SCHOOL OF PUBLIC HEALTH

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IMPACT OF NATIONAL HEALTH INSURANCE SCHEME STATUS ON CATASTROPHIC HEALTH EXPENDITURE AMONG HOUSEHOLDS IN GHANA

BY

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DECLARATION

I, Sandra Kwakye, the author of this dissertation, do hereby declare that with the exception of references to the literature and works of other researchers which have been duly cited, the work in this dissertation is the result of my original work and has not been submitted elsewhere for another degree.

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Date: …….

DEDICATION

I dedicate this work to God Almighty for the grace and mercies He has shown me throughout the period of my study in this school and for a successful completion of my project work.

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First of all, I will like to acknowledge God, who by His mercy and grace has carried me through this course successfully.

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LIST OF ABBREVIATION

CHE	Catastrophic health expenditure
GDP	Gross domestic product
GLSS6	Ghana living standard survey round six
GSS	Ghana Statistical Services
HI	Health Insurance
HIS	Health Insurance Scheme
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
OOP	Out-of-pocket payment
PMS	Propensity score matching
W.H.O	World Health Organization

ABSTRACT

Background: Ghana's pro-poor National Health Insurance Scheme (NHIS) has been implemented since 2004 to provide financial protection to households through the reduction of financial obstacles to accessing health care services therefore averting payment at point of use of health services. Using secondary data from the Ghana Living Standards Survey Round 6 (GLSS6).

Objectives: The study sought to determine the proportion of households faced with catastrophe due to health care payments, impact of NHIS on out-of-pocket payment and the impact of NHIS on catastrophic health payments.

Methods: To estimate proportion of households incurring catastrophic health expenditure, frequency, percent frequency and confidence intervals of point estimates were used. Chi-square test of independence and t-test were used to determine the relationship between variables and NHIS status. Multiple regression analysis coupled with propensity score matching with nearest neighbor (1 and 2) procedures was used to determine the impact of NHIS on OOP and CHE. Data analysis was done using Stata SE version 15 (StataCorp, Texas USA) and $p<0.05$ considered statistically significant.

Results: The study found the proportion of households faced with catastrophic health expenditure to be 6.20% and 0.34% estimating health expenditure to be >= 10% and 40% of non-food expenditure respectively. Age, sex, place of residence, marital status, education, wealth quintile and size of household were found to be associated with NHIS status. The regression analysis showed statistically significant relationship between NHIS and CHE at 10% threshold. Using propensity score matching impact estimate technique, also showed statistically significant impact of NHIS on CHE at 10% threshold.

Conclusion: The study therefore recommends further research to ascertain the quality of services provided under the NHIS and the reasons for making OOP especially amongst the marginalized.

Keywords: out-of-pocket payment, catastrophic health expenditure, non-food expenditure and NHIS.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The ultimate objective of a healthcare system is to ensure that individuals benefit from high-quality care that household income can support. Additionally, health systems also function to safeguard households from suffering healthcare expenses that are relatively high compared to their earnings, in order to avert any adverse effects on the economic well-being of households (Kimani, Mugo & Kioko, 2016). As noted by Baeza and Packard (2006), this responsibility of assurance and the process of achieving this deed is often termed, the goal of health system's financial protection. In sub-Saharan Africa and many developing countries, out-of-pocket (OOP) spending by households is primarily the means of funding healthcare, severely affecting the economic status of households, especially the poor (Kimani et al., 2016).

Studies have found that using OOP payment when health services are needed is an unfair way to manage a health system since social groups will be burdened unevenly, particularly the vulnerable (WHO, 2000). The utmost financial weight in such a health system is placed on the household, and if the fee for healthcare surpasses the capability to pay during service delivery, the probable response will be to evade or defer seeking essential care (WHO, 2000). This consequently, could have detrimental outcomes as families are often left with options to decide on saving a member from illness or suffering after financially providing for a healthcare and sustaining other basic needs like education, food or housing (Frenk, González-pier, Gómez-dantés, Lezana, & Knaul, 2006). Therefore, health expenses could contribute significantly to poverty (Baeza & Packard, 2006; Van Doorslaer et al., 2006; Wagstaff & Van Doorslaer, 2003).

Catastrophic health expenditures (CHE) is basically, paying for healthcare beyond a set limit 10% (Wagstaff & Van Doorslaer, 2003) and 40% (Xu et al., 2003) often used in the literature with consequences of financial suffering to a number or percentage of households, which may lead to poverty. Automatically, it does not compare to high healthcare costs. Even cost of healthcare services that seem small can be financially overwhelming for households that are of low economic status (Su et al., 2006).

Elgazzara et al., (2010), stated that, OOP payments for healthcare have resulted in concerns on policies for three major reasons. Firstly, households may be forced into impoverishment because of OOP payments for health. Secondly, households exposed to such health payments may restrain other necessary household expenditure. As such, a comparatively small expense can result in financial catastrophe for poor household with budget strained already, forcing cutbacks in basic expenses like food, shelter, clothing, or children's education. Likewise, financial catastrophe and bankruptcy, can result even households of higher economic due to huge health care expenditure (Xu et al., 2007). Thirdly, households in place of facing sudden financial consequences after paying fee for health services, may decide on forgoing essential healthcare services, hence, generating a sequence of ill health, disability, and poverty.

To address high OOP expenditures and its financial challenges while improving equitable access to healthcare, some developing countries such as Ghana, Nigeria, Tanzania, Rwanda and Kenya have come up with several strategies, of which the most prominent is the health insurance (Brugiavini & Pace, 2016).

Health insurance is, therefore, defined as a scheme that ensures the mobilization of resources for health, reduces expenses in healthcare that are not funded by insurance, as well as making available health care services for the under-privileged (Dalinjong & Laar, 2012).

According to the World Health Organization (WHO), health insurance is intended to ensure access to better health care (WHO, 2000), as well as reduce healthcare costs that are not funded by insurance (Xu, et al., 2003). Despite these benefits, health insurance schemes appear to be lop-sided, as studies have shown that enrolment often favours a small number of rich individuals as against the huge number of under-privileged and helpless individuals (Savedoff, de Ferranti, Smith & Fan, 2012).

Existing literature on Ghana's health insurance highlight the gains of the policy while addressing the accompanying challenges as well. Key among the challenges are out-of-pocket payments clients make for healthcare services despite the existence of the scheme.

However, this studies were not conducted nationwide and could not be said to be nationally representative. Considering the pre-financed nature of the scheme and the patronage of disadvantaged groups, it is expedient to examine the extent to which such payments are made, how they impact on the marginalized and how such payments are influenced by the NHIS.

1.2 Problem statement

Ghana's National Health Insurance Scheme (NHIS) is a social insurance system where members of the country pay an amount of money (premium) to a mutual fund, from which their cost of health care services are catered for during time of sickness (NHIA, 2013). Management of the funds is done at the district level (NHIA, 2013). However, the district schemes again receive support from the central government through National Health Insurance Fund (NHIA, 2013). The National Health Insurance Fund is a fund raised from 2.5% Health Insurance Levy (VAT) on certain goods and services, and 2.5% of contributions from social security levy from all Ghanaian

workers. The NHIS of Ghana pools funds from various sources to ensure healthcare services is provided to the populace. Regardless of the contribution from different levels, the NHIS provides to all subscribers, a universal benefit package, thus warranting horizontal equity to the use of healthcare service (NHIA, 2013). The NHIS has a large and increasing number of deprived groups in its membership base. NHIS operates with the principle of cross-subsidization in its design, which ensures that the rich subsidize for the poor by paying more, the contributions of healthier individuals is used to cross-subsidize the sick, and adults of high economic status pay to cross-subsidize children and extremely poor individuals.

According to Currie and Madrian (2005), health insurance has the potential of providing increased purchasing through protecting households from the risk of health surprises, which might weaken the ability of households to making or saving money. It is supposed to improve right to obtain health care and bring about universal health coverage and equity by ensuring that avoidable, unfair and redeemable differences do not exist between the poor, the vulnerable and the rich irrespective of where they find themselves.

Existing literature on Ghana's health insurance highlight the gains of the policy while addressing the accompanying challenges as well. Key among the challenges are out-of-pocket payments clients make for healthcare services despite the existence of the scheme. Considering the pre-financed nature of the scheme and the patronage of disadvantaged groups, it is expedient to examine the extent to which such payments are made, how they impact on the marginalized and how such payments are influenced by the NHIS.

1.3 Research questions

This study set out to seek answers to the following research questions:

1. What is the proportion of households incurring CHE in Ghana?
2. What is the effect of NHIS coverage on OOP health expenditure?
3. What is the effect of NHIS coverage on CHE?

1.4 Objectives of the study

1.4.1 General objective

The general objective of the study was to determine the effect of NHIS coverage on CHE among households in Ghana.

1.4.2 Specific objectives

The specific objectives of the study were to:

1. Determine the proportion of households incurring catastrophic health expenditure
2. Estimate the impact of NHIS enrollment on out-of- pocket health expenditure
3. Estimate the impact of NHIS enrollment on catastrophic health expenditure

1.5 Significance of the study

The NHIS as a policy that seeks to establish health equity and universal health coverage with the intention of ameliorating the challenges faced by the poor in assessing health service delivery, could have unintended consequences, which may lead to the poor losing out in using the scheme. This study highlights specifically the proportion of households faced with catastrophic health

expenditure and the extent to which NHIS enrollment has influenced out-of-pocket health care expenditure, which leads to catastrophic health expenditure. Thus, the findings of the study would help policy developers to put in appropriate measures to insulate the pro-poor policy objective of the Ghana's NHIS. The study will further add to the available literature on this topic and also serve as a source of reference for other students and researchers who wish to further explore this topic or other similar ones.

1.6 Conceptual framework

The conceptual framework of the study is depicted in Figure 1. Out of pocket health expenditure subsequently leads to catastrophic health expenditure with several factors contributing to it. Some socio-demographic characteristics of households such as Sex and educational level of household members also has direct influence on the kind of employment individuals have, as some jobs are stereotyped for males and females respectively. Residential location also influences the type of employment people are engaged in and their earnings thereof and hence, ability to enroll on health insurance and also expend on health.

Some of these socio-demographic characteristics of households also have direct influence on whether individuals within the household are enrolled on NHIS and hence have, a valid NHIS membership, are equipped to make OOP or are likely to experience catastrophic effects of the OOP.

Employment status, income level and health status of household members also influence each other directly, such that the health status of individuals can influence the nature and type of employment household members can have or go into and this subsequently influences the income

of the household as well. Employment status as well as income (wealth quintile) have an influence on the health status of households, which could either be positive or negative. Certain types of employment have their own health risk and so can influence the health status of individuals within the households. The income status of individuals may vary depending on their age. Adults may earn more than younger ones.

Since enrollment on NHIS requires payment of premiums by a greater portion of the population, it is obvious that the employment status of household members as well as the wealth status of household contribute to whether or not household members have valid NHIS enrollment.

The health status of household members can also determine whether or not household members are enrolled with a valid NHIS as well as the type of facility and service accessed. Also the type of care or health services needed and the type of facility (public, private etc.) where health care or services is accessed can determine whether or not individuals within a household are enrolled with a valid NHS or not and vice versa.

Having a valid NHIS enrollment determines whether or not out-of-pocket payment on health will be made and if out-of-pocket payment on some health care needs are to be made, the extent to which it impacts on the households economic status, that is whether catastrophic health expenditure is incurred or not.

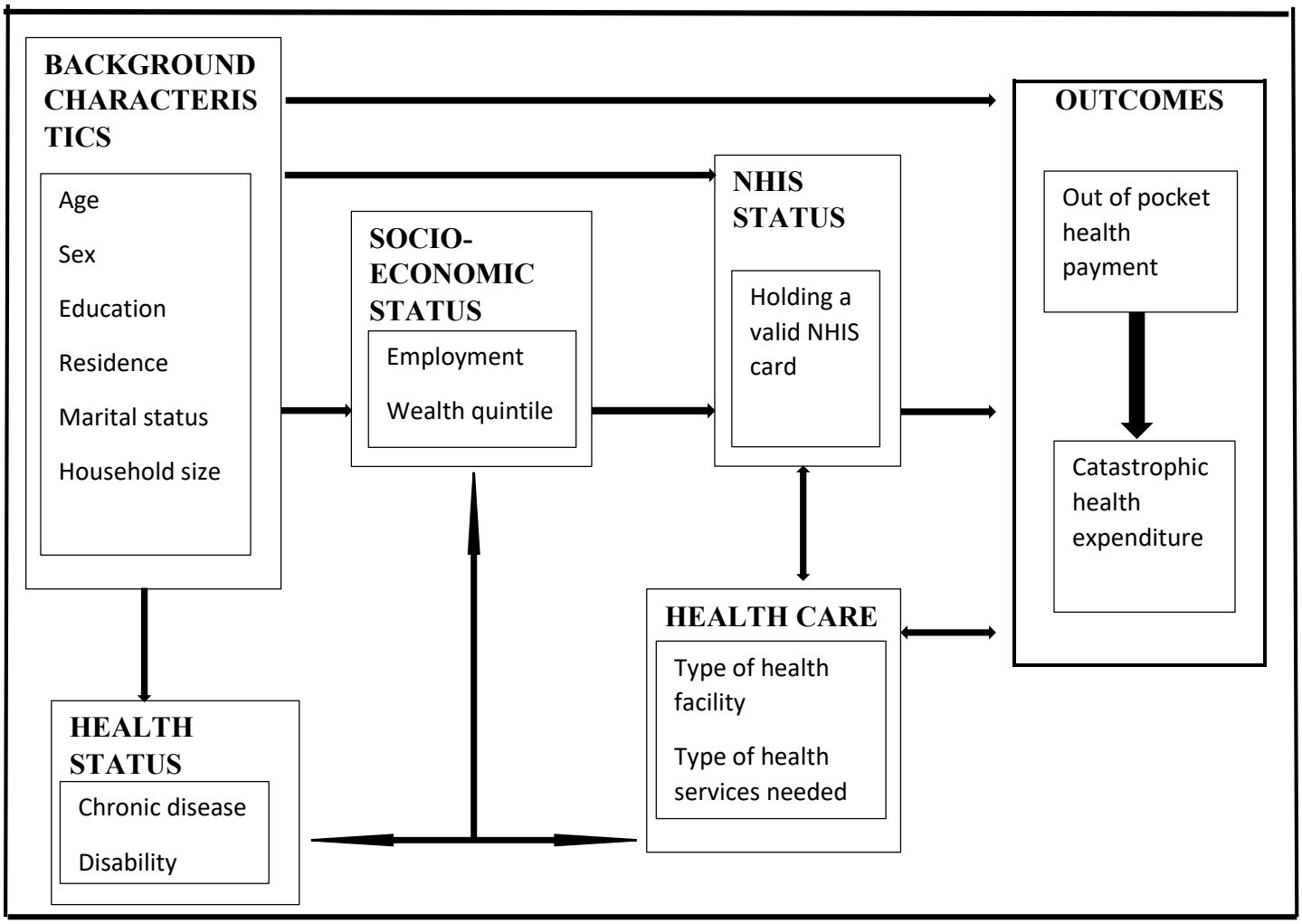


Figure 1: Conceptual Framework for NHIS and Catastrophic Health Expenditure among Households.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature and previous studies on the impact of NHIS on health expenditure across different countries and among different populations. The chapter is presented according to the following, based on the study. It reviews literature on systems of health financing, household demographic characteristics and health financing, examines the proportion of households incurring catastrophic health expenditure, impact of NHIS coverage on out of pocket expenditure and impact of NHIS coverage on catastrophic health expenditure.

2.2 Systems of health care financing

The global move towards universal health coverage with its call for improved healthcare financing as an effective tool has received much attention over the decade. Premising on the need for expanded inclusion and an increased financial risk protection with the ultimate goal of improving lives, various countries have since 2005 been engaged in practical steps towards improved healthcare financing. This notwithstanding, it is evidenced that not all such measures have proven wholly beneficial. Gottre and Schieber (2006), in a World Bank report offer a view of the global landscape of health financing systems. Notably, the developed countries rely largely on government (through taxation) in financing healthcare. This averagely accounts for 10% of gross domestic products (GDP). Germany as an example employs social health insurance which pools funds through taxes from employers and employees ensuring a near universal health coverage (Carrera, Siemens & Bridges, 2008). On the other hand, the diversity of options of financing lies

largely with developing countries. Munge and Briggs (2013), identify three main sources of funding for healthcare in Kenya; OOP payment (29.1%), government (34%) and donors (35%). Donor funding in this regard is often dedicated to specific programmes, which may not necessarily encompass the entire population or a majority of it. With over a quarter of health financing emerging from OOP payments, Kenya's health care financing system is described as regressive since OOP contributions have the propensity to further impoverish the poor (Munge & Briggs, 2013).

Studies from Tanzania indicate a more socially central source of fund generation. In Tanzania, majority (42%) of the funds for health financing is from donors while the government taxation (from public servants only) accounts for 30 % of all funds. However, Tanzania practices a community health funding system at the district level which comprises voluntary contributions by individuals interested and that accounts for 5% of health funds while 23% of all funds are from out-of-pocket payment. This system of financing contrasts with that of South Africa where private medical schemes exist and are the largest contributors accounting for 45% of all funds (Ataguba & Akazilli, 2010).

Accordingly, state contributions are pooled through similar schemes as Tanzania and account for 40% while out-of-pocket payment account for 14% of the funds. In furtherance, although such a system pools much funds from the private sector, it only secures 16% of the population while the majority of the population are challenged with insufficient funds from the remaining sectors. While public funds are insufficient to offer a comprehensive coverage, OOPs are burdensome for citizens. South Africa's system has undergone rigorous scrutiny with legislative measures being employed to adopt a better health insurance system and reduce the burden of cost on individuals.

Chad provides access to care by four main mechanisms: direct payment, free access to selected services, health insurance and health mutual (Azétsop & Ochieng, 2015). About 20,000,000 Chadians benefit from the Health Care Fund (for each treatment episode), which is equivalent to USD 1,240 of health care cost (Axelson, Bales, Minh, Ekman, & Gerdtham, 2009).

In several settings where the health insurance policy is implemented, insured patients are said to have free access to some service (Macinko, Guanais, & Fa, 2006), and family's experience of catastrophic health expenditure is limited (Brugiavini & Pace, 2016). More obviously, research suggest that NHIS registration and patronage is a significant health cost reduction for most families (Million Death Study collaborators, 2010). This is particularly relevant, especially for poor households and the aged (Ukwaja, Alobu, Abimbola, & Hopewell, 2013). In fact, Sambo and colleagues argue that most families that are able to maintain a consistent household health and retain resources are those that rely on health insurance (Sambo, Kirigia & Orem, 2013), considering that they are able to limit the extent of health expenditure on family resources (Bennett, 2004).

The institution of nominal user fees in Ghana started in 1985 with the public sector. This was done substantially to reclaim at least 15% of recurrent expenditure (Nguyen, Rajkotia, & Wang, 2011). To replace out-of-pocket fees at points of service in Ghana, NHIS, which is said to be an equitable policy for financing pro-poor health was instituted in 2004 (Aryeetey et al., 2013). A study by Musango, Orem, Elorainio & Kirigia, (2012), showed that the NHIS cushions households from catastrophic out-of-pocket expenditures and also leads to complete increment in the funds available for health service delivery. The principal aim of the NHIS in Ghana is to provide quality health services for every citizen of Ghana without any out-of-pocket expenses at the point of service (Dalinjong et al., 2017). This is because excessive dependence on direct out-of-pocket

expenses for health care delivery may expose households to the danger of financial calamity (Kirigia, Zere, & Akazili, 2012).

However, in Ghana, members of households, which are of low socio economic status (68%) were unable to afford renewal payments as compared to high socio economic status households (44%) (Jehu-appiah, Aryeetey, Agyapong, Spaan, Hoop & Baltussen, 2011a). This notwithstanding, membership to the scheme is currently voluntary (Amporfu, 2013), and about 34% of Ghana's population are holders of valid NHIS card (Dalinjong et al., 2017). The minimum and maximum contributions from the informal sector to the NHIS range between GH¢7.20 and 47.70 ($8–$53) (Singh et al., 2015), but studies indicate the service is pro-poor (Kusi, Hansen, Asante, & Enemark, 2015).

2.3 Household socio-demographic characteristics and health financing.

Demographic attributes are known to hugely influence patients' ability to access and finance their healthcare (Jehu-appiah et al., 2011b). For instance, household heads who are married are likely to result in more catastrophic health expenditures than those not married due to the increased need for more health care service and more non-insured household members (Chu, Liu, Chen, Tsai, & Chiu, 2005). Contrary, Kusi et al (2015), conducted a study among a similar population in Ghana and found no relationship between marital status and health expenditure. In another research conducted among cancer patients and health financing, patients who were married had a higher health purchasing power than their single counterparts (Bernard, Farr, & Fang, 2011). Similarly, advanced age is associated with less patronage of any private finance, resulting into less catastrophic health expenditure (Engelchin-nissan & Shmueli, 2015). Age has social significance

in most societies, and confers a right on older persons to particular treatment at no cost and are sometimes enrolled on the NHIS at no fee (Ganle, Parker, Fitzpatrick, & Otupiri, 2014). In other systematic reviews, Odeyemi and Nixon, (2013), also reported the significance of age on catastrophic health expenditure, reporting younger patients incur higher cost of health services than late adults and aged.

Social, economic progress and development with time within a nation, can have a positive effect on the enrolment on the NHIS (Odeyemi, 2014). For instance, a study among mothers of under-five and health financing suggested that a mother's educational status had significant association with the type of health care facility where health care was accessed as well as their insurance status (Rehman, Shaikh, & Ronis, 2014). Similarly, it is also significant to note that individuals who live in urban areas are cited as more concerned on the effect of their contributions and quality of care, which can be arguably attributed to the level of education of the urban dwellers (Cornelissen, Asante, Spaan, & Velden, 2016). In other literature, factors associated with lower likelihood of participation in a health insurance programmes included being a member of the majority ethnic group (Axelson et al., 2009), employment in the formal sector (Buigut, Ettarh, & Amendah, 2015), and higher educational level (Dixon, Tenkorang, & Luginaah, 2013).

Access to quality healthcare is dependent on several other factors, including availability of income. For example, most Ugandans prefer to make different contributions based on their income levels (Orem & Zikusooka, 2010). As a consequence, patients in rural areas and low income quartile, either did not seek care at all, or had informal care mostly (Long, Xu, Bekedam, & Tang, 2013). Furthermore, assumptions are at times made about the price of drugs and the patterns of their use (Amporfu, 2013), or on income level or frequency of disease occurrence at the household level rather than on actual health state of a household member (Goryakin & Suhrcke, 2014).

2.4 Catastrophic health expenditure among households

Preliminary literature suggest that catastrophic health expenditure on households include transport and treatment cost, which may result in poor families becoming more impoverished (Murray, Hunter, Bisht, Ensor, & Bick, 2014). Aside this, studies have confirmed that, health seeking-behaviour of low economic status household prevented mostly by cost of transport and health care delivery (Alvesson, Lindelow, Khanthaphat, & Laflamme, 2013). In other settings, abrupt rise in the cost of drugs is said to be the fundamental reason for the rise in the costs of healthcare for families (Kumar et al., 2011).

Catastrophic Health Expenditure (CHE) is a term used to describe the cost incurred on health care that can be detrimental to household's financial capacity and capability in order to sustain its survival needs (Wp et al., 2012). Households are said to incur catastrophic health expenditure when a household's total expenses on health care (out-of-pocket payment) is the same or above a certain threshold of the households non-subsistence spending or capacity to pay. Threshold is mostly set at 10% (Buigut et al., 2015) and 40% (Xu, 2005). There is a higher likelihood for households having members suffering from chronic diseases in experiencing catastrophic health expenditure than those without these conditions (Si et al., 2017). This assertion is in line with studies conducted in the developing and developed countries (Adisa, 2015). As a result, households that do not receive support from the public may experience a higher medical costs burden as compared with households enrolled on Medical-Aid (Choi et al., 2016). Similarly, households with no member being part of an insurance or subsidized schemes, have a higher risk for suffering catastrophic expenses (Amaya-lara, 2016).

To bring about Universal Health Coverage, many countries have designed and implemented health sector reforms (Chen, Palmer, & Si, 2017). Notwithstanding, 44 million households globally, face catastrophic health expenditures annually (Wang, Li, & Chen, 2015), of which most are in low-and-middle-income countries or countries that lack risk-sharing mechanisms (Amaya-lara, 2016). Health insurance schemes are essential tools for financing the cost of health care delivery in countries which are developing (Dixon et al., 2013). Although, 84% of the world's poor suffers 93% of the global burden of disease (Preker et al., 2002), only 11% of global health spending (US$ 2800 billion) occurs in low- and middle-income countries (Kirigia et al., 2012).

In settings like Kenya, studies indicate that catastrophic health expenditures decreased with the quintile of wealth increasing, raising equity questions (Buigut et al., 2015), but proportion of insured Kenyans is only 10% (Barasa, Maina, & Ravishankar, 2017). Ukwaja et al., (2013), showed that financing of health in Nigeria was without risk-pooling mechanisms. This is because in Nigeria, the national health insurance scheme covers only a section (<5%) of the county's population who are federal government workers. However, this is not a universal phenomenon. For example, continents like Asia with a high share of OOP payments are more likely to have a greater percentage of households having catastrophic health expenditure (Tangcharoensathien et al., 2010).

Additionally, it is reported that Mongolians have 12.1% of households incurring catastrophic payments for health care, with only 8% as insured clients (Dorjdagva, Batbaatar, Svensson, Dorjsuren, & Kauhanen, 2016). The U.S Census Bureau reported that out of the insured population, 32.6% of them was protected by public health insurance as of 2103 (Benjamin, Buthion, Vidal-trécan, & Briot, 2014). More than half of the respondents (65%) in Ghana are active contributors of the NHIS (Cornelissen et al., 2016), and almost all respondents (94 %) had accessed

health services with their NHIS card in one or more of the health facilities in Ghana (Dixon et al., 2013). In another community based study of 6790 individuals in Ghana, about 40.3 % of the respondents were presently insured while about 22.4 % reported that they were previously insured and 37 % had never been insured (Kotoh & Vander, 2016).

Meanwhile, evidence from Orissa in India confirms that out-of-pocket payment on healthcare absorbs more than one quarter of households resources (Binnendijk, Koren, & Dror, 2012). Other micro-level household data analysis reveals that community financing improves access to health care needed by rural and informal sector workers and gives some financial cushioning for them against the cost of treatment (Preker et al., 2002).

2.5 Impact of NHIS coverage on out-of-pocket health expenditure

The World Health Organization discourages payment of user-fees at the service delivery point and encourages reliance on a pre-payment scheme (World Health Organisation, 2010). This should however, be made compulsory for those who can afford and subsidized for the poor and under-privileged who cannot pay taxes or a premium. This would go a long way to reduce out-of-pocket expenditure as well as impoverishment of the populace (World Health Organisation, 2010).

Various studies have reported varying changes in out-of-pocket expenditure after the introduction of one form of health insurance or another. Studies have shown a reduction in out-of-pocket expenditure as high as 200% (Jowett, Contoyannis, & Vinh, 2003). In Mexico, Galarraga and colleagues (2010), reported a reduction of an overall financial protection for the poor after the introduction of the Seguro Popular Programme. However, there was no reduction found in out-of-

pocket expenditure. Additionally, there was no protective effect on drug expenditures. Using an alternative analysis method (Instrumental variable method) however, showed a protective effect for drug expenditures (Galarraga et al., 2010).

In the case of Indonesia, Aji, De Allegri, Souares and Sauerborn (2013), found that the introduction of the two main insurance schemes, Askeskin and Askes, resulted in a significant decrease in out-of-pocket expenditure. The Instrumental Variable model was used in the assessment. Askeskin and Askes decreased out-of-pocket expenditure by 34% and 55% respectively in comparison with non-subscribers of both schemes. The third insurance scheme, Jamsostek had a non-significant effect on out-of-pocket expenditure (Aji et al., 2013).

In addition, the Taiwanese people had a significant reduction in out-of-pocket expenditure as well as an increase in accessibility to health care services after the implementation of the National Health Insurance (NHI). A 23.08 % reduction in out-of-pocket expenditure was reported by Chu and colleagues (2005). Contrary to the above findings, the health insurance schemes in China and India have been unsuccessful in the financial protection of the poor (Aji et al., 2013; Wagstaff & Lindelow, 2008).

In Ghana particularly, report indicated that providers usually solicit informal payments from the non-insured patients by charging for services out-of-pocket fees (Nguyen et al., 2011). Thus, non-insured individuals are asked to buy drugs, which are said to be out of stock, and requiring patients to make payments for “better” drugs, which are not covered by NHIS (Dalinjong et al., 2017). However, Kusi et al., (2015), reported that there was a minimal or no impact of health insurance

on out-of-pocket health expenditures and catastrophic health expenditures depending on the structure and services offered by the scheme.

2.6 Impact of NHIS coverage on catastrophic health expenditure

The issues of effect of health insurance on CHE is of a huge concern globally in the attainment of a universal health coverage. As much as possible, countries are working towards the elimination or the reduction of OOP made on healthcare (Wagstaff et al, 2018). Although OOP could subsequently become a catastrophic expenditure, the cost of healthcare services does not naturally translate into a financial burden on households (Puteh & Amualm, 2017). However, the existence of robust and protective policies could have significantly positive effect on CHE. Studies have conversely demonstrated negative impacts of NHIS on CHE amidst the existence of sufficient health insurance policies. Nationally, evaluation studies of the effect of NHIS have been conducted at different thresholds with varying outcomes. Karan, Yip, and Mahal (2017), evaluated the effect of India's health insurance on CHE using the difference-in-difference method. The study identified no effect of the health insurance on CHE for both outpatient and in-patient services sought. The scheme had huge financial challenges and was unable to live up to its mandate of providing equitable healthcare.

Similarly, studies in India allude to the negative risk protection rendered by the health insurance (HI), (Joglekar, 2012). This was prominent amongst the urban population since individuals had to make payments to secure private medical insurance services. Whereas Karan et al. (2017), concentrated much on the rural populace, Joglekar (2012) made inference based on the urban

households. The urban households according to the India study could further explore options at the cost of the individuals of the household hence the increasing CHE. Employing the propensity score model, Galarraga et al. (2010), found significant effect of Mexico's health insurance on CHE. With increased coverage and expanded benefits, the HI shielded enough, the healthcare needs of the populace with a reduction of CHE by 4.6 percentage points (p.p). These findings corroborate with studies conducted in Ghana, which found that the NHIS had a 3p.p reduction on CHE (Aryeetey et al., 2016). However, this study was conducted within two regions of the country and could not be said to be nationally representative.

2.7 Summary of the chapter

This chapter has reviewed existing and current literature relevant to the objectives of the study. The section explores the numerous systems of financing healthcare adopted in various populations. Although diverse, the primary goal is the attainment of UHC amongst populations. These systems have varied influences on OOP and subsequently, CHE amongst households. Different thresholds have been used to examine the strength or otherwise of available health systems as well as their effect on CHE. Although there are studies in Africa and Ghana on OOP, CHE and the NHIS, none had explored the current state of the NHIS for the entire population. The next chapter presents the methods applied to this study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods employed for this study. It provides information on the study design, study area, population of interest, variables of interest, data and data source, power analysis, data acquisition and management data processing and analysis, ethical consideration and a summary of what the chapter entails.

3.2 Study design

A cross-sectional survey was used to obtain data for the Ghana living standard survey 6.

3.3 Study area

Ghana is located 750 km above the equator on the west coast of Africa. It lies between latitudes 4^0 44' and 11^0 11' north and longitudes 3^0 15' west and 1^0 12' east. Longitude 0^0 pass through Tema. The total area of the country is about 238,540 km^2. The country shares boundaries with Burkina Faso to the north, La Cote d'Ivoire to the west, and Togo to the east. The Gulf of Guinea, which is part of the Atlantic Ocean, forms the southern boundary of the country. (Ghana Statiscal Service, 2010)

Ghana is made up of ten administrative regions which are sub - divided into 212 districts. The city of Accra is the administrative as well as the commercial capital of Ghana. (Ghana Statiscal Service, 2010)

3.4 Study population

In 2010, Ghana's population was estimated to be 24,658,823 according to the population and housing census. The population and housing census also reported that, out of the household members that were counted, 42.4% of them were children of the heads of the households while 27% and 10.5% of them were heads and spouses respectively. Other relatives constituted 11.9% of the household members. About 65.3% of the household heads were males while female household heads were 34.7%. (Ghana Statiscal Service, 2010).

3.5 Study variables

The variables of interest in this study were divided into dependent and independent as explained below.

3.5.1 Dependent variable

The primary dependent variable for the study was catastrophic health expenditure (CHE). CHE in this study was measured as household's annual total out-of-pocket health payments (hospitalization excluded) equal or exceeding 10% (Wagstaff &Van Doorslaer, 2003; Buigut et al., 2015) and 40% (Hao et al., 2012; Xu et al., 2003) of household's non-food expenditure. Catastrophic health expenditure was constructed as a dummy variable with values 1 and 0. A catastrophic health of 1 indicated a household with catastrophic expenditure while 0, represented those without catastrophic expenditure. The formula indicated below show how it was calculated.

$$Catastrophic\ health\ expenditure_h = 1\ if\ \frac{oop_h}{NFexp_h} \geq 0.1 \ldots\ldots\ldots\ldots (1)$$

$$Catastrophic\ health\ expenditure_h = 0\ if\ \frac{oop_h}{NFexp_h} < 0.1 \ldots\ldots\ldots\ldots (2)$$

And

$$Catastrophic\ health\ expenditure_h = 1\ if\ \frac{oop_h}{NFexp_h} \geq 0.4 \ldots\ldots\ldots\ldots (1)$$

$$Catastrophic\ health\ expenditure_h = 0\ if\ \frac{oop_h}{NFexp_h} < 0.4 \ldots\ldots\ldots\ldots (2)$$

Defining the variables

oop_h: Total annual household out-of- pocket payment for health (excluding hospitalization)

$NFexp_h$: Total annual household expenditure on non-food items

The secondary outcome variable for the study was out-of-pocket health expenditure: OOP health payments refer to expenditures made by households at the point of receiving health care services. These are typically payments made for consultation with a doctor, buying of medication, medical investigations and products as well as other expenses made on other sources of treatment such as alternative or traditional medicine. Spending on special nutrition hospitalization and health-related transportation were excepted (Xu, 2005).

3.5.2 Independent variables

Age: age in years of household head, measured as continues variable.

Sex: sex of household head, measured as a categorical binary variable.

Marital status: head of household's marital status, measured as a categorical variable.

Educational level: highest educational qualification of household head. This was measured as a categorical binary variable.

Employment status: employment status of household head, measured as a categorical binary variable.

NHIS status: Household's NHIS status (at least one member of the household has NHIS coverage). Measured as a categorical binary variable

Residence: Residential location of household in rural or urban locations measured as a categorical binary variable.

Wealth quintile: Estimates of relative household wealth based on asset data, measured as a categorical variable.

Household size: number of members within a household, measured as a continuous variable.

3.6 Data and data source

This study employed data from the Ghana Living Standards Survey six round (GLSS 6) conducted in 2012-2013. GLSS 6 is a nationally representative survey conducted across the ten regions of Ghana. The data contain information on out-of-pocket health payment, NHIS and other key variables of interest.

This was a descriptive quantitative study. The data for the study was derived from a cross-sectional survey from the Ghana Living Standard Survey 6.

GLSS6 is based on multi-stage stratified-cluster sampling design. The sample size of GLSS 6 involved 16,772 households. Households were selected into the study using two-stage stratified sampling design. One thousand, two hundred (1,200) enumeration areas were obtained initially to form the Primary Sampling Units. These units were allocated into the 10 regions by employing

probability proportional to population size (PPS) technique. Divisions were done to further divide the EAs into urban and rural localities of residence. All the households in the selected Primary Sampling Units (PSUs) were listed completely to form the secondary sampling units (SSUs). Fifteen (15) households from each PSU were systematically selected at the second stage for the study. Details of the study design can be found in GLSS (2014) report page (GSS, 2014).

The GLSS Round 6 used interviewer-administered questionnaires as the data collection instrument. This study adopted the household questionnaire of the GLSS 6. A data sheet (appendix A) was developed out of the GLSS 6 data to help obtain the appropriate data for the study.

3.7 Power analysis

The sample size of 16,772 household resulted in a power of 99.9% after assuming an impact estimate of 0.20 reduction in out-of-pocket health expenditure among households with at least one member covered with NHIS compared with households with no NHIS coverage using a type I error of 5% and equal variance 1.2. This shows that the study was powered enough to detect a significant impact of NHIS on out-of pocket health expenditure.

3.8 Data acquisition and management

Data was acquired from the Ghana statistical services through an online registration with a personal email address and password, information on the purpose of the data requested was required by GSS and provided by the principal investigator before access to the GLSS 6 data was acquired through a download of the micro-data. The data has been stored on an external hard drive and the principal investigator is the only person with access to it.

Key variable required for the study are identified from the GLSS 6 data. Some key variables identified were renamed and recoded and other variables created.

3.9 Data processing and analysis

The study describes the background characteristics of household using descriptive statistical analyses based on measures of central tendencies and dispersion to analyze quantitative continuous variables. Frequency, percent frequency and contingency tables were used to summarize categorical variables. Data were presented graphically using histograms and diagnostic graphs.

Association between categorical variables and NHIS status was based on Chi-square test of independence. Association between continuous variables and NHIS status was investigated using t-test. A multivariable logistic regression analysis was used to determine the relationship between covariates and NHIS coverage.

To estimate proportion of households incurring catastrophic health expenditure, frequency, percent frequency and confidence intervals of the point estimates were used.

To determine the relationship between covariates and OOP health payment, multiple linear regression analysis was employed. Additionally, multivariable logistic regression analysis was used to determine the relationship between covariates and CHE at both 10% and 40% threshold.

To evaluate the impact of NHIS on OOP and CHE, propensity score matching procedure was used. The propensity scores for households, which is defined as the probability of at least one household member covered with NHIS given the observed covariates was predicted for each observation by

fitting a logit model and an average propensity scores generated. Thus the probability of a household being covered with NHIS given the observed covariates was given by;

$$e_i(X_i) = P(NHIS_i|X_i), where;$$

$e_i(X_i)$: Estimated propensity score.

$NHIS_i$: At least one household member covered with NHIS

X_i: Households background characteristics and other observed factors.

Propensity score matching was used because program (NHIS) has already been introduced and every citizen is expected to enroll, therefore, randomization is not possible in this situation using the secondary data. In addition, propensity score matching is employed in order to construct comparison groups since assignment to the treatment is done on the basis of observable variables and not done randomly. To ensure the comparison group is as similar as possible to the treatment group in terms of the observable before the start of the treatment, propensity score matching was employed.

3.9.1 Assessing common support or diagnosing matches from NHIS

Numerical and graphical diagnosis were used to evaluate and assess common support of the distribution of propensity scores between households with at least one member covered and those without NHIS coverage. A comparison of the multi-dimensional histograms and Kernel density plots of the covariates in the matched NHIS and non-NHIS households was generated. A balanced sampling test was done to evaluate the quality of matching.

To estimate the actual treatment effect, propensity score matching using 1:1 and 1:2 nearest neighbour of the treatment on the outcome, out-of-pocket payment with bandwidth 0.25 and

bootstrapping with 200 replications were done with a bandwidth of 0.08 to determine the actual treatment effect on the treated (ATT).

Similar statistical analytic technique was employed to examine the effect of NHIS enrollment on catastrophic health expenditure at both thresholds.

The study assumed that standardized differences greater than 10% in absolute value indicated serious imbalance in the covariate of interest between the two groups.

Data was analyzed using Stata SE version 15 (StataCorp, Texas USA) and $p<0.05$ was considered statistically significant.

3.10 Ethical consideration/ access to dataset

Permission was sought from the Ghana Statistical Service through online application to access the GLSS Round 6 data for this study.

3.11 Summary of the chapter

The chapter provided information on the methods applied to the study, providing information on the study design, study area, study population, study variables, data and data source, power analysis, data acquisition and management, data processing and analysis as well as ethical considerations. The next chapter presents the results of the study.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the results of the study. It presents the background characteristics of the respondents, factors influencing NHIS status, prevalence of catastrophic health expenditure among households in Ghana, association between socio-demographic factors and holding a valid NHIS, association between NHIS and OOP, association between NHIS and CHE, results of propensity score matching and impact estimates of NHIS on catastrophic health expenditure and out of pocket health expenditure.

4.2 Background characteristics of respondents

The total number of households for the study was 16,722 with a mean age of household head been 45.06 years ± 15.59 and mean household size was 3.99 ± 2.63. 3

The result showed that 12,045 (69.47%) of the household heads were males and 4,727 (30.53%) were females. Additionally, 9,327 (44.61%) and 7,445 (55.39%) lived in rural and urban areas respectively. The table also indicates that 11,829 (67.87%) of the households had at least, one member with NHIS coverage and 4,943 (32.13%) had no member with NHIS coverage. Detailed distribution of the socio-demographic characteristics of households can be found in table 1.

Table 1: Background characteristics of respondents.

Characteristics	Frequency	Percentage (%)
Sex		
male	12,045	69.47
female	4,727	30.53
Total	16,772	100
Residence		
Urban	7,445	55.39
Rural	9,327	44.61
Total	16,772	100
Marital status		
Never married	1,753	12.32
Married	9,871	54.84
Consensual union	1,450	9.57
Separated	656	4.41
Divorced	1,129	7.80
Widowed	1,910	11.05
Total	16,772	100
Education		
None	8507	42.83
Primary	5114	35.87
Secondary	1424	9.78
Tertiary	1727	11.52
Total	16772	100
Employment		
Not employed	1768	10.49
Employed	15004	89.51
Total	16772	100
Income quintiles		
First	3374	13.19
Second	2946	15.96
Third	3000	18.31
Fourth	3371	22.09
Fifth	4081	30.44
Total	16772	100
Catastrophic health expenditure: threshold 40%		
Not incurred	16710	99.66
Incurred	62	0.34
Total	16772	100
Catastrophic health expenditure: threshold 40%		
Not incurred	15689	93.80
Incurred	1083	6.20
Total	16772	100
NHIS status		
No NHIS	4943	32.13
Has NHIS	11829	67.87
Total	16772	100
Age of head of household mean±SD	45.06±15.59¥	
Annual Out-of-pocket health expenditure in GHC mean±SD	84.73±222.50¥	
Household size mean±SD	3.99±2.63¥	

¥ Estimates of means and standard deviation

4.3 Factors influencing NHIS status (at least one member of household holding a valid NHIS card)

Using a bivariate analysis based on the Chi-square test of independence to determine the association between NHIS status and socio-demographic characteristics, it was found that sex, that is being a male or female household head ($\chi^2 = 7.70$, p= 0.006) was significantly associated with NHIS status. The following variables were found to be significantly associated with holding a valid NHIS; marital status of household head ($\chi^2 = 724.14$, p< 0.001), educational level of household head ($\chi^2 = 87.44, p < 0.001$), employment status of household head ($\chi^2 = 8.16, 0.004$), income quintile of household ($\chi^2 = 37.18, p < 0.001$), age of household head ($\chi^2 = -15.47, p < 0.001$) and size of household ($\chi^2 = -22.25, p < 0.001$). The results are shown in Table 2 below.

Table 2: Factors influencing NHIS status (at least one member of household holding a valid NHIS card)

Characteristics	No NHIS n(%)	NHIS n(%)	χ^2, p-value	Full sample n(%)
Sex			7.70,0.006**	
Male	3623(30.13)	8400(69.87)		12023(100)
female	1320(27.96)	3401(72.04)		4721(100)
Residence			0.34, 0.36	
Urban	2168(29.16)	5267(70,84)		7435(100)
Rural	2775(9.81)	6534(70.19)		9309(100)
Marital status			724.14,<0.001***	
Never married	917(52.34)	835(47.66)		1752 (100)
Married	2308(23.42)	7546(76.58)		9875(100)
Consensual union	565(39.07)	881(60.93)		1446(100)
Separated	2251(38.38)	403(61.64)		654(100)
Divorced	391(34.66)	737(65.34)		1128(100)
Widowed	510(26.74)	1397(73.26)		1907(100)
Education			87.44,<0.001***	
None	2666(31.42)	5820(68.58)		8486(100)
Primary	1544(30.23)	3564(69.77)		5108(100)
Secondary	376(26.42)	1047(73.58)		1423(100)
Tertiary	357(20.67)	1370(79.33)		1727(100)
Employment			8.16, 0.004**	
Not employed	469(26.59)	1259(73.41)		1764(100)
Employed	4474(29.87)	10506(70.13)		14980(100)
Income quintiles			37.18,<0.001***	
First	921(27.37)	2444(72.63)		3365(100)
Second	856(29.15)	2081(70.85)		2937(100)
Third	890(29.72)	2105(70.28)		2995(100)
Fourth	930(27.62)	2437(72.38)		3367(100)
Fifth	1346(32.99)	2734(67.01)		4080(100)
Age of head of household mean±SD	42.92±15.44¥	47.06±15.90¥	-15.47,<0.001***	45.83±15.90¥
Household size mean±SD	3.53±2.65¥	4.57±2.78¥	-22.25,<0.001***	4.26±2.78¥

*% = row Percentages, n=frequency, SD = Standard Deviation, *P-value notation: ***p<0.001, **p<0.01, p*<0.05, ¥ Estimates are mean and standard deviation.*

4.4 Factors influencing NHIS status using multivariable logistic regression analysis

Almost all of the factors were found to be significantly associated with NHIS.

The odds of a female headed household having at least one member covered with the NHIS was 1.62 times the odds in male headed households (AOR=1.62, 95% CI: 1.42 – 1.84), p<0.001.

The odds of a household with a married household head having at least one member covered with the NHIS was 2.52 times the odds in households with head never married (AOR=2.52, 95% CI: 2.06 – 3.08), p<0.001 as shown in table 3 below.

Table 3: Factors influencing NHIS status using multivariable logistic regression analysis

	NHIS status (at least one household member has NHIS)	
Characteristics	**COR [95% CI]**	**AOR [95% CI]**
Sex		
Male	Ref	Ref
Female	1.16***[1.06 – 1.28]	1.62***[1.42 – 1.84]
Marital status		
Never married	Ref	Ref
Married	3.72***[3.17 – 4.36]	2.52***[2.06 – 3.08]
Consensual union	2.35***[1.88 – 2.94]	2.02***[1.61 – 2.54]
Separated	2.13***[1.69 – 2.69]	1.49**[1.16 – 1.92]
Divorced	2.28***[1.85 – 2.81]	1.56***[1.24 – 1.95]
Widowed	3.55**[2.93 – 4.31]	1.96***[1.55 – 2.46]
Education		
None	Ref	Ref
Primary	1.10[0.99 – 1.22]	1.34***[1.19 – 1.50]
Secondary	1.22*[1.02 – 1.47]	2.10***[1.70 – 2.53]
Tertiary	1.64***[1.36- 1.98]	2.29***[1.85 – 2.23]
Employment		
Not employed	Ref	Ref
Employed	0.83*[0.71 – 0.97]	0.91 [0.77 – 1.07]
Income quintiles		
First	Ref	Ref
Second	1.09 [0.92 – 1.28]	1.25**[1.05 – 1.48]
Third	1.00 [0.83 – 1.20]	1.19[0.98 – 1.45]
Fourth	1.17 [0.99 – 1.39]	1.55***[1.27 – 1.90]
Fifth	0.85 [0.71 – 1.02]	1.30*[1.27 – 1.63]
Age of head of household	1.02***[1.02 – 1.03]	1.01***[1.01 – 1.02]
Household size	1.19***[1.16 – 1.22]	1.15***[1.12 – 1.19]

**P-value notation: ***p<0.001, **p<0.01, p*<0.05*

4.5 Proportion of households incurring catastrophic health expenditure

The overall proportion of catastrophic health expenditure among the households was 6.20% using a thresholds of 10%. The proportion of CHE among households with at least one member covered with NHIS was 5.74% and 7.21% among households with no member covered. Among male and female headed households, the proportion of CHE was 5.31% and 8.22% respectively. The proportion of catastrophic health expenditure was 8.80% and 4.10% respectively among households in rural and urban areas. When catastrophic health expenditure was estimated at health expenditure greater or equal to 40% of non-food expenditure, the overall proportion among the households was 0.34%. The proportion of CHE among households with at least one member covered with NHIS was 0.35% and 0.31% among households with no member covered. Among male and female headed households, catastrophic health expenditure was 0.24% and 0.56% respectively and 0.56% and 0.16% respectively among households in rural and urban areas. Detailed distribution of proportion of catastrophic health expenditure by socio-demographic characteristics of households can be found in table 4 below.

Table 4: Proportion of households incurring catastrophic health expenditure

Characteristics	Catastrophic health expenditure @ 10% threshold			Catastrophic health expenditure @ 40% threshold		
	Frequency (n)	(%)	Chi^2, p-value	Frequency (n)	(%)	Chi^2, p-value
NHIS status			5.63, 0.02*			0.11, 0.74
No NHIS	395	7.21		18	0.31	
Has NHIS	688	5.74		44	0.35	
Total	1083	6.20		622	0.34	
Sex			22.91,<0.001***			7.32, 0.007**
Male	703	5.31		35	0.24	
Female	380	8.22		27	0.56	
Total	1083	6.20		62	0.34	
Residence			39.99, <0.001***			10.00, 0.002**
Urban	294	4.10		11	0.16	
Rural	789	8.80		51	0.56	
Total	1083	6.20		62	0.34	
Marital status			15.17, <0.001***			4.30, 0.001***
Never married	69	3.05		5	0.35	
Married	561	5.58		25	0.19	
Consensual union	109	6.61		4	0.23	
Separated	37	5.52		1	0.18	
Divorced	96	8.19		8	0.79	
Widowed	211	11.26		19	0.92	
Total	1083	6.20		62	0.34	
Education			44.89, <0.001***			7.79, <0.001***
None	733	9.15		50	0.63	
Primary	255	4.6		9	0.12	
Secondary	44	2.72		2	0.15	
Tertiary	51	3.12		1	0.00	
Total	1083	6.20		62	0.34	
Employment			40.35, <0.001***			9.16, 0.003**
Not employed	191	10.98		16	0.91	
Employed	892	5.64		46	0.27	
Total	1083	6.20		62	0.34	
Income quintiles			7.24, <0.001***			2.43, 0.50*
First	226	7.39		22	0.75	
Second	232	8.27		13	0.41	
Third	203	6.41		7	0.18	
Fourth	211	6.12		11	0.32	
Fifth	211	4.52		9	0.24	
Total	1083	6.20		62	0.34	
Age of head of household mean [95% CI]	50.70 [49.33 – 52.07]			56.37 [51.17 – 61.57]		
Household size mean [95% CI]	3.75 [3.52 – 3.97]			3.39 [1.98 – 4.81]		

*% = row Percentages, n=frequency, CI=confidence interval, *P-value notation: ***p<0.001, **p<0.01, p*<0.05*

4.6 Association between NHIS and out-of-pocket health expenditure using multiple linear regression model

Results from the multiple linear regression model showed that there was no statistically significant relationship between NHIS and out of pocket health expenditure. The results are detailed in table 5.

Table 5: Association between NHIS and out-of pocket health expenditure using Multiple Linear Regression Model

	Out-of-pocket health expenditure	
Characteristics	$u\beta[95\%\ CI]$	$a\beta[95\%\ CI]$
NHIS coverage		
No NHIS	Ref	Ref
Has NHIS	12.44*[2.38 – 22.50]	-6.58[-17.42 – 4.26]
Sex		
Male	Ref	Ref
Female	0.94 [-9.54 – 11.43]	10.67[-1.71 – 23.05]
Residence		
Urban	Ref	Ref
Rural	-12.16[-24.91 – 0.60]	12.26*[0.44 – 24.09]
Marital status		
Never married	Ref	Ref
Married	46.57***[33.56 – 59.59]	22.43**[5.07 – 39.80]
Consensual union	45.15***[25.93 – 64.37]	39.69***[18.98 – 60.40]
Separated	39.02*[0.63 – 77.40]	24.95[-12.22 – 62.12]
Divorced	26.11**[9.70 – 42.51]	10.32[-10.25 – 30.89]
Widowed	38.98***[22.64 – 55.31]	18.80[-4.07 – 41.68]
Education		
None	Ref	Ref
Primary	12.38*[3.10 – 21.67]	1.36[-7.69 – 10.42]
Secondary	8.67[-6.45 – 23.79]	-2.10[-17.72 – 13.52]
Tertiary	43.06***[20.04 – 66.08]	11.01[-11.74 – 33.77]
Employment		
Not employed	Ref	Ref
Employed	-16.89*[-33.15 – 0.63]	-19.16* [-36.03 – -2.28]
Wealth quintiles		
First	Ref	Ref
Second	23.69***[15.06 – 32.31]	43.40***[34.85 – 51.95]
Third	39.50*** [28.51 – 50.49]	70.98***[59.23 – 82.74]
Fourth	50.04*** [38.13 – 61.95]	95.38***[83.03 – 107.73]
Fifth	91.30*** [75.11 – 107.50]	157.00***[139.44 – 174.56]
Age of head of household	0.76***[0.47 – 1.05]	0.62***[0.25 – 0.98]
Household size	7.95***[5.56 – 10.34]	15.53***[12.18 – 18.88]

P-value notation:*P<0.001, **p<0.01, *p<0.05*

4.7 Association between NHIS and CHE using multivariable logistic regression model

Results from the multivariable logistic regression model shows that there was statistically significant relationship between NHIS and catastrophic health expenditure when CHE threshold was set at 10% of non-food expenditure and this effect is positive whereas there was no statistically significant relationship when threshold was set at 40% of non-food expenditure. The results are shown in table 6.

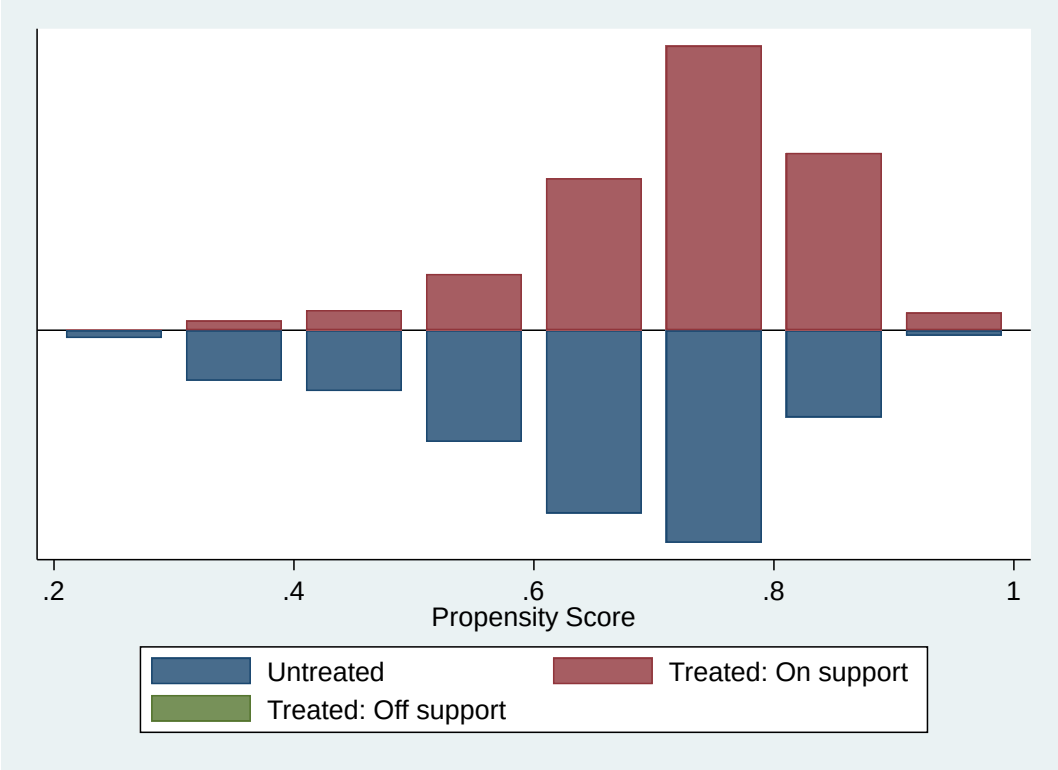
Table 6: Association between NHIS and CHE using Multivariable logistic regression model

	Catastrophic health expenditure @ 10% threshold		Catastrophic health expenditure @ 40% threshold	
Characteristics	**COR [95% CI]**	**AOR [95% CI]**	**COR [95% CI]**	**AOR [95% CI]**
NHIS Status				
No NHIS	Ref	Ref	Ref	Ref
Has NHIS	0.78*[0.64 – 0.96]	0.75**[0.61 – 0.93]	1.12[0.56 – 2.24]	1.24[0.64 – 2.41]
sex				
male	Ref	Ref	Ref	Ref
female	1.60***[1.32 – 1.34]	1.30[0.94 – 1.79]	2.35**[1.24 – 4.45]	1.13[0.54 – 2.34]
Residence				
Rural	Ref	Ref	Ref	Ref
urban	0.44***[0.34 – 0.57]	0.52***[0.40 – 0.70]	0.28**[0.12 – 0.65]	0.35*[0.14 – 0.88]
Marital status				
Never married	Ref	Ref	Ref	Ref
Married	1.88***[1.35 – 2.61]	1.69*[1.10 – 2.58]	0.54[0.18 – 1.68]	0.23[0.05 – 1.13]
Consensual union	2.25***[1.52 – 3.33]	1.98**[1.30 – 3.03]	0.65[0.15 – 2.83]	0.36[0.06 – 2.12]
Separated	1.86*[1.13 – 3.07]	1.25[0.74 – 2.13]	0.52[0.06 – 4.76]	0.22[0.02 – 2.27]
Divorced	2.84***[1.90 – 4.22]	1.72**[1.12 – 2.65]	2.29[0.55 – 9.51]	0.79[0.16 – 3.89]
Widowed	4.04***[2.87 – 5.67]	1.73*[1.13 – 2.63]	2.65[0.83 – 8.49]	0.41[0.09 – 1.90]
Education				
None	Ref	Ref	Ref	Ref
Primary	0.48***[0.40 – 0.57]	0.63***[0.52 – 0.77]	0.19***[0.09 – 0.42]	0.32**[0.13 – 0.79]
Secondary	0.28***[0.19 – 0.40]	0.47***[0.31 – 0.71]	0.23[0.05 – 1.06]	0.42[0.07 – 2.73]
Tertiary	0.32***[0.23 – 0.45]	0.53**[0.36 – 0.79]	0.14[0.02 – 1.05]	0.29[0.04 – 2.08]
Employment				
Not employed	Ref	Ref	Ref	Ref
Employed	0.48***[0.39 – 0.61]	0.58***[0.46 – 0.74]	0.30**[0.13 – 0.69]	0.54[0.24 – 1.24]
Wealth quintiles				
First	Ref	Ref	Ref	Ref
Second	1.13 [0.88 – 1.45]	1.26[0.98 – 1.63]	0.55 [0.19 – 1.58]	0.60[0.26 – 1.41]
Third	1.86 [0.66 – 1.12]	1.04[0.79 – 1.37]	0.24**[0.09 – 0.64]	0.31*[0.11 – 0.87]
Fourth	0.12 [0.62 – 1.08]	1.09[0.83 – 1.44]	0.42* [0.17 – 1.02]	0.57[0.21 – 1.56]
Fifth	0.59*** [0.45 – 0.78]	0.94[0.70 – 1.26]	0.31** [0.13 – 0.78]	0.52[0.16 – 1.66]
Age of head of household	1.02***[1.02 – 1.03]	1.01***[1.00 – 1.02]	1.04***[1.02 – 1.06]	1.17***[1.13 – 1.21]
Household size	0.96*[0.93 – 1.00]	0.93***[0.89 – 0.97]	0.90[0.69 – 1.19]	0.92[0.68 – 1.25]

**P-value notation: ***P<0.001, **p<0.01, *p<0.05*

4.8 Propensity score matching results

The propensity score histogram by households' NHIS status in figure 2 showed moderate overlap of the propensity scores with a good control match for each NHIS recipient household. This indicates that very few NHIS recipient household did not find a good match (lack of common support).

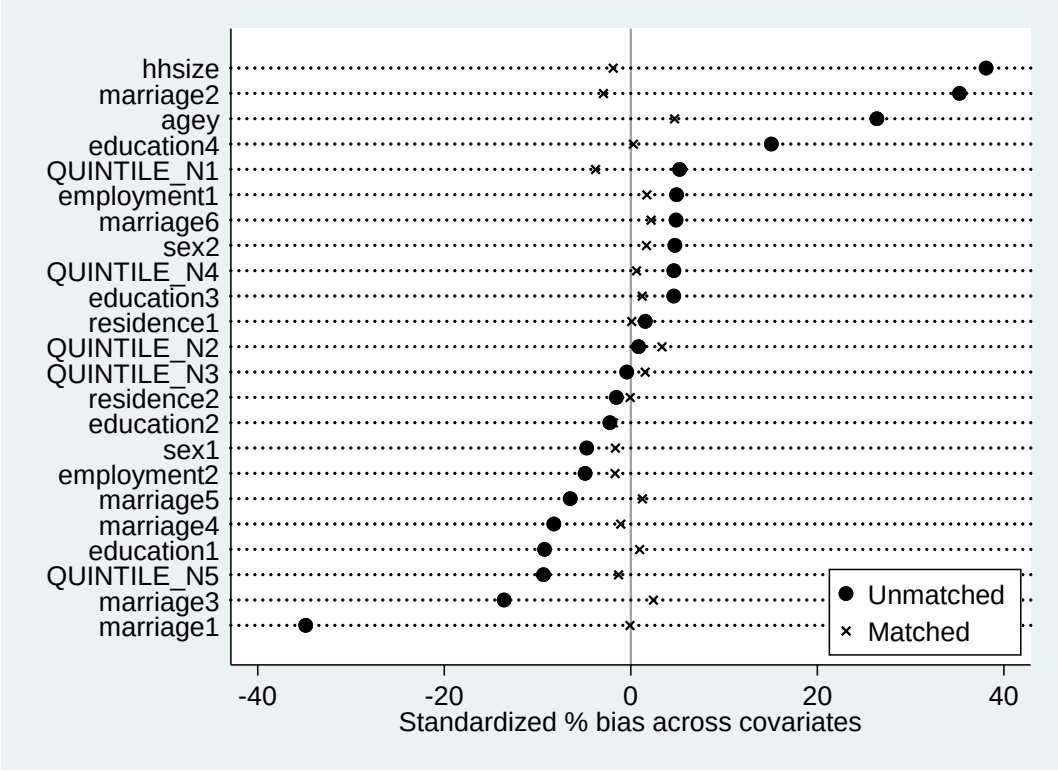


Treated on support represent those NHIS recipient households that found a valid counterfactual (good match); untreated: Non-NHIS recipient households; Treated off support: NHIS recipient households that did not find a valid counterfactual (no good match).

Figure 2: Assessing common support: The propensity score histogram by households NHIS status.

4.8.1 Covariate balance between NHIS and non-NHIS recipient households

The diagnostic graph assessment of the covariate balance between NHIS and non-NHIS recipient households showed that standardized percentage bias between the two groups reduced drastically after matching for most covariates used in the propensity score model (figure 3).



***Abbreviation**: hhsize: Household size (number of people in a household), residence : Residential location (Rural or urban), sex: Sex of household head, agey: Age in years of household head, marriage : Marital status of household head, education : level of education of household head, employment: employment status of household head, wealth quintile: economic status of the household; index number 1, 2 ,3, 4, 5 and 6 represent 1st, 2nd, 3rd, 4th,5th and 6th order polynomial terms respectively.*

Figure 3: Covariate balance between NHIS and non-NHIS recipient households: Standardize percentage bias across covariates.

4.8.2 Standardized differences between NHIS recipient and non-NHIS recipient households

For instance, bias in age of heads of households between the two groups reduced from 26.4% to 4.7% resulting in an absolute percentage reduction in bias of 82.3%. The bias in household size between NHIS and non-NHIS recipient households reduced by 95% after matching. Median bias between the NHIS and non-NHIS recipient households reduced from 10.5 to 1.7 after matching. Detail of the bias reduction between NHIS and non-NHIS recipient households can be found in table 7 below.

Table 7: Standardized differences between NHIS recipient and non-NHIS recipient households

variables	Before matching				After matching				
	NHIS recipient	Non-NHIS recipient	Bias	p-value	NHIS recipient	Non-NHIS recipient	Bias	p-value	*% rABS (Bais)*
Age	47.06	42.92	26.4	<0.001	47.05	46.32	4.7	<0.001	82.3
Household size	4.57	3.53	38.1	<0.001	4.57	4.62	-1.9	0.169	95.0
Sex									
Male	0.71	0.73	-4.7	0.006	0.71	0.72	-1.7	0.204	64.7
female	0.29	0.27	4.7	0.006	0.29	0.28	1.7	0.943	64.7
Marital status									
Never married	0.07	0.19	-34.9	<0.001	0.07	0.07	-0.1	0.919	99.7
Married	0.64	0.47	35.2	<0.001	0.64	0.65	-2.9	0.021	91.6
Consensual union	0.07	0.11	-13.6	<0.001	0.07	0.07	2.4	0.036	82.3
Separated	0.03	0.05	-8.3	<0.001	0.03	0.04	-1.1	0.359	86.8
Divorced	0.06	0.08	-6.5	<0.001	0.06	0.06	1.2	0.314	81.2
Widowed	0.12	0.10	4.8	0.005	0.12	0.11	2.2	0.103	55.4
Residence									
Rural	0.45	0.44	1.6	0.359	0.45	0.45	0.1	0.948	94.5
urban	0.55	0.56	-1.6	0.359	0.55	0.55	-0.1	0.948	94.5
Education									
No education	0.49	0.54	-9.2	<0.001	0.49	0.49	0.9	0.474	89.9
Primary	0.30	0.31	-2.2	0.184	0.30	0.31	-1.9	0.146	15.7
Secondary	0.09	0.08	4.6	0.007	0.09	0.09	1.2	0.368	73.9
Tertiary	0.12	0.07	15.1	<0.001	0.12	0.12	0.3	0.855	98.3
Employment									
Unemployed	0.11	0.09	4.9	0.004	0.11	0.10	1.7	0.199	65.2
Employed	0.89	0.91	-4.9	0.004	0.89	0.90	-1.7	0.199	65.2
Wealth quintile									
First quintile	0.21	0.19	5.2	0.002	0.21	0.22	-3.8	0.005	27.4
Second quintile	0.18	0.17	0.8	0.623	0.18	0.16	3.3	0.010	-298.8
Third quintile	0.18	0.18	-0.4	0.796	0.18	0.17	1.5	0.238	-248.6
Fourth quintile	0.21	0.19	4.6	0.007	0.21	0.20	0.6	0.652	87.1
Fifth quintile	0.23	0.27	-9.4	<0.001	0.23	0.24	-1.3	0.296	85.8
Median bias		10.5				1.7			
Rubin's B		61.3*				8.6			
Rubin's R		0.76				1.04			

*Abbreviations: Rubin's B: The absolute standardized difference of the means of the linear index of the propensity score in the treated (NHIS recipient) and (matched) non-treated group (non-NHIS recipient households); Rubin's R: The ratio of treated (NHIS recipient households) to (matched) non-treated variances of the propensity score index. Rubin (2001) recommends that B be less than 25 and that R be between 0.5 and 2 for the samples to be considered sufficiently balanced. P-value notation: *** p<0.001, ** p<0.01, *p<0.05.*

4.9 Impact estimates of NHIS on out-of-pocket and catastrophic health expenditure

Using matching procedures, this study estimated the average treatment (NHIS) effect (ATET) on the primary and secondary outcome measures of interest. After adjusting for key covariates, NHIS reduces out-of-pocket health payments by 5.83 Ghana cedis although the impact appear not statistically significant [95% CI: 1.0 – 3.0; p=0.166].

There was statistically significant impact of NHIS coverage on catastrophic health expenditure set at a threshold of 10% of non-food expenditure. At the threshold of 10% of non-food expenditure, NHIS reduces CHE by 2.0 percentage points [95% CI: 1.0 – 3.0; p<0.001]. Whereas at a threshold of 40% of non-food expenditure, NHIS increases CHE though not statistically significant by 0.1 percentage point [95%CI: 0.1 – 0.2; p=0.507]. The results are indicated in table 8.

Table 8: Impact estimates of NHIS on out-of-pocket and catastrophic health expenditure

Matching procedures and sensitivity analysis	**Out-of-pocket health expenditure**	**Catastrophic health expenditure @ 10% threshold**	**Catastrophic health expenditure @ 40% threshold**
Matching procedures	ATET [95% CI]	ATET [95% CI]	ATET [95% CI]
Propensity score matching 1:1	-5.83[-14.07 – 2.41]; p=0.166	-0.02[-0.03 – -0.01]; p<0.001***	0.001[-0.001– 0.002]; p=0.507
Propensity score matching 1:2	-5.83[-14.31 – 2.66]; p=0.178	-0.02[-0.03 – -0.01]; p<0.001***	0.001[-0.001 – 0.003]; p=0.560

P-value notation*P<0.001, **p<0.01, *p<0.05*

4.10 Summary of the chapter

The chapter presented the results of the study and its interpretations based on the set objectives. Generally most socio-demographic characteristics had a relationship with at least one member of the household holding a valid NHIS card. Additionally, NHIS had some positive impact on CHE at 10% threshold of non-food expenditure whereas NHIS did not have any significant impact on OOP. The next chapter discusses the findings in relation to previous studies on the topic.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

With the primary goal of providing financial protection and improved access to health care services, the study sought to determine the impact of NHIS on CHE among households in Ghana. This chapter therefore offers a discussion of the results vis-à-vis existing literature and the objectives of the study. It further explores best practices and evidence with respect to the incidence of OOP and catastrophic expenditure amidst the introduction of National Health Insurance Schemes. To this end, the chapter is sectioned accordingly.

5.2 Proportion of Households incurring CHE

The proportion of households incurring CHE was expressed as an incidence of the key determinants of OOP amongst the study population. Using the thresholds of 10% and 40%, the overall CHE was 6.20% and 0.34% respectively. The significant difference between the outcomes of the two thresholds was an affirmation of the inversely proportional nature of CHE as a function of the given thresholds.

With 6.2% of households spending beyond 10% of non-food expenditure, this appears to be below the global average of 7% (Wagstaff et al., 2018). At the same threshold, Thailand records a lower CHE of 2.8%. The gradual and progressive implementation of a Universal Health Coverage (UC) with expanded benefits in Thailand is known to account for this. Similarly, Botswana and Mozambique recorded lower CHE 6% and 5% respectively in Africa (WHO, 2014). Conversely,

CHE was higher amongst households in Kenya (11.1%), Nigeria (16.4%) and Uganda (49%) (Kimani et al., 2016; Aregbeshola & Khan, 2018). Using the living standards survey and at the same threshold, the CHE in Vietnam was 24.4% (Minh et al., 2013).

The existence of varying economic conditions and health finance systems in the various countries account for such differences in the levels of CHE. However, earlier studies in Ghana, employing the GLSS 5 recorded a higher CHE of 10.7% between 2005 and 2006 (Dalinjong et al., 2017). Although the study by Dalinjong et al, (2017), was equally nationally representative as compared with the current study, it was conducted at the initiating phase of the NHIS when coverage was minimal. This is to suggest that progressively over time, the CHE may have been reduced and reasons for this reduction can be explored in further studies. The CHE was higher amongst the rural households as compared with the urban households. This corroborates with numerous studies that observed such trends (Kusi et al., 2015; Kimani et al., 2016; Aregbeshola & Khan, 2018). Due to the relatively low income within the rural areas and yet similar service charges at the public health centers, it stands to reason that OOP will consume a higher percentage of the incomes of the rural households as compared to the urban ones.

At the 40% threshold of non-food expenditure, CHE was lower and recorded at 0.34%. Higher CHE have however, been recorded in Kenya, Nigeria and South Africa at 11.4%, 13.7% and 13.4% respectively (Kimani et al., 2016; Aregbeshola & Khan, 2018; Babikir, Satty& Mwambi 2018). The CHE of 0.34% for this study indicates that in the absence of hospitalization, OOP health care is significant amongst a section of the households and to catastrophic limit. Again, this was particularly higher amongst rural households where there were payments for larger household sizes with a relatively small income.

5.3 Impact of NHIS on OOP

The NHIS was found to have no impact on OOP. The expenses made by households on health was therefore, unaffected by their enrollment on the NHIS. This is consistent with studies on low and middle income countries, which hold that NHIS has no effect on OOP in most developing states (Acharya et al., 2013). Evaluations in Senegal and Mali further corroborate this finding (Chankova, Sulzbach, & Diop, 2008). However, Aryeetey et al. (2016), and Nguyen et al. (2011), speak to the reduction of OOP by NHIS. The general assertions held in both studies were that the expansive coverage of the NHIS contributes largely to the reduction in OOP on both in-patient and out-patient services. It must however, be mentioned that this current study focused on health expenditure without hospitalization. With in-patient services bearing a bulk of health expenditure, its coverage by NHIS is likely to have a positive influence on OOP. The absence of this factor from the study therefore, leaves the analysis at the level of other medical expenses excluding hospitalization. Notably, these services are often likely to come as cost to the insured as much as it is to the uninsured due to reasons of unavailability of medication, non-coverage of specified services, poor quality of services for the insured or withdrawal of the NHIS services from the facility.

5.4 Impact of NHIS on CHE

The study demonstrates an impact of NHIS on CHE at a thresholds of 10%. Specifically, there was a reduction of CHE by 2pp at 10% and no significant impact at 40% threshold. Although the impact of NHIS on CHE appears marginal in this study, it is indicative of a shielding effect of the NHIS hence, a progressive step towards the attainment of financial risk protection. Households were thus 2% less likely to incur CHE once insured. The total health expenditure used in the study excludes

hospitalization hence, the CHE is most likely attributable to funds spent on medications, diagnostic services and other outpatient services. Over the years, the implementation of the NHIS has been fraught with challenges as regards medication availability and sufficiency of funds for some services provided. In such instances, patients resort to OOP to complement provisions made by the NHIS. Such payments eventually become catastrophic considering the low income levels and high proportion of food expenditure as observed in other developing countries. Observations of a marginal decline in CHE amidst health insurance was reported by Galarraga (2010) in Mexico where the HIS reduced CHE by 54%. In India however, the HIS was observed to have increased CHE by 14.5% (Karan et al., 2017). Variations in the benefits and scope of services offered by the various NHIS could account for the country-wide differences.

5.5 Limitations to the study

Despite the afore-discussed observations the study had a few limitations. Several factors may influence catastrophic health expenditure beside NHIS. But most of these factors were not measured and therefore were not controlled for in the analysis and this could bias the results. Factors such as the type of illness and disabilities in household members, assets, the health care system, free health care, and social protection policies indirectly related to the health system and many others can have an influence on out-of-pocket payment and hence catastrophic health expenditure but were not measured and controlled for in the analysis.

In addition, the survey data does not distinguish between the type of illness and the different health facilities an individual sought healthcare from throughout the year, hence the researcher would not know whether treatment received from the health facility is covered by NHIS or not.

The matching procedure employed only reduces the selection bias between the intervention and the control group on the variables that were directly observed. Differences between respondent with NHIS and those with no NHIS in terms of the variables that were not directly observed could not be controlled for, this can affect the impact estimate of the results. That notwithstanding, the rigorous statistical technique employed still make the results robust and fit for purpose.

5.6 Summary of the chapter

The chapter discussed the findings of the study, relating it to other relevant studies on the topic. It discussed the proportion of households incurring CHE, impact of NHIS on OOP, impact of NHIS on CHE. The study affirms the inversely proportional relationship of the various thresholds of CHE and how they could be affected by socio-demographic characteristics. It further admits a marginal protective effect offered by the NHIS against CHE at a threshold of 10%. The chapter also highlights the limitations of the study. The next chapter provides conclusions and recommendations to the study.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions of the study

The study sought to assess the impact of NHIS on out-of-pocket payments and catastrophic health expenditure as well as the proportion of households incurring catastrophic health expenditure.

The study found the proportion of households faced with catastrophic health expenditure to be 6.20% and 0.34% estimating health expenditure to be >= 10% and 40% of non-food expenditure respectively. Age, sex, marital status, education, wealth quintile and size of household were found to be associated a valid NHIS coverage.

Findings from the study also showed that there was statistical significant relationship between NHIS and CHE at 10% threshold, while no significant relationship exists between NHIS and out of pocket health expenditure and as well as NHIS and catastrophic health expenditure set at 40% of non-food expenditure.

The study showed statistically significant impact of NHIS on CHE set at 10% threshold but no significant impact of NHIS on out of pocket health expenditure and catastrophic health expenditure set at the 40% threshold. The study therefore, recommends further research to ascertain the quality of services provided under the NHIS and the reasons for making OOP especially amongst the marginalized.

6.2 Recommendations

From the findings of the study, the following recommendations are made:

1. There will be the need for further studies to qualitatively identify reasons for the non-usage of the NHIS especially amongst rural dwellers. This will inform policy makers on areas of the scheme to address in making it more encompassing.
2. The services catered for by the scheme are the basic healthcare services required by citizens; consultation, medications laboratory and other investigations. It will be necessary to further research into identifying the exact services paid for by OOP in order to ascertain what could be a drain on citizens and even to catastrophic limits.
3. Government will have to invest in impact evaluation of the NHIS using other designs to be able to identify which areas the NHIS impacts positively on out-of-pocket health payment in order for redirection of the NHIS implementation for effectiveness and efficiency.

REFERENCES

Acharya, A., Vellakkal, S., Taylor, F., Masset, E., Satija, A., Burke, M., & Ebrahim, S. (2013). The Impact of Health Insurance Schemes for the Informal Sector in Low- and Middle-Income Countries: A Systematic Review. *The World Bank Research Observer*, *28*(2), 236–266. https://doi.org/10.1093/wbro/lks009

Adisa, O. (2015). Investigating determinants of catastrophic health spending among poorly insured elderly households in urban Nigeria. *International Journal for Equity in Health*, *14*(79), 1–

11. https://doi.org/10.1186/s12939-015-0188-5

Aji, B., De Allegri, M., Souares, A., & Sauerborn, R. (2013). The impact of health insurance programs on out-of-pocket expenditures in Indonesia: an increase or a decrease? *International Journal of Environmental Research and Public Health, 10*(7), 2995-3013. doi:10.3390/ijerph10072995

Alvesson, H. M., Lindelow, M., Khanthaphat, B., & Laflamme, L. (2013). Coping with uncertainty during healthcare-seeking in Lao PDR. *BMC International Health and Human Rights*, *13*(28).

Amaya-lara, J. L. (2016). Catastrophic expenditure due to out-of- pocket health payments and its determinants in Colombian households. *International Journal for Equity in Health*, *15*(182), 1–11. https://doi.org/10.1186/s12939-016-0472-z

Amporfu, E. (2013). Equity of the premium of the Ghanaian national health insurance scheme and the implications for achieving universal coverage. *International Journal for Equity in Health*, *12*(4), 1–9.

Aregbeshola, B. S., & Khan, S. M. (2018). Determinants of catastrophic health expenditure in Nigeria. *The European Journal of Health Economics*, *19*(4), 521-532.

Aryeetey, G. C., Jehu-appiah, C., Kotoh, A. M., Spaan, E., Arhinful, D. K., Baltussen, R., … Agyepong, I. A. (2013). Community concepts of poverty : an application to premium exemptions in Ghana ' s National Health Insurance Scheme. *Globalization and Health*, *9*(12).

Aryeetey, G. C., Westeneng, J., Spaan, E., Jehu-appiah, C., Agyepong, I. A., & Baltussen, R. (2016). Can health insurance protect against out- of-pocket and catastrophic expenditures and also support poverty reduction ? Evidence from Ghana ' s National Health Insurance Scheme. *International Journal for Equity in Health*, *15*(116), 1–11.

Ataguba, J. & Akazilli, J. (2010). Health care financing in South Africa: moving towards universal coverage. *Continuing Medical Education*, *28*(2).

Axelson, H., Bales, S., Minh, P. D., Ekman, B., & Gerdtham, G. (2009). Health financing for the poor produces promising short-term effects on utilization and out-of-pocket expenditure : evidence from Vietnam. *International Journal for Equity in Health*, *8*(20). https://doi.org/10.1186/1475-9276-8-20

Azétsop, J., & Ochieng, M. (2015). The right to health , health systems development and public health policy challenges in Chad. *Philosophy, Ethics, and Humanities in Medicine*, *10*(1), 1–14. https://doi.org/10.1186/s13010-015-0023-z

Babikir, A., Satty, A., & Mwambi, H. (2018). Determinants of out-of-pocket health expenditure and their welfare implications in a South African context. *Journal of Economic and Financial Sciences*, *11*(1), 7.

Baeza, C. and Packard, T.G. (2006). Beyond Survival: Protecting Households from Health Shocks in Latin America. Washington, DC: World Bank and Stanford University Press.

Barasa, E. W., Maina, T., & Ravishankar, N. (2017). Assessing the impoverishing effects , and factors associated with the incidence of catastrophic health care payments in Kenya. *International Journal for Equity in Health*, *16*(31), 1–14. https://doi.org/10.1186/s12939-

017-0526-x

Benjamin, L., Buthion, V., Vidal-trécan, G., & Briot, P. (2014). Impact of the healthcare payment system on patient access to oral anticancer drugs : an illustration from the French and United States contexts. *BMC Health Services Research*, *14*(274).

Bennett, S. (2004). The role of community-based health insurance within the health care financing system : a framework for analysis. *Health Policy and Planning*, *19*(February), 147–158. https://doi.org/10.1093/heapol/czh018

Bernard, D. S. M., Farr, S. L., & Fang, Z. (2011). National Estimates of Out-of-Pocket Health Care Expenditure Burdens Among Nonelderly Adults With Cancer : 2001 to 2008. *Journal of Clinical Oncology*, *29*(20), 2821–2826. https://doi.org/10.1200/JCO.2010.33.0522

Binnendijk, E., Koren, R., & Dror, D. M. (2012). Hardship financing of healthcare among rural poor in Orissa , India. *BMC Health Services Research*, *23*(January).

Brugiavini, A., & Pace, N. (2016). Extending health insurance in Ghana: effects of the National Health Insurance Scheme on maternity care. *Health Economics Review, 6*(7), 1-10.

Brugiavini, A., & Pace, N. (2016). Extending health insurance in Ghana: effects of the National Health Insurance Scheme on maternity care. *Health Economics Review*, *6*(1), 7. https://doi.org/10.1186/s13561-016-0083-9

Buigut, S., Ettarh, R., & Amendah, D. D. (2015). Catastrophic health expenditure and its determinants in Kenya slum communities. *International Journal for Equity in Health*, *14*(46), 1–12.

Carrera, P. M., Siemens, K. K., & Bridges, J. (2008). Health care financing reforms in Germany: The case for rethinking the evolutionary approach to reforms. *Journal of health politics, policy and law*, *33*(5), 979-1005.

Chankova, S., Sulzbach, S., & Diop, F. (2008). Impact of mutual health organizations: Evidence from West Africa. *Health Policy and Planning*, *23*(4), 264–276. https://doi.org/10.1093/heapol/czn011

Chen, M., Palmer, A. J., & Si, L. (2017). Improving equity in health care financing in China during the progression towards Universal Health Coverage. *BMC Health Services Research*, *17*(852), 1–8. https://doi.org/10.1186/s12913-017-2798-7

Choi, J. W., Shin, J., Cho, K., Nam, J., Kim, J., & Lee, S. G. (2016). Medical security and catastrophic health expenditures among households containing persons with disabilities in Korea : a longitudinal population-based study. *International Journal for Equity in Health*, *15*(119), 1–8. https://doi.org/10.1186/s12939-016-0406-9

Chu, T., Liu, T., Chen, C., Tsai, Y., & Chiu, T. (2005). Household out-of-pocket medical expenditures and national health insurance in Taiwan : income and regional inequality. *BMC Health Services Research, 9*, 1–9. https://doi.org/10.1186/1472-6963-5-60

Million Death Study collaborators (2010). Causes of neonatal and child mortality in India: nationally representative mortality survey. *Lancet*, *376*(9755), 1853–1860. https://doi.org/10.1016/S0140-6736(10)61461-4.

Cornelissen, D., Asante, F. A., Spaan, E., & Velden, K. Van Der. (2016). Does capitation payment under national health insurance affect subscribers ' trust in their primary care provider ? a cross- sectional survey of insurance subscribers in Ghana. *BMC Health Services Research*, *16*(437), 1–10. https://doi.org/10.1186/s12913-016-1622-0

Curie J, & Madrain B. (2005). Health Insurance and the Labour Market. Handbook of Labour Economics, Volume 3, Chapter 50. Edited by O. Ashenfelter & D. Card; Amsterdam: Elsevier-North Holland: 2005.

Dalinjong, P. A., & Laar, A. S. (2012). The national health insurance scheme : perceptions and experiences of health care providers and clients in two districts of Ghana. *Health Economics Review*, *2*(13), 1–13.

Dalinjong, P. A., Welaga, P., Akazili, J., Kwarteng, A., Bangha, M., & Oduro, A. (2017). The association between health insurance status and utilization of health services in rural Northern Ghana : evidence from the introduction of the National Health Insurance Scheme. *Journal of Health, Population and Nutrition*, *36*(42), 1–10. https://doi.org/10.1186/s41043-017-0128-7

Dixon, J., Tenkorang, E. Y., & Luginaah, I. (2013). Ghana ' s National Health Insurance Scheme : a national level investigation of members ' perceptions of service provision. *BMC International Health and Human Rights*, *13*(35).

Dorjdagva, J., Batbaatar, E., Svensson, M., Dorjsuren, B., & Kauhanen, J. (2016). Catastrophic health expenditure and impoverishment in Mongolia. *International Journal for Equity in Health*, *15*(105), 1–9. https://doi.org/10.1186/s12939-016-0395-8

Elgazzara, H., Raada, F., Arfa, C., Mataria, A., Salti, N., Chaaban, J., … & Majbouri, M. (2010). Who Pays? OOP Health Spending and Equity Implications in the Middle East and North Africa. *Health, Nutrition and Population (HNP) Discussion Paper*. Washington, DC: World Bank

Engelchin-nissan, E., & Shmueli, A. (2015). Private finance of services covered by the National Health Insurance package of benefits in Israel. *Israel Journal of Health Policy Research*, 1–8.

Galárraga, O., Sosa-Rubí, S. G., Salinas-Rodríguez, A., & Sesma-Vázquez, S. (2010). Health insurance for the poor: impact on catastrophic and out-of-pocket health expenditures in Mexico. *The European Journal of Health Economics*, *11*(5), 437-447

Ganle, J. K., Parker, M., Fitzpatrick, R., & Otupiri, E. (2014). A qualitative study of health system barriers to accessibility and utilization of maternal and newborn healthcare services in Ghana after user-fee abolition. *BMC Pregnancy and Childbirth*, *14*(425), 1–17.

Ghana Statistical Services (2014). Ghana living standards survey Round 6. *Ecosystems and Human Well-Being: A Framework for Assessment*, *12*(16), 81–87.

Ghana Statiscal Service. (2010). Summary Report of Final. Population & Housing Census.

Goryakin, Y., & Suhrcke, M. (2014). The prevalence and determinants of catastrophic health expenditures attributable to non-communicable diseases in low- and middle-income

countries : a methodological commentary. *International Journal for Equity in Health*, *13*(107), 1–5.

Gottret, P., & Schieber, G. (2006). *Health financing revisited: a practitioner's guide*. The World Bank.

Hao, YanhuaLi, Y., Wu, Q., Xu, L., Legge, D., Gao, L., Ning, N., & Wan, G. (2012). Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: policy implications of universal health insurance. *Bulletin of the World Health Organization*, *90*(9), 664–671.

Jehu-appiah, C., Aryeetey, G., Agyepong, I., Spaan, E., & Baltussen, R. (2011). Household perceptions and their implications for enrolment in the National Health Insurance Scheme in Ghana. *Health Policy and Planning*, *27*(April 2011), 222–233.

Jehu-appiah, C., Aryeetey, G., Spaan, E., Hoop, T. De, Agyepong, I., & Baltussen, R. (2011). Equity aspects of the National Health Insurance Scheme in Ghana : Who is enrolling , who is not and why ? *Social Science & Medicine*, *72*(2), 157–165.

Joglekar, R. (2012). Can Insurance Reduce Catastrophic Out-of-Pocket Health Expenditure ? Rama Joglekar Can Insurance Reduce Catastrophic Out-of-Pocket Health. *Health (San Francisco)*, (September).

Jowett, M., Contoyannis, P., & Vinh, N. D. (2003). The impact of public voluntary health insurance on private health expenditures in Vietnam. *Social Science & Medicine, 56*(2), 333-342. doi:https://doi.org/10.1016/S0277-9536(02)00031-X

Karan, A., Yip, W., & Mahal, A. (2017). Social Science & Medicine Extending health insurance to the poor in India : An impact evaluation of Rashtriya Swasthya Bima Yojana on out of pocket spending for healthcare. *Social Science & Medicine*, *181*, 83–92. https://doi.org/10.1016/j.socscimed.2017.03.053

Kimani, D. N., Mugo, M. G., & Kioko, U. M. (2016). *Catastrophic Health Expenditures And Impoverishment In Kenya*. *European Scientific Journal, ESJ* (Vol. 12).

Kirigia, J. M., Zere, E., & Akazili, J. (2012). National health financing policy in Eritrea : a survey of preliminary considerations. *BMC International Health and Human Rights*.1–11.

Kotoh, A. M., & Geest, S. Van Der. (2016). Why are the poor less covered in Ghana ' s national health insurance ? A critical analysis of policy and practice. *International Journal for Equity in Health*, *15*(34), 1–11. https://doi.org/10.1186/s12939-016-0320-1

Kumar, A. K. S., Chen, L. C., Choudhury, M., Ganju, S., Mahajan, V., Sinha, A., & Sen, A. (2011). India : Towards Universal Health Coverage 6 Financing health care for all : challenges and opportunities. *The Lancet*, *6736*(10), 1–12.

Kusi, A., Enemark, U., Hansen, K. S., & Asante, F. A. (2015). Refusal to enrol in Ghana ' s National Health Insurance Scheme : is affordability the problem ? *International Journal for Equity in Health*, *14*(2), 1–14.

Kusi, A., Hansen, K. S., Asante, F. A., & Enemark, U. (2015). Does the National Health Insurance Scheme provide financial protection to households in Ghana ? *BMC Health Services Research*, *15*(331), 1–12.

Long, Q., Xu, L., Bekedam, H., & Tang, S. (2013). Changes in health expenditures in China in 2000s : has the health system reform improved affordability. *International Journal for Equity in Health*, *12*(40), 1–8.

Macinko, J., Guanais, F. C., & Fa, M. De. (2006). Evaluation of the impact of the Family Health Program on infant mortality in Brazil, 1990–2002. *Journal of Epidemiology and Community Health*, *60*, 13–19.

Minh, H. V., Phuong, N. T. K., Saksena, P., James, C. D., & Xu, K. (2013). Financial burden of household out-of pocket health expenditure in Viet Nam : Findings from the National Living Standard Survey 2002 – 2010. *Social Science & Medicine*, *96*, 258–263. https://doi.org/10.1016/j.socscimed.2012.11.028

Munge, K., & Briggs, A. H. (2013). The progressivity of health-care financing in Kenya. *Health policy and planning*, *29*(7), 912-920.

Murray, S. F., Hunter, B. M., Bisht, R., Ensor, T., & Bick, D. (2014). Effects of demand-side financing on utilisation , experiences and outcomes of maternity care in low- and middle-income countries : a systematic review. *BMC Pregnancy and Childbirth*, *14*(30).

Musango, L., Orem, J. N., Elovainio, R., & Kirigia, J. (2012). Moving from ideas to action - developing health financing systems towards universal coverage in Africa. *BMC International Health and Human Rights,* 1–11.

National Health Insurance Authority. (2013). NHIS Annual Report, Ghana.

Nguyen, H. T. H., Rajkotia, Y., & Wang, H. (2011). The financial protection effect of Ghana National Health Insurance Scheme : evidence from a study in two rural districts. *International Journal for Equity in Health*, *10*(4), 1–12.

Odeyemi, I. A. O. (2014). Community-based health insurance programmes and the national health insurance scheme of Nigeria : challenges to uptake and integration. *International Journal for Equity in Health*, *13*(20), 1–13.

Odeyemi, I. A. O., & Nixon, J. (2013). Assessing equity in health care through the national health insurance schemes of Nigeria and Ghana : a review-based comparative analysis. *International Journal for Equity in Health*, *12*(9), 1–18.

Orem, J. N., & Zikusooka, C. M. (2010). Health financing reform in Uganda : How equitable is the proposed National Health Insurance scheme ? *International Journal for Equity in Health*, *9*(23), 1–8.

Preker, A. S., Carrin, G., Dror, D., Jakab, M., Hsiao, W., & Arhin-tenkorang, D. (2002). Effectiveness of community health financing in meeting the cost of illness. *Bulletin of the World Health Organization*, *80*(1), 143–150.

Puteh, S. E., & Almualm, Y. (2017). Catastrophic health expenditure among developing countries. *Health Systems Policy Research*, *4*, 1.

Rehman, A., Shaikh, B. T., & Ronis, K. A. (2014). Health care seeking patterns and out of pocket payments for children under five years of age living in Katchi Abadis (slums), in Islamabad , Pakistan. *International Journal for Equity in Health*, *13*(30), 2–7.

Rubin, D. (2001) 'Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation'. *Health Services & Outcomes Research Methodology* 2, 169–188.

Sambo, L. G., Kirigia, J. M., & Orem, J. N. (2013). Health financing in the African Region : 2000 – 2009 data analysis. *International Archives of Medicine*, *6*(10), 1–17.

Savedoff, W. D., de Ferranti, D., Smith, A. L., & Fan, V. (2012). Political and economic aspects of the transition to universal health coverage. *The Lancet, 380* (9845), 924–932.

Si, Y., Zhou, Z., Su, M., Ma, M., Xu, Y., & Heitner, J. (2017). Catastrophic healthcare expenditure and its inequality for households with hypertension : evidence from the rural areas of Shaanxi Province in China. *International Journal for Equity in Health*, *16*(27), 1–12.

Singh, K., Osei-akoto, I., Ottchere, F., Sodzi-tettey, S., Barrington, C., Huang, C., … Speizer, I. (2015). Ghana's National Health Insurance scheme and maternal and child health: a mixed methods study. *BMC Health Services Research, 15*(108), 1-13

Su, T., Koouyate, B. & Flessa, S. (2006). "Catastyrophic Household Expenditure for Healthcare in a low-income Society: A study from Nouna District, Burkina Faso". *Bulletin of the World Health Organization, 84* (1), 21-27.

Tangcharoensathien, V., Aljunid, M., Mukti, G., Akkhavong, P., Lao, B., Huong, B., & Mills, A. (2010). Health Financing Reforms in South East Asia : challenges in achieving universal coverage. *World Development Indicators Database*, *4*, 1–31.

Ukwaja, K. N., Alobu, I., Abimbola, S., & Hopewell, P. C. (2013). Household catastrophic payments for tuberculosis care in Nigeria : incidence , determinants , and policy implications for universal health coverage. *Infectious Diseases of Poverty*, *2*(21), 1–9.

Van Doorslaer, E., O'Donnell, O., Rannan-Eliya, R.P., Samanathan, A., Adhikari, S.R. (2006). "Effect of Payments for Healthcare on Poverty Estimates in 11 Countries in Asia: An Analysis of Household Survey Data." *Lancet* 368(9544): 1357–1361.

Wagstaff, A., & Van Doorslaer, E. (2003). Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–1998. *Health Economics,* 12, 921–934.

Wagstaff, A., Flores, G., Hsu, J., Smitz, M. F., Chepynoga, K., Buisman, L. R., ... & Eozenou, P. (2018). Progress on catastrophic health spending in 133 countries: a retrospective observational study. *The Lancet Global Health*, *6*(2), e169-e179.

Wagstaff, A., & Lindelow, M. (2008). Can insurance increase financial risk?: The curious case of health insurance in China. *Journal of Health Economics, 27*(4), 990-1005.

Wang, Z., Li, X., & Chen, M. (2015). Catastrophic health expenditures and its inequality in elderly households with chronic disease patients in China. *International Journal for Equity in Health*, *14*(1).

World Health Organization. (2014). WHO African Region Expenditure Atlas, November 2014.

World-Health-Organisation. (2010). The world health report: health systems finanancing: the path to universal coverage. Geneva: World Health Organization.

World Health Organization (2000). Health Systems: Improving Performance. Geneva: The World Health Organization.

Wp, S. E., Aizuddin, A. N., Zainuddin, Z., Rizal, M., Manaf, A., & Aljunid, S. (2012). Catastrophic Health Expenditure and its influencing factors in Malaysia. *BMC Health Services Research*, *12*(Suppl 1), 6963.

Xu, K., D. B. Evans, G. Carrin, A. M. Aguilar-Rivera, P. Musgrove, and T. Evans. (2007). "Protecting Households from Catastrophic Health Spending." *Health Affairs* 26(4): 972–983.

Xu, K., Xu, K., Evans, D., Evans, D., Carrin, G., Carrin, G., … Aguilar-Rivera, A. M. (2005). Designing health financing systems to reduce catastrophic health expenditure. *Bulletin of the World Health Organization*, *85*(9), 8.

Xu, K., Evans, D. B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C. J. (2003). Household catastrophic health expenditure: a multicounty analysis. *Lancet*, *362*, 111–117.

Xu, K. (2005). Distribution of health payments and catastrophic expenditures Methodology. *FER/EIP Discussion Paper ;*, (no.2.), 11 p.

APPENDICES

Appendix A: Data extraction sheet

Variable	Variable name	Description
Household ID	HID	Household unique identification number
Personal identification number	PID	Personal identification number for all respondents
Residence	rururb	Residential location of household either in rural or urban location
Household size	hhsize	Number of members in a household
Age	agey	Age in years of household head
Sex	sex	Sex of household head. Either male or female
Marital status	S1q6	Marital status of head of house hold
Education	hhedu	Level of education of household head. Recoding done
employment	Emp_status	Employment status of household head. Re-categorizing and recoding done.
NHIS	S3bq5	NHIS coverage for all household members. Re-categorizing and recoding done.
Income quintile	QUINTILE_N	Income quintile at national level. Calculated based on Per capita annual food and non-food consumption expenditure in real terms,

		converted to 2005 $PPP using 2005 $PPP exchange rate, and weighted by population weights
Total annual health expenditure	TOTHLTH	Total annual household expenditure on health (excludes hospitalization)
Total annual non-food expenditure	TOTNFD	Total annual household expenditure on non-food items