}$ is the mean of E_i', and N is the total sample size. The rank dependent catastrophic headcount is a measure of the proportion of households that make catastrophic health payments.

The rank-dependent catastrophic gap (G'_{cat}) which measures the deviation from the catastrophic thresholds where $E_i=1$ is computed as

$G'_{cat} = N^{-1} (\sum_{i=1}^{N} O_i') = \mu'_{O'}$ ..... eq (3)

where $\mu'_{O'}$ is the mean of O_i', and N is the sample size.

The mean positive rank-dependent catastrophic gap (PG'_{cat}) measures the extent to which catastrophic health payments are substantial amongst those incurring them (i.e. excluding the zeros-households who do not incur health payments above the established threshold). The positive rank dependent gap index (PG'_{cat}) is computed.

$PG'_{cat} = \frac{\sum_{i=1}^{n} O_i'}{\sum_{i=1}^{n} E_i'} = \mu'_{O'} / \mu'_{E'}$ ..... eq (4)

1.4.2.3 Measuring the concentration indices for catastrophic headcount and payment gap

The concentration index is computed to measure the extent of economic inequality in the distribution of catastrophic health expenditure. The concentration Index is measured as twice the area between the concentration curve and the line of equality (Wagstaff and van Doorslaer, 2003). A positive concentration index indicates a higher concentration of financial catastrophe among richer households whereas a negative concentration index indicates a higher concentration of financial catastrophe among poorer households. A concentration index with a

zero value indicates the absence of inequality (Wagstaff and van Doorslaer, 2003). The concentration index was computed as:

$$C = \frac{2}{\mu}\text{cov}\,(f_i, H_i) \quad \text{..... eq (5)}$$

Where C is the concentration index, f_i is the catastrophic health expenditure indicator, μ is the mean of the catastrophic health expenditure indicator and H_i is the fractional rank of individuals in the distribution of income

1.5 Research Ethics

This study will use secondary household survey data which do not contain any identifying information and is completely devoid of links to households. As such, it can be considered as a minimal ethical risk study. However, written approval will be obtained from the research team for the use of the data given that the data is strictly available to only the IHOPE research team. The research analysis shall be conducted with full compliance of the research ethics of the primary study and the data shall be kept from unauthorized access via encrypting data files. Additionally, ethical approval will be obtained from the Human Research Ethics Committee of the University of Cape Town and the Institutional Review Board of the NHRC.

1.6 Dissemination

The findings of the study would be disseminated through two main publications. These include a journal article and a policy brief. The journal article will be submitted to an appropriate peer-review journal. Additionally, the study findings would be presented at appropriate conferences and annual health review meeting

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2. Part B: Literature Review

2.0 Introduction

This chapter presents a detailed rapid review of the literature on financial risk protection in health. Specifically, it identifies and discusses the theoretical foundations of financial risk protection in health. It also introduces and discusses the methodological approaches employed in measuring financial risk protection and the theoretical debates underlying these methodological approaches. Finally, it reviews the assessment of catastrophic health expenditure as well as methodological issues germane to measuring catastrophic health expenditure with varied survey instruments.

A rapid literature review was undertaken to ensure all key relevant studies were included in the analysis. A comprehensive search on PubMed, ProQuest, Google Scholar, EBSCOhost, and Jstor were used to identify published studies and grey literature relevant to this thesis. Catastrophic health expenditure (CHE), OOP health payments, impoverishment due to OOP, survey instruments used to measure OOP and CHE, and other related synonyms were employed as keywords in the search parameters.

2.1 Theoretical and Methodological Review

2.1.1 Financial Risk Protection

Financial risk protection is defined as the protection of the wellbeing of individuals or households from financial burden and risk in accessing health care (Saksena et al., 2014; Wagstaff, 2008). These risks are often related to the uncertainties in timing of illness and the associated cost implications to households (Moreno-Serra et al., 2013). Typically, ill-health prompts an increase in household medical expenditure and reduces the total amount of time available to engage in economic activities. In an attempt to adjust to these changes, households may reduce their consumption of non-medical goods and services, and may even experience significant welfare losses (World Health Organization, 2009). The notion that health payments impose huge risks and are potential pathways to poverty are well established in theory and empirical evidence (Aregbeshola and Khan, 2018a; Goudge et al., 2009; Grossman, 1972; Knaul et al., 2011; Wagstaff, 1986; Zeckhauser, 1970). The Wagstaff-Grossman model of healthcare demand and the Zeckhauster theory of health insurance, for instance, both posit that the opportunity cost of paying for health care is the non-medical consumption foregone (Grossman, 1972; Wagstaff, 1986; Zeckhauser, 1970). Unfortunately, this is the plight of underprivileged households with unstable incomes, who spend a greater proportion of their income on necessities, yet experience the highest disease burden (McIntyre et al., 2006a; Russell, 2004; Wagstaff, 2002; Whitehead et al., 2001).

Furthermore, aside foregoing non-medical consumption, households may liquidate their savings and assets or resort to borrowing as coping mechanisms to meet the demands of health care (Leive and Xu, 2008; McIntyre et al., 2006a). However, these coping mechanisms are mostly insufficient in shielding non-medical consumption, specifically health care costs associated with inpatient health services (Gertler and Gruber, 2002; Leive and Xu, 2008). Rather, they trigger investment shocks and increase the vulnerability of households to adverse outcomes and poverty (Flores et al., 2008; McIntyre et al., 2006a; Novignon et al., 2012; Somi et al., 2009). Indeed, the possibility of households slipping into the medical poverty trap[1] is further heightened when ill-health necessitates the loss of income. This argument above strengthens the assumption that poverty and ill-health are intertwined and mutually reinforcing (McIntyre et al., 2006a; Narayan et al., 2000; Wagstaff, 2002).

Amongst other things, the complex association between health payments and poverty has exhorted academic debates on how "risks" should be defined within the context of financial protection. This is because there are three key costs of ill-health that have been recognised and discussed extensively in the literature. These costs, partly discussed above, constitute the basis for the lack of consensus among economists on the definition and measurement of "risks". These costs include (i) an increase in out-of-pocket (OOP) health payments and a decline in non-medical consumption, (ii) income losses due to reduced labour supply and productivity and (iii) health care foregone (Gertler and Gruber, 2002; Leive and Xu, 2008; Moreno-Serra et al., 2011; O'Donnell, 2019; Wagstaff, 2005).

While some argue that financial protection concerns shielding non-medical consumption from the cost of paying for health care (O'Donnell, 2019; Wagstaff, 2008), others suggest that financial protection should safeguard individuals or households from all of these costs (Moreno-Serra et al., 2013, 2011; Saksena et al., 2014). The latter viewpoint is premised on the prospect of financial barriers serving as deterrents to the use of health care and further exacerbating existing socio-economic inequalities; and income losses triggering the economic vulnerability of households to poverty.

Conceptually, solely focusing on medical expenses and their impacts on non-medical consumption provides a partial reflection of the risks of ill-health on household wellbeing. Indeed, several studies on the economic burden of diseases provide a detailed depiction of the

[1] The medical poverty trap is defined as the descent of households into poverty or deeper into poverty due to the effects of health care payments in increasing morbidities, reducing access to care and loss of income (Whitehead et al., 2001).

likely financial risks of ill-health (Akweongo et al., 2013; Bloom et al., 2012; Russell, 2004). However, this viewpoint has been strongly opposed on grounds that "healthcare foregone is a health risk and not a financial risk" and protection against income losses does not fall within the jurisdiction of the health financing system (Moreno-Serra et al., 2011; O'Donnell, 2019; Wagstaff, 2008).

While acknowledging the close interdependency between the financial and health implications of health needs, financial protection is predominantly focused on how the burden of health financing is distributed across individuals. This is largely in response to concerns over the equity and efficiency impacts of OOP health payments and their resultant effects on non-medical consumption (Moreno-Serra et al., 2013; O'Donnell, 2019; Waters et al., 2004).

There are numerous interventions to protect households from the burden of health payments (Ataguba and Goudge, 2012; Mathauer et al., 2019; O'Donnell, 2019; Schieber et al., 2006). These interventions are centred on reducing the reliance on direct health payments via risk pooling[2] and prepayment arrangements[3] (World Health Organization, 2010). Risk pooling and prepayment arrangements originate from three core principles underlying the theory of the demand for health insurance. These core principles revolve around shielding individuals against harm to health, strengthening collective risk management and mitigating financial vulnerability induced by health payments (Hoffman, 2011). These principles are justified on the ethical premise that they control OOP health payments by spreading the payment risks (Cutler and Zeckhauser, 2000).

2.1.2 Methodological Approaches to Measuring Financial Risk Protection

The dominant theoretical issues and debates in the measurement of financial protection emerged after the publication of the World Health Report (WHR) 2000 (World Health Organization, 2000). Indeed, the conceptualization of "risk" in the context of financial protection can be traced to the ideologies and views expressed in the report. The report argued that improving 'fair financing' is a way to guarantee financial protection and equitable health financing. As advanced by Wagstaff (2001), the notion of 'fair financing is centred on preventing the disproportionate burden of health payments on disposable income. A health

[2] Risk pooling is concerned with sharing the risks linked with the need to use and pay for health services across groups of people such that the healthy subsidize the sick due to assumed lower health risks and the young subsidize the old (World Health Organization, 2010). Thus, the risk of ill-health and incurring medical expenses is shared among individuals in the pool (McIntyre, 2007).

[3] Prepayment simply refers to a mechanism that allow people make financial contributions to health before they are sick so they can be drawn on when sick (World Health Organization, 2010; Xu et al., 2003).

system is therefore deemed fair when health payments are made based on ability-to-pay (ATP) rather than the risk of illness (World Health Organization, 2000).

To assess the financial risks of health payments, the WHR 2000 report introduced a fairness of financial contribution (FFC) index based on the ATP principle. However, linking ATP to health payments can be conceived and interpreted differently. The FFC index was therefore criticized for its inability to distinguish between horizontal inequity[4] and progressiveness[5] or regressiveness[6] of health payments (Wagstaff, 2001). Ataguba (2018) expounded this view, arguing that ATP should be valued based on a progressive principle since regressive methods of payments are inequitable and unfair. Moreover, the FFC index does not capture the redistribution of resources prompted by health payments (Almeida et al., 2001; Sen, 2003). The FFC index was viewed as incapable of measuring fairness in health financing and its shortcomings subsequently prompted the development of other methodologies.

The two most popular methodologies for measuring financial protection are the catastrophic and impoverishment methodologies (O'Donnell et al., 2007; Wagstaff, 2008; Wagstaff and van Doorslaer, 2003; Xu et al., 2007). These methodologies are based on two core assumptions. The first assumption states that health payments should be viewed as "involuntary, unplanned and non-discretionary". The second assumption on the other hand holds the view that "households financed health payments entirely out of its current non-medical consumption" (Wagstaff, 2008; Wagstaff and van Doorslaer, 2003). These assumptions are constantly criticized on grounds that health payments are not always non-discretionary and health payments financed via coping mechanisms may overstate the extent of catastrophe and impoverishment (Wagstaff, 2008; Wagstaff and van Doorslaer, 2003).

Furthermore, a number of authors have argued that the conceptualization of financial risk protection is narrow, with methodologies that do not capture specific critical costs that can potentially disrupt household welfare such as health care foregone and income losses (Moreno-Serra et al., 2011; O'Donnell et al., 2007; Wagstaff, 2008). The theoretical premise for delinking these costs from financial risk protection was elucidated above. However, one would

[4] Horizontal inequity occurs when individuals/households with similar ATP spend different proportions of the ATP on health (Wagstaff, 2001)

[5] Health payments are deemed progressive when the rich contribute a relatively higher proportion of their ATP in funding health services relative to the poor (Ataguba et al., 2018).

[6] Health payments are considered regressive when the poor contribute a relatively higher proportion of the ATP in funding health services relative to the rich (Ataguba et al., 2018).

agree that the extent by which medical expenses plunges households into a trajectory of welfare losses or poverty depends on these costs.

2.1.2.1 Catastrophic Health Payments

Catastrophic health payments are health payments that exceed a pre-specified fraction of household resources (Kawabata et al., 2002; Wagstaff and van Doorslaer, 2003; Xu et al., 2003). While the catastrophic label may be misunderstood to be an indicator of excessive health costs, this however could not be further from the truth. Catastrophic health payments in reality represents the extent to which exposure to unexpected health payments can drain an excessive proportion of household income (Kawabata et al., 2002; Wagstaff and van Doorslaer, 2003; Xu et al., 2003).

Comparing health payments and household income is important because it enables a better understanding of households' exposure to risks related to health payments. This understanding can be attained via the ethical concepts of equity and efficiency. The notion of equity aligns with Rawls' egalitarian concept which posits that the burden of health payments should not disproportionately fall on those with limited resources. Wagstaff and van Doorslaer (2003) further this notion by emphatically stating that it is "unfair for any household to incur health payments that exhaust an excessively large share of its resources". The concept of efficiency on the other hand is centred on maximising welfare gains either via non-health consumption or investment. The idea behind the concept of efficient is that if health payments constitute a large proportion of household income, it will possibly disrupt non-medical consumption and investments and lead to welfare losses (Moreno-Serra et al., 2013; O'Donnell, 2019).

Calculating catastrophic health payments is however not straightforward because the conceptual basis and manner of calculation varies considerably. There is in fact numerous conceptual and methodological debates among health economists on the calculation of catastrophic health payments and whether these calculations indeed capture household's exposure to health payment risks. Hence, catastrophic health payments are calculated using different threshold levels and measures of living standard. For instance, the budget share approach defines health payments as catastrophic if they exceed a pre-determined proportion of household resources without distinguishing spending on necessities (Wagstaff and van Doorslaer, 2003). The possible challenge with defining household resources in this manner is that the budget share may be low for poor households who spend a greater proportion of their resources on necessities (O'Donnell et al., 2007). Cylus et al., 2018 expounded this perspective

by arguing that the budget share approach may underestimate the financial hardship among the poor, especially at higher threshold levels (Cylus et al., 2018).

Defining household resources in respect to household's ATP[7] is a possible solution to the limitation of the budget share approach. The idea behind the ATP concept is that resources spent on necessities should not be considered as part of resources available for health (Hsu et al., 2018). Computing a households necessities can either be based on actual household spending on necessities or normative judgement (O'Donnell et al., 2007; Thomson et al., 2016; Xu et al., 2003). However, quantifying households necessities based on normative judgements has been criticised by some authors (for example Hsu et al., 2018; Pal, 2012; Thomson et al., 2016; Wagstaff and Eozenou, 2014) on grounds that such a quantification can result in poorer households being assumed to have a higher ATP than richer households, subsequently resulting in the overestimating of financial hardship among the rich relative to the poor. Moreover, whether or not cost of housing and utilities should be considered as necessities remains a subjective issue (Thomson et al., 2016).

Since measuring catastrophe involves a comparison between health payments and households living standards, it is important to define living standards. However, defining living standards requires a decision among three sets of measures: consumption expenditure, income, and assets. The most used measures are consumption expenditure and income. Consumption expenditure and income are however conceptually and practically different because unlike income, consumption expenditure is less prone to measurement errors. Determining between consumption expenditure or income as the accurate instrument for measuring household living standards also depends on the coping mechanisms adopted after a health shock (O'Donnell et al., 2007; Wagstaff, 2019). However, the coping mechanisms adopted are not accounted for in the traditional measures of catastrophe (Flores et al., 2008). For instance, consumption expenditure may overstate a household's living standard due to borrowing and selling. However, it might understate living standards due to saving (O'Donnell et al., 2007). The coping mechanism-adjusted catastrophic payment measure proposed by Flores et al., 2008, is better suited to capture the total disruption of current consumption as compared to the previously mentioned approaches (Flores et al., 2008; Wagstaff, 2019). However, Flores methodology has not been extensively explored or applied in health economics research. An asset-based measure is an alternative to income and consumption expenditure. Often, a

[7] Ability-to-pay is defined as income/resources remaining after basic spending on food and other necessities have been deducted (Wagstaff and van Doorslaer, 2003; Xu et al., 2003).

principal component analysis is applied to asset data to generate a single indicator for socio-economic status. However, it is hardly adopted in the measure of financial catastrophe due to inherent and contextual shortcomings (Howe et al., 2008; Poirier et al., 2020).

As previously mentioned, threshold levels are used to calculate financial catastrophe. These threshold levels reflect critical points at which health payments disrupt non-medical consumption. However, the selection of the threshold defined is arbitrary (Akazili et al., 2017b; Ataguba, 2012). Wagstaff and van Doorslaer (2003), for instance, defined health payments as catastrophic when they exceed 25% of the total household expenditure. Alternatively, the World Health Organization (WHO) proposes a threshold level of 40% of household's capacity to pay[8] (Xu et al., 2003). Different threshold levels have been used extensively in the health economics literature which can prompt diverse conclusions about the extent of financial catastrophe.

In general, the financial catastrophe methodology summarizes the incidence and intensity of hardship caused by health payments (Wagstaff and van Doorslaer, 2003). Wagstaff and van Doorslaer, (2003), further proposed the use of a concentration index[9] to determine how the proportion of those exceeding the threshold vary across socio-economic status. However, using a uniform threshold across households with different socio-economic status to measure financial catastrophe and therein applying the concentration index may underestimate the severity of catastrophic payments amongst poorer households. Other researchers have argued that the threshold levels used for analysing financial catastrophe medical should vary depending on socio-economic status (Ataguba, 2012; Onoka et al., 2011). Ataguba, 2012 and Onoka et al., 2011 both argue that indices of catastrophic health expenditure should account for diminishing marginal utility of income and vertical equity. However, although these approaches have awakened debates on introducing fair indices in the measures of catastrophic health payments, these methodologies still rely on arbitrary thresholds.

Despite several unresolved conceptual and practical issues surrounding the catastrophic methodology, this methodology is widely used. Even the United Nation employed the catastrophic methodology as an indicator in its Sustainable Development Goals (SDGs) (World Health Organization and World Bank, 2015). This is because the analysis produced by this

[8] Capacity to pay is defined as total household expenditure net the food expenditure of a sampled population (Xu et al., 2003).

[9] Concentration Index is a measure of inequality in one variable over the distribution of another (mostly defined in respect to socio-economic status) (O'Donnell et al., 2016).

measure is relevant and "has been effective in drawing attention to the strain that utilization of health care can place on household finances" (O'Donnell, 2019).

2.1.2.2 Impoverishment due to Out-of-Pocket Health Payments

A household is considered impoverished due to health payments when household living standards fall below the poverty line or further below (for already poor households) after health payments (Wagstaff, 2008). As argued by Wagstaff and van Doorslaer, 2003 "no one ought to be pushed into poverty or deeper into poverty due to health payments" (Wagstaff and van Doorslaer, 2003). This ethical position is the origin of the impoverishment methodology. Thus, the impoverishment methodology provides a basic understanding of the effect of health payments on poverty, a key element the catastrophic methodology is blinded to (Wagstaff, 2008; Wagstaff and van Doorslaer, 2003).

In computing impoverishment due to health payments, three criteria must be defined; a welfare indicator, a poverty line and a poverty measure (Foster et al., 1984; Ravallion, 1998; Saksena et al., 2014). In regards to defining a welfare indicator, poverty is frequently conceptualized using income-based or consumption-based measures (Wratten, 1995). Income and consumption-based measures are used as indicators of the absence of goods and services that can be financially purchased (Saksena et al., 2014). Analogous to the catastrophic methodology, such indicators of welfare have been argued to be imperfect (O'Donnell et al., 2007; Wagstaff, 2008). For instance, Arsenijeric et al., 2013, contend that a discrepancy exists when income and consumption measures are used to define health payments-induced poverty, with consumption poverty rate relatively lower than the income poverty rate. This discrepancy was partly attributed to the impact of the coping mechanisms adopted (Arsenijevic et al., 2013).

If households are able to mobilize additional resources to smoothing non-medical consumption when faced with a health shock, then one of the basic assumptions underlying the impoverishment methodology breakdowns- health payments are paid entirely by sacrificing consumption of other goods (Berma et al., 2010; O'Donnell, 2019; van Doorslaer et al., 2006). Thus, in computing impoverishment due to health payments, ignoring other possible funding sources to meet health care costs can potentially overestimate or underestimate the impoverishing effects of health payments (Flores et al., 2008; Goudge et al., 2009; van Doorslaer et al., 2006).

In defining a poverty line, subjective choices may be involved because poverty lines can either be absolute or relative (Ravallion, 1998). Absolute poverty lines represent levels of income below which individuals are unable to meet basic subsistence. Conversely, relative poverty lines are computed as a proportion of mean or median income required to satisfy basic subsistence (O'Donnell et al., 2007; Ravallion, 1998). The strengths and weaknesses of the relative and absolute poverty lines have been extensively documented in the literature (Ravallion, 1998; Saksena et al., 2014). The frequently used poverty lines are the US$ 1.90 per person per day (adjusted to represent purchasing power parity in relation to the 2011 consumer prices across countries) developed by the World Bank (Ferreira and Sanchez-Paramo, 2017) and other country-specific poverty lines. (Arndt and Simler, 2010; Gentilini and Sumner, 2012) have documented how country specific poverty lines are calculated as well as their advantages. For international comparisons however, it is necessary to have a unique poverty line, preferably, the World Bank poverty line (Saksena et al., 2014).

Researchers have over the years developed several methods to promote the successful measurement of impoverishment (Blackorby and Donaldson, 1980; Foster et al., 1984; Kakwani, 1980). However, the most frequently used poverty measure is the Foster-Greer-Thorbecke (FGT) measure (Foster et al., 1984). Due to its decomposability property as well as its propensity to satisfy favourable axioms, FGT has been documented as one of the best measures today. The impoverishment methodology due to medical expenses adapts the conceptualization of (Foster et al., 1984) and measures impoverishment using the FGT indices namely the poverty headcount index (measures the prevalence of poverty), the poverty gap (measures the intensity of poverty), as well as the normalized poverty gap index (measures the severity of poverty among the poor) (Wagstaff et al., 2018b; Wagstaff and van Doorslaer, 2003).

2.1.2.2 Heterogeneity in the Design and Implementation of Household Surveys for Measuring financial risk protection

Researchers typically rely on cross-sectional or longitudinal survey data in estimating financial protection. Cross-sectional data are however argued to be limited for a detailed analysis of welfare losses induced by health payments (O'Donnell et al., 2007). This is because they are mostly focused on only one period of time and unable to capture long-terms dynamics of health payments on welfare (O'Donnell et al., 2007). Additionally, cross-sectional surveys rarely contain data on sources of funding health care, making it difficult to adjust for coping

mechanisms in the traditional measures of financial protection (Flores et al., 2008; Wagstaff, 2019). However, due to the absence of longitudinal surveys, particularly in developing countries, cross-sectional data are used to satisfy the basic data requirements of the impoverishment and financial catastrophe methodologies.

Cross-sectional and longitudinal surveys may either be health specific or focused on general consumption expenditure (Raban et al., 2013; Saksena et al., 2014). Frequently, the design of the survey instrument varies across surveys in the length of the recall period, the number of disaggregated health expenditure questions and the framing of questions in the survey questionnaire (Heijink et al., 2011; Lu et al., 2017; Lavado et al., 2013; Raban et al., 2013; Saksena et al., 2014). These variations, also regarded as non-sampling errors, may influence the estimates of financial protection and may limit the tracking of financial protection overtime or cross-country analysis (Heijink et al., 2011; Lu et al., 2017; Neter, 1970; Saksena et al., 2014; Raban et al., 2013; Xu et al., 2009).

Xu et al. (2019) suggest that questionnaires for household expenditure data should be standardized to facilitate comparative studies across countries and overtime. While his recommendation is well placed, there is a dearth of research on the sensitivity of estimates of OOP health payments and financial protection to varied survey instruments. Indeed, while the standardization of survey instruments is worthwhile, "it is more difficult to convince people to use someone else's standard instrument rather than their own" (Saksena et al., 2014).

2.1.3 Conclusion

For this study, only catastrophic health expenditure was used in measuring financial risk protection due to data limitations for the impoverishment methodology. This is because although both catastrophic and impoverishing expenditure require almost the same data, when measuring a impoverishment, a living standard indicator (either measured in terms of income, consumption expenditure or wealth) must be defined. The IHOPE study only had data on non-food expenditure. Measuring household living standard, however requires both non-food expenditure and food expenditure.

2.2 Empirical Review

Literature Review Search Strategy

A comprehensive search on PubMed, ProQuest, Google Scholar, EBSCOhost, and Jstor were used to identify published studies and grey literature relevant to this thesis. Catastrophic health expenditure (CHE), OOP health payments, survey instruments used to measure OOP and CHE, and other related synonyms were employed as keywords in the search parameters.

Titles and abstracts of studies obtained from the search were screened. A full text review of relevant articles was then retrieved for data extraction. A manual review of potentially relevant studies was conducted from the bibliography of reviewed studies to supplement the initial search strategy. Formal reports relevant to the objectives of this study were also retrieved from the WHO and World Bank websites.

Inclusion and Exclusion Criteria

Studies which measured catastrophic health expenditure were eligible for inclusion. Studies that assessed the impact of survey instruments on estimates of household expenditure, health expenditure, and financial protection also met the inclusion criteria. Studies, however, had to be relevant to at least one of the objectives of this study and be published in English. In addition, studies should have a clear and sound description of the theoretical and methodological approaches applied in the analysis of financial protection.

The review focused on studies published between 2009 and 2020. However, five studies preceding 2009 which are still seminal to the objectives of this study were reviewed. Furthermore, the studies reviewed were predominantly from low and middle-income countries (per World Bank classification) across all continents. However, most of the countries in this empirical review where from Africa and Asia. The empirical review was not restricted to only nationally representative estimates since such estimates were limited in developing countries.

Overall, data were extracted from a total of thirty-five reviewed studies. Twenty-six of these studies used the CHE methodology and nine examined the sensitivity of estimates of OOP health expenditure and financial protection to survey instruments. All reviewed studies and their respective characteristics were summarized and synthesized into the appropriate sub-headings below:

2.2.1 Reviewed Studies Assessing Catastrophic Health Payments

Summary of reviewed studies

Out of the 26 studies which applied the catastrophic methodology, 12 were from Africa, 5 from Asia and 2 from Europe. 7 studies were multi-country or multi-continental including countries

in North America, South America and Australia. For instance, Wagstaff et al., 2017 and Xu et al., 2007 conducted a multi-country analysis of 89 and 133 countries respectively. Among all the reviewed studies, only 3 were not nationally representative. Additionally, the reviewed studies were mostly published between 2010 and 2020. However, about 5 seminal and relevant articles preceding 2010 were considered in the analysis.

The most commonly used methodologies for assessing the incidence and intensity of catastrophic health payments were the Xu et al. (2003) and Wagstaff and van Doorslaer, (2003) methodologies. According to the Xu et al. (2003) methodology, health payments at or exceeding 40% capacity-to-pay (CTP) are deemed financially catastrophic. A households CTP, in this instance, is calculated as total household expenditure net the average subsistence food expenditure of the sampled population. Conversely, the Wagstaff and van Doorslaer, (2003) methodology defines health payments as financially catastrophic at or above 10% of total household expenditure or 40% of ATP. ATP is calculated as total household expenditure net basic spending on food and other necessities. Additionally, the Wagstaff and van Doorslaer, (2003) methodology includes the calculation of a catastrophic payment headcount, gap, concentration indices and weighted headcount and gap measures. Other methodologies applied in assessing catastrophic health payments included; the Ataguba, (2012) rank dependent threshold methodology and the Flores et al. (2008) financial coping mechanism-adjusted catastrophic methodology. Different threshold levels ranging from 2.5% (e.g.) to 40% (e.g.) were used across the reviewed studies. Additionally, Gabani and Guinness, 2019 introduced an incidence of households foregoing HC services (HFH) methodology that incorporates foregone health care into the standard measures of catastrophe.

Household consumption expenditure were predominantly used to measure socio-economic status (SES)/ATP/CTP. Furthermore, most studies conducted logistic regression analysis to determine the predictors of CHE and computed a concentration index to determine the distribution of OOP health payments and CHE. The summary of the review studies is presented in Table 2.1 below.

Table 2.1: Studies Assessing Catastrophic Health Payments

Study	Type of Study	Date Source	Country, year(s) of analysis	Objectives of the study	Measure of SES ATPCTP	What makes out-of-pocket (OOP) payment	How is financial risk protection assessed	Findings and explanations (and conclusions)	Limitations and Shortcomings
Akazili et al., 2017	Cross-sectional study	Ghana LSS	Ghana, 2005/2006	To assess the catastrophic effects of OOP health care payments	HH Expenditure	All direct medical expenses net insurance reimbursement Recall periods: 12 month and a weekly diary for 12 weeks HH expenditure data were annualized	Wagstaff and van Doorslaer, 2003 methodology was used The threshold levels varied from 5%-40% of HH total expenditure (THE) and non-food expenditure (NFE)	In terms of THE: catastrophic headcount ranged from 2.56% (20% threshold) to 11.00% (5%) In terms of NFE: catastrophic headcount ranged from 2.43 (40% threshold) to 10.70 (10%) Catastrophic headcount and gap mostly concentrated among the poor	Does not capture indirect cost of illness (income losses & foregone care) Data used may be relatively old for timely policy making

Akinkugbe et al., 2012	Cross-sectional survey	HES and HBS	Botswana, 2002/2003 and Lesotho, 2002/2003	To assess the degree of inequality in the distribution of health expenditure across income quintiles in Botswana and Lesotho; To examine the characteristics of HHs which face CHE and impoverishment	HH Expenditure	All direct medical expenses net insurance reimbursements Recall period: 6-month recall period for inpatient and outpatient care However, only monthly HH expenditures were used in the analysis	Xu et al., 2003 methodology was used The 40% of CTP (HH non-subsistence expenditure) threshold level A multiple logistic regression was conducted to analyse the determinants of CHE Computed a concentration index for OOP spending Computed a fairness in financial contribution index (FFCI)	About 7% and 1% of HHs incurred CHE in Botswana and Lesotho respectively HHs in rural areas were more likely to incur CHE than those in urban areas. Unemployed HH heads, size of HH, an elderly member increased the risk of CHE in both countries. Female HH heads & educated HH heads were less likely to incur CHE. In Botswana, OOP spending is concentrated among the poor The FFC indices showed that Lesotho (0.85) health system was relatively more fair than that of Botswana (0.62)	Data is subject to recall bias and bias due to infrequent medical expenses
Aregbesholа and Khan, 2018	Cross-sectional survey	The Harmonized Nigerian LSS	Nigeria, 2009/2010	To examine the financial burden of OOP health spending among HHs in Nigeria	HH Expenditure	All direct medical expenses	Wagstaff and van Doorslaer, 2003 methodologies were used The threshold levels used were 10% of THE and 40% of ATP (NFE)	The catastrophic headcount was 16.4% at the 10% threshold level whereas it was 13.7% at the 40% threshold The intensity of CHE is concentrated among the non-poor	Data is subject to recall bias and bias due to infrequent medical expenses Recall bias could affect the accuracy of data collected

Atag uba, 2012	Cross-section al survey	Natio nal LSS	Nigeria, 2003/200 4	To develop statistical weights for the measurement of CHE which generate different thresholds for different levels of income (threshold levels increase as income increase)	HH Expen diture	All direct medical expenses net insurance reimbursements	Adapted the Wagstaff and van Doorslaer, 2003 methodology and incorporated an aversion parameter to generate rank-dependent thresholds The threshold levels ranged from 10%-20% of total HH expenditure and 20%-40% of ATP	The rank dependent catastrophic headcount increases as the value of the parameter & threshold levels increase The rank-dependent catastrophic gap & the weighted catastrophic gap decrease as the initial thresholds increase The positive gaps increase with increasing initial threshold Fixed threshold result in lower estimates of financial catastrophe as compared to threshold levels which vary with income	Does not capture foregone care Initial threshold levels are subjective Self-reported data plagued with recall biases
Baras a et al., 2017	Cross-section al survey	HH Expe nditu re and Utiliz ation Surve y	Kenya, 2013	To measure CHE and impoverishm ent due to OOP health spending and to explore factors that are associated with CHE	HH Expen diture	All direct medical expenses net insurance reimbursements, including transport cost Recall period: 4-week recall period All expenditure data were annualized	Xu et al., 2003 methodology was used The 40% of CTP (HH non-food expenditure) threshold was used Concentration index was calculated to determine the distribution of CHE A logistic regression was conducted to determine the predictors of CHE	Incidence of catastrophe was 4.52% (direct health cost) & 6.57% (direct & transport costs) The incidence was higher among rural HHs than urban HH The mean positive overshoot was 3.75% (direct OOP) & 5.73% (direct & transport costs) CHE are concentrated among the poor Elderly/unemployed HH heads, lower SES, large HH size, an elderly HH	Data source was outdated Self-reported data plagued with recall biases

								member or with a chronic diseases increased the risk of CHE	
Borde et al., 2020	A cohort study	District survey	Southern Ethiopia, 2017/2018	To assess the financial risk of seeking maternal and neonatal healthcare	HH Expenditure	All direct and indirect medical expenses net informal payments for health services & insurance reimbursement Recall period: 3-month recall period for both inpatient &outpatient However, expenditure data were annualized	Wagstaff and van Doorslaer, 2003 methodology was used The threshold levels were 10% of THE and 40% of NFE A logistic regression analysis was conducted to identify factors associated with CHE	The incidence and mean positive overshoot of financial catastrophe were 45.6% and 22.8% respectively at 10% of THE and 74.4% and 272.5% respectively at 40% of NFE CHE was concentrated among the poor About 13% of HHs employed different coping mechanisms HHs with neonatal illness were 3 times more likely to incur CHE than HH without neonatal diseases	Distribution of OOP spending was skewed to the right Indirect costs (foregone health care, income losses and cost of death due to illness) were not considered Self-reporting OOP spending are plagued with biases

Chantzaras and Yfantopoulos, 2018	Cross-sectional Survey	HBS	Greece, 2008-2015	To estimate the progression of financial protection of Greek HHs against OOP payments during the economic crisis	HH Expenditure	All direct medical expenses net insurance reimbursements	Xu et al., 2003 methodology was used A range of threshold levels (10%-40%) of CTP (NFE) were used Applied the financial fairness contribution index (FFCI) Conducted a binary logistic regression analysis to explore possible determinants of CHE and impoverishment Calculated the concentration index for CHE	Averagely, for all threshold levels, the incidence & intensity of CHE was higher in 2015 compared to 2008 The incidence & intensity of CHE were generally concentrated among the poor The FFCI shows a consistent decrease in inequality in the distribution of the OOP burden from 2008 up until 2012. Having an elderly member, children, & HHs of higher SES were most likely to face CHE whereas larger HHs, HH heads with higher educational level, female HH heads, employed HH heads & insurance are less likely to prompt CHE	Could not identify coping mechanisms Does not capture indirect cost of illness Does not distinct between types of health services purchased & whether the correspond to actual health needs and quality Self-reported data plagued with recall biases
Chuma and Maina, 2012	Cross-sectional survey	National Health Expenditure and Utilization	Kenya, 2007	To estimate the catastrophic and impoverishing effects of OOP health payments	HH Expenditure	All direct medical expenses Recall period: 4-week & 1-year recall for outpatient care and inpatient care respectively All expenditure data were annualized	Wagstaff and van Doorslaer, 2003 methodology was used The threshold levels ranged from 5%-40% of THE and CTP (NFE)	Across all threshold levels, the catastrophic indices (headcount, gap) were higher when expressed in terms of NFE compared to THE CHE is concentrated among the poor The weighted catastrophic indices are generally higher than the	Does not capture indirect cost of illness (income losses and foregone care) Recall bias could affect the accuracy of data collected

		Survey						unweighted across thresholds and income	
Dorjdagva et al., 2016	Cross-sectional survey	HH SES	Mongolia, 2012	To estimate catastrophe & impoverishment under the social health insurance scheme in Mongolia	HH Expenditure	All direct medical expenses	Wagstaff and van Doorslaer, 2003 methodology was used The threshold levels ranged from 5%-40% of THE and ATP (NFE)	Across all threshold levels, the catastrophic headcount & gap were higher when expressed in terms of NFE compared to THE Catastrophic headcount ranged from 1.1% to 7% depending on the threshold & measure used The rich are more likely to incur CHE	Does not address the distribution of CHE Self-reported data plagued with recall biases

Flores et al., 2008	Cross-sectional survey	National Survey	India, 1996/2004	To develop measures of financial protection that take account of financial coping mechanisms	HH Expenditure	All direct and indirect medical expenses for inpatient care All expenditure data were annualized	Adapted the Wagstaff and van Doorslaer, 2003 methodology and incorporated measures for financial coping mechanisms Threshold level ranged from 5%-20% of THE	About 44% (urban) and 52.2% (rural) of HHs rely on coping mechanisms A huge difference between the unadjusted and coping-adjusted catastrophic headcounts. For instance, catastrophic headcount was 2.20% (unadjusted) and 0.21 (adjusted) in rural areas at 10% CHE is overestimated if financial coping mechanisms are not accounted for	The analysis is limited to only inpatient care Does not capture indirect cost of illness Self-reported data plagued with recall biases
Gabani and Guiness, 2019	Cross-sectional survey	HH IES	Liberia, 2014	To measure the financial risk associated with healthcare and propose a method that incorporates foregone health care into the standard measures	HH Expenditure	All direct medical expenses net insurance reimbursement OOP data was annualized	Wagstaff and van Doorslaer, 2003 & Xu et al., 2003 methodologies were used Threshold levels varied from 10% to 25% of THE and 30% to 40% of CTP (NFE) A sensitivity analysis was conducted to show how CHE varied across different thresholds A concentration index was used to measure the level of equity in the	The incidence of catastrophe ranged between 0.4% and 2.1% depending on the threshold The intensity of CHE ranged between 14.4% and 44.6% depending on the threshold Across all thresholds, CHE was concentrated among the poor From the sensitivity analysis, using a NFE threshold resulted in a higher CHE incidence The incidence of HFH is 8.0% From the HFH sensitivity	Indirect cost (time spent to receive health care services) were not considered The HFH does not explore the possible reasons why HH forego healthcare The HFH index is unable to differentiate between HHs who access health care without incurring health

							sampled population Gabani and Guiness, 2019 incidence of HHs foregoing health care services (HFH) methodology was used	analysis, as the threshold value increase, even more HH are experiencing health shocks and not incurring CHE	expenditure and HH who forego health care

Knaul et al., 2011	Cross-sectional survey	HH-level data from different countries	A multi-country analysis of 12 Latin America and Caribbean countries using data from 2003 to 2008	To compare patterns of CHE in 12 countries	HH Expenditure	All direct medical expenses	Applied the Xu et al., 2003 methodology Threshold level of 30% of non-subsistence expenditure was used	CHE ranged from 0.4% in Costa Rica to around 2-5% in Colombia, Bolivia, Brazil, Mexico & Peru, to around 7-11% in Argentina, Dominican Republic, Ecuador, Guatemala & Nicaragua Averagely, CHE are more prevalent in rural areas than in urban areas Averagely, poor HHs are more exposed to incurring CHE HHs with children/elderly, large HH sizes & without insurance are more likely to incur CHE	They key assumptions underlying this methodologies break down if HHs make discretionary OOP payments or employed coping mechanisms
Kwesiga et al., 2015	Cross-sectional survey	National HH Survey	Uganda, 2009/2010	To assess the catastrophic and impoverishing impacts of paying for health care OOP	HH Expenditure	All direct medical expenses	Ataguba, 2012 rank-dependent threshold methodology was used Threshold levels ranged from 5% to 25% of total HH expenditure	The catastrophic headcount was 38.0%, 22.8%, 15.3% and 6.7% at 5%, 10%, 15% and 25% threshold respectively The catastrophic gap was 3.8%, 2.5%, 1.7% and 0.8% at 5%, 10%, 15% and 25% threshold respectively	The choice of the value of the inequality aversion parameter is subjective The study does not identify the predictors of CHE

Ngcamphalala and Ataguba, 2018	Cross-sectional	HH IES	Swaziland, (2009/2010)	To assess financial catastrophe and impoverishment due to OOP health spending	HH Expenditure	All direct medical expenses net insurance reimbursement Recall period: 1-month for both impatient and outpatient care However, total HH expenditure was annualized	Ataguba, 2012 rank-dependent threshold methodology was used to assess financial catastrophe A range of threshold levels (5%-40%) were used for THE and NFE	The incidence of catastrophe ranged from 2.4% (25% threshold) to 16.8% (5% threshold) of THE The incidence ranged from 2.7% (40% threshold) to 24.2% (5% threshold) of NFE Across all indices, estimates of financial catastrophe were relatively higher when expressed in terms of NFE than THE	Does not capture indirect cost of illness Choice of threshold is subjective Data used may be relatively old for timely policy making
Nguyen et al., 2011	Cross-sectional survey	District HH Survey	Ghana, 2007	To examine the impact of the National Health Insurance on HHs' OOP spending and CHE	HH Income and Expenditure	All direct medical expenses net preventive care Recall period: 2-week & 12-month for inpatient and outpatient care respectively OOP expenditure was annualized	Wagstaff and van Doorslaer, 2003 methodology was used The threshold level of 5% and 10% of total HH income and 10% and 20% of NFE were used Conducted a regression analysis to determine the probability of having CHE between the insured and uninsured	CHE ranged from 0.9%-1.5% (insured) and 2.1%-2.8% (non-insured) across threshold levels At the 10% threshold level, CHE was higher when expressed in terms of non-food expenditure compared to total income From the regression analysis Insurance reduces the probability of incurring OOP and CHE	Could not establish a perfect relationship between insurance and OOP/CHE Relying on districts surveys limits generalization Combining District HH survey and Ghana LSS increases biases

Nundoochan et al., 2019	Cross-sectional survey	HBS	Mauritius, 2001/2002, 2006/2007, 2012	To examine trends in OOP health spending, catastrophic health expenditure & impoverishment and to predict the core determinants of financial catastrophe	HH Expenditure	All direct medical expenses	Xu et al., 2003 and Wagstaff and van Doorslaer, 2003 methodologies Threshold levels were 10% and 20% of THE and 40% of total NFE A logistic regression analysis was used to determine the determinants of CHE	The incidence of catastrophe increased from 5.78% in 2001/2002 to 8.85% in 2012, and 0.61% in 2001/2002 to 1.25% in 2012 for 10% & 40% threshold levels respectively Urban populations experience higher incidence of CHE than rural populations The key determinants of CHE were HHs having one member who is 60 years or over, and a retired HH head	Does not capture indirect cost of illness (income losses and foregone care) Insurance reimbursements were not deducted from total health expenditure
Reddy et al., 2013	Cross-sectional study	World Health Survey	An inter-continental analysis of 4 Asian countries, 2002/2003	To examine the validity of five survey measures of economic burden caused by health payments	HH Income	All direct medical expenses Recall period: 4 weeks for outpatient & 11 months for inpatient OOP data was annualized	Applied the Xu et al., 2003 methodology in this analysis The threshold level of 40% of non-subsistence expenditure was used	About 50% of HHs reported paying for health care Malaysia had the lowest percentage of HHs with CHE (4.6%) while the Philippines showed the highest rate (18.6%) Generally across countries, CHE measure was positively correlated to health care need Wealth and risk protection correlated negatively with CHE in all countries	The indicators for health care need, wealth and risk protection were imperfect Annualizing OOP data may not accurately reflect full-year expenditures The analysis of only 4 Asian countries may limit generalization

Somkotra and Lagrada, 2008	Cross-sectional study	HH SES	Thailand, 2000, 2002 and 2004	To measure the level & pattern of OOP health payments as a share of HH resources & to examine the catastrophe & impoverishment during the transitional period	HH Expenditure	All direct medical expenses Recall period: 1-month for (outpatient, medicines and traditional medicines) & 1-year for inpatient care HH expenditure data were annualized	Wagstaff and van Doorslaer, 2003 methodologies was used Threshold ranged from 5%-10% of THE and 20%-30% of NFE A concentration index was used to measure the level of equity in the sampled population	The incidence and intensity of financial catastrophe decline from 2000 to 2004 CHE is concentrated among the rich	Does not capture indirect cost of illness Measures of CHE only provide short-term effects of OOP Data is subject to recall bias and bias due to infrequent medical expenses
van Doorslaer et al., 2007	Cross-sectional study	LSS, IES etc.	An inter-continental analysis of 14 Asian countries using data from 1994 to 2000	To assess catastrophic payment for health care in Asia	HH Expenditure	All direct medical expenses Recall period: ranged from 2 weeks (mostly outpatient) to 1 year (mostly inpatient) OOP are scaled to a year	Wagstaff and van Doorslaer, 2003 methodology A range of threshold levels (5%-25%) for THE and (15%-40%) for NFE were used Concentration indices were calculated to determine the distribution of CHE	The mean OOP as a percentage THE & NFE ranged from 1.37% (Malaysia) to 5.49% (Vietnam), & 1.13% (Malaysia) to 12.64% (Vietnam) respectively The headcount indices generally fall as the threshold is raised For both THE and ATP, CHE are more prevalent in Bangladesh, Vietnam, China and India The incidence of CHE is lowest in Malaysia, Sri Lanka, Thailand, Indonesia and the Philippine	The study does not measure impoverishment, a closed related risk of OOP Does not capture indirect cost of illness (income losses and foregone care) Data subject to both recall and small sample biases

								In terms of THE, CHE is concentrated among the rich whereas it is concentrated among the poor in terms of ATP	
Van Mint et al., 2013	Cross-sectional survey	Living Standard Surveys	Vietnam, 2002-2010	To estimate the extent of financial protection over time and identify socio-economic determinants associated with them	HH Expenditure	All direct medical expenses net insurance reimbursements A twelve-month recall period for all OOP spending	Xu et al., 2003 methodology was used 40% threshold level of CTP (NFE) Logistic regression analysis to explore the determinants of catastrophic health expenditure	The proportion of households with CHE decreased from 4.7% (2002) to 3.9% (2010) HHs with health insurance, and large HH size lowered the rates of CHE whereas HHs with elderly members, and children less than 6 years increased the rates of CHE HHs in rural areas had higher rates of CHE than those in urban areas	Could not identify coping mechanisms Inconsistencies and unavailability of data inhibited the analysis of the pattern CHE by type of medical care

Wagstaff and van Doorslaer, 2003	Cross-sectional	LSS	Vietnam, 1993-1998	To compare two threshold approaches used in measuring the fairness of health care payment; catastrophe and impoverishment	HH Expenditure	All direct medical expenses net insurance reimbursement Recall period: 12 months for all OOP	Used the Wagstaff & van Doorslaer, 2003 methodology. Measures the catastrophic payment headcount, mean poverty gap as well as weighted headcount and gap measures via concentration indices Threshold levels ranged from 2.5%-15% (THE) & a10%-40% of ATP (NFE) Concentration indices were calculated to determine the distribution of CHE	The CHE indices reduced from 1993-1998 for all threshold levels and SES measure In terms of THE: At lower thresholds the incidence of CHE is more concentrated amongst the poor whereas at higher threshold levels, the incidence of CHE is more concentrated among the rich In terms of ATP: For all threshold levels, the incidence and severity of CHE is more concentrated amongst the poor The CHE indices were relatively higher when expressed in terms of ATP than total consumption expenditure	Does not capture foregone care The assumptions underlying this methodologies break down if HHs make discretionary OOP payments or employed coping mechanisms

Wagstaff et al., 2017	A cross-sectional survey using different HHs surveys		A multi-country analysis (133 countries) using data from 1984 to 2015	To estimate the global incidence of CHE trends, 2000-2010, and associations between CHE and macroeconomic and health system variables at the country level.	HH Expenditure	All direct medical expenses net insurance reimbursements Recall period: ranged from less than 3 months to 12 months All expenditure data were annualized	Wagstaff and van Doorslaer., 2003 was used Threshold levels of 10% and 25% of THE A multiple regression analysis was conducted to explore the relation between a country's incidence of CHE and other macroeconomic indicators and health system characteristics	10% threshold: incidence of catastrophe ranged from 0.3% (Zambia, 2010) to 44.9% (Lebanon, 1999): Mean & median incidences across countries were 9.2% and 7.1% respectively 25% threshold: mean & median incidence across countries were 1.8% & 1.0% respectively In 2010 (10% threshold), about 11.7% of the world's population incurred CHE The incidence of CHE varies across countries with similar health systems The incidence of CHE at both threshold levels were significantly and positively associated with GDP per person	Different survey instruments were used to collect OOP data across countries Does not include transportation cost and other indirect costs Could not identify coping mechanisms

Wang et al., 2018	Cross-sectional surveys	LSS, IES etc.	An inter-continental analysis of eight South-East Asian countries using data from 2010 to 2015	To measure financial protection and investigate the main components of OOP payments on health care	HH Expenditure	All direct medical expenses net insurance reimbursement Recall period of 30 days for outpatient care and 12 months for inpatient care	Wagstaff and van Doorslaer., 2003 was used Threshold levels used were 10% and 25% of THE	About 242.7 and 56.4 million people had catastrophic expenditure at the 10% & 5% threshold levels respectively Across threshold, Maldives had the largest incidence of catastrophe followed by India and Bangladesh. Thailand and Timor-Leste had the lowest The dominant component of OOP spending was medicines Incidence of catastrophe was concentrated among the rich	Variations in the design survey instruments across countries limit direct comparisons Does not incorporate coping mechanisms Does not capture the indirect costs of illness (income losses and foregone care)
Xu et al., 2003	Cross-sectional survey	LSS, IES etc.	Multi-country analysis (59 countries) using data from 1990 to 2000	To measure the extent of catastrophic health expenditure	HH Expenditure	All direct medical expenses net insurance reimbursement	Xu et al., 2003 methodology was used Threshold level of 40% of CTP (average food expenditure) A multi-variate OLS regression was used for the cross-country analysis	Catastrophe varied widely across countries from less than 0.01% (Czech Republic and Slovakia) to 10.5% (Vietnam) Developed countries recorded lower rates of catastrophe with only Portugal, Greece, Switzerland and the USA exceeding 0.5%. In developing countries, catastrophe ranged from >0.5% to 3%< Catastrophe increases with poverty; increases with health care use; increases	Lack of data on the indirect costs of seeking healthcare (transport, food, lost earnings and foregone earnings) Measurement error for expenditure particularly associated with variations in recall period may inhibit

								when OOP spending increases as a share of total health expenditure	cross-country analysis
Xu et al., 2007	Cross-sectional	National Surveys	A multi-country analysis (89 countries) using data from 1990 to 2003	To measure the financial consequences of paying for health care	HH Expenditure	All direct medical expenses net insurance reimbursement Recall period for inpatient care ranged from six to twelve months However, OOP data was annualized	Xu et al., 2003 methodology was used Threshold level of 40% of CTP (average food expenditure) Conducted a regression analysis on possible explanatory variables of financial catastrophe across countries	The incidence of catastrophe ranged from about 0% (Czech Republic, Slovakia and United Kingdom) to above 10% (Brazil and Vietnam) The average incidence of catastrophe across countries was 2.3% ; median of 1.47% The relationship between the explanatory variables and catastrophe varied across income levels. The greater the prepayments share in total health spending, the lower the incidence of catastrophe across income levels	Different survey instruments to collect OOP data across countries introduces more biases to the analysis Does not include transportation cost and other indirect costs

Yardim et al., 2010	Cross-sectional	Turkstat, HBS and CES	Turkey, 2006	To identify the level of CHE and to reveal predictive factors associated with CHE	HH Expenditure	All direct medical expenses net insurance reimbursements Both recall and diary methods were used to collect data on OOP However, all expenditure variables were converted to monthly figures	Xu et al., 2003 methodology was used Threshold of 40% CTP (non-subsistence expenditure) Applied a univariate and multivariate analysis to explore the determinants of CHE	About 0.6% of HHs incurred financial catastrophe CHE varied across quintiles from the poorest to the richest; 0.5%, 0.9%, 0.6%, 0.5%, 0.5% respectively HHs with elderly or disabled members, no insurance increase the risks of CHE Rural HHs face 2.5 times more CHE than urban HHs	Could not identify coping mechanisms Does not capture indirect cost of illness Recall bias could affect the accuracy of data collected

2.2.2 Reviewed Studies Assessing the Sensitivity of Estimates of OOP Health Expenditure and Financial Protection to Varied Survey Instruments

Summary of reviewed studies

The sensitivity of estimates of OOP health expenditure and financial protection to varied survey instruments has not been extensively explored in the literature. Thus, only 9 studies were considered in this analysis. 1 from Africa, 2 from Asia, 1 from North America and 1 from Europe. 4 studies were multi-country or multi-continental. Heijink et al. (2011) and Lavado et al. (2013) conducted a multi-country analysis of 144 and 78 countries, respectively. The reviewed studies were mostly published between 2009 and 2019 with one study preceding 2009.

Estimates of OOP health expenditure and/or financial protection where mainly compared across the different survey instruments in each study, either using test-retest results, or self-reported data with a gold standard or just between surveys. Subsequently, where applicable, the Wagstaff and van Doorslaer, (2003) and the Xu et al. (2003) methodologies were used to assess financial protection. Furthermore, a number of studies conducted a logistic regression to determine household socioeconomic and demographic factors that affected the sensitivity of estimating OOP/CHE/Impoverishment to survey design.

Table 2.2: Studies Assessing the Sensitivity of Estimates of OOP Health Expenditure and Financial Protection to Varied Survey Instruments

Study	Type of Study, Date Source	Country, year(s) of analysis	Objectives of the study	SES/ATP/CTP	Design of out-of-pocket survey instrument	How is financial risk protection assessed	Findings and explanations (and conclusions)	Limitations and Shortcomings
Davern et al., 2005	Cross-sectional survey, CPS-DS	United States, 2001	To compare differences btw income measures that used a single-item list and multi-item list	HH Income	Used an aggregated household income estimate as the standard to compare the omnibus family income measure	To examine the difference between the omnibus in-come amount and the aggregated income amount: used a logistic regression & a Hotdecked imputation procedure Compared estimates of poverty from original aggregated income (Official Census Bureau Poverty estimates from the CPS-DS) to the hot-decked amounts	A huge difference between the aggregated income amounts and the omnibus income categories Averagely, only 31% of the income amounts match between the aggregated and the omnibus measures There is a significantly higher number of people below 100% of FPL using the hotdeck than are using the aggregated amounts	The accuracy of the expenditure estimates from the different surveys could not be determined since there was no gold standard in interpreting the results

Goyanka et al., 2019	Cross-sectional survey, CES and HMS	India, CES 2004/05 and 2011/12 and HMS 2004 and 2014	To assess the trends in impoverishment estimates over time and identify the factors explaining these trends	HH Expenditure	CES 2011/12: Varied recall periods (7, 30 & 365 days for different items) All direct medical expenses 325 items on food & NFE & 19 items of health expenditure & 23 items on SED characteristics HMS 2014: Varied recall periods (15,30 & 365 days for different items) 20 items of health expenditure, 1 item on THE & 15 items on SED characteristics All direct medical expenses net insurance reimbursement	The Wagstaff and van Doorslaer methodology was used The PL used was the India Tendulkar poverty line for 2011/2012 set at 816 for rural and 1000 for urban sector	Using the HMS surveys, impoverishment due to OOP increased slightly from 7.23% in 2004 to 7.53% in 2014 Using the CES, impoverishment declined slightly from 4.81% in 2004/05 to 4.41% in 2011/12 In 2004/05, according to HMS estimates, 26.4 million more people are impoverished due to OOPE compared to CES in the same year Using similar methodologies but different types of surveys lead to a very different outcome on tracking impoverishment	The accuracy of the expenditure estimates from the different surveys could not be determine since there was no gold standard in interpreting the results

Heijink et al., 2011	Cross-sectional survey, LSS (49), HBS (35) and other surveys (30)	A multi-country analysis of 114 countries	To explore the current evidence on measurement errors in self-reported HH expenditure and health expenditure	None	Different surveys with variations in recall periods, number of breakdown items, method of data collection, question wording, and classification of system of health care sector	Performed a literature review on measurement error in health care related surveys Reviewed survey instruments that have been used in different type of HH surveys which collected information on HH expenditure & health expenditure from the International HH Survey Network	About 50% of surveys used a 1-month (outpatient) & 12-month (inpatient) recall period Longer and shorter recall periods generated different outcomes. However, the extent of the difference varied across surveys More detailed items generated higher estimates. However, the there is no evidence on the optimal number of disaggregation More validation studies should be conducted to improve data quality	The accuracy of the expenditure estimates from the different surveys could not be determine since there was no gold standard in interpreting the results
Kjellsson et al., 2014	Cross-sectional, Public Health Survey and Registry Data	Sweden, 2008	To examine the role of the length of recall period in self-reported hospitalization	None	A recall period of 1 month, 3 months, 6 months and 12 months on hospitalization were used in the survey The registry data included hospitalization at public hospitals	Compared self-reported data from the public health survey with registered data Applied the Clarke et al., 2008 framework to determine the optimal length of a recall period for an aggregated measure of hospitalization	As the recall period increases, the extent of agreement between self-reported and registered data decreases Recall error increases with the length of the recall period Worth noting, all the recall periods are still plaqued with biases.	The registry data, (the gold standard), may be plagued with measurement errors Limitations in generalizing findings

Lavado et al., 2013	Cross-sectional survey, WHS, LSS, HBS etc.	A multi-country analysis of 78 countries, 1980-2010	To examine the effects of HH expenditure survey characteristics on the estimated share of OOP health payments	None	Surveys varied in how the report expenditure, method of collection (diary or recall), variation in recall periods & expenditure questions Number of questions on health expenditure & THE varied from 1 (WHS) to 274 (Dominican Republic 2007 ENIGH) and 1 (WHR) to 2431 (Dominican Republic 2007 ENIGH) respectively The recall period varied from 10 days to 12 months	Health expenditure was the dependent variable and modelled as a function of recall period, number of health questions and total expenditure questions (A regression analysis)	Across surveys, the greater the number of health expenditure questions, the greater the health expenditure share Estimates of health expenditure from the diary method were relatively lower A 1-month increase in recall period was accompanied by a 6% reduction in health expenditure share Country income classification, GDP and education were not found to be significantly related to health expenditure share	The accuracy of the expenditure estimates from the different surveys could not be determine since there was no gold standard in interpreting the results

Lu et al., 2009	Cross-sectional survey, WHS and LSS	A multi-country analysis of 43 countries (fWHS, 2002-2004) and 3 countries (LSS, 1997-2001),	To examine the effect of survey design, specifically the number of items and recall period, on estimates of HH OOP and CHE	HH Expenditure	WHSs: A single item question on OOP and an eight-item more detailed questions Recall period of 4 weeks for outpatient, hospitalization, medicines etc. & an 11-month recall for hospitalization LSS: Recall period (2 weeks ≤ OOP ≤ 12 months), number of items and type of module used to collect OOP (either health or consumption) varied across countries	The Xu et al., 2003 methodology was used The threshold level of 40% of CTP was used CTP was defined in terms of non-subsistence expenditure Compared estimates of OOP and CHE within and across surveys	WHS: The ratio of annual OOP from the single-item measure and the eight-item measure ranged from 0.25 to 1.37 The single-item measure yielded a significantly lower estimate than the eight-item measure For hospitalization (WHS), averagely a shorter recall period yielded larger estimates for average annual health spending Estimates of OOP varied across survey instruments in the same year	The accuracy of the expenditure estimates from the different surveys could not be determine since there was no gold standard in interpreting the results

Lu et al., 2017	Cross-sectional survey Rwanda Integrated Living Conditions Survey (EICV)	Rwanda, 2005 and 2010/2011	To examine the sensitivity of measuring the progress in financial protection to survey design and its socioeconomic and demographic determinants	HH Expenditure	The EICV included a health module (Method 1) and general module (Method 2) in the questionnaire for OOP payments Method 1: Had a recall period of 2 weeks, & 5 & 6 survey questions in 2005 and 2010/2011 respectively Method 2: In 2005, had a recall period of 12 & 10 months & had 9 questions on OOP. In 2010/20011 used a recall period of 12 months & 4 weeks & had 22 questions	The Xu et al., 2003 methodology was used The threshold level used was 40% of CTP (non-subsistence expenditure) A multilevel logistic regression to determine HH socioeconomic and demographic factors that affected the sensitivity of estimating CHE to survey design Sensitivity analysis of threshold levels (10%, 20% and 30% of CTP)	For both years, Method 1 produced significantly higher average annual HH OOPs estimates than Method 2. In 2005,Method 1 generated significantly higher estimates(9.2%) than Method 2 (7.4%) In 2010/2011, the CHE was 5.6% (Method 1) and 8.2% (Method 2) Sensitivity analysis: The results of CHE using different threshold were consistent with the ones using the 40% except in 2010 for threshold 10% A HHs size, income quintile and the education level of the HH head had a significantly positive associate with consistency of HCHE The survey design had a significant effect on estimating the level and trend of CHE in Rwanda	Data used was collected from rural areas in Rwanda. Thus limits generalizability Does not differentiate the effect of survey design resulting from recall period, survey frame, and number of questions, respectively

Raban et al., 2013	Cross-sectional survey, WHS and CESs	India, 2003-2009/2010	To assess the comparability of OOP payments and CHE estimates from different HH surveys in India	HH Expenditure	CESs: Included 2 CES (NSS 2004/2005 and NSS 2009/2010) The NSS 2004/05 and type 1 of NSS 2009/10 used the same questionnaire and thus used for the analysis. Had 6 and 2 items for outpatient care (1 month and 1 year recall periods respectively), and 5 items for inpatient (1 year recall period) Health-focused surveys: Included 3 surveys WHS 2003, NSS 2004, and SAGE 2007/2008. The number of items ranged from 4 to 12, with recall periods for outpatient (15 days, 1 month and 1 year) and inpatient (1 year)	Xu et al., 2003 and Wagstaff and van Doorslaer, 2003 methodologies were used The threshold level used was 10% of total HH expenditure and 40% of CTP (non-food expenditure)	The estimates of CHE for NSS 2004/05 and NSS 2009/10 were the same In terms of both THE and CTP, CHE was most frequently found in WHS 2003 and SAGE 2007/08, followed by NSS 2004/05 and NSS 2009/10 Across surveys, outpatient OOP payments is responsible for a large proportion of the HHs with CHE The proportion of the HHs that reported paying OOP for inpatient care varied substantially between surveys Methods used in each survey had a greater effect on the frequency with which HHs reported having OOP for inpatient care than on the amount In WHS 2003 and SAGE 2007–08, OOP payments for outpatient and inpatient care were two to three times higher than in the other surveys Estimates of OOP varied across survey instruments	The accuracy of the CHE estimates from the different surveys could not be determine since there was no gold standard in interpreting the results

Xu et al., 2009	Cross-sectional survey, WHS, LSS, HBS etc.	A multi-country analysis of 50 countries (from the WHS) and 31 countries (other surveys)	To examine the reliability and consistency between different ways of collecting HH expenditure and health expenditure within the survey and with other types of HH surveys	None	World Health Surveys: A single item question on OOP and more detailed questions Health expenditure excluded transportation costs and insurance reimbursements Other Surveys: Included the Living Standard Survey, HH Budget Survey, Income and Expenditure Survey and nation-specific surveys) The number of questions and recall period varied across surveys and countries. The recall period typically used is a one-month recall period for frequent spending and a 1 year recall period for durables and sometimes hospitalization	Conducted a test-retest reliability analysis for all surveys that reached 10% sample target and who retested more than 100 HHs An intra-class coefficient (ICC) index was used to explore both internal and external reliabilities Comparison of test–retest results; the aggregated and reported total household expenditure and health expenditure; the expenditures from the WHS and other type of surveys	In the WHS, the average of reported total OOP is lower than the aggregated total while for HH total expenditure the estimate is similar from the two measures The WHS was found to report lower total household expenditure but higher OOP comparing with other types of surveys WHS are reliable sources of data based on the test–retest estimates The health-specific WHS tends to give a higher estimate in health expenditure but a lower estimate in other expenditures than other survey	The accuracy of the expenditure estimates from the different surveys could not be determine since there was no gold standard in interpreting the results

2.3 Discussion of Reviewed Studies

The reviewed articles suggest a declining trend in the incidence and intensity of catastrophic health payments over the past few years (Nundoochan et al., 2019; Somkotra and Lagrada, 2008; Van Minh et al., 2013). This is primarily due to the increased international advocacy for the removal of user fees and the introduction of risk-sharing prepayment systems for health care across several countries (McIntyre et al., 2006b). However, the burden of catastrophic health expenditure is still excessive, especially in developing countries. Xu et al. (2003), for instance, reported that while developed countries recorded lower rates of financial catastrophe with only Portugal, Greece, Switzerland and the USA exceeding 0.5%, financial catastrophe in developing countries ranged from less than 0.5% to more than 3%. This finding was consistent with other reviewed studies (Doorslaer et al., 2007; Wagstaff et al., 2018a; Xu et al., 2007). A possible contributor to this pattern may be the high financial burden of expenditure on medicines which has consistently dominated other components of OOP (Aregbeshola and Khan, 2018b; Njagi et al., 2018; Wang et al., 2018). The unavailability of drugs in most public facilities and subsequent heavy reliance on private pharmacies, as well as the prevalence of self-medication in developing countries are key drivers of the high cost burden of medicines (Shafie et al., 2018).

The limited availability of financial protection especially for poorer households also increases the risks of financial catastrophe. This was revealed by numerous reviewed studies which reported high incidence and intensity of catastrophic health payments among the uninsured and the poor (Akazili et al., 2017c; Akinkugbe et al., 2012; Borde et al., 2020; Chantzaras and Yfantopoulos, 2018). This is particularly alarming given that the poor are mostly with the greatest health care need and are most likely to forgo health care due to financial barriers (Bhutta et al., 2014; Russell, 2004). Nevertheless, insured households are not guaranteed a 100% of financial protection as shown in the reviewed studies (Knaul et al., 2011; Nguyen et al., 2011; Van Minh et al., 2013; Yardim et al., 2010). High co-payments, informal payments amongst others, irrespective of insurance status can prompt catastrophic health payments (Azzani et al., 2019).

Furthermore, the estimates of the incidence and intensity of catastrophic health expenditure tend to differ when expressed in terms of household total consumption expenditure or ATP/CTP and in terms of the threshold level used. For instance, the incidence and intensity of financial catastrophe were relatively lower when expressed in terms of total expenditure than in terms of non-food expenditure across the reviewed studies (Ngcamphalala and Ataguba, 2018; Nguyen et al., 2011;

Wagstaff and Doorslaer, 2003). This is because food expenditure constitutes a high proportion of total expenditure, particularly in developing countries and in poorer households (O'Donnell et al., 2007). Thus, in investigating financial catastrophe, it is better to express the denominator in terms of non-food expenditure to fully capture the extent of financial catastrophe among the poor (O'Donnell et al., 2007; Wagstaff and van Doorslaer, 2003; Xu et al., 2003). However, expressing financial catastrophe in terms of non-food expenditure is not without fault (Hsu et al., 2018; Pal, 2012; Thomson et al., 2016; Wagstaff and Eozenou, 2014). Additionally, estimates of catastrophe tend to be lower when higher threshold levels were used (Akazili et al., 2017c; Akinkugbe et al., 2012; Dorjdagva et al., 2016).

Unlike traditional methodologies (for e.g. Wagstaff and van Doorslaer, 2003; Xu et al., 2003) recent methodologies (Ataguba, 2012; Flores et al., 2008; Gabani and Guinness, 2019) provide broader insights of the risks of health payments. Ataguba (2012) for instance, who generated the rank-dependent threshold as a reflection of vertical equity reported that fixed threshold values were more likely to lead to lower catastrophic headcounts compared with threshold levels which vary with socioeconomic status. This methodology is considered superior to the traditional measures of financial catastrophe since it accounts for vertical equity (Ataguba, 2012). Additionally, the Flores et al. (2008) coping mechanism-adjusted methodology demonstrated that financial catastrophe is overestimated when using traditional measures of catastrophe since coping mechanism are not accounted for, whereas, the Gabani and Guinness (2019) household foregoing health care services (HFC) index showed that most households are not incurring financial catastrophe because they forego seeking health care. This viewpoint is however debatable. These methodological advances have been useful in pointing out the many financial risks associated with health shocks. However, whether indirect costs of health care are including in standard measures of catastrophe remains subjective.

The predictors of financial catastrophe also varied across studies. Household demographic and socio-economic factors were shown to be key determinants of financial catastrophe. Households with an unemployed head, with a large family size, a member with a chronic disease, with elderly members and children, and without insurance cover, had an increased risk of incurring financial catastrophe (Akinkugbe et al., 2012; Barasa et al., 2017; Knaul et al., 2011; Nguyen et al., 2011; Nundoochan et al., 2019; Reddy et al., 2013; Wagstaff and Doorslaer, 2003). These are mostly

associated with the greater need for health services amongst the elderly, children and those with chronic diseases (Li et al., 2006). Additionally households in rural areas were more predisposed to incur financial catastrophe than households in urban areas (Barasa et al., 2017; Van Minh et al., 2013; Yardim et al., 2010). This may be due to higher concentration of low-income earners in rural areas (Salari et al., 2019).

Conversely, an educated or female or employed household head, and a household with insurance cover reduced the risks of incurring CHE (Akinkugbe et al., 2012; Chantzaras and Yfantopoulos, 2018; Nguyen et al., 2011; Wagstaff and Doorslaer, 2003; Xu et al., 2003). This suggest that an educated household head increases the efficiency of a household in maintaining a higher health stock but less medical care (Grossman, 1972). Moreover, higher education is linked to an increase in income (Bhandari and Bordoloi, 2006). Employed household heads are more likely to have higher and stable incomes to satisfy health care demands with ease than unemployed household heads. Additionally, female household heads are possibly more likely to be educated and employed (Azzani et al., 2019).

The limitations of the reviewed studies on catastrophic health expenditure have been centered on their inability to capture indirect costs of illness (income losses, foregone care, transport costs, etc.), their reliance on cross-sectional data and their inability to detect long-term welfare changes due to ill-health as well as the presence of recall biases which can possibly affect the accuracy of data collected. The concerns over cross-sectional data and recall biases are well-placed with propositions to improve the collection of household data. However, whether current methodologies for assessing financial protection capture indirect costs of illness still remains a subjective.

Different surveys such as the living standard survey, consumption and expenditure survey and other national surveys have been extensively used in measuring OOP health spending and financial protection. From the reviewed studies, while more detailed health expenditure lists yielded higher aggregates expenditure compared to single-item (Heijink et al., 2011; Lavado et al., 2013; Nguyen et al., 2011), shorter recall periods yielded larger estimates of health expenditure than long recall periods (Lu et al., 2009). This is primarily due to tendency for more questions and probing to improve respondent recall and shorter recall periods reduces recall biases (Raban et al., 2013). However, the key limitations to these analyses is that the accuracy of the expenditure estimates

from the different surveys could not be determined since there was no gold standard in interpreting the results.

2.4 Conclusion

This review provides important insights into the financial risks households' typically experienced due to health shocks. Catastrophe and impoverishment due to health payments are prevalent in developing countries, the magnitude however varies across countries. Additionally, the poor and vulnerable are disproportionately affected by the burden of catastrophic health payments and impoverishment. Pre-payment systems are protective against catastrophic and impoverishment. Furthermore, aside direct medical costs, indirect costs such as transportation costs, and coping mechanisms expose households to financial risks or welfare losses. The predictors of catastrophe and impoverishment vary across countries and across different socio-demographic characteristics such as HH size, HH head employment status, number of children or elderly, HH insurance status, amongst others. Also, within country and cross-country analyses were challenging due to different survey instruments, threshold levels and analytical procedures. Also, there is a dearth of studies exploring the sensitivity of estimates of OOP and/or financial protection to survey instruments, although differences have been observed.

2.4 Literature Review Gaps

The literature review has demonstrated that most of the studies assessing catastrophic health expenditure have relied on different survey instruments. However, though the vast pool of survey data, very few studies have explored the sensitivity of estimates of catastrophic health expenditure to survey estimates. Only one study assessed the sensitivity of estimates of OOP health payments and financial catastrophe to survey instruments in a developing country context. Even so, that study relied only on data from rural areas and could not differentiate the effect of survey instrument from recall period, survey frame, and number of questions to estimates of OOP and financial catastrophe. Additionally, despite methodological advancements in the indicator of financial catastrophe to account for vertical equity in health financing, very limited studies have explored and used the Ataguba, (2012) rank dependent threshold methodology. This study intends to fill these gaps.

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3. Part C: Journal Manuscript

Health Economics, Policy and Law Journal

Sensitivity of measuring the progress in financial risk protection to varied survey instruments: A case study of Ghana

Abstract

Valid and reliable data on household health expenditure and other household consumption expenditure are important for monitoring the progress towards Universal Health Coverage (UHC). This study assessed the sensitivity of estimates of out-of-pocket health payments and catastrophic health expenditure to the choice of survey instruments. A household budget survey dataset collected in Ghana, in 2017/2018 by the Navrongo Health Research Center was used in this study. Catastrophic health expenditure was out-of-pocket health expenditure that exceeded a certain fraction of household non-food expenditure, depending on the socioeconomic group. The mean and median household out-of-pocket health expenditure per annum ranged from US$74.11 to USD$106.49, and US$13.69 to US$20.33, respectively depending on the type of survey instrument used. Also, between 7.98% and 12.68% of households incurred catastrophic out-of-pocket health payments, depending on the survey instrument used. The findings show that estimates of out-of-pocket health spending and financial catastrophe are sensitive to the level of disaggregation of out-of-pocket health spending questions in survey instruments. Further research is needed, preferably validation studies, to enhance the reliability and comparability of estimates of OOP health expenditure and catastrophic health expenditure.

Introduction

The primary goal of any health system is to maintain and improve the health outcomes of the population. The health system, in so doing, is required to ensure that, amongst other things, all people are financially protected from the hardship associated with health payments, have access to needed quality health care services and access to safe, effective quality and affordable essential medicines and vaccines (World Health Organization 2010). This goal, commonly referred to as Universal Health Coverage (UHC), has been established as a global health priority as emphasised by its inclusion in the Sustainable Development Goals (SDGs) adopted by the United Nations (UN) (United Nations 2015). UHC reiterates the importance of financial protection in improving equity in health care access and population health outcomes (Lu et al. 2017; World Health Organization 2010).

In pursuit of achieving UHC, many countries have enacted major legislation and health system reforms to improve coverage to needed health care services and financial protection by reducing reliance on out-of-pocket (OOP) health payments (Boerma et al. 2009; Chu, Kwon, and Cowley 2019; Knaul et al. 2006; Lu et al. 2012; Mtei et al. 2012). However, there are still wide gaps in financial protection particularly in developing countries (Akazili et al. 2017; Chuma and Maina 2012; Nguyen, Rajkotia, and Wang 2011; Van Minh et al. 2013). These gaps have resulted in the surge in demand for expertise, evidence and measures of progress to incentivise global dialogue and exchange of country experience to inform policy decisions (Boerma et al. 2009; Hsu et al. 2018).

A common measure of financial protection is catastrophic health expenditure (Hsu et al. 2018; Wagstaff and van Doorslaer 2003; Xu et al. 2003). Catastrophic health expenditure is incurred when OOP health spending exceeds a pre-determined fraction of household

resources, reducing the household's available resources at the expense of other consumption goods and services (Xu et al. 2003). The catastrophic health expenditure assesses the impact of OOP health spending on the affordability of health services (Heijink et al. 2011) from the health service user perspective. The interest in the impact of OOP health spending on the affordability of health service is, amongst other things, due to the regressive and inequitable nature of OOP health spending as compared to other mechanisms for health financing (pre-payment, taxes etc. (van Doorslaer et al. 2006). However, it remains the predominant health financing mechanism in many countries. In 2017, for instance, about 32% of total current health expenditure globally was attributed to OOP health spending, ranging from less than 10% in developed countries to more than 70% in some developing countries (World Health Organization 2010).

Household surveys that contain information on household consumption or expenditure, including health-specific expenditure, have been used extensively for monitoring catastrophic health expenditure (Xu et al. 2003). Household surveys such as Living Standard Measurement Surveys (LSMS), World Health Surveys (WHS), Household Budget Surveys (HBS), and Income and Expenditure Surveys, amongst others, serve as the predominant sources of data on household OOP health spending (Heijink et al. 2011; Lu et al. 2017; Raban, Dandona, and Dandona 2013; Xu et al. 2009). These surveys are the primary sources of information for evaluating health interventions and policies and computing national health accounts (Lavado, Brooks, and Hanlon 2013). However, amongst other things, these surveys may be plagued with errors, which may be due to variations in the design of the survey instrument (Heijink et al. 2011; Lu et al. 2017; Raban, Dandona, and Dandona 2013; Rannan-Eliya 2008; Xu et al. 2009).

The design of survey instruments, for instance, mostly vary across surveys in the length of the recall period, the number of disaggregated health expenditure questions, the framing of questions in the survey instruments, how data are collected (either dairy or recall period), and the module used to collect health expenditure data (either using the expenditure or health module) (Heijink et al. 2011; Lavado, Brooks, and Hanlon 2013; Lu et al. 2017; Raban, Dandona, and Dandona 2013). Furthermore, there are variations within the same survey across different countries and years, potentially influencing estimates of catastrophic health expenditure (Lu et al. 2009). A study by Lu et al. (2009), for instance, showed that whereas a shorter recall period yielded a larger estimate of average OOP health spending than a longer recall period, surveys with fewer OOP health questions yielded lower estimates of average health spending than surveys with more OOP health spending questions. Another study by Lu et al. (2017) reported that a health module with a shorter recall period and few OOP questions yielded a significantly higher annual average household OOP estimate than a consumption module with a long recall period and more questions. Additionally, whereas the health module generated higher estimates of catastrophic health expenditure than the consumption module in 2005, in 2010/11 it was the opposite; the consumption module generated significantly higher estimates of catastrophic health expenditure than the health module (Lu et al., 2017). The findings of Lu et al. (2017) contrast with a study by Lavado et al. (2013) which reported that the greater the number of health expenditure questions, the greater the health expenditure share of total consumption expenditure. Also, a one-month increase in the recall period was accompanied by a 6% reduction in the health expenditure share of household expenditure (Lavado et al., 2013).

This study contributes to ongoing efforts towards improving the reliability and comparability of estimates of out-of-pocket health expenditure and catastrophic health expenditure across surveys, by assessing the sensitivity of estimates of OOP health spending and catastrophic health expenditure to the level of disaggregation of OOP health spending questions. Previous studies that documented the impact of the level of disaggregation of OOP health spending questions on estimates of OOP spending and catastrophic health expenditure relied on surveys of different years, and with varying survey characteristics, making it difficult to point out the exact characteristic accounting for the different estimates of OOP and catastrophic expenditure. This study makes it possible to distinctively assess the sensitivity of OOP spending estimates and catastrophic health expenditure to the level of disaggregation of health questions across a similar survey instrument and in the same year.

Methodology and Analysis

Data Source

The study used data from the 2017/2018 'In-depth Household Out-of-pocket Health Expenditure' (IHOPE) household budget survey (HBS) conducted by the Navrongo Health Research Center (NHRC). The IHOPE HBS was implemented at the Navrongo Health Demographic Surveillance System (NHDSS) site located in the northern part of Ghana. The survey employed a cross-sectional survey design to verify how detailed the number of questions on health expenditure could be in household expenditure, income or budget surveys to obtain accurate and reliable estimates of OOP health spending. Using the revised United Nations statistical classification of individual consumption according

to purpose (COICOP-18), the health expenditure module was disaggregated into three different levels: Versions I, II and III containing 11, 44 and 56 health expenditure items, respectively. The number of non-health items and recall periods, however, were held constant across versions. The characteristics and differences between versions are depicted in Table 3.1.

The surveys used a three-stage stratified random sampling approach. In the first stage, households were stratified based on the four enumeration areas demarcated by the Ghana Statistical Service. Households were then divided into clusters based on sub-zones. Then households were randomly selected from each cluster for each version. After cleaning the data, the total sample size was 2530 households (795, 955 and 780 non-overlapping households for versions I, II and III, respectively). The IHOPE survey collected data on household consumption expenditure, including health expenditure.

The independent variables used for this analysis included household non-food expenditure, including OOP health payments, household size and sex, marital status and level of education of household head. The variables selected for this analysis were based on their relevance to the study and other studies' recommendations (O'Donnell et al. 2007; Wagstaff and van Doorslaer 2003; Xu et al. 2007).

Table 3.1: Characteristics of the different versions of the IHOPE Household Budget Survey

		IHOPE Household Budget Survey		
	Characteristics	**Version I**	**Version II**	**Version III**
1	**Purpose**	Collect data on health expenditure using the existing health questionnaire which is already in general household surveys	A new tool developed to collect data on health expenditure through benchmarking the existing COICOP OOPs questions in household surveys	Existing measurements of OOP health spending from health survey integrated into household consumption or expenditure module of the general household survey. The Demographic and Health Survey (DHS) was used.
2	**Sample Size**	795 households	955 households	780 households
3	**Recall Periods**	Four weeks for outpatient services, four weeks and six months depending on the category of medical	Four weeks for outpatient services, four weeks and six months depending on the category of medical appliances	Four weeks for outpatient services, four weeks and six months depending on the category of medical appliances and six months for inpatient services.

		appliances and six months for inpatient services	and six months for inpatient services	
4	**Number of Items** (The detailed disaggregation of each COICOP groups, ECOICH is shown in Appendix 2)	Contained 231 non-health items and 11 health items. The health items were based on the ECOICH-D3 level of disaggregating of health expenditure list.	Contained 231 non-health items and 44 health items. The health items were based on the ECOICH-D4 level of disaggregating of health expenditure list	Contained 231 non-health items and 56 health items. The health items were based on the ECOICH-D5 level of disaggregating of health expenditure list.
5	**Composition of health expenditure**	Medical services that required overnight stays (curative and rehabilitative care & long-term care), medical products (therapeutic appliances and equipment), medical services that did not require an overnight stay (medical services, dental services and paramedical services) and pharmaceutical products		

Living Standards Measurement

Total household non-food expenditure will be used to measure a household's capacity to pay. A household's capacity to pay is defined as effective income remaining after basic food needs have been met (Xu et al., 2003). . Household consumption expenditure is predominantly used to measure living standards because it is more stable over time and easier to assess than income because income is prone to under-reporting (Deaton and Zaidi 1999). The aggregate household consumption non-food expenditure variable was obtained from non-food items such clothing, products and services for the regular maintenance and repair of the dwelling, transport, photographic and cinematographic products and services, sporting and recreational products and services, social protection services, stationery and other educational products and services etc.) because this was the only measure included in the survey. The non-food expenditure was annualized across all the three data sets.

Measurement of Out-of-pocket Health Payments

OOP health payments are defined as direct health care payments made at the point of service use, excluding prepayment for health services either in the form of taxes or insurance premiums or contributions and where applicable, health insurance reimbursements (World Health Organization 2010). All direct OOP health payments were included net insurance reimbursements. The data on OOP health payments were annualised across the three data sets. The unit of analysis of OOP health payments was at the household level. To obtain the annualised household OOP health spending, the 4-week

recall period for outpatient and some medical appliances, and the 6-month recall period for inpatient and other medical appliances (where appropriate) as shown in Table 1, were multiplied by 12 and 2 respectively. The total annualised household OOP health spending was then obtained by summing the annualised OOP spending for the outpatient, inpatient, medical appliances and other items.

Data Analysis

Data analysis was conducted using Stata 15. To examine the possibility that any differences in estimates of catastrophic health expenditure across the three versions are attributed to the survey instrument, the means and confidence intervals were estimated for the household size, household income and household OOP health spending. An unpaired t-test was also performed to determine if there are statistically significant differences in the estimates of household size, income and OOP health spending across the three different versions. Additionally, boxplots were used to show the distribution of household annual OOP health spending and household annual non-food expenditure.

Measuring Catastrophic Health Expenditure

The generalised methodology proposed by Ataguba (2012) was used in estimating catastrophic health payments. The Ataguba (2012) methodology was used for this analysis because, unlike other traditional methodologies such as Xu et al. (2003) and Wagstaff and van Doorslaer, (2003), it accounts for diminishing marginal utility of income of different socio-economic groups. It is a generalised method that can be used to obtain results for the Xu et al. (2003) and Wagstaff and van Doorslaer, (2003) approaches, for instance.

The approach also better reflects vertical equity in the measures of financial catastrophe than other traditional methodologies. OOP health payments are defined as catastrophic if they exceed a predetermined threshold, z% of their household income, but with z% increasing with income. Thus, z is a rank dependent threshold such that financial catastrophe is a function of where the individual or household sits in the income distribution range (Ataguba, 2012). The rank-dependent threshold is defined using an inequality aversion parameter (γ). When the value of γ decreases, the weight on those at the upper end of the income distribution increases. Thus, low-income households face a lower threshold level than high-income households. When the value of $\gamma = 1$, households across the entire income distribution face the same threshold, consistent with traditional methodologies (e.g. Wagstaff and van Doorslaer, 2003; Xu et al., 2003). The Ataguba (2012) generalised methodology is grounded on the premise that measures of catastrophic health payments should incorporate a vertical equity principle in health finance such that the thresholds are a function of the income distribution because, small OOP health payments can be more devastating to poorer households compared to richer households (Wagstaff and van Doorslaer, 2003). Using a fixed threshold level as argued by Ataguba (2012) does not provide an adequate quantification of the incidence of financial catastrophe between poor and non-poor households.

If we define R as the household income, in this case total non-food expenditure, and T_i as the household total OOP health spending, and if z_{cat} is the initial (fixed) threshold level of household non-food expenditure, then the rank-dependent threshold is computed as:

$$z'_{cat} = w(p;\gamma) \times z_{cat} \text{.....eq (1)}$$

where γ is the inequality aversion parameter, p is the household or individual's percentile or rank, and $w(p;\gamma) = \gamma(1-p)^{\gamma-1}$ for $\gamma \in (0,1]$. Based on the recommendation of Ataguba (2012), γ is set at 0.8 and the initial thresholds are set at 25, 30, 35 and 40 percent of total household non-food expenditure. This study only considered non-food consumption expenditure as a proxy for household income since the dataset does not have complete information on food expenditure, limiting the computation of financial catastrophe using the total household expenditure approach. A detailed description of this methodology is provided elsewhere (Ataguba 2012).

This paper implements the three indices for financial catastrophe using the rank-dependent thresholds. These include the rank-dependent catastrophic headcount, payment gap, and mean positive gap. These indices are computed as follows:

Let O_i' represent the rank-dependent catastrophic overshoot such that $O_i' = \max(0, (T_i/R) - z_{cat})$. The rank-dependent overshoot measures the aggregate or average amount by which OOP health payments exceed the threshold (z'_{cat}).

$E_i' = 1(O_i' > 0)$ is defined as a measure which indicates whether a household exceeds a rank-dependent threshold, then $E_i' = 1$ when $O_i' > 0$ and zero when otherwise. Thus, the rank-dependent catastrophic headcount is computed as:

$$H'_{cat} = N^{-1}\left(\sum_{i=1}^{N} E_i'\right) = \mu'_{E'} \quad \text{..... eq (2)}$$

where $\mu'_{E'}$ is the mean of E_i', and N is the total sample size. The rank dependent catastrophic headcount is a measure of the proportion of households that make catastrophic health payments.

The rank-dependent catastrophic gap (G'_{cat}) which measures the deviation from the catastrophic thresholds where $E_i=1$ is computed as

$G'_{cat} = N^{-1} (\sum_{i=1}^{N} O_i') = \mu'_{O'}$……. eq (3)

where $\mu'_{O'}$ is the mean of O_i', and N is the sample size.

The mean positive rank-dependent catastrophic gap (PG'_{cat}) measures the extent to which catastrophic health payments are substantial amongst those incurring them (i.e. excluding the households who do not incur health payments above the established threshold). The positive rank dependent gap index (PG'_{cat}) is also computed.

$PG'_{cat} = \frac{\sum_{i=1}^{n} O_i'}{\sum_{i=1}^{n} E_i'} = \mu'_{O'} / \mu'_{E'}$……..eq (4)

Measuring the concentration indices for catastrophic headcount and payment gap

The concentration index is computed to measure the extent of economic inequality in the distribution of catastrophic health expenditure. A positive concentration index indicates a higher concentration of financial catastrophe among wealthier households, whereas a negative concentration index indicates the opposite. A concentration index with a zero value indicates the absence of inequality (Wagstaff and van Doorslaer, 2003). The concentration index was computed as:

$C = \frac{2}{\mu} \text{cov} (f_i, H_i)$…….. eq (5)

Where C is the concentration index, f_i is the catastrophic health expenditure indicator, μ is the mean of the catastrophic health expenditure indicator and H_i is the fractional rank of individuals in the distribution of income.

Results

Descriptive Statistics

The descriptive statistics of the study population of the three data versions are depicted in Table 3.2. The average household size was estimated at 5.48, 5.16 and 5.04 members for versions I, II and III, respectively. The socio-demographic characteristics of the sampled population across the three versions did not vary significantly. For instance, across the three versions, household heads were predominantly males, had no formal education and were employed. Whereas the mean household annual OOP health spending ranged between US$ 74.11 and US$ 106.49, the median household annual OOP health spending ranged between US$ 13.69 and US$ 20.33, depending on the survey version. From Table 3.2, more disaggregation of OOP health spending questions results in a lower estimate of OOP health spending.

The boxplots[1] in Figures 3.1 and 3.2 show the distribution of household annual OOP health spending and household annual non-food expenditure, respectively. The red diamond mark in the middle of each version represents the median values. Figure 3.1

shows the presence of a few outliers. Also, OOP health spending across all the versions has a positively skewed distribution, a typical characteristic of the distribution of OOP health spending, showing that relatively many households reported low or no OOP health expenditure with a few reporting very high OOP health payments. A similar pattern is observed in Figure 3.2 for household annual non-food expenditure.

Table 3.2: Socio-demographic characteristics of the study population

Socio-demographic Characteristics of the Study Population							
Household Characteristics		**Version I**		**Version II**		**Version III**	
		N	**n (Percentage)**	**N**	**n (percentage)**	**N**	**n (percentage)**
Sex of Household Head	Male	795	500 (62.89)	955	639 (66.91)	780	492 (63.08)
	Females		295 (37.11)		316 (33.09)		288 (36.92)
Educational Level of Household Head	None	793	377 (47.54)		521 (54.55)		423 (54.23)
	Primary		247 (31.15)		274 (28.69)		195 (25.00)
	Secondary		98 (12.36)		91 (9.53)		101 (12.95)
	Tertiary		71 (8.95)		69 (7.23)		61 (7.82)
Employment Status of Household Head	Unemployed	792	53 (6.69)	955	48 (5.03)	780	42 (5.38)
	Employed		721 (91.04)		898 (94.13)		724 (92.82)
	Other		18 (2.27)		8 (0.84)		14 (1.79)
Marital Status of Household Head	Married	795	476 (59.87)	955	625 (65.45)	780	454 (58.21)
	Widowed		238 (29.94)		247 (25.86)		248 (31.79)
	Never Married		29 (3.65)		30 (3.14)		28 (3.59)
	Other		52 (6.55)		53 (5.55)		50 (6.41)

Household Characteristics	Version I			Version II			Version III		
	N	Mean (median)	S. D	N	Mean (median)	S. D	N	Mean (median)	S. D
Household Size	795	5.48 (5)	2.77	954	5.16 (5)	2.7	780	5.04 (5)	2.55
Age of Household Head	795	55.09 (53)	16.44	954	54.22 (53)	16.23	780	55.72 (54)	16.77
Number of Children	795	2.22 (2)	1.78	954	2.22 (2)	1.7	780	2.03 (2)	1.66
Number of Adults	795	3.26 (3)	1.7	954	2.93 (3)	1.62	780	3.02 (3)	1.58
Household Annual OOP[2] (USD$)	795	106.49 (20.33)	513.04	954	74.11 (13.69)	247.97	780	96.25 (17.43)	669.89
Household non-food expenditure (USD$)	795	925.99 (530.29)	1332.02	955	809.18 (462.03)	1512.90	780	712.57 (339.11)	1138.23

Figure 3.1: Box plot of household annual OOP health spending

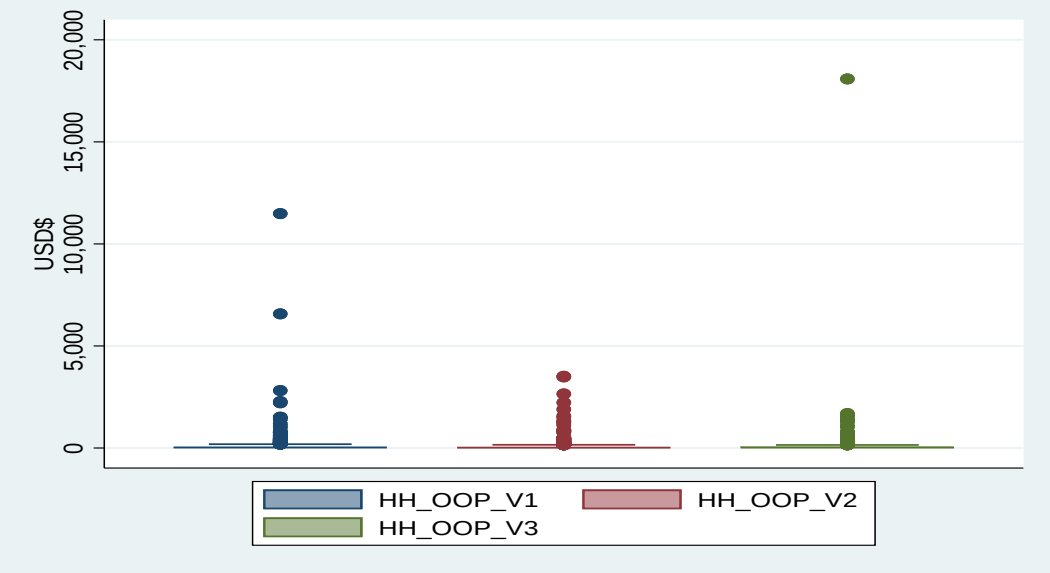
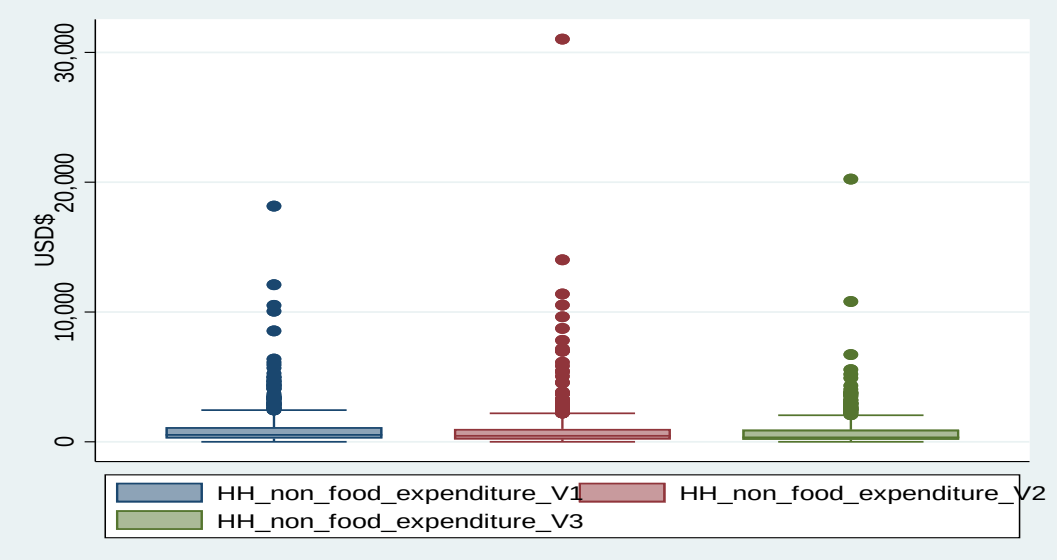


Figure 3.2: Box plot of household annual non-food expenditure



Catastrophic out-of-pocket health payments

The distribution of the estimates of catastrophic OOP health payments gauged using the catastrophic incidence, catastrophic payment gap and catastrophic mean positive gap indices across the three data versions are presented using bar graphs in Figures 3.3, 3.4 and 3.5. As evident in Figures 3.3, as the initial threshold levels for total household non-food expenditure increased from 25 to 40 percent, the catastrophic headcount and catastrophic payment gap decreased across all three versions. For versions I, II and III, the catastrophic headcount decreased from 3.82 percent to 2.19 percent, 3.38 percent to 2.07 percent and 5.77 percent to 3.63 percent, respectively. This implies that, for instance, in the case of version I, about 3.82 percent and 2.19 percent of the study population incurred OOP health payments that exceeded 25 percent and 40 percent of the initial threshold level of total household non-food expenditure, respectively. Also, at all threshold levels, version III (with 56 health items) generated higher estimates of financial catastrophe than versions I (11 health items) and II (44 health items). At the 25 percent initial threshold level of total household non-food expenditure, for instance, the catastrophic headcount decreased by 11.5 percent and increased by 70.7 percent when the number of OOP health questions increased from 11 to 44 and from 44 to 56, respectively. A similar pattern is observed at the 40 percent initial threshold level of total household non-food expenditure. However, the percentage changes are much higher at the 40 percent initial threshold level (e.g. a 5.5% percent decrement in catastrophic headcount as the number of OOP health questions increased from 11 to 44 and a 75.4 percent percent increment in catastrophic headcount as the number of OOP health questions increased from 44 to 56).

As depicted in Figure 3.4, the catastrophic payment gap ranges from 7.98 percent to 21.86 percent across versions I, II and III, respectively as the initial threshold levels for total household non-food expenditure increased from 25 percent to 40 percent. What this means is that, for instance in the case of version II, on average, households incurred OOP health payments in excess of the 25 percent and 40 percent initial thresholds by 14.26 percent and 7.98 percent , respectively. The mean positive gap increased across all versions as the initial threshold levels for total household non-food expenditure increased from 25 percent to 40 percent. The mean positive gap declined from 23.46 percent to 22.48 percent, increased from 23.72 percent to 25.98 percent and increased from 26.41 percent to 28.64 percent for versions I, II and III, respectively as the initial threshold levels increased from 25 percent to 40 percent. Across all threshold levels, version III recorded the highest estimates for catastrophic overshoot and mean positive gap.

The concentration indices for catastrophic headcount and overshoot were all negative across all threshold levels and data versions as depicted in Table 3.3. This implies that catastrophic health payments are concentrated among poor households. At all threshold levels, version III recorded a relatively higher concentration of catastrophic health payments among poor households, followed by versions I and II. Only the concentration indices for catastrophic headcount and overshoot for versions I and II across all threshold levels and the concentration index for catastrophic headcount at an initial threshold level of 25 percent of total non-food expenditure for version I, were statistically significant at the 5 percent level.

Figure 3.3: A bar graph showing the distribution of catastrophic headcount across the three data versions

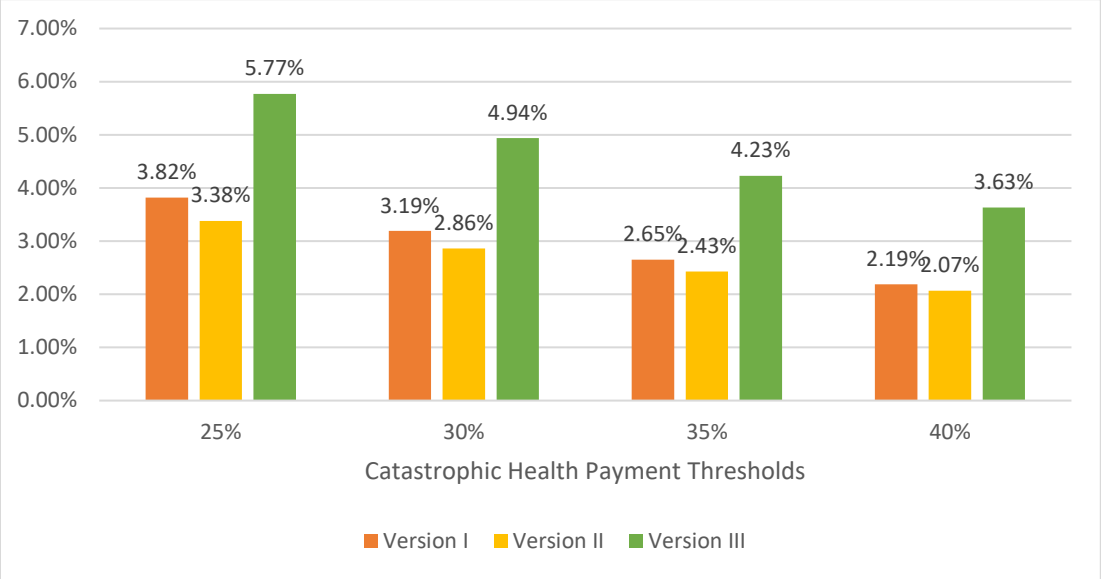


Figure 3.4: A bar graph showing the distribution of catastrophic overshoot across the three data versions

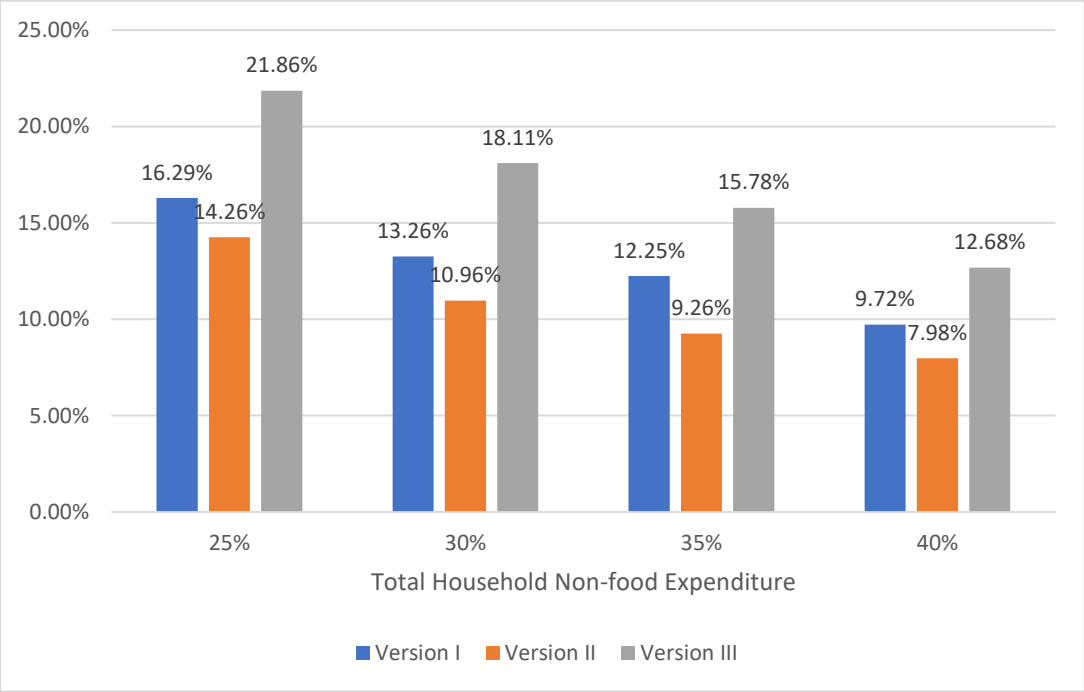


Figure 3.5: A bar graph showing the distribution of catastrophic mean positive gap across the three data versions

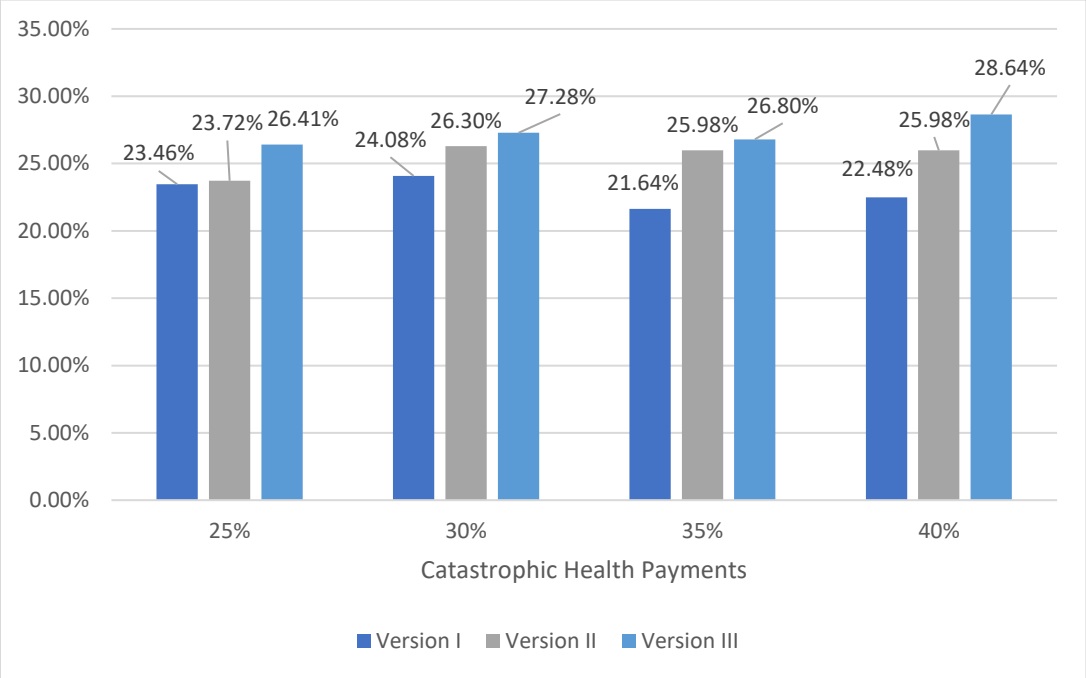


Table 3.3: Concentration indices for catastrophic health payments

Versions		Threshold Levels as a proportion of Total HH non-food Expenditure							
		25%		30%		35%		40%	
		Index (SE)	P-value	Index (SE)	P-value	Index (SE)	P-value	Index (SE)	P-value
Version I	Concentration Index (Headcount)	-0.104 (0.462)	0.0249	-0.088 (0.052)	0.0928	-0.088 (0.055)	0.1056	-0.096 (0.062)	0.1213
	Concentration Index (Overshoot)	-0.107 (0.063)	0.0894	-0.117 (0.068)	0.087	-0.133 (0.074)	0.0717	-0.150 (0.080)	0.0604
Version II	Concentration Index (Headcount	-0.206 (0.043)	0.0000	-0.252 (0.049)	0.0000	-0.276 (0.054)	0.0000	-0.344 (0.057)	0.0000
	Concentration Index (Overshoot)	-0.310 (0.068)	0.0000	-0.346 (0.074)	0.0000	-0.383 (0.080)	0.0000	-0.420 (0.086)	0.0000
Version III	Concentration Index (Headcount)	-0.197 (0.038)	0.0000	0.24 (0.042)	0.0000	-0.255 (0.046)	0.0000	-0.262 (0.052)	0.0000
	Concentration Index (Overshoot)	-0.329 (0.057)	0.0000	-0.356 (0.063)	0.0000	-0.383 (0.068)	0.0000	-0.413 (0.073)	0.0000

Unpaired t-test Analysis

The unpaired t-test analysis of key variables is shown in Table 3.4. Only the mean difference for household size (0.32) was statistically significantly between Versions I and II at the 95 percent confidence interval. For versions I and III, only the mean household annual OOP health payment US$ 10.24 was not statistically significant at the 95 percent confidence interval. For Versions II and III, the difference in the mean household size (0.11), household non-food expenditure US$ 94.74 and household annual OOP health payments US$ 22.14 were not statistically significant at the 95 percent confidence interval.

Additionally, the unpaired t-test analysis of catastrophic health payments across the three data versions is shown in Tables 3.5 and 3.6. The estimates of differences in catastrophic headcount and overshoot, across all thresholds levels of non-food expenditure, were only statistically significant between versions I and III, and versions II and III.

Table 3.4: Unpaired t-test analysis of key variables used in the analysis

Variables	Version I		Version II		Version III		VI and VII Unpaired t-test		VI and VIII Unpaired t-test		VII and VIII Unpaired t-test	
	N	Mean (S.D)	N	Mean (S.D)	N	Mean (S.D)	Mean difference (95% CI)	P-value	Mean difference (95% CI)	P-value	Mean difference (95% CI)	P-value
Household Size	795	5.48 (2.77)	955	5.16 (2.70)	780	5.04 (2.56)	0.32 (0.07,0.58)	0.0139	0.43 (0.17, 0.70)	0.0012	0.11 (-.14,0.36)	0.3828
Household Non-food Expenditure (USD$)		925.99 (1332.02)		809.18 (1512.90)		712.57 (1138.23)	116.81 (-18.18, 251.80)	0.0898	213.42 (90.85, 335.98)	0.0007	96.61 (-31.87, 225.09)	0.1405
Household OOP health spending (USD$)		106.49 (513.04)		74.11 (247.85)		96.25 (669.89)	32.38 (-4.46, 69.23)	0.0849	10.24 (-48.67, 69.15)	0.7332	-22.14 (-68.08, 23.80)	0.3466

Note: Version I= VI, Version II=VII and Version III=VIII. Versions I, II and III contained 11, 44 and 56 health items respectively. However, the number of items for other consumption expenditure and the recall periods were constant across versions.

Table 3.5: Unpaired t-test analysis of catastrophic headcount across the three versions

Initial threshold level	Version I		Version II		Version III		VI and VII Unpaired t-test		VI and VIII Unpaired t-test		VII and VIII Unpaired t-test	
	N	Mean (S.D)	N	Mean (S.D)	N	Mean (S.D)	Mean difference (95 CI)	p-value	Mean difference (95 CI)	p-value	Mean difference (95 CI)	p-value
25%	795	0.16 (0.37)	955	0.15 (0.36)	780	0.22 (0.42)	0.0085 (-0.026, 0.043)	0.6264	-0.0596 (-0.098, -0.0206)	0.0027	-0.0681 (-0.104, -0.031)	0.0003
30%		0.13 (0.33)		0.12 (0.33)		0.19 (0.37)	0.0108 (-0.020, 0.042)	0.4994	-0.0525 (-0.089, -0.0165)	0.0044	-0.0633 (-0.097, -0.029)	0.0002
35%		0.12 (0.33)		0.11 (0.31)		0.16 (0.37)	0.0175 (-0.012, 0.047)	0.2508	-0.0396 (-0.074, -0.0050)	0.0249	-0.0571 (-0.088, -0.025)	0.0005
40%		0.10 (0.30)		0.09 (0.29)		0.13 (0.34)	0.0049 (-0.022, 0.033)	0.7275	-0.0339 (-0.065, -0.0024)	0.0347	-0.0388 (-0.068, -0.009)	0.0103

Note: Version I = VI, Version II=VII and Version III=VIII. Versions I, II and III contained 11, 44 and 56 health items respectively. However, the number of items for other consumption expenditure and the recall periods were constant across versions.

Table 3.6: Unpaired t-test analysis of catastrophic overshoot across the three versions

Initial threshold level	Version I		Version II		Version III		VI and VII Unpaired t-test		VI and VIII Unpaired t-test		VII and VIII Unpaired t-test	
	N	Mean (S.D)	N	Mean (S.D)	N	Mean (S.D)	Mean difference (95 CI)	p-value	Mean difference (95 CI)	p-value	Mean difference (95 CI)	p-value
25%	793	0.04 (0.12)	940	0.03 (0.12)	774	0.06 (0.16)	0.0044 (-0.007, 0.015)	0.4548	-0.0195 (-0.034, -0.005)	0.0065	-0.0239 (-0.037, -0.010)	0.0006
30%		0.03 (0.11)		0.03 (0.11)		0.05 (0.15)	0.0033 (-0.007, 0.013)	0.5353	-0.0174 (-0.030, -0.005)	0.0082	-0.0208 (-0.033, -0.008)	0.0013
35%		0.03 (0.10)		0.02 (0.10)		0.04 (0.14)	0.0021 (-0.007, 0.012)	0.6611	-0.0158 (-0.028, -0.004)	0.0093	-0.0179 (-0.030, -0.006)	0.0026
40%		0.02 (0.09)		0.02 (0.09)		0.04 (0.13)	0.0011 (-0.008, 0.010)	0.8029	-0.0144 (-0.025, -0.004)	0.0094	-0.0155 (-0.026, -0.005)	0.0047

Note: Version I = VI, Version II=VII and Version III=VIII. Versions I, II and III contained 11, 44 and 56 health items respectively. However, the number of items for other consumption expenditure and the recall periods were constant across versions.

Discussion

This study assessed the sensitivity of estimates of OOP health spending and catastrophic health expenditure to the level of disaggregation of OOP health expenditure questions in survey instruments. The results presented in this paper reveal three key findings. The first finding indicates that estimates of OOP health expenditure and catastrophic health expenditure are sensitive to the level of disaggregation of OOP health expenditure questions in the survey instruments. For instance, version I with 11 health items generated higher annual mean and median estimates of OOP health spending than versions II and III with 44 and 56 health items, respectively. Also, version III generated higher estimates of catastrophic health expenditure, followed by versions I and II. The second finding showed that irrespective of the initial threshold level and the version of data, a high proportion of households are exposed to catastrophic health expenditure. The third finding also demonstrated that irrespective of the threshold level and the version of data, catastrophic health payments are concentrated among poor households.

The results of this study provide new evidence and knowledge of the extent to which survey instruments influence estimates of OOP health expenditure and catastrophic health payments. The evidence described in this study contradicts several previous studies (Heijink et al. 2011; Hsu et al. 2018; Lavado, Brooks, and Hanlon 2013; Lu et al. 2017; 2009; Xu et al. 2009) on the effect of the level of disaggregation of questions on estimates of OOP spending and catastrophic health expenditure. For instance, Lu et al., 2009 reported that longer questions generated significantly higher mean estimates of OOP health spending than shorter questions (Lu et al. 2009). However, this finding is consistent with a study conducted by Xu et al. (2009) who observed a higher OOP health spending for the aggregated total than the omnibus. This is because detailed questions and probing

are likely to improve respondent recall (Browning, Crossley, and Weber 2003; Lu et al. 2009; Raban, Dandona, and Dandona 2013; Wagner 2016; Winter 2004). However, it is important to note that a lengthy questionnaire can be inundated with biases such as lower response rates, higher dropouts and lower quality responses (Choi and Pak 2004; Groves 2006; Raban, Dandona, and Dandona 2013). Though the estimates of OOP health expenditure in this study varied across the three versions, the unpaired t-test analysis showed no statistically significant difference in the estimates across the three versions. Hence, one cannot conclude that the differences in the estimates of OOP health expenditure were attributed to the level of disaggregation of OOP health expenditure questions in the survey instrument. Also, the differences in estimates of financial catastrophe across the versions cannot directly be attributed to the level of disaggregation of OOP health expenditure questions in the survey instrument given that financial catastrophe was computed using OOP health expenditure and non-food consumption expenditure.

Estimates of OOP health payments and catastrophic health expenditure did not follow the same pattern across versions. Unlike version I which had the highest mean and median OOP health payments, version III recorded the highest estimates of catastrophic health expenditure than any of the versions. A possible explanation for these results is the effect of the non-food expenditure component on estimates of catastrophic health expenditure. For instance, if the estimates of non-food expenditure are relatively low, then catastrophic health expenditure might be overestimated given that the denominator is small (Raban, Dandona, and Dandona 2013). From the observed results, the mean and median non-food

expenditure was lowest in version III compared to the other versions (versions II and I, in order of smallness) and could have accounted for these findings.

Further analysis of the distribution of OOP health payments showed that across the three versions, the mean OOP health spending constitutes roughly between 9 percent and 13 percent of average household non-food expenditure. These findings are not far-fetched given that OOP health payments are a large component of health care financing in Ghana, constituting about 40 percent of current health expenditure(World Health Organization, 2017). Additionally, the delay in reimbursement of private and public health facilities under the National Health Insurance Scheme (NHIS) and the emergence of alternative delivery systems where providers issue prescription forms for insured clients to purchase drugs out of the facilities, the preference for clients who make OOP health payments over those who are insured, the withdrawal of services mainly by the private sector for clients of the NHIS and the proliferation of informal payment systems (Alhassan, Nketiah-Amponsah, and Arhinful 2016; Dalinjong and Laar 2012; Owusu-Sekyere and Bagah 2014; Sodzi-Tettey et al. 2012), among other factors, may have accounted for the surge in mean OOP health payment as observed by Aryettey et al. (2016). Aryettey et al. (2016) reported a surge in the mean monthly OOP health payment from GH¢ 23 to GH¢33 for outpatient services and from GH¢ 51 to GH¢62 for in-patient service between 2009 and 2011. The relatively high mean OOP as a percentage of average household non-food expenditure across the three versions is further disquieting given that this study showed that catastrophic headcount and overshoot are concentrated among poor households. This can further increase the vulnerability of poor households to adverse outcomes as well as deepen poverty (Flores et al., 2008; McIntyre et al., 2006).

The incidence and severity of catastrophic health payments reported in this study are relatively lower (except for version III) than a previous study that assessed catastrophic health expenditure at the national level (Akazili et al., 2017). Akazili et al (2017) used a fixed threshold level of non-food expenditure and found that 2.43 percent of households spent more than 40 percent of their non-food consumption expenditure on OOP health payments (Akazili et al. 2017). This figure is much higher than the 2.19 percent, and 2.07 percent of households who incurred catastrophic health expenditure at the 40 percent threshold level of non-food expenditure for version I and II, and lower than the 3.63 percent of households who incurred catastrophic health expenditure at the 40 percent threshold level of non-food expenditure for version III. Though various reasons could have accounted for these disparities, these variations further raises concerns on the impact of survey instruments on the measurement of financial catastrophe.

Using different survey instruments can result in the overestimation or underestimation of OOP health spending and catastrophic health expenditure, potentially limiting the tracking of a country's progess towards UHC. Using different survey instruments could also limit cross-country comparisons of the extent of financial protection. . Some studies have proposed a standardised survey instrument across countries for the measurement of OOP health spending and catastrophic health expenditure (Lu et al. 2017; 2009; Saksena, Hsu, and Evans 2014; Xu et al. 2009). However, in reality, this is challenging because first, the evidence on the effects of survey instruments are inconsistent across countries and over time (Lu et al. 2017). Secondly, there is a lack of validation data (i.e. validating household OOP health spending data using non-survey methods) on the optimal survey

instruments for collecting data on household OOP health expenditure and consumption expenditure (Saksena, Hsu, and Evans 2014).

A key strength of this study is the use of different survey instruments that varied in the level of disaggregation of OOP health expenditure questions for assessing catastrophic health expenditure. Though the estimates of OOP health spending across the different versions of survey instruments were not statistically significant to the level of disaggregation of OOP health spending questions, the findings of this study add to the growing knowledge on the effects of survey instruments on estimates of OOP health spending and catastrophic health expenditure and the need for further research to enhance the reliability and comparability of estimates of OOP health expenditure and catastrophic health expenditure over time and across countries.

Another key strength of this study is the use of threshold levels which vary based on a household's socio-economic status to measure catastrophic health expenditure. This is a methodological advancement in the indicators used to measure catastrophic health expenditure and it is more predisposed to account for vertical equity and the diminishing marginal utility of income in health financing (Ataguba 2012). Using uniform threshold levels irrespective of socio-economic status is more likely to lead to lower catastrophic health expenditure estimates than variable threshold levels that vary with socio-economic status thus potentially underestimating financial catastrophe.

The key shortcomings of this study are associated with the survey design. Firstly, the IHOPE data are not nationally representative. Data were collected from relatively rural areas in Ghana, limiting the generalisability of the study findings to other regions and countries. Secondly, self-reported data are subject to recall bias and bias due to irregular

health expenditure. Also, the initial threshold levels used and the inequality aversion parameter to generate the variable thresholds in the Ataguba (2012) methodology are subjective. Another possible limitation of this study is linked to its scope of analysis. The study only focused on the effects of different survey instruments on measuring financial catastrophe using one methodology, a more modern methodology. In future, research assessing the effects of different survey instruments on measuring catastrophic health expenditure should be conducted across different approaches to measuring financial catastrophe in order to document how estimates of financial catastrophe change across these methodologies when using different survey instruments.

Conclusion

The findings of this study show that estimates of OOP health expenditure and catastrophic health expenditure varied depending on the level of disaggregation of OOP health expenditure questions. Health policymakers need to exercise caution when interpreting estimates of OOP health expenditure and catastrophic health expenditure since the findings could be due to the survey instrument. Further research is needed, preferably validation studies, to enhance the reliability and comparability of estimates of OOP health expenditure and catastrophic health expenditure over time and across countries.

Acknowledgement

The author would like to express her gratitude to Associate Professor John E. Ataguba and Dr. Amarech Obse, for their unflinching support, guidance and direction throughout the development of this manuscript. The author is also grateful to Dr. Abraham Oduro,

Dr. James Akazili, Dr. Maxwell Dalaba and Dr. Isaiah Agorinya for granting access to the In-depth Household out-of-pocket Health Expenditure (IHOPE) data for analysis and for their guidance and support.

Author Contribution

The author was responsible for acquiring the data, analyzing the data, developing and submitting the manuscript for publication

Funding

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily attributed to the NRF

Competing Interest

No competing interests between the authors.

Footnote

1. A boxplot illustrates the distribution of a variable. The boxplot represents the 25th percentile, median and 75th percentile. The whiskers show the 5th and 95th percentiles. The circles (dots) represent the outliers.
2. Household Annual OOP health payments and Household non-food expenditure were captured in Ghana cedis (GHS) but reported in USD. 1 USD = 4.82 GHS 2018 average exchange rate was used for the conversion from GHS to USD (Bank of Ghana, 2018).

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4. Part C: Policy Brief

How sensitive is the assessment of financial protection in health to the choice of data collection tools in Ghana?

Key Message:

- Out-of-pocket health payments are proxy estimates of financial hardship due to out-of-pocket health payments are sensitive to the choice of data collection tools
- About 9.75%, 7.98% and 12.68% of the sampled populations, using three different data sets, spend more than 40% of their non-food expenditure as out-of-pocket health payments
- When interpreting estimates of out-of-pocket health payments and financial hardships due to out-of-pocket health payments, there is the need to pay attention to how out-of-pocket health payments are collected
- To determine a reliable data collection instrument that would be used to collect out-of-pocket health payments that reflect reality, out-of-pocket health payments data from the health provider can be used to validate the results from different data collection tools.

Introduction

Direct out-of-pocket health payments at the point of service use often constitute a major access barrier to needed health care. Out-of-pocket health payments can also expose households to financial hardship by reducing a household's resources, affecting its ability to purchase other necessities such as food, clothing and shelter. These payments could even push households into poverty or further into poverty. When households incur out-of-pocket health payments that come with financial hardships, such households lack financial protection in health. It is imperative to protect households from out-of-pocket health payments to achieve universal health services coverage and improve population health outcomes.

Many countries have introduced different health system interventions to reduce direct out-of-pocket health payments at the point of service to achieve universal coverage with health services However, out-of-pocket health payments are still heavily relied on when using health care services, especially in many low and middle-income countries. Health policymakers are advocating for the exchange of reliable country-level evidence and experience, especially from countries that are far advanced in significantly reducing out-of-pocket health payments.

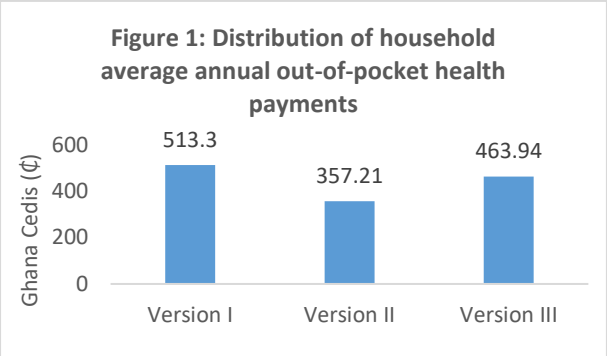
Often, the evidence on out-of-pocket health payments and financial protection in health comes from different household surveys. These surveys use different data collection tools, which vary in the framing of survey questions, number of health expenditure questions, amongst others, potentially influencing the estimates of out-of-pocket health payments and financial catastrophe. Financial catastrophe is an indicator of the lack of financial protection in health. Health payments are defined as catastrophic when they exceed a specific proportion of a household's resource, reducing the household's basic resources at the expense of other consumption goods and services. This study assesses whether the estimates of out-of-pocket health payments and financial catastrophe are sensitive to the number of questions of out-of-pocket health payments in a data collection tool.

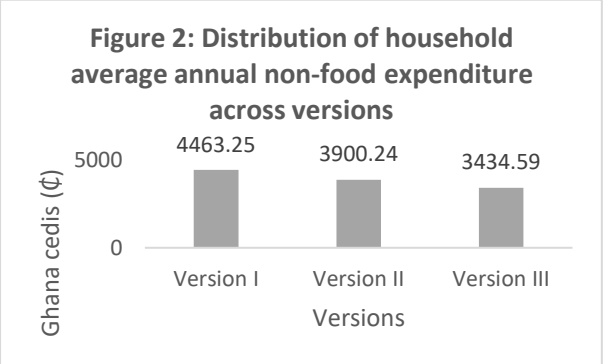
How was this study conducted?

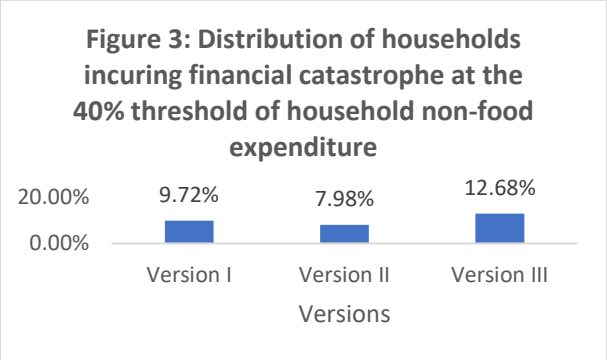
The study used data from the 'In-depth Household Out-of-pocket Health Expenditure' (IHOPE) research study conducted by the Navrongo Health Research Center (NHRC) in 2017/2018. The study was conducted in the Kassena-Nankana District of northern Ghana. Three different data collection tools (herein referred to as versions I, II and III) were used. The

distinction between the data collection tools was the number of questions on out-of-pocket health payments; versions I, II and III contained 11, 44 and 56 out-of-pocket health payment questions, respectively. The study then compared estimates of out-of-pocket health payments and financial catastrophe across the different versions. Households that the share of out-of-pocket health payments exceeded 40% of their total non-food expenditure are said to have incurred financial catastrophe.

Findings







- Whereas the average household annual out-of-pocket health payments collected using version I was the highest, version II recorded the lowest estimate of out-of-pocket health payments as shown in figure 1.
- Additionally, the average household non-food expenditure varied across versions, with version I recording the highest estimate followed by version II and then version III as shown in figure 2.
- Whereas the highest number of households who incurred out-of-pocket health payments that exceeded 40% of their non-food expenditure was in version III, version II recorded the least as shown in figure 3.
- Also, poor households were more likely to incur health payments that exceeded 40% of their non-food expenditure.

Conclusion

Estimates of out-of-pocket health payments and financial catastrophe were sensitive to the data collection tool used. For instance, version I with 11 out-of-pocket health questions generated the highest estimates of out-of-pocket health payments. Version III with 56 out-of-pocket health questions generated the lowest estimates of out-of-pocket health payments. Whereas version III generated the highest estimates of financial catastrophe, version II (with 44 health items) generated the least.

Implications and Recommendations

Implications

- The use of different data collection tools resulted in different estimates of the extent to which households in the Kassena-Nankana District of northern Ghana are financially protected from the burden of out-of-pocket health payments. Thus, there is a need to pay attention to how out-of-pocket health payments data are collected.
- Using data collection tools with detailed questions on out-of-pocket health payments can improve respondent recall and improve estimates of household out-of-pocket health payments. However, very detailed questions can result in lower response rates and lower quality responses.

Recommendations

Accurate and comparable information on out-of-pocket health payments and financial protection in health are essential for informing policy decisions. Based on the study findings, the director of the Research and Development Directorate (RDD) of the Ghana Health Service can use this evidence to improve the reliability and comparability of estimates of out-of-pocket health payments and financial protection in health. Thus, efforts should be directed towards the following measures:

- Validation studies, preferably using out-of-pocket health payments data from the health provider level can be used to validate the results from different data collection tools to determine the appropriate data collection tool for out-of-pocket health payments.
- The director of RDD needs to ensure collaboration between all key stakeholders interested in reliable health accounts data in the country in these validation studies to ensure the uptake and use of appropriate data collection tools for out-of-pocket health payments.

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5. Part E: Appendices

Appendix 1: Characteristics of the Different Versions of the Household Budget Survey

		IHOPE Household Budget Survey		
	Characteristics	**Version I**	**Version II**	**Version III**
1	**Purpose**	Collect data on health expenditure using the existing health questionnaire which is already in general household surveys	A new tool developed to collect data on health expenditure through benchmarking the existing COICOP OOPs questions in household surveys	Existing measurements of OOP health spending from health survey integrated into household consumption or expenditure module of the general household survey. The Demographic and Health Survey (DHS) was used.
2	**Sample Size**	795 households	955 households	780 households
3	**Recall Periods**	4 weeks for outpatient services, 4 weeks and 6 months depending on the category of medical appliances and 6 months for inpatient services	4 weeks for outpatient services, 4 weeks and 6 months depending on the category of medical appliances and 6 months for inpatient services	4 weeks for outpatient services, 4 weeks and 6 months depending on the category of medical appliances and 6 months for inpatient services.
4	**Number of Items** (The detailed disaggregation of each COICOP groups or classes, ECOICH is shown in Appendix 2)	Contained 231 non-health items and 11 health items. The health items were based on the ECOICH-D3 level of disaggregating of health expenditure list.	Contained 231 non-health items and 44 health items. The health items were based on the ECOICH-D4 level of disaggregating of health expenditure list	Contained 231 non-health items and 56 health items. The health items were based on the ECOICH-D5 level of disaggregating of health expenditure list.
5	**Composition of health expenditure**	Medical services that required overnight stays (curative and rehabilitative care & long-term care), medical products (therapeutic appliances and equipment), medical services that did not require an overnight stay (medical services, dental services and paramedical services) and pharmaceutical products		

Appendix 2: Enhanced COICOP based on the COICOP 2018 level of disaggregation of health items

Type of information	*Version-1* **Level of Disaggregation – 11 Health items**	Recall periods: D- days/ M-Months				
		15d	**30d**	**3M**	**6M**	**12M**
	COICOP code 06.2.3 Inpatient care services					
To be asked in bold Examples are given in brackets for more see explanatory notes. **If helpful can add at the end of the explanations:** **for patients with disabilities, the elderly (or those who requires permanent surveillance or constant help due to limited functional capacity)**	**I.LONG. Medical treatment and / or care that required overnight stay in a nursing home; (medical convalescent homes; palliative care establishments) or any other long term care medical facility**				**X**	**X**
	I.CURR. Medical and dental treatment that required an overnight stay in any type of facility (e.g. hospitals, clinics) **excluding long term care medical facility**				**X**	**X**
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to I.LONG & I.CURR	Includes payments for all medical services, diagnostic and laboratory tests, medicines and medical products needed during the overnight stay. Also include emergency transportation services and emergency rescue. Excludes: non-emergency transportation and non-medical costs for patient's relative.					
	COICOP code 06.2.1 Preventive care services					
	P.IMMV. Immunization/vaccination services including for maternal and child care			**X**	**X**	
Inclusion/Exclusion criteria to be specified when asking about the amount	Includes ; travel and tourism vaccination as well as any other immunization/vaccination service.					
	P.OTHR. Other preventive services such as prenatal/postnatal care, child growth and development visits, family planning, screening, tests, consultations to detect communicable or non-communicable diseases before symptoms appear (e.g. diabetes, heart problems)			**X**	**X**	
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to both P.IMMV & P.OTHR	Includes diagnostic and laboratory tests needed to provide preventive services but exclude payments for the vaccine itself when separately invoiced from the service.					
	COICOP code 06.4.2 Emergency transportation and emergency rescue					
Alternative wording: transportation for medical emergency reasons (e.g. by ambulance)	**O.EMER. Patient emergency transportation services and emergency rescue services (excluding those associated with an overnight stay)**	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount	Excludes non-emergency transportation services					
	COICOP code 06.2.2 & 06.2.3 Outpatient dental & other outpatient services					
	O.DENT. Dental consultations and services that did not require an overnight stay;	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount	Includes dental diagnostics services and laboratory tests needed to provide outpatient dental services (e.g. X-rays, blood tests) For any dental illness, disease, injury or health problem; from any type of provider; inside or outside a hospital setting					

	O.CRRL. other medical <u>consultations and services</u> than dental and preventive that did not require an overnight stay	**X**	**X**			
<u>Inclusion/Exclusion criteria to be specified when asking about the amount</u>	Includes any diagnostic and laboratory test needed to provide outpatient medical services (e.g. X-rays, blood/urine tests), but excludes emergency transportation services and emergency rescue					
	<u>COICOP code 06.1.1</u>					
	M.HERH. Herbal medicines (tablets or syrups) and homeopathic products for consumption outside a health facility or institution.	**X**	**X**			
	M.MVCP. Medicines (branded, generic)**, vaccines, oral contraceptives, vitamins and minerals and other pharmaceutical preparations for consumption outside a health facility or institution.**	**X**	**X**			
	<u>COICOP code 06.1. 2 medical diagnostic products, prevention and protective devices</u>					
<u>Inclusion/Exclusion criteria to be specified when asking about the amount</u>	**D.** (Pregnancy tests, incontinence products and absorbent including diapers for the aging population, inhalers, mechanical contraceptives; insecticide treated mosquito nets, blood pressure devices) **and other medical health products for personal use outside a health facility or institution**.	**X**	**X**			
Only applies to some diagnostic products	Includes repair, rental and maintenance					
	<u>COICOP code 06.1.3 Assistive products for vision, hearing, mobility and daily living.</u>					
	A. Purchase, repair, rental/maintenance of (glasses for vision; hearing aids; crutches & wheelchairs; therapeutic footwear; walkers; pressure relief mattresses) **and all other assistive health products** .				**X**	**X**
Type of information	***Version-2*** **Level of *D*isaggregation – 44 Health items**	**Recall periods: D- days/ M-Months**				
		15d	**30d**	**3M**	**6M**	**12M**
	<u>COICOP code 06.2.3 Inpatient care services</u>					
<u>To be asked in bold</u> Examples are given in brackets for more see explanatory notes **If helpful can add at the end of the explanations: for patients with disabilities, the elderly (or those who requires permanent surveillance or constant help due to limited functional capacity)**	**I.LONG. Medical treatment and / or care that required overnight stay in a nursing home; (medical convalescent homes; palliative care establishments) or any other long term care medical facility If yes**					
	I.LONG.SP.1 medical services during the overnight long term care				**X**	**X**
	I.LONG.SP.2 medicines during the overnight long term care				**X**	**X**
	I.LONG.SP.3 medical products during the overnight long term care				**X**	**X**
	I.LONG.DT. diagnostic and laboratory tests				**X**	**X**
	I.LONG.NM. Non-medical cost for the patient (cooking, cleaning, accommodation) during the overnight long term care				**X**	**X**
	I.LONG.ER.1 Emergency transportation and rescue services by ambulance or other vehicles specially adjusted for medical purposes				**X**	**X**
	I.LONG.ER.2 Emergency transportation services and rescue by ordinary vehicles or airplanes (not specially adjusted for a medical purpose)				**X**	**X**
	I.CURR Medical and dental treatment that required an overnight stay in any type of facility (e.g. hospitals, clinics) **excluding long term care medical facility If yes**					

	I.CURR.SP.1. medical, dental services during overnight stay				**X**	**X**
	I.CURR.SP.2. medicines for medical or dental treatment during overnight stay				**X**	**X**
	I.CURR.SP.3. medical products for medical or dental treatment during overnight stay				**X**	**X**
	I.CURR.DT. diagnostic and laboratory tests for medical or dental treatment during overnight stay (e.g. x-rays, scans, blood tests)				**X**	**X**
	I.CURR.NM. Non-medical costs for the patient (cooking, cleaning, accommodation)				**X**	**X**
	I.CURR.ER.1. emergency transportation and rescue services by ambulance or other vehicles specially adjusted for medical purposes				**X**	**X**
	I.CURR.ER.2. Emergency transportation services and rescue by ordinary vehicles or airplanes (not specially adjusted for a medical purpose)				**X**	**X**
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to both I.LONG.SP.1 & I.CURR.SP.1	*If possible* exclude diagnostic and laboratory tests during the overnight stay I.LONG.DT/ I.CURR.DT. and emergency transportation services and emergency rescue (I.LONG.ER / I.CURR.ER)					
Applies to all I.LONG. & I.CURR	Excludes: non-emergency transportation and non-medical costs for patient's relative.					
	COICOP code 06.2.1 Preventive care services					
	P.IMMV.MC. Immunization/vaccination services for maternal and child care			**X**	**X**	
	P.IMMV.OV. Travel and tourism vaccination, any other compulsory or voluntary immunization/vaccination service.			**X**	**X**	
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to P.IMMV.OV	Includes; travel and tourism vaccination as well as any other immunization/vaccination service.					
Applies to both P.IMMV.MC and P.IMMV.OV	Excludes payments for the vaccine itself when separately invoiced from the service.					
	P.OTHR. Other preventive services than immunization/vaccination					
	P.OTHR.GH.1 Family planning, counselling, prenatal/postnatal care services for both the mother and new born (during the six weeks or 42 days)			**X**	**X**	
	P.OTHR.GH.2 Child growth and development consultation visits and any other consultations to monitor "good" health of children and adults			**X**	**X**	
	P.OTHR.DI. screening, tests, consultations to detect communicable or non-communicable diseases before symptoms appear (e.g. diabetes, heart problems)			**X**	**X**	
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to all P.IMMV & P.OTHR	Includes diagnostic and laboratory tests needed to provide preventive services					
	COICOP code 06.4.2 Emergency transportation and emergency rescue					
Alternative wording: transportation for medical emergency reasons (e.g. by ambulance)	**O.EMER. Patient emergency transportation services and emergency rescue services (excluding those associated with an overnight stay)**					
	O.EMER.AV. by ambulance or other vehicles specially adjusted for medical purpose	**X**	**X**			

	O.EMER.NA. by ordinary vehicles or airplanes (not specially adjusted for a medical purpose)	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount	Excludes non-emergency transportation services					
	COICOP code 06.2.2 & 06.2.3 Outpatient dental & other outpatient services					
	O.DENT Outpatient dental care					
	In a hospital setting					
	O.DENT.CS.1 Dental consultations and services that did not require an overnight stay in a hospital setting	**X**	**X**			
	O.DENT.DT.1. Diagnostic and laboratory tests needed to provide dental consultations and services in a hospital setting	**X**	**X**			
	Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)					
	O.DENT.CS.2. Dental consultations and services that did not require an overnight stay Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)	**X**	**X**			
	O.DENT.DT.2. Diagnostic and laboratory tests needed to provide dental consultations and services Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to O.DENT.CS..1 & O.DENT.CS.2	Excludes dental diagnostics services and laboratory tests needed to provide outpatient dental services (e.g. X-rays, blood tests)					
	O.CRRL. Other medical consultations and services than dental and preventive that did not require an overnight stay					
	In a hospital setting					
	O.CRRL.CS.1.1 consultations and services of specialists (paediatricians, surgeons, cardiologists, ophthalmologist, mental health)	**X**	**X**			
	O.CRRL.CS.1.2 consultation and services of general doctors	**X**	**X**			
	O.CRRL.CS.1.3 consultation and services of nurses, midwifes and other health care practitioner	**X**	**X**			
	O.CRRL.DT.1 diagnostic and laboratory tests needed to provide other medical services that did not require an overnight stay in a hospital setting	**X**	**X**			
	Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)					
	O.CRRL.CS.2.1 consultations and services of specialists (paediatricians, surgeons, cardiologists, ophthalmologist, mental health)	**X**	**X**			
	O.CRRL.CS.2.2 consultation and services of general doctors	**X**	**X**			
	O.CRRL.CS.2.3 consultation and services of nurses, midwifes and other health care practitioner	**X**	**X**			
	O.CRRL.DT.2 diagnostic and laboratory tests needed to provide other medical services that did not require an overnight stay outside a hospital setting	**X**	**X**			

Inclusion/Exclusion criteria to be specified when asking about the amount Applies to all O.CRRL.CS.1 & O.CRRL.CS.2	excludes diagnostic and laboratory test needed to provide outpatient medical services (e.g. X-rays, blood/urine tests)					
	COICOP code 06.1.1					
	M.HERH. Herbal medicines (tablets or syrups) and homeopathic products for consumption outside a health facility or institution.	**X**	**X**			
	M.MVCP. Medicines (branded, generic)**, vaccines, oral contraceptives, vitamins and minerals for consumption outside a health facility or institution.**					
	M.MVCP.IA. antibiotics	**X**	**X**			
	M.MVCP.IO.Other medicines (branded, generic, homeopathic) to treat (presumed or diagnosed) bacterial infections (e.g. malaria, diarrhoeas, dysentery, increased frequency of stools with or without blood and mucus in stools; worms infestations)	**X**	**X**			
	M.MVCP.CD. medicines to treat (presumed or diagnosed) non-communicable diseases or chronic diseases (e.g. diabetes, hypertension)	**X**	**X**			
	M.MVCP.FP. oral contraceptives and contraceptives in the form of injections	**X**	**X**			
	M.MVCP.SY medicines to treat fevers, pain and other symptoms (e.g. nausea; vomiting, constipation; inflammation)	**X**	**X**			
	M.MVCP.VM. vitamins, mineral	**X**	**X**			
	M.MVCP.OM. other medicines and pharmaceutical preparations not elsewhere specified	**X**	**X**			
	COICOP code 06.1. 2 medical diagnostic products, prevention and protective devices					
	D. (Pregnancy tests, incontinence products and absorbent including diapers for the aging population, inhalers, mechanical contraceptives; insecticide treated mosquito nets, blood pressure devices) **and other medical health products for personal use outside a health facility or institution**.	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount Only applies to some diagnostic products	Includes repair, rental and maintenance					
	COICOP code 06.1.3 Assistive products for vision, hearing, mobility and daily living.					
	A.PURC. Purchase of (glasses for vision; hearing aids; crutches & wheelchairs; therapeutic footwear; walkers; pressure relief mattresses) **and all other assistive health products** .				**X**	**X**
	A.RRMN. Repair, rental/maintenance of (glasses for vision; hearing aids; crutches & wheelchairs; therapeutic footwear; walkers; pressure relief mattresses) **and all other assistive health products** .				**X**	**X**

Type of information	*Version-3* **Level of *D*isaggregation – 56 Health items**	Recall periods: D- days/ M-Months				
		15d	30 d	3M	6M	12M
	COICOP code 06.2.3 Inpatient care services					
To be asked in bold Examples are given in brackets for more see explanatory notes **If helpful can add at the end of the explanations:** **for patients with disabilities, the elderly (or those who requires permanent surveillance or constant help due to limited functional capacity)**	**I.LONG. Medical treatment and / or care that required overnight stay in a nursing home; (medical convalescent homes; palliative care establishments) or any other long term care medical facility** **If yes**					
	I.LONG.SP.1 medical services during the overnight long term care				**X**	**X**
	I.LONG.SP.2 medicines during the overnight long term care				**X**	**X**
	I.LONG.SP.3 medical products during the overnight long term care				**X**	**X**
	I.LONG.DT. diagnostic and laboratory tests				**X**	**X**
	I.LONG.NM. Non-medical cost for the patient (cooking, cleaning, accommodation) during the overnight long term care				**X**	**X**
	I.LONG.ER.1 Emergency transportation and rescue services by ambulance or other vehicles specially adjusted for medical purposes				**X**	**X**
	I.LONG.ER.2 Emergency transportation services and rescue by ordinary vehicles or airplanes (not specially adjusted for a medical purpose)				**X**	**X**
	Medical and dental treatment that required an overnight stay in any type of facility (e.g. hospitals, clinics) **excluding long term care medical facility** **If yes**					
	I.CURR.SP.1. medical, dental services during overnight stay				**X**	**X**
	I.CURR.SP.2 medicines for medical or dental treatment during overnight stay				**X**	**X**
	I.CURR.SP.3 medical products for medical or dental treatment during overnight stay				**X**	**X**
	I.CURR.DT. diagnostic and laboratory tests for medical or dental treatment during overnight stay (e.g. x-rays, scans, blood tests)				**X**	**X**
	I.CURR.NM. Non-medical costs for the patient (cooking, cleaning, accommodation)				**X**	**X**
	I.CURR.ER.1.emergency transportation and rescue services by ambulance or other vehicles specially adjusted for medical purposes				**X**	**X**
	I.CURR.ER.2. Emergency transportation services and rescue by ordinary vehicles or airplanes (not specially adjusted for a medical purpose)				**X**	**X**
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to both I.LONG.SP.1 & I.CURR.SP.1	*If possible* exclude diagnostic and laboratory tests during the overnight stay I.LONG.DT/ I.CURR.DT. and emergency transportation services and emergency rescue (I.LONG.ER / I.CURR.ER)					
Applies to all I.LONG. & I.CURR	Excludes: non-emergency transportation and non-medical costs for patient's relative.					
	COICOP code 06.2.1 Preventive care services					
	P.IMMV.MC Immunization/vaccination services for maternal and child care			**X**	**X**	

	P.IMMV.OV Travel and tourism vaccination, any other compulsory or voluntary immunization/vaccination service.			**X**	**X**	
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to P.IMMV.OV	Includes; travel and tourism vaccination as well as any other immunization/vaccination service.					
Applies to both P.IMMV.MC and P.IMMV.OV	Excludes payments for the vaccine itself when separately invoiced from the service.					
	P.OTHR. Other preventive services than immunization/vaccination					
	P.OTHR.GH.1 Family planning, counselling, prenatal/postnatal care services for both the mother and new born (during the six weeks or 42 days)			**X**	**X**	
	P.OTHR.GH.2 Child growth and development consultation visits and any other consultations to monitor "good" health			**X**	**X**	
	P.OTHR.DI. screening, tests, consultations to detect communicable or non-communicable diseases before symptoms appear (e.g. diabetes, heart problems)			**X**	**X**	
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to all P.IMMV & P.OTHR	Includes diagnostic and laboratory tests needed to provide preventive services					
	COICOP code 06.4.2 Emergency transportation and emergency rescue					
Alternative wording: transportation for medical emergency reasons (e.g. by ambulance)	**O.EMER. Patient emergency transportation services and emergency rescue services (excluding those associated with an overnight stay)**					
	O.EMER.AV by ambulance or other vehicles specially adjusted for medical purpose	**X**	**X**			
	O.EMER.NA by ordinary vehicles or airplanes (not specially adjusted for a medical purpose)	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount	Excludes non-emergency transportation services					
	COICOP code 06.2.2 & 06.2.3 Outpatient dental & other outpatient services					
	O.DENT Outpatient dental care					
	O.DENT.CS.1 Dental consultations and services that did not require an overnight stay in a hospital setting	**X**	**X**			
	O.DENT.DT.1 Diagnostic and laboratory tests needed to provide dental consultations and services in a hospital setting	**X**	**X**			
	O.DENT.CS.2 Dental consultations and services that did not require an overnight stay Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)	**X**	**X**			
	O.DENT.DT.2 Diagnostic and laboratory tests needed to provide dental consultations and services Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to O.DENT.CS.1 & O.DENT.CS.2	Excludes dental diagnostics services and laboratory tests needed to provide outpatient dental services (e.g. X-rays, blood tests)					
	O.CRRL. Other medical consultations and services than dental and preventive that did not require an overnight stay					
	In a hospital setting					

	O.CRRL.CS.1.1 consultations and services of specialists (paediatricians, surgeons, cardiologists, ophthalmologist, mental health)	**X**	**X**			
	O.CRRL.CS.1.2 consultation and services of general doctors	**X**	**X**			
	O.CRRL.CS.1.3 consultation and services of nurses, midwifes and other health care practitioner	**X**	**X**			
	O.CRRL.DT.1 diagnostic and laboratory tests needed to provide other medical services that did not require an overnight stay in a hospital setting	**X**	**X**			
	Outpatient settings (e.g. private practice, office, medical center, clinics, polyclinics)					
	O.CRRL.CS.2.1 consultations and services of specialists (paediatricians, surgeons, cardiologists, ophthalmologist, mental health)	**X**	**X**			
	O.CRRL.CS.2.2 consultation and services of general doctors	**X**	**X**			
	O.CRRL.CS.2.3 consultation and services of nurses, midwifes and other health care practitioner	**X**	**X**			
	O.CRRL.DT.2. diagnostic and laboratory tests needed to provide other medical services that did not require an overnight stay outside a hospital setting	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount Applies to all O.CRRL..CS1 & O.CRRL..CS.2	excludes diagnostic and laboratory test needed to provide outpatient medical services (e.g. X-rays, blood/urine tests)					
	COICOP code 06.1.1					
	M.HERH. Herbal medicines (tablets or syrups) and homeopathic products for consumption outside a health facility or institution.					
	M.HERH.PR prescribed	**X**	**X**			
	M.HERH.OC over-the-counter (self-prescription)	**X**	**X**			
	M.MVCP. Medicines (branded, generic)**, vaccines, oral contraceptives, vitamins and minerals for consumption outside a health facility or institution.**					
	prescribed					
	M.MVCP.PR.IA. antibiotics	**X**	**X**			
	M.MVCP.PR.IO. Other medicines (branded, generic, homeopathic) to treat (presumed or diagnosed) bacterial infections (e.g. malaria, diarrhoeas, dysentery, increased frequency of stools with or without blood and mucus in stools; worms infestations)	**X**	**X**			
	M.MVCP.PR.CD. medicines to treat (presumed or diagnosed) non-communicable diseases or chronic diseases (e.g. diabetes, hypertension)	**X**	**X**			
	M.MVCP.PR.FP. oral contraceptives and contraceptives in the form of injections	**X**	**X**			
	M.MVCP.PR.SY. medicines to treat fevers, pain and other symptoms (e.g. nausea; vomiting, constipation; inflammation)	**X**	**X**			
	M.MVCP.PR.VM. vitamins, mineral	**X**	**X**			
	M.MVCP.PR.OM. other prescribed medicines and pharmaceutical preparations not elsewhere specified	**X**	**X**			
	over-the-counter (self-prescription)					
	M.MVCP.OC.IA. antibiotics	**X**	**X**			

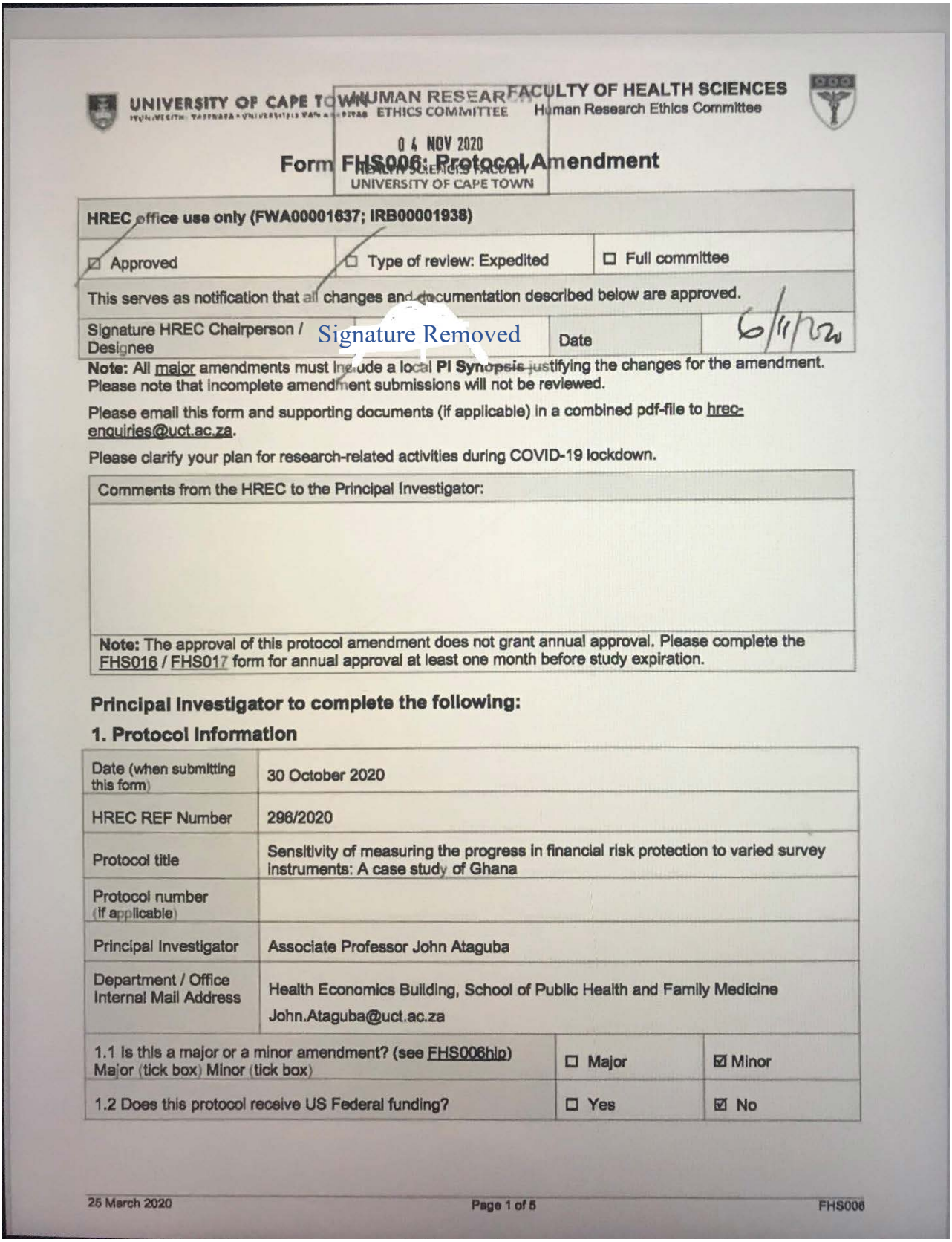
	M.MVCP.OC.IO Other medicines (branded, generic, homeopathic) to treat bacterial infections (e.g. malaria, diarrhoeas, dysentery, increased frequency of stools with or without blood and mucus in stools; worms infestations)	**X**	**X**			
Examples on NCD should list the most prevalent in country/site	**M.MVCP.OC.CD medicines to treat (presumed or diagnosed) non-communicable diseases or chronic diseases** (e.g. diabetes, hypertension)	**X**	**X**			
	M.MVCP.OC.FP oral contraceptives and contraceptives in the form of injections	**X**	**X**			
	M.MVCP.OC.SY medicines to treat fevers, pain and other symptoms (e.g. nausea; vomiting, constipation; inflammation)	**X**	**X**			
	M.MVCP.OC.VM vitamins, mineral	**X**	**X**			
	M.MVCP.OC.OM other self-prescribed medicines and pharmaceutical preparations not elsewhere specified	**X**	**X**			
	COICOP code 06.1. 2 medical diagnostic products, prevention and protective devices for personal use outside a health facility or institution					
	D.DIAG. (pregnancy tests; thermometers, glucose-meters, blood pressure meters) **and other medical diagnostic products**	**X**	**X**			
	D. PREP condoms and other mechanical contraceptive devices, masks , medicinal stockings (e.g. compression stockings), medicinal gloves, insecticide treated mosquito – nets **and other prevention, protective medical devices**	**X**	**X**			
	D.TRTM inhalers, syringes, humidifiers, nebulizers, hot bags, ice packs, first aid kits, bandages **and other treatment devices for personal use**	**X**	**X**			
Inclusion/Exclusion criteria to be specified when asking about the amount Only applies to some diagnostic products	Includes repair, rental and maintenance					
	COICOP code 06.1.3 Assistive products for vision, hearing, mobility and daily living.					
	A.PURC.VH. Purchase of glasses for vision; white canes, glass eyes, contact lenses, hearing aids and **other assistive products for vision and hearing**				**X**	**X**
	A.RRMN.VH. Repair, rental/maintenance of assistive health products for vision and hearing				**X**	**X**
	A.PURC.MD. Purchase of crutches & wheelchairs; therapeutic footwear; walkers; pressure relief mattresses **and all other assistive health products for mobility and daily living.**				**X**	**X**
	A.RRMN.MD. Repair, rental/maintenance of assistive health products for mobility and daily living.				**X**	**X**

Appendix 3: Outline of Variables to be used in the analysis

Variables	Description	Scale of Measurement	Categories: code
Age	Age of study participants	Binary	<18year: 0
			≥18years: 1
Gender	Gender of Study participants	Binary	Male: 0
			Female: 1
Gender of Household Head	Gender of Household Head	Binary	Male: 0
			Female: 1
Household Head Level of Education	Highest Level of Education of Household Head	Categorical	Tertiary Education: 0
			Secondary Education: 1
			Primary Education: 2
			None: 3
Household Head Marital Status	Household Head Marital Status	Categorical	Married: 0
			Consensual Union: 2
			Separated: 3
			Divorced: 4
			Widowed: 5
			Never Married: 6
Geographical Zone	Geographical location of household in the Kassena-Nankana District	Categorical	West: 0
			East: 1
			North: 2
			South: 3
			Central: 4
Socio-economic Status of Household	Socio-economic status of households calculated from total household consumption expenditure	Categorical	Poorest: 1
			Very Poor: 2
			Poor/Middle: 3
			Less Poor: 4
			Least Poor: 5
		Categorical	Insured: 0

Health Insurance Status	Health Insurance Status of study participants		Uninsured: 1
Type of Health Facility	Type of health facility study participant sought care from	Variable with multiple modalities	Public Health Facility
			Private Health Facility but accredited by the NHIS
			Private Health Facility without accreditation from NHIS
			Traditional Healers
Type Health Service	The type of health service obtained	Variable with multiple modalities	In-patient
			Out-patient
			Medical appliances Over-the counter
Household size	Number of household members	Continuous	
Adult Equivalent Household Size	Number of Household members adjusted for age, economies of scale and calorie intake	Continuous	
Total household expenditure	Household expenditure on goods and services	Continuous	

Appendix 4: UCT Human Research Ethics Approval



UNIVERSITY OF CAPE TOWN

HUMAN RESEARCH ETHICS COMMITTEE

04 NOV 2020

HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)		
☑ Approved	☐ Type of review: Expedited	☐ Full committee
This serves as notification that all changes and documentation described below are approved.		
Signature HREC Chairperson / Designee: Signature Removed	Date	6/11/2020

Note: All major amendments must include a local **PI Synopsis** justifying the changes for the amendment. Please note that incomplete amendment submissions will not be reviewed.

Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.

Please clarify your plan for research-related activities during COVID-19 lockdown.

Comments from the HREC to the Principal Investigator:
Note: The approval of this protocol amendment does not grant annual approval. Please complete the FHS016 / FHS017 form for annual approval at least one month before study expiration.

Principal Investigator to complete the following:

1. Protocol Information

Date (when submitting this form)	30 October 2020		
HREC REF Number	296/2020		
Protocol title	Sensitivity of measuring the progress in financial risk protection to varied survey instruments: A case study of Ghana		
Protocol number (if applicable)			
Principal Investigator	Associate Professor John Ataguba		
Department / Office Internal Mail Address	Health Economics Building, School of Public Health and Family Medicine John.Ataguba@uct.ac.za		
1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)		☐ Major	☑ Minor
1.2 Does this protocol receive US Federal funding?		☐ Yes	☑ No

25 March 2020 Page 1 of 5 FHS006

1.3 If the amendment is a major amendment and receives US Federal Funding, does the amendment require full committee approval? **Note:** Any protocol amendments for **Full Committee** review MUST be submitted on the monthly HREC submission dates. (Please email an electronic copy to hrec-enquiries@uct.ac.za)	☐ Yes	☑ No

2. List of Proposed Amendments with Revised Version Numbers and Dates

Please itemise on the page below, all amendments with revised version numbers and dates, which need approval.
This page will be detached, signed and returned to the PI as notification of approval. Please add extra pages if necessary.

1. Removed the second objective in the initial proposal that is " To assess the sensitivity of estimates of impoverishment to using different survey instruments to collect out-of-pocket health payment"

The objective was removed because the primary study does not meet the data requirements to measure impoverishment due to out-of-pocket health payments.

2. The second objective was replaced with: "To assess the sensitivity of estimates of out-of-pocket health payments to using different survey instruments to collect out-of-pocket health care spending."

Introduced a new objective to replace the deleted objective. This objective will also provide additional insights to the outcome of the first objective of the initial proposal "To assess the sensitivity of estimates of financial catastrophe to using different survey instruments to collect out-of-pocket health care spending"

3. Protocol status (tick ✓)

☐	Open to enrolment
☐	No participants have been enrolled
☐	Closed to enrolment (tick ✓)
☐	Research-related activities are ongoing
☐	Research-related activities are complete, long-term follow-up only
☑	Research-related activities are complete, data analysis only

4. Proposed changes will affect: (tick ✓ all the categories that apply)

	Protocol
☑	Study objectives, design (including investigator's brochure, clinical activities, study length)
☐	Study instruments, questionnaires, interview schedules
☐	Sample size
☐	Recruitment methods
☐	Eligibility criteria (inclusion and exclusion criteria)
☐	Drug/device (composition, amount, schedule, route of administration, combination with other drugs/devices, safety information)
☑	Data collection/ analysis

☐	Principal Investigator. (Please attach revised conflict of interest and PI declaration statements. Refer: sections 7 and 8.4 in the New Protocol Application Form FHS013)
☐	Consent form and information sheet
☐	Recruitment materials (e.g. advertisements)
☐	Administrative (e.g. change in sponsor's name, change in contact information)
☐	Other. Please specify:

4.1 In your opinion, will there be any **increase** in risk, discomfort or inconvenience to participants?	☐ Yes	☑ No
If yes, please provide a detailed justification/explanation:		
N/A		

4.2 What follow-up action do you propose for participants who are already enrolled in the study?	
☐	Inform current participants as soon as possible
☐	Re-consent current participants with revised consent/assent forms (append)
☑	No action required
☐	Other. Please describe:

5. Detailed description of the change(s)

Please attach, for each amendment, a summary of all changes which clearly indicates:

i. Old wording (e.g. ~~strikethrough~~ text, CHANGED FROM and CHANGED TO)

ii. New wording (e.g. *italicized*, **bold**, tracked)

iii. Detailed rationale/ justification/ explanation for each change

6. Ethics Review Levy – cost including vat

Cost for Major Amendments - R3 691.20

(Protocols funded by UCT (e.g. departmental funding / student research) and by certain grant funding organizations (e.g. MRC, NRF, CANSA,) are exempt from charges)

For invoicing purposes, please provide:

Sponsor's name	N/A
Contact person	N/A
Address	N/A
Telephone number	N/A

Email Address	N/A

7. Signature

My signature certifies that I will maintain the anonymity and/ or confidentiality of information collected in this research. If at any time I want to share or re-use the information for purposes other than those disclosed in the original approval, I will seek further approval from the HREC.

Signature of PI	Signed by candidate	Date	29 October 2020

Appendix 5: Journal Instructions for Authors

Health Economics, Policy and Law

General correspondence and queries should be sent to the journal's Managing Editor, Ketevan Rtveladze at hepl@cambridge.org.

Submission

All manuscripts must be submitted online via the website:

http://mc.manuscriptcentral.com/hepl

Detailed instructions for submitting your manuscript online can be found at the submission website by clicking on the 'Instructions and Forms' link in the top right of the screen; and then clicking on the 'Author Submission Instructions' icon on the following page.

The Editor will acknowledge receipt of the manuscript, provide it with a manuscript reference number and assign it to reviewers. The reference number of the manuscript should be quoted in all correspondence with HEPL Office and Publisher.

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Articles

Original research articles should be between 6,000 and 8,000 words, including tables and figures, with an accompanying abstract not exceeding 200 words. Guest editorials, review articles and debate essays may also be considered. Authors should note the journal's editorial policy when making submissions.

Guest editorials will be invited pieces in which authors will provide a short, analytical commentary on a topical issue. The recommended length for guest editorials is 2,000 words. Some issues of the

journal may also contain review articles (5,000 words) and debate essays (3,000 words). Review articles will feature a discussion of two or three books on a related theme while debate articles will assess an area within the scholarly disciplines or policies pertinent to health. For specific comments on the appropriateness of an idea for a review article, debate essay or a research article generally, please contact Adam Oliver at a.j.oliver@lse.ac.uk.

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1. Manuscripts should be clearly typed in double spacing and should have a left-hand margin of at least 25 mm/1 inch and a right-hand margin of at least 40mm/1.5 inches. Type size should be no smaller than 12 points. Contributors are asked to retain an exact replica themselves for use in answering copy-editor's enquiries and correcting proofs.

2. Footnotes should be numbered consecutively (in superscript) within the text and listed in a separate section at the end of the article before the References.

3. *Referencing*. Authors must use the author-date system of referencing as described in The Chicago Manual of Style, 15th Edition, (The University of Chicago Press, 2003). In this system

citations in the text and footnotes list the author's surname and the year of publication of the work in parentheses. Eg. (Sen and Williams, 1963). Where there are three or more authors, list the first author's surname, followed by et al. and the year of publication. The full list of cited references is then provided alphabetically at the end of the article. References should contain, in the case of books, the names of authors as they appear on the title page, the year of publication, the full title including any subtitle, the place of publication and the name of the publisher, and in the case of articles, the name(s) of the author(s), the year of publication, the full title of the article, the name of the journal, the volume and issue numbers, and the page reference (number of first and last page).

Le Grand, J. (2003), *Motivation, agency and public policy: of knights & knaves, pawns & queens*. Oxford: Oxford University Press.

Harsanyi, J.C. (1982), 'Morality and the theory of rational behaviour', in A. Sen and B. Williams (Eds), *Utilitarianism and beyond*. Cambridge: Cambridge University Press.

Arrow, K.J. (1963), 'Uncertainty and the welfare economics of medical care', *American Economic Review*, 53(5): 941-73.

4. Tables and Figures. Each table and figure should be on a separate sheet, numbered and collected together at the end of the article, after the References. Their place in the text should be indicated by a space and the words 'Table X (Figure X) about here'. Tables should be clearly laid out and designed to fit into a space 190 x 120mm. Vertical lines between columns should be omitted, and horizontal lines limited to the top and bottom of the table, with an additional line below the column headings. Totals and percentages should be labeled, and units identified. Figures should not contain more detail than can be clearly shown in a space 190 x 120mm.

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5. *Spelling*: Please use English rather than American spelling. In general use the spelling –ise/isation rather than –ize/ization (eg. organise/organisation).

Capitals: Please keep these to a minimum and be consistent throughout the manuscript.

Italics should be used for foreign words except proper names and words (such as role, elite) that have entered common English usage. The use of italics for emphasis is discouraged.

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Last updated 5th May 2020