VARIATION OF CATASTROPHIC HEALTH EXPENDITURE BY CHRONIC DISEASE IN KENYA

By

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DECLARATION

I, Vivian Nyansarora Nyakangi, declare that this research paper is my original work and has not been previously submitted for a degree nor as part of degree requirements in any other institution.

Signature:  **Date:** 13/11/2020

This research paper has been submitted as a requirement for partial fulfilment of the requirements for the award of Master of Science in Health Economics and Policy with my approval as a supervisor.

Signature:  **Date:** 13/11/2020

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DEDICATION

To my lovely family. My husband, Walter Kabeo, who has been very supportive and has encouraged me throughout my studies. My daughter, Skyler Maria, whom I spent much time away from during my studies.

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My parents and parents-in-law who have supported me to reach greater heights in my academic life through their constant encouragement.

ABSTRACT

Background: Protection of households from financial risk as a result of seeking healthcare is one of the fundamental goals of universal health coverage (UHC). Out-of-pocket health expenses create barriers to healthcare utilization and exposes households to financial catastrophe. Households with chronically ill members face higher financial risks because of the long-term need for healthcare.

Objective: The aim of this study was to determine the effect of chronic illness on catastrophic health expenditure in Kenyan households.

Methods: Using data from Kenya Household Healthcare Expenditure and Utilization Survey (KHHEUS) 2018, the study estimated the incidence of catastrophic health expenditure across the different types of chronic illnesses. Catastrophic health expenditures was estimated using the WHO methodology where a household whose out-of-pocket expenses for health were more than 40 percent of total expenditure on non-food items was deemed catastrophic. The effect of each chronic disease on catastrophic health expenditure was assessed using logistic regression.

Results: The overall CHE incidence was estimated to be 7.96%. The incidence was higher amongst households with chronic diseases members (10.12%) as compared to those without (5.89%). The incidence of CHE was highest for households with cancer at 22.72%, followed by TB 15.19%, diabetes 14.86%, hypertension 12.21%, other cardiac diseases 11.03%, mental disorders 9.68%, asthma 9.12%, other respiratory diseases 9%, and HIV/AIDS 8.26%. Cancer increased the likelihood of a household incurring CHE by 7.6%, diabetes 3.5%, TB 3.4%, hypertension 1.9%, and other cardiac diseases by 0.9%. Overall, having a chronic disease member increases the likelihood of household incurring CHE by 2.2%.

Conclusion: Chronic illnesses expose households to the negative effects of out-of-pocket health spending such catastrophic expenditure which limit spending on other basic necessities. There is a need for greater financial protection of households with chronically ill members to not only cushion them from out-of-pocket expenditures but also help them access the much needed healthcare without forgoing other needs.

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ABBREVIATIONS AND ACRONYMS

CHE: Catastrophic health expenditure

KHHEUS: Kenya Household Healthcare Expenditure and Utilization Survey

KNBS: Kenya National Bureau of Statistics

LMICs: Low and middle-income countries

MOH: Ministry of Health, Kenya

MPO: Mean positive overshoot

NCDs: Non-communicable diseases

NHIF: National Hospital Insurance Fund, Kenya

OOP: Out-of-pocket

THE: Total health expenditure

UHC: Universal Health Coverage

OPERATIONAL DEFINITION OF TERMS

Catastrophic health expenditure (CHE): Annual out-of-pocket expenditures on health exceeding 40 percent of the household's annual non-food expenditure.

Chronic diseases: These are diseases that are continuing or occurring again and again for a long time.

Incidence of CHE: The proportion of households that have incurred CHE.

Mean positive overshoot: A measure of the intensity of catastrophic expenditure.

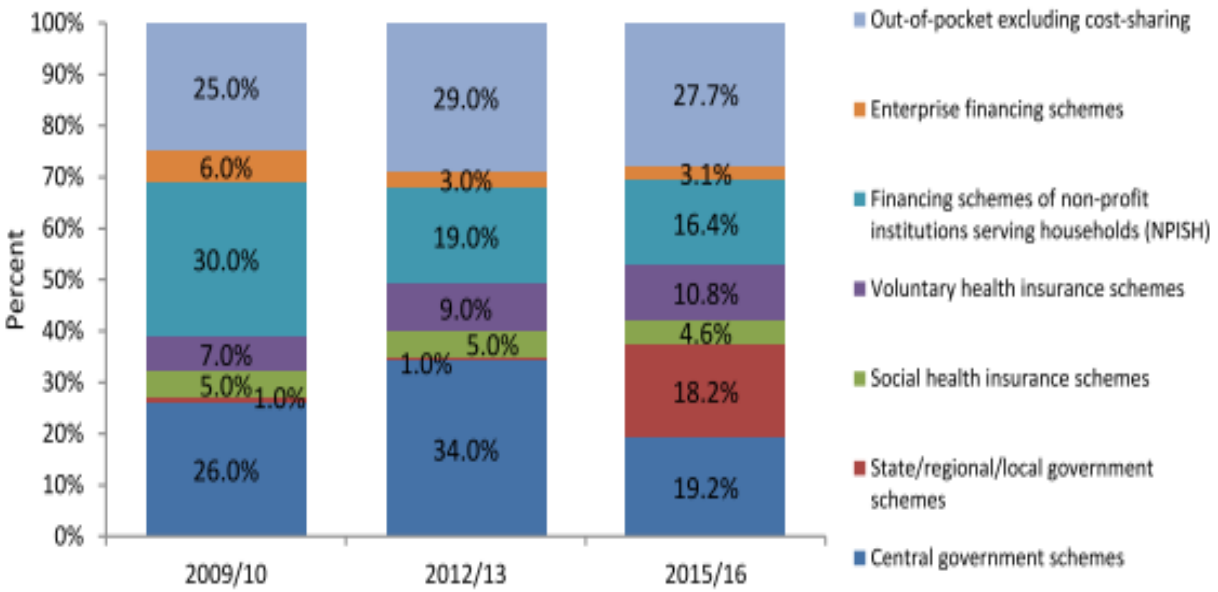
Out-of-pocket health expenditures: Payments made when receiving healthcare services provided by any type of provider. They include registration, consultation, drugs, vaccines, diagnosis, and medical check-up fees. They exclude insurance premiums.

CHAPTER ONE: INTRODUCTION

1.1: Background

Financial risk protection is a global agenda that is anchored in Sustainable Development Goal (SDG) 3.8 (United Nations, 2015). The primary aim of universal health coverage (UHC) is to have accessible health services with little or no financial burden on households (Saksena et al., 2014; WHO & IBRD/The World Bank, 2017). Like many other low and middle-income countries (LMICs), households in Kenya face financial hardship when they pay for healthcare services out-of-pocket (Murphy et al., 2019). The Kenyan health care system still depends heavily on households to finance healthcare directly out-of-pocket. Households' out-of-pocket health expenses constituted 25 percent of total health expenditure (THE) in 2009/2010, 29 percent in 2012/2013, and 27.7 percent 2015/2016 respectively as illustrated in Figure 1 (MOH, 2017).

Figure 1: Trends in current health expenditure financing schemes, FY 2009/10, 2012/13, 2015/16



Source: MOH, 2017

In Kenya, only 19 percent of the citizens are covered by medical insurance (Kazungu & Barasa, 2017; MOH, 2018), this implies that a vast majority of the population have to pay for their healthcare costs out-of-pocket. Such payments cause barriers to healthcare care access and can threaten financial security of households (Murphy et al.,

2019). Out-of-pocket payments are not only regressive but can also lead to financial catastrophe and impoverishment (Chuma & Okungu, 2011). At 40 percent non-food expenditure, 7.1 percent households in Kenya were estimated to have incurred catastrophic health expenditures (CHE) in 2018, 4.5 percent in 2013 and 11.7 percent in 2007 as a result of out-of-pocket health expenses (Barasa et al., 2017; Kimani et al., 2016; Salari et al., 2019). In all these studies, the poorest groups incurred the highest incidence of CHE, and having a chronic disease was positively related with the occurrence of CHE.

High out-of-pocket expenses for healthcare force households to employ coping mechanisms that can be detrimental to their overall health and economic wellbeing in the long-term. Such coping mechanisms include selling assets, borrowing, use of household savings, and even sometimes forgoing care when they cannot afford it completely (Murphy et al., 2019; Oyando et al., 2019). This is even more detrimental for households with chronically ill members who face long-term out-of-pocket payments for healthcare.

Chronic diseases often carry a high economic burden (Essue et al., 2018; Subramanian et al., 2018). Households with chronically ill members face higher financial risks than the households without (Barasa et al., 2017; Bhojani et al., 2012; Rahman et al., 2013; Rezapour et al., 2019; Subramanian et al., 2018; Sun et al., 2009). Treatment and diagnosis of chronic diseases can be costly resulting to CHE when the costs are borne by households through out-of-pocket payments (Subramanian et al., 2018). Households in Kenya with a chronically ill member have are more likely to incur CHE in comparison to those without (Barasa et al., 2017).

The study hypothesises that households with a member who has a chronic disease incur higher out-of-pocket healthcare payments as compared to those without and that the incidence of CHE varies across the different types of chronic diseases. The aim of the study, therefore, was to estimate the incidence of CHE across different types of chronic disease and their effect on CHE using a nationally representative household survey on healthcare expenditure. This is important as it will provide more evidence on healthcare expenditure on chronic diseases by Kenyan households.

1.2: Research Problem statement

While studies have consistently shown that households with chronically ill members have a greater likelihood of CHE, little is known about the incidence of CHE for the different types of chronic illnesses in Kenya. Different types of chronic diseases have varying effects on the incidence of CHE depending on the seriousness of the illness and associated treatment costs (Choi et al., 2015; Essue et al., 2018). Households with chronically ill members have been shown to have a higher likelihood of incurring CHE than those without (Barasa et al., 2017; Salari et al., 2019). They are also more exposed to the negative effects of out-of-pocket for health expenses because of the long-term and sometimes lifelong need for care and medicines. In addition to that, chronic illnesses also have a negative impact on household income resulting from loss of productivity thus reducing income for households to spend not only on healthcare but also to maintain its subsistence needs (Mwai & Muriithi, 2016b). Therefore, there is a need to understand the burden borne by households in seeking care for the different types of chronic diseases.

1.3: Justification

Kenya has committed to achieving UHC by 2022. To achieve this, Kenya must reduce the proportion of healthcare financing that is borne directly by households and individuals as out-of-pocket payments to access health care services. In 2018 KHHEUS, 19.4 percent of Kenyans did not seek healthcare after reporting an illness citing “high cost of care” as the reason (MOH, 2018). While the level of CHE in the country is known, there is lack of information on the extent to which households with chronically ill members are exposed to CHE. This information is important because it can help with the design of an equitable and accessible health services and in addressing health care access and utilization concerns for people with chronic diseases while being protected from health-related financial catastrophe. Findings from this study will, therefore, inform policymakers in Kenya on the effect of chronic disease on out-of-pocket health payments and ultimately CHE. Such information are be important in the design of policies to help in health systems strengthening to confer financial risk protection to households with chronically ill members such as better risk pooling mechanisms that can lead to more protection to households with chronically ill members**.**

1.4: Objectives

1.4.1: Broad objective

To determine the effect of chronic diseases on the incidence of catastrophic healthcare expenditures in Kenyan households.

1.4.2: Specific objectives

1. To describe out-of-pocket healthcare payments of households with chronically ill members and those without.
2. To estimate the incidence and intensity of CHE across the different chronic diseases.
3. To determine the effect of different types of chronic disease on CHE.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

In this chapter we discuss empirical and theoretical literature with the aim of highlighting the knowledge gaps that this study aims fill. The first part of the chapter, discusses theoretical literature on demand for healthcare and healthcare utilization which informs the theoretical basis for this study. The second part discusses empirical literature on catastrophic health spending, the economic effects of chronic diseases, and finally the methodological review.

2.2: Theoretical review

2.2.1: Grossman model of health demand

The Grossman model (1972) provides a theoretical framework for understanding the demand for health and healthcare and the socioeconomic determinants for health. According to the model, when born, individuals are initially endowed with optimum amount of health that reduces as time goes by and they die once the amount falls below a precise level. The amount of health can however be increased by investments like healthcare, diet, exercise and nutrition. Healthcare is therefore sought because it improves health implying that the demand for healthcare is derived from the demand for health (Grossman, 1972, 1999).

Healthcare financing is an input in the production of healthcare, however, this is subject to a budget constraint. While health and hence healthcare is desirable, it is not the only thing that consumers value. Individuals have other activities that they value but have only limited incomes with which to finance their healthcare and the other activities, both of which have a cost (Wagstaff, 1986). Out-of-pocket healthcare payments as a component of healthcare financing can, therefore, discourage healthcare consumption and ultimately impact health.

Healthcare does not follow the conventional theory of demand as the cost of health is dependent on other factors other than healthcare. One such factor is age, where the cost of health will rise with a rise in age as the stock of health depreciates faster as people age. Investments for health, therefore, become more costly as people age (Grossman, 1999; Wagstaff, 1986). Chronic diseases are also another factor that

increase the demand for health hence increasing healthcare inputs such as health expenditures for the afflicted households and individuals.

2.2.2: Andersen's behavioural model

Andersen's behavioural model of health care describes the factors that lead to service use and hence health expenditures. It has been widely applied in research on health service utilization (Babitsch et al., 2012). The model postulates that use of health services is affected by individual and environmental factors. These factors can be classified into three broad groups i.e. need, predisposing and enabling characteristics (Andersen, 1995).

The predisposing factors are those determine the likelihood of an individual to use health services. These include the socio-demographic factors such as age, gender, education and beliefs about health. (Andersen, 1995; Babitsch et al., 2012). The enabling factors are the resources that are needed for one to use healthcare. They are divided into community and personal enabling factors. Community resources include health facilities and the availability of health personnel. This involves physician and hospital density, quality management oversight. People must also have resources to seek the services they need and make use of them. Personal enabling factors include income and health insurance (Andersen, 1995; Babitsch et al., 2012). The last is need which can either be a perceived or evaluated one. Perceived need is how people worry about their health and their perceptions on symptoms of disease such as pain. Evaluated need on the other hand is the objective measurements and professional diagnosis of a person's health status. (Andersen, 1995; Babitsch et al., 2012; Friedman, 1957). An individual perceives their need for health to be high or important or who has a confirmed illness, therefore, has a higher likelihood to seek healthcare.

2.2.3: Summary of theoretical review

From the Grossman demand model, we can deduce that the demand for healthcare and consequently health expenditures are affected by factors such as education, health status, and age. Additionally, when people are sick they have less time to dedicate to economic activities and therefore generate lesser income. For chronically ill people this creates a vicious cycle of non-productivity and high expenditures in health as they have more sick days and yet require frequent healthcare that they need to finance. This model does provide some theoretical underpinning on why people with chronic diseases in society are more likely to incur CHE. From the behavioural model for health care,

theoretical determinants of health expenditures may be categorized as perceived and evaluated needs, demographic characteristics and socio-economic characteristics. We can, therefore, infer that people with chronic diseases have a higher propensity to seek healthcare as they have evaluated need for that. That alone means they are more likely to seek care more than those without chronic diseases in the population and therefore the likelihood to spend more in healthcare.

2.3: Empirical review

2.3.1: Catastrophic healthcare expenditure and determinants

CHE is one of the measures of healthcare financial risk protection amongst other like impoverishment due to out-of-pocket health expenditures (Saksena et al., 2014). It is based on the impact of health expenses paid out-of-pocket on households and is considered catastrophic when it limits spending on other necessities such as education (Saksena et al., 2014). CHE is reported as the incidence that is the proportion of households who have incurred CHE and the intensity to which households incur CHE (Xu et al., 2005). It has been associated with healthcare utilization as households can only incur CHE after spending on healthcare (Masiye & Kaonga, 2016; Minh & Tran, 2012; Prinja et al., 2019).

The incidence of CHE is influenced by both individual and household factors. One such factor is the type of illness. Most studies have demonstrated that chronically ill people spend more on healthcare and are more predisposed to CHE (Barasa et al., 2017; Buigut et al., 2015). Prinja et al. (2019) also found that increased period of hospitalization increases the likelihood of incurring CHE and chronically ill people are more likely to be hospitalised for longer. However, some studies show that having non-chronic diseases can increase the likelihood of a household incurring CHE as compared to having a chronic disease (Aregbeshola & Khan, 2018; Kimani et al., 2016).

Household head socio-demographics such as their education, employment, gender, and age have also been found to affect CHE. Being educated is protective towards incurring CHE (Aregbeshola & Khan, 2018; Barasa et al., 2017; Kimani et al., 2016). Education is a positive determinant for healthcare utilisation and lesser out-of-pocket expenditure on the same (Masiye & Kaonga, 2016). This is because educated people are likely to have more knowledge about health and likely to use preventive services more and health care. They are also likely to be in employment which enables them to have more resources to pay for their healthcare expenses (Azzani et al., 2019). In some studies,

the gender of the household head had a significant association to the occurrence of CHE where female-headed households had a higher likelihood of incurring CHE (Buigut et al., 2015; Kimani et al., 2016; Li et al., 2012) while in other studies this did not show a significant effect on CHE at both 10 percent and 40 percent thresholds (Aregbeshola & Khan, 2018). Other household head characteristics such as being unemployed which is closely linked to education and being elderly also increase the likelihood of CHE in a household (Aregbeshola & Khan, 2018; Buigut et al., 2015; Kimani et al., 2016).

Household-level characteristics such as socioeconomic status and household size are also important determining factors of CHE. At 40 percent of non-food expenditure, the socioeconomic status of a household has a significant impact on CHE (Aregbeshola & Khan, 2018; Barasa et al., 2017; Kimani et al., 2016). However, at 10 percent of the total household expenditure, it was not significant determinant of CHE (Aregbeshola & Khan, 2018). This could be attributed to findings from other studies that have shown that lower thresholds (10 percent of total household expenditure) do not accurately predict CHE in poorer households (Kimani et al., 2016). The association of out-of-pocket health expenses and socio-economic status is positive as poorer people have a higher likelihood of paying out-of-pocket for healthcare as compared to richer people in society exposing them more to CHE (Masiye & Kaonga, 2016). The effect the household's insurance status on CHE has been found to be both negative and positive (Azzani et al., 2019). In Kenya, Kimani et al (2016) found that having any form of health insurance did shield households from incurring CHE. Subsequent studies in 2013 and 2018 have, however, found having a member within a household covered by health insurance not to be protective against incurring CHE (Barasa et al., 2017; Salari et al., 2019). This could be attributed to the low levels of insurance coverage in the country of which most are insured by NHIF which does not provide a comprehensive benefit package and hence may not confer financial risk protection (Barasa et al., 2017; Kimani et al., 2016). Other household characteristics such as larger household size and residing in a rural area were also increase the likelihood of incurring CHE (Aregbeshola & Khan, 2018; Kimani et al., 2016).

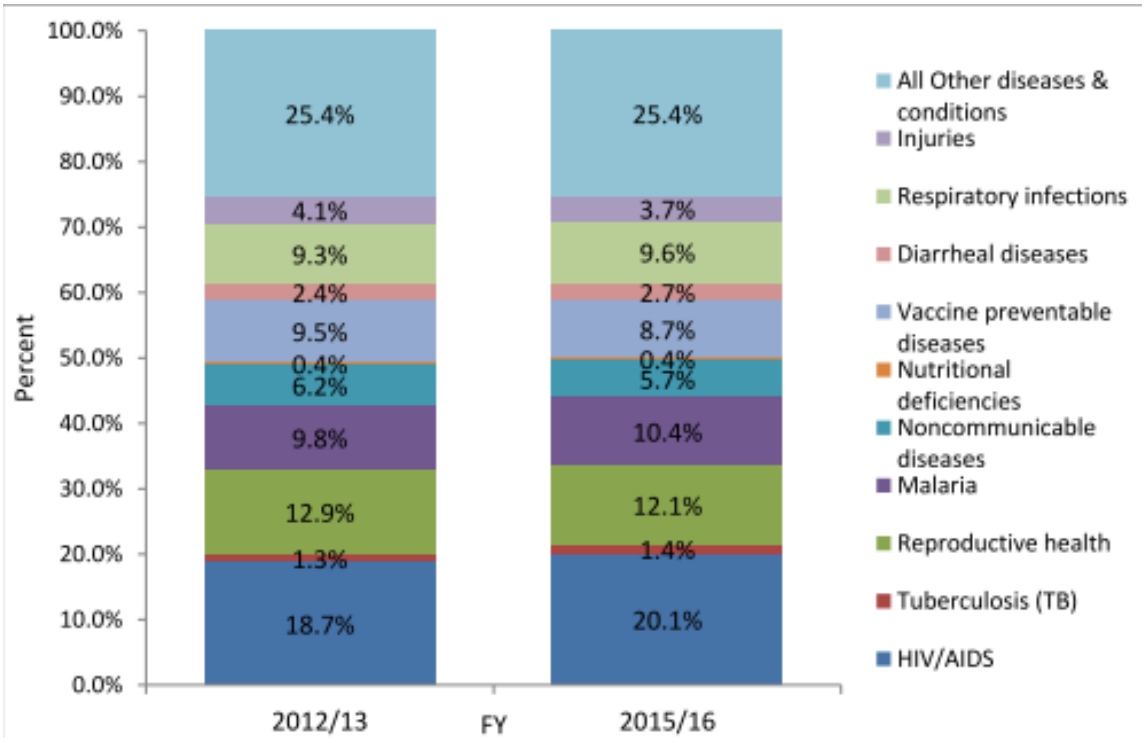
Other factors that have been positively associated with CHE are visiting a private facility and/or tertiary care facilities for healthcare (Prinja et al., 2019) and having incurred CHE once there was a likelihood to experience a recurrence in the following year (Lee & Yoon, 2019).

The review of literature has identified some important individual and household level determinants of catastrophic expenditures such as age, gender, employment, residence, socio-economic status, health utilization, types of illness, insurance status, and previous occurrence of CHE in a household.

2.3.2: Health expenditure on chronic disease

According to the Kenya National Health Accounts (NHA) 2015/16, total health expenditure in Kenya was KES 346 billion. Expenditure on NCDs and chronic non-communicable diseases (HIV and TB) was 27.2 percent of total health expenditure as shown in Figure 2 (MOH, 2017). During the same period, 27.7 percent of total health expenses was financed from out-of-pocket expenses on health by households. In April 2015 National Hospital Insurance Fund (NHIF) expanded their package to include chronic diseases, and associated services such as chemotherapy for cancer patients, renal dialysis and kidney transplant for chronic kidney disease members (Barasa et al., 2018). However, households which had members with one or more chronic diseases still had higher odds of incurring CHE in 2018 as it was the case in 2013 before the reform (Barasa et al., 2017; Salari et al., 2019). This, however, could be as a result of low insurance coverage in the country (MOH, 2018).

Figure 2: Distribution of THE by Diseases/Conditions, FY 2012/13, and FY 2015/16.



Source: MOH, 2017

The 2018 KHHEUS showed that 13 percent of households in Kenya suffer from chronic conditions with the leading conditions being hypertension, other respiratory disorders, and asthma. Females (57.9 percent) were more likely to suffer from chronic diseases than males. Similarly, people residing in rural areas (63 percent) had a higher likelihood of suffering from chronic conditions compared to those in urban areas. Hypertension, diabetes, other cardiac disorders, kidney problems, arthritis, and cancer were more prevalent among older people in the population (MOH, 2018).

Households with members who are chronically ill are affected by both pro-longed treatment costs and loss of income from reduction in productive time dedicated to economic activities (Essue et al., 2018; Mwai & Muriithi, 2016b; Schofield et al., 2016; Wafula et al., 2013; Xu et al., 2018). The effect extends to the healthy members of the family who have to take care for the ill member and hence diverting their time from economic activities (MOH & NTLD - Program, 2017; Wafula et al.,2013). Mwai and Muriithi (2016) found that although general health conditions reduced household income by 13.6 percent, NCDs, which are usually chronic, reduced household income by 28.6 percent (Mwai & Muriithi, 2016b). Apart from expenses on health care, other expenditures such special nutrition and food supplements, which are not considered as out-of-pocket expenses for health, can also be considerably high in households with chronically ill members (MOH & NTLD - Program, 2017). Wafula et al (2013) found that households with an HIV disease member spent more on food as compared to those without. Oyando et al (2019) also showed that health-related transport costs were major cost drivers of outpatient care for hypertension patients seeking healthcare in public facilities in a rural county in Kenya (Oyando et al., 2019). This exemplifies the reality that even when the direct medical costs for treating some chronic illnesses in public facilities may be affordable (Subramanian et al., 2018), households still suffer economic and financial losses from other associated indirect costs that may not be captured in out-of-pocket payments for healthcare (Essue et al., 2018).

Households with chronically ill members incur higher CHE incidence and intensity than those without (Barasa et al., 2017; Rezapour et al., 2017; Salari et al., 2019). Barasa et al (2017) found that households with chronically ill members had twice the odds of incurring CHE in comparison to those without. This findings were similar to those of Salari et al (2019) five years later. Studies from other settings; India (Bhojani et al.,

2012), Vietnam (Minh & Tran, 2012), Korea (Choi et al., 2015) and China (Sun et al., 2009) have also reported similar findings.

Different types of chronic diseases have varying effects on the incidence of CHE contingent upon the seriousness of the illness and associated treatment costs (Choi et al., 2015; Essue et al., 2018). Choi et al (2015) found that the incidence of CHE was highest amongst households with chronic kidney disease who were 3 times more likely to incur CHE than those without. Oyando et al (2019) found that about half, 57.7 percent, of people who sought hypertension care in public facilities in Machakos County in Kenya incurred CHE (Oyando et al., 2019). In Kenya dialysis for chronic kidney disease and stroke admissions have been found to be some of the most expensive treatments with an estimated cost of $5,338 and $1,874 respectively per patient for 1 year in a public facility (Subramanian et al., 2018). Complications resulting from chronic diseases such as stroke, kidney failure, myocardial infarctions are also costly to treat (Subramanian et al., 2018).

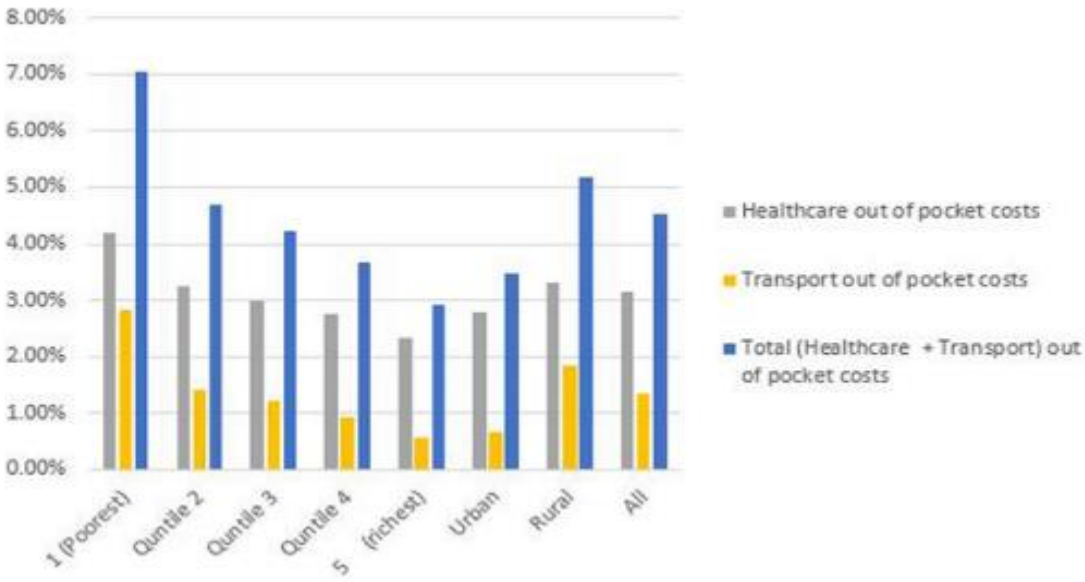
Households that have members with chronic diseases are more likely to employ coping mechanisms to be able to bear the recurring costs of treatment (Murphy et al., 2019). Most commonly used coping strategies include borrowing from well-wishers or money lenders, selling of assets, spending less on capital goods, spending less on education, delaying/foregoing treatment and reduction in savings (MOH & NTLD - Program, 2017; Murphy et al., 2019; Oyando et al., 2019). Some of the coping strategies - borrowing money on interest, spending less on education and selling of assets- can be detrimental as they impact negatively on future economic prospects of households. Foregoing or delaying care due to lack of money to spend on healthcare can also result in complications that are even more costly to treat (Murphy et al., 2019).

2.3.3: Methodological review

WHO defines out-of-pocket payments as the direct costs that individuals incur when seeking health services excluding prepaid costs in the form taxes and health insurance (WHO, 2020). Direct medical costs such as medicines, consultation, and lab tests are therefore considered as out-of-pocket health expenses according to the WHO definition. Some studies, however, have included health-related transport expenditure as part of out-of-pocket expenses (Barasa et al., 2017; Myint et al., 2019; Oyando et al., 2019; Prinja et al., 2019; Salari et al., 2019). Barasa et al (2017) argue that health-related transport expenses constitute a large proportion of out-of-pocket expenses especially

for the poorest in the population and those in rural areas and therefore have a significant effect on health utilization as illustrated in Figure 3.

Figure 3: Proportion of out-of-pocket health payments to household expenditure.



Source: Barasa et al (2017)

In measuring CHE, the choice of methodology is at the discretion of the researcher given no consensus on a standard approach (Goryakin & Suhrcke, 2014). Researchers, therefore, use different approaches to set the denominator and the threshold at which to consider health expenditure as catastrophic (Goryakin & Suhrcke, 2014; Hsu et al., 2018). The two regularly utilized methodologies are 10 percent of total household consumption or 40 percent of non-food expenditure (Wagstaff & van Doorslaer, 2003). The numerator is common, out-of-pocket health expenditure, but the denominator can either be total household expenditure/income or total household expenditure net of spending on necessities/capacity to pay whose proxy is mostly food expenditure, therefore, referred to as non-food expenditure (Adam Wagstaff & van Doorslaer, 2003; Xu et al., 2005). When using the total household expenditure the threshold at which CHE is determined is lower, 10 percent but other studies have also used 15 percent and 25 percent (Kimani et al., 2016; Adam Wagstaff & van Doorslaer, 2003). However, this approach does not accurately detect CHE in poor whose share of the budget is lower as most of their resources are spent on basic necessities such as food (Cylus et al., 2018; O'Donnel et al., 2008).

When using the non-food expenditure as the denominator, the threshold at which CHE is determined is higher, at 40 percent (Adam Wagstaff & van Doorslaer, 2003; Xu et al., 2005). Cylus et al, however, argue that using non-food expenditure as a proxy for basic necessities does not accurately capture subsistence spending. Instead, partial normative food expenditures that take account of household size or normative spending on food, housing, and utilities would capture subsistence spending more accurately (Cylus et al., 2018). WHO defines CHE as out-of-pocket expenses on health that are equal to or exceed 40 percent of the household's capacity to pay (Xu et al., 2003). It has been found that using non-food expenditure as the denominator better detects CHE among the poor households whose budget share after spending on basic necessities is smaller (Kimani et al., 2016; Onoka et al., 2011).

In determining the incidence of CHE, some studies have used the two methodologies sequentially (Aregbeshola & Khan, 2018; Buigut, Ettarh, & Amendah, 2015; Chuma & Maina, 2012; Kimani et al., 2016; Lee & Yoon, 2019), while others have used the WHO methodology but varying the thresholds at 10, 20 and 40 percent (Lee & Yoon, 2019; Onoka et al., 2011; Salari et al., 2019). Recent studies conducted in Kenya have used WHO methodology to estimate CHE (Barasa et al., 2017; Oyando et al., 2019; Salari et al., 2019).

Reviewed studies used varying methodologies in estimating the determinants of CHE. Most of the studies applied the logistic model to assess household characteristics associated with incurring CHE because of the outcome variable is binary (Barasa et al., 2017; Buigut et al., 2015; Minh & Tran, 2012; Myint et al., 2019; Salari et al., 2019). Other studies have used multilevel logistic regression models (Xu et al., 2018), 2SRI (Mwai & Muriithi, 2016a), and ordinary least squares (OLS) (Wang, Li, & Chen, 2015) models.

Secondary data from national surveys on health expenditure were mostly used in the determination of CHE. In Kenya, studies on CHE (Barasa et al., 2017; Mwai & Muriithi, 2016a; Salari et al., 2019) have mostly used the Kenya Health Expenditure and Utilization Surveys.

2.2.4: Summary of empirical review

Reviewed literature has shown that chronic illness is one of the positive determinants of CHE amongst other socio-demographic characteristics. However, few studies have

estimated effects of the different types of chronic diseases on CHE. It is also evident from the literature that households with chronic diseases bear heavy economic costs that can result in detrimental coping mechanisms. Finally, the variation in methodologies used to estimate CHE and its determinants.

CHAPTER THREE: METHODOLOGY

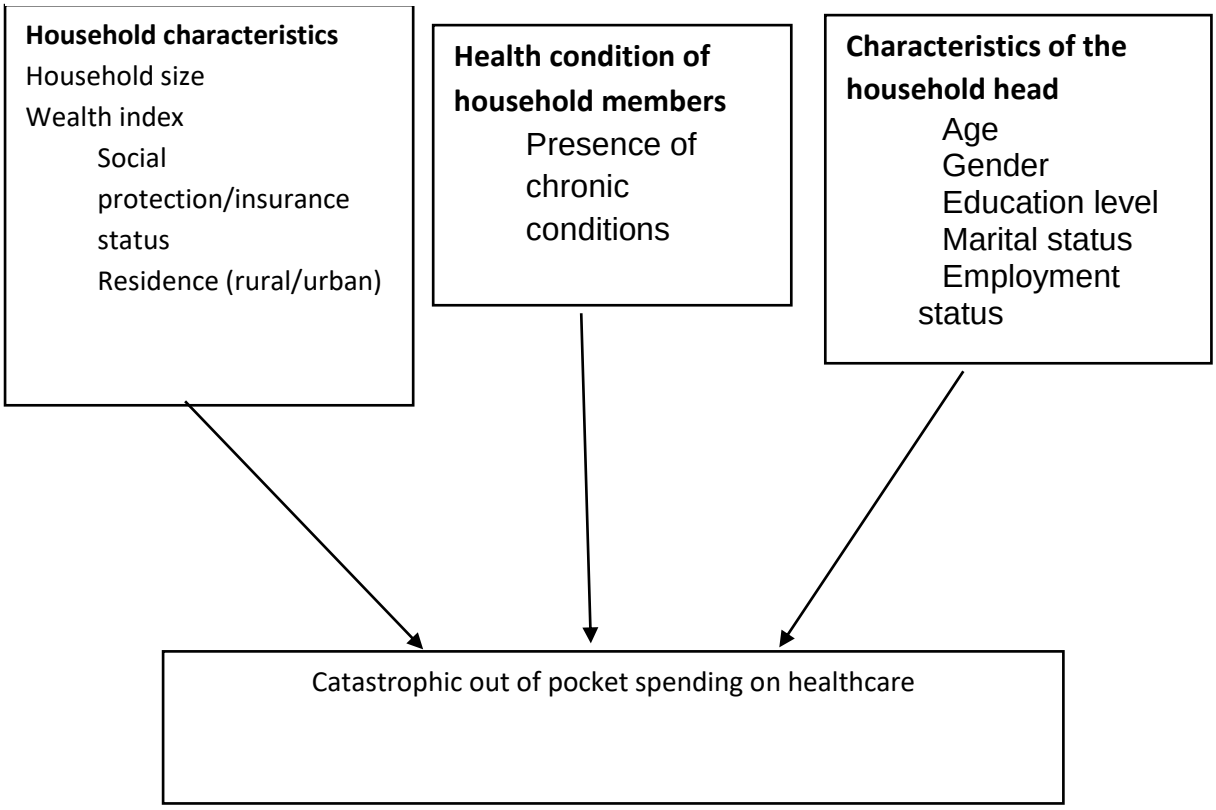
3.1: Introduction

In this chapter, we describe the methodological approach applied to meet the study objectives. It presents the conceptual framework guiding the study, analytical plan, variables and their measurement, study area, data source, and ethical considerations.

3.2: Conceptual framework

The analysis was guided by the conceptual framework in **Figure 4** that was adapted from Myint et al (2019) and modified to suit the current study. The independent variables were taken according to the theoretical (Andersen, 1995; Grossman, 1972; A. Wagstaff, 1986) and empirical literature on determinants of health expenditure (Aregbeshola & Khan, 2018; Azzani, Roslani, & Su, 2019; Masiye & Kaonga, 2016). In his model, Grossman postulates the demand for healthcare to be affected by characteristics such as education, age, and income (Grossman, 1972). According to Andersen's behavioral model for health care, health expenditure can be affected by factors like occupation, gender, income, age, education, health insurance and and experience of illness (Andersen, 1995). Empirical literature on health care expenditures has included some measures from the two theories to explain the determinants of health expenditure (Adam Wagstaff & van Doorslaer, 2003; Xu et al., 2003). Most studies have found socio-demographic characteristics such as age, gender, education, employment status, place of residence, marital status, health status, and healthcare utilization to affect health expenditure and consequently CHE (Barasa et al., 2017; Kimani et al., 2016; Masiye & Kaonga, 2016; Zeng et al., 2018). Based on this, the social demographic characteristics in **Figure 4** were included in the analysis. Azzani et al (2019) grouped the characteristics as: Household characteristics, illness/treatment factors, and household head characteristics as illustrated in the framework (Azzani et al., 2019). In this study, the focus was on the effect of chronic diseases on CHE while controlling for the other socio-demographic factors which were found to have a significant effect on CHE.

Figure 4: Conceptual framework for determinants of CHE



3.3: Statistical analysis and model Specification

3.3.1: Description of out-of-pocket health expenditures

Information for out-of-pocket expenses on health was recorded for outpatient visits and inpatients admissions on registration, consultation, laboratory tests, medicines, diagnostic tests (radiology), chemotherapy, and dialysis. For outpatient services, detailed information for the above spending categories was recorded for utmost four visits in the past four weeks. For inpatient admissions, the recall period was twelve months and detailed information was recorded for a maximum of two inpatient admissions. Out-of-pocket spending for each of the spending categories was calculated by getting the mean expenditure per visit/admission and multiplying that by the number of visits/admission reported during the recall period. The median out-of-pocket spending was then estimated for each of the spending categories for households with and without chronically ill members. Though not included in out-of-pocket healthcare payments, we also estimated healthcare-related transportation costs for households with chronically ill

members and those without. The Mann-Whitney U test (Wilcoxon rank sum test) was used to compare differences in out-of-pocket health payments among households with member(s) who have a chronic disease and those without.

3.3.2: Calculation of CHE

This study used the WHO approach of determining CHE to identify households that incurred CHE. This method and the threshold was chosen because it better detects CHE amongst the poor as postulated by Kimani et al.(2016), and also because most recent studies on CHE conducted in Kenya have used this method, therefore, it will be easier to compare the results and draw meaningful conclusions (Barasa et al., 2017; Oyando et al., 2019; Salari et al., 2019; Subramanian et al., 2018). In this approach out-of-pocket payment was the numerator and non-food expenditures of the household the denominator. When out-of-pocket expenses on health were 40 percent or more of the non-food expenditure, the household was deemed to have incurred CHE. This was estimated as follows:

$$cata_h = 1 \; if \; \frac{OOP_h}{xi - f(x)} \geq 0.4 \quad \text{..... (1)}$$

$$cata_h = 0 \; if \; \frac{OOP_h}{xi - f(x)} < 0.4 \quad \text{..... (2)}$$

Where oop_h is the households' out-of-pocket payments for healthcare, x is the total expenditures of household i, $f(x)$ is the food expenditure of the household, and 0.4 is the threshold at which out-of-pocket payments are considered catastrophic.

The incidence of CHE (headcount) is the proportion of households that incurred CHE and was determined as follows

$$Headcount = \frac{1}{N}\sum_{i=1}^{N} E_i \quad \text{..... (3)}$$

Where N is the total number of households, E is an indicator that takes a value of 1 if the out-of-pocket payments of a household i exceed the 0.4 of non-food expenditure, and 0 if it does not.

To catastrophic overshoot is a measure of the extent to which the household's out-of-pocket payments for health the catastrophic threshold. It was estimated as follows.

$$Overshoot = \frac{1}{N}\sum_{i=1}^{N} E_i \left(\left[\frac{OOP_h}{xi - f(x)} \right] - 0.4 \right) \quad \text{.....(4)}$$

Mean positive overshoot (MPO) is the measure of the intensity of CHE which is computed from dividing the catastrophic overshoot by all households that have incurred CHE and was estimated as follows

$$MPO = \frac{Overshoot}{Headcount} \quad \text{.....(5)}$$

The incidence and intensity of CHE was also estimated for households that have a member(s) with a chronic disease and those without and for each of the chronic diseases specified in the data.

3.3.3: Model specification

This study used logistic regression to assess the effect of chronic diseases on CHE while controlling for socio-demographic characteristics. This model was selected because it has been used in previous studies on determinants of CHE (Barasa et al., 2017; Buigut et al., 2015; Minh & Tran, 2012; Myint et al., 2019; Salari et al., 2019) and the binary nature of the dependent variable. This study estimated independent models, each for hypertension, diabetes, other cardiac diseases, asthma, HIV/AIDS, mental disorders, TB, other respiratory diseases, and cancer.

The dependent variable was CHE while the independent variables were chronic illnesses and socio-demographic characteristics (comprising of age *(agehh),* gender *(genderhh),* marital status *(maritalhh),* residence *(resid),* household size *(hhsize*), education *(educationlv),* employment status *(emplymnt),* wealth index *(w_index)* and insurance status *(insured))*. Bivariate analysis was conducted between the predictor variable and each of the explanatory variables. After bivariate analysis variables that were significant at 10% level (0.1) were included in the multivariate model.

The logistic regression equation was specified as follows:

$$log\left(\frac{Pr(cata_i=1)}{1-Pr\,(cata_i=1)}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \varepsilon_i \quad \text{..... (7)}$$

Where;

$cata_h$- is the binary dependent variable (CHE) which is equal to 1, if a household incurred CHE and 0, if not.

β= the parameters to be estimated

x_1 =the main independent *variable for each of the chronic diseases*. This is be a binary variable taking of 1 if a household has the chronic disease and 0, if otherwise.

x_2 = household socio-demographic characteristics found to be significant at bivariate analysis.

ε_i = the error term

To interpret the findings of the model, we estimated odds ratios and marginal effects that measured the effect of each of the chronic illnesses on the CHE while holding the socio-demographic characteristics constant.

3.4: Assessment of model fit

3.4.1: Likelihood ratio test (LRT)

The likelihood ratio test (LRT) was used to assess the fit of the estimated model. The LRT compared the fitted model to the null model (a model with the intercept only). This test was done to determine whether the model to be estimated was correctly specified to achieve meaningful results. This test employed the p-value whereby if the p-value of the LR test is less than 0.05, then there is significant association between the predictor and the explanatory variables, and if p-value was greater than 0.05 then no significant relationship exists between the predictor and explanatory variables.

3.4.2: Pseudo R-squared (McFadden R-squared)

The pseudo R-squared is calculated as follows;

$$R^2 = 1 - {}^{Lur}/_{Lr}$$

It compared the unrestricted log-likelihood (Lur) for the model we are restricting and the restricted log-likelihood with only an intercept. If the independent variables have no explanatory power, the restricted model will be the same as the unrestricted model and R^2 will be equal to zero.

3.5: Definition of variables and measurement

Out of the whole data set, I extracted a few variables that were relevant for this study. This included variables with information on socio-demographics, chronic diseases,

healthcare expenditure, household expenditure, and insurance cover as shown in **Table 1.**

Table 1: Variable definition and measurement

Variable names and labels	**Variables codes in KHHEUS 2018**	**Variable definition**	**Variable measurement and management**
		Dependent variable	
Catastrophic health expenditure *(CHE)*	Total expenditure (THE)-Continuous variable in Kshs. Food expenditure (FE)- Continuous variable recorded in Kshs. Health expenditure (HE)- Continuous variable recorded in Kshs.	CHE is a calculated variable from total household expenditure, food expenditure, and health expenditure variables.	Binary variable 1= Yes 0=No
		Independent variables	
Hypertension *(hyp)*	Yes, No	The variable indicates whether any member within the household has hypertension or not.	Binary variable 1= Yes 0=No
Diabetes *(diabetes)*	Yes, No	The variable indicates whether any member within the household has diabetes or not.	Binary variable 1= Yes 0=No
other cardiac diseases *(cardiac_dis)*	Yes, No	The variable indicates whether any member within the household has a cardiac disease or not.	Binary variable 1= Yes 0=No
Asthma *(asthma)*	Yes, No	The variable indicates whether any member within the household has asthma or not.	Binary variable 1= Yes 0=No
HIV/AIDS *(HIV)*	Yes, No	The variable indicates whether any member within	Binary variable 1= Yes 0=No

		the household has HIV/AIDS or not.	
Mental disorders *(mental_dis)*	Yes, No	The variable indicates whether any member within the household has a mental disorder or not.	Binary variable 1= Yes 0=No
Tuberculosis *(TB)*	Yes, No	The variable indicates whether any member within the household has TB or not.	Binary variable 1= Yes 0=No
Other respiratory diseases *(resp_dis)*	Yes, No	The variable indicates whether any member within the household has a respiratory disease or not.	Binary variable 1= Yes 0=No
Cancer *(cancer)*	Yes, No	The variable indicates whether any member within the household has cancer or not.	Binary variable 1= Yes 0=No
Age *(agehh)*	Continuous variable ranging from 0- 98 years	This is the age of the head of the household in complete years.	Continuous variable
Gender *(genderhh)*	Female Male	Gender of the head of the household.	Binary variable 1 =female, 0= male
Marital status *(maritalhh)*	Never married, married, divorced, separated	The variable indicates whether the household head is married or not.	Binary variable 1= married, 0= not married
Residence *(resid)*	Urban, rural	Location of the household.	Binary variable 1 =urban, 0 =rural
Household size *(hhsize)*	Continuous variable ranging from 1 to 22	This is the number of people living within a household.	Continuous variable
The education level *(educationlv)*	Nursery, Primary, Post primary/ vocational, Secondary, College (middle level), University, Informal	Highest level of education attained by the household head.	Ordinal categorical variable 1=Primary, 2=Secondary, 3= Tertiary

Employment status *(emplymnt)*	Working (formal/ informal employment), Seeking work , Homemakers Students Others	The variable indicates whether the household head is employed or not.	Binary variable 1=Employed, 0= unemployed
Socio-economic status *(w_index)*	Poorest, Second, Middle, Fourth, Richest	Households are categorized into five quintiles of wealth from poorest to richest.	Ordinal categorical variable 1= Poorest 2= Second 3= Middle 4= Fourth 5= Richest
Insurance (*Insured*)	Insured Not insured	This variable indicates whether any member within the household has health insurance.	Binary variable 1= Yes 0= No

Source: *Author's compilation, KHHEUS 2018*

3.5.1: Dependent variable

The dependent variable was CHE which was computed using the WHO approach as outlined above. CHE was calculated from household expenditures that were collected in the survey. Apart from out-of-pocket health expenditure which were collected at individual level, all other household health expenditures were collected at the household level. The recall period for most food expenditures was 7 days, while that of other household expenditures was 4 weeks and one year. Out-of-pocket payments were calculated by adding up out-of-pocket health payments for inpatient and outpatient health services. All expenditures were annualized by multiplying by 52 those recorded on a 7 day recall period and 13 for 4 weeks recall periods.

3.5.2: Independent variable

The independent variables were the types of chronic diseases. For this study chronic diseases were defined as diseases or conditions that are continuing or occurring again and again for a long time (Bernell & Howard, 2016). This implies that not only the widely known non-communicable diseases such hypertension, diabetes and cancer were considered chronic buts also conditions such as HIV, chronic respiratory diseases and hormonal disorders because of their prolonged course of illness as defined by Bernell and Howard (2016). Therefore, persistent communicable and non-communicable

diseases were considered as chronic diseases (WHO, 2002). In the KHHEUS 2018, conditions that lasted for at least three months and could recur were regarded as chronic. Nine chronic diseases were included in the analysis; hypertension, diabetes, other cardiac diseases, asthma, HIV/AIDS, mental disorders, TB, other respiratory diseases, and cancer. We also adjusted for socio-demographic characteristics such as age, gender, marital status, residence, household size, the education level, employment, household size, insurance status and socio-economic status.

3.6: Description of study population and setting

Kenya has an estimated population of 47 million people (KNBS, 2019). It is divided into 47 counties. (Government of Kenya, 2010). Healthcare is a devolved function managed by the specific county governments. Only 19 percent of the citizens are covered by health insurance most of whom are in the formal sector (MOH, 2018). In the fiscal year 2018/2019, budgetary allocation for health was 9.2 percent of the total budget (MOH, 2019). The Kenyan health care system depends heavily on out-of-pocket payments for healthcare which accounts for 27.7 percent of total healthcare expenditure (MOH, 2017). The prevalence of chronic diseases as of 2018 was 13 percent (MOH, 2018).

3.7: Data sources and statistical analysis

The study used data from a national survey on health utilization and expenditure, KHHEUS 2018 (MOH, 2018). The survey was conducted by KNBS for the MOH, Kenya from April to May 2018. This was a household based survey that that comprised of 37,500 households selected from 1,500 clusters (577 in urban and 923 in rural areas) spread across the country. The selection of the sample followed a two-stage stratified cluster sampling design in which 1,500 clusters were sampled in the first stage and the random selection of 25 households from each of the clusters. The questionnaire used in the 2018 KHHEUS was developed by the Technical Working Committee (TWC), pretested, reviewed, and improved before training. Information collected included; identification information, household composition, utilization of outpatient, and other health-related services, inpatient services, and corresponding health expenditure (MOH, 2018).

Data from this survey were selected for use because i) similar studies have used similar datasets, ii) it is the most recent dataset of its kind and iii) it meets requirements defined by Xu et al to determine catastrophic healthcare payments in that: it is nationally

representative; has socioeconomic information and health utilization information and household expenditures in different spending categories (Xu et al., 2005).

3.8: Ethical considerations

The study used secondary data from a national survey conducted by MOH, Kenya. The data were available on request and do not contain any personal identifying information, therefore, no ethical approval required.

CHAPTER FOUR: RESULTS

4:1: Introduction

This chapter presents the empirical results on the effect of chronic diseases on CHE. The findings are presented in accordance to specified objectives in chapter one.

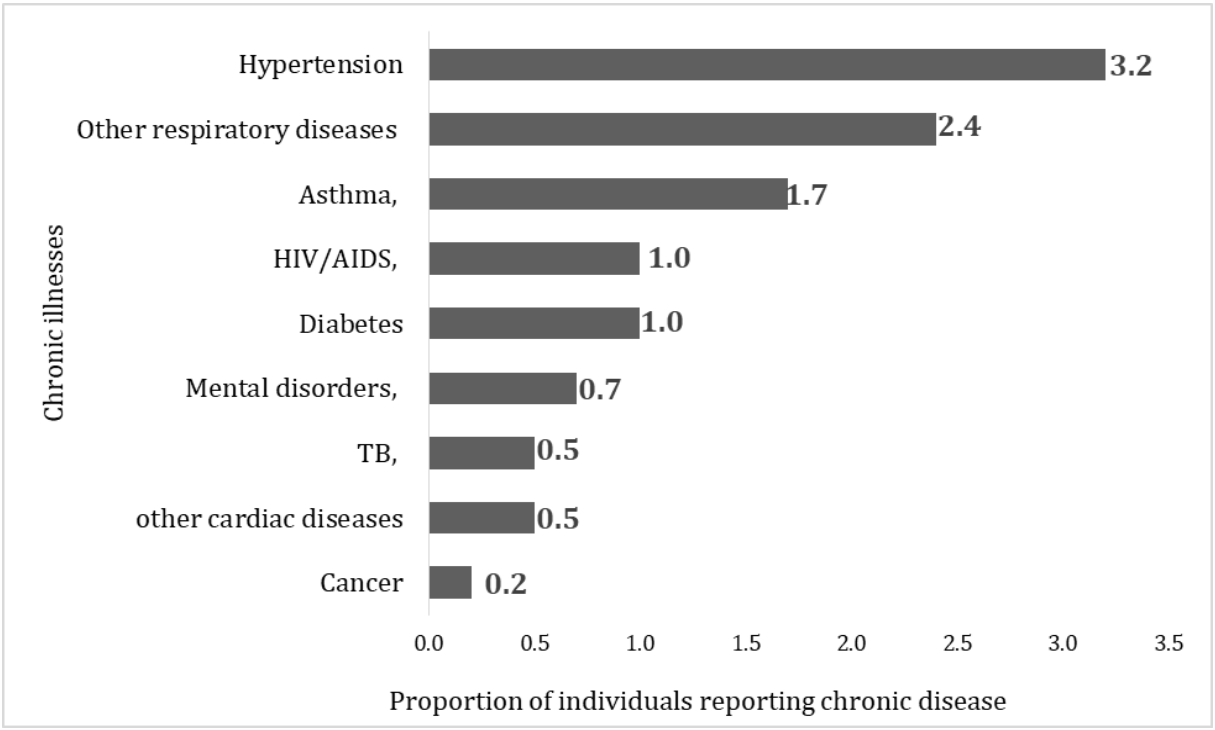
4.2: Sample description

The sample is described in terms of the distribution of chronic diseases and socio-demographic characteristics for individuals with and without chronic diseases.

4.2.1: Distribution of chronic diseases

A total of 31,655 households comprising of 141,132 individuals were surveyed. Overall, 37.8% (11,978) of households and 13.8% (19,534) of individuals reported to suffer from at least one chronic disease. Hypertension was the most prevalent chronic disease with 3.2% (4,694) of individuals reporting to be suffering from it followed by other respiratory diseases at 2.4% (3,444) and asthma 1.7% (2,509). The rest of the chronic conditions were distributed as follows; HIV/AIDS 1.0% (1,416), diabetes 1.0% (1,412), mental disorders 0.7% (1,075), other cardiac diseases 0.5% (768), TB 0.5% (738), and cancer 0.2% (333) as represented in **Figure 5**.

Figure 5: Distribution of chronic illnesses in Kenya, 2018



Source: *Author's computation, KHHEUS 2018*

4.2.2: Socio-demographic characteristics

There were significant differences in socio-demographic characteristics of individuals with and without chronic diseases as shown in **Table 2**. Persons with chronic diseases were older with a mean age of 39.3 years (SD=23.2) as compared to those without chronic diseases whose mean age was 22.1 (SD=17.8). A higher proportion of females (57.7%) had chronic diseases compared to the proportion of females (49.8%) who did not have. A higher proportion of married persons (57.9%) had chronic diseases compared to the proportion of married persons (51.1%) without chronic disease. Similarly, a higher proportion of employed people (44.8%) had chronic diseases compared to the proportion of employed individuals (27.3%) without chronic disease. Though significant, there were slight differences in educations levels between individuals with chronic diseases and those without chronic diseases. Of those with chronic diseases 7.3% had tertiary education, 20.6% had secondary education and 72.1% primary school education. Of those without chronic diseases, 7.3% had tertiary education, 21.4% secondary education and 71.4% primary school education. The mean household size for persons without chronic diseases was significantly small (mean=5.2, SD=2.7) in comparison the mean household size of those without chronic diseases (mean=5.9, SD=2.7). A higher proportion of chronic diseased individuals resided in urban areas (35.6%) compared to those without chronic diseases (32.2%). More individuals with chronic diseases (19.1%) had a health insurance as compare to those without chronic diseases (16.1%).

Table 2: Socio-demographic characteristics

		With chronic disease N=19,534		**Without chronic disease N=124,974**		***P-value***
		n (%)	**mean (SD)**	**n (%)**	**mean (SD)**	
Individual characteristics						
Age in years			39.3 (23.2)		22.1 (17.8)	<0.001*
Gender	Male	8,272 (42.3)		62,721 (50.2)		<0.001**
	Female	11,262 (57.7)		62,253 (49.8)		
Marital status	Not married	6,709 (42.1)		34,736(48.9)		<0.001**
	Married	9,211 (57.9)		36,237 (51.1)		
Education level	Tertiary	1,384 (7.3)		8,367 (7.2)		0.035**
	Secondary,	3,918 (20.6)		24,875 (21.4)		
	Primary,	13,719 (72.1)		82,852 (71.4)		

Employment status	Employed,	8,355 (44.8)		29,810 (27.3)	<0.001**
	Unemployed	10,296 (55.2)		79,377 (72.7)	
Household characteristics					
Household size			5.2 (2.7)	5.9 (2.7)	<0.001*
Residence	rural	12,578(64.4)		84,683 (67.8)	<0.001**
	urban	6,956 (35.6)		40,291 (32.2)	
Wealth index	Poorest	3,966 (20.3)		30,912 (24.7)	<0.001**
	Second	4,039 (20.7)		28,273 (22.6)	
	Middle	4,723 (24.1)		25,970 (20.8)	
	Fourth	4,360 (22.3)		23,374 (18.7)	
	Richest	2,446 (12.5)		16,445 (13.2)	
Insurance status	Yes	3,726 (19.1)		20,113 (16.1)	<0.001**
	No	15,808 (80.9)		104,861 (83.9)	

Source: *Authors computation, KHHEUS 2018,* *******Welch Two Sample t-test P-value,* ******** *Two sample proportion t-test P-value*

4.3: Comparison of annual out-of-pocket spending between individuals with and without chronic diseases.

Table 3 presents annual out-of-pocket health payments for persons with and without chronic diseases. The expenditures were significantly higher amongst people with chronic diseases in comparison to those without chronic diseases in most spending categories**.** The median total out-patient expenditure was KES 5,850 (IQR=1,950 – 16,900) for chronically ill people and KES 3,250 (IQR=1,300 – 9,100) for those without chronic illnesses, in-patient expenditure was KES 2,900 (IQR=800 – 10,000) for those with chronic disease and KES. 2,000 (IQR=900 – 6,012) for those without, expenditure on health-related transport was KES 650 (IQR=390 – 1,300) for those with chronic diseases and KES 650 (IQR=585 – 1,550) for those without and expenditure on medicines outside health facilities was KES 2,600 (IQR=1,040 – 9,100) for those with chronic diseases and KES 1,300 (IQR=650 – 3,900) for those without. The highest expenditure amongst individuals with chronic diseases was on dialysis with a median cost of KES 13,000 (IQR=2,600 - 117,000), surgical operation whose median cost was KES 10,000 (IQR=5,000 – 50,000), followed by expenditure on medicines whose median cost was KES 5,850 (IQR=2,600 – 14,300) and medical check-ups whose median cost was KES 5,200 (IQR=1,950 – 13,000). They spent least on inpatient

registration (median= KES 200, IQR=100 - 500), laboratory tests (median= KES 500, IQR=238 -1,500) and bed charges (median= KES 500, IQR=500 - 1,450).

Table 3: Comparison of out-of-pocket spending between individuals with and without chronic illnesses (KES)

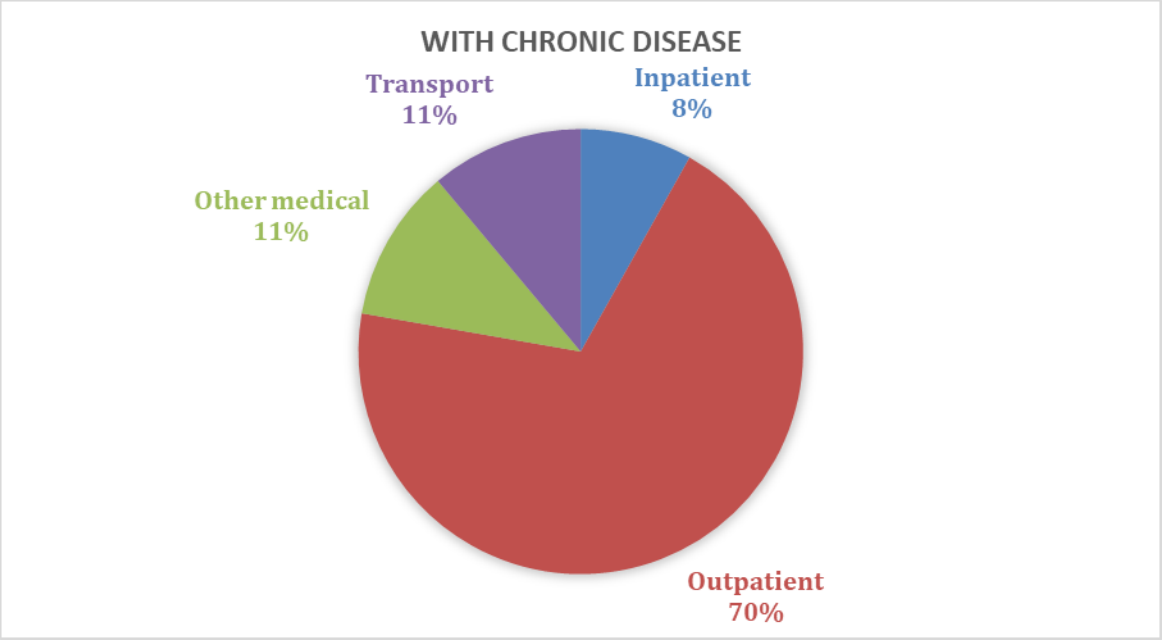
	With chronic disease	Without chronic disease	Wilcoxon rank sum test
	Median (IQR)	Median (IQR)	P-value
Out-patient expenditure in KES			
Registration	650 (390 – 1,300)	650 (260 - 1300)	<0.001
Consultation	3,900 (1,950 – 10,562)	2,600 (1,300 – 6,500)	<0.001
Medicines	5,850 (2,600 – 14,300)	3,900 (1,300 -7,800)	<0.001
Diagnostic tests	3,900 (1,950 – 13,000)	2,600 (1,300 – 6,500)	<0.001
Medical check-up	5,200 (1,950 – 13,000)	3,900 (1,300- 7,800)	0.015
Dialysis	13,000 (2,600 - 117,000)	3,900 (2,080 – 7,800)	0.004
Total out-patient expenses	5,850 (1,950 – 16,900)	3,250 (1,300 – 9,100)	<0.001
In-patient expenditure in KES			
Registration	200 (100 - 500)	200 (100 - 300)	0.018
Consultation	800 (300- 1,000)	500 (200 – 1,000)	<0.001
Medicines	2,000 (700 - 5,000)	1,200 (600 – 3,000)	0.001
Imaging tests	1,200 (600 – 4,500)	1,000 (500 - 2,500)	0.065
Surgical operation	10,000 (5,000 – 50,000)	16,000 (5,000 – 40,000)	0.960
Laboratory test	500 (238 -1,500)	300 (150 – 1,000)	0.003
Bed charges	500 (500 - 1,450)	500 (300 – 1,438)	0.891
Total in-patient expenses	2,900 (800 – 10,000)	2,000 (900 – 6,012)	0.002
Transport	650 (390 – 1,300)	650 (585 – 1,550)	<0.001

Other medical expenses	2,600 (1,040 – 9,100)	1,300 (650 – 3,900)	<0.001

Source: *Author's computation, KHHEUS 2018*

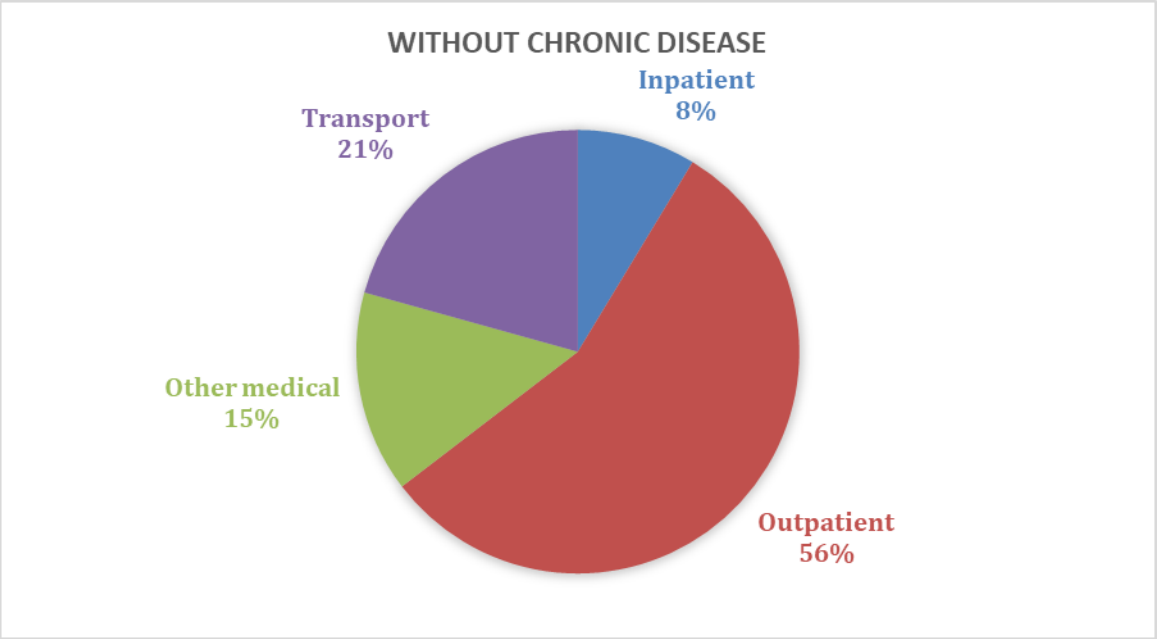
For both individuals with chronic diseases and those without, the proportion of out-patient costs as a share of total out-of-pocket health payments was the highest as compared to in-patient costs. Out-patient costs were twice as high for those with chronic diseases and 1.6 times as high for those without compared to in-patient costs. These percentages ware higher for individuals with chronic diseases (70%) as compared to those without chronic diseases (56%) as illustrated in **Figures 6 and 7.**

Figure 6: Distribution of out-of-pocket costs for individuals with chronic illnesses.



Source: *Author's computation, KHHEUS 2018*

Figure 7: Distribution of out-of-pocket costs for individuals without chronic illnesses.



Source: *Author's computation, KHHEUS 2018*

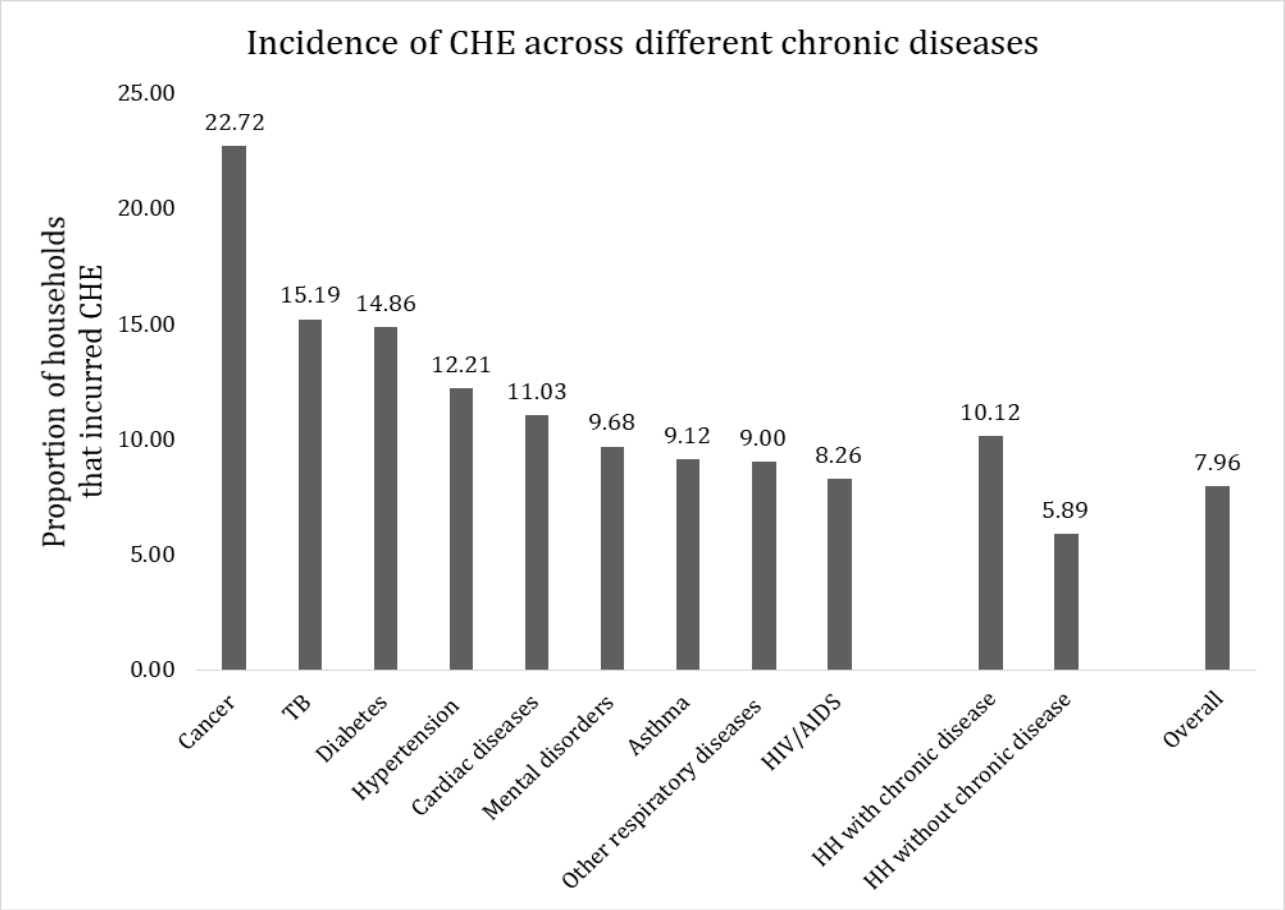
4.5: Incidence and intensity of CHE

The incidence of CHE is described as the proportion of household incurring CHE whereas the intensity of CHE outlines the extent to which households actually incurred CHE. This measures are estimated for the different types of chronic diseases.

4.5.1: The incidence of CHE across different chronic diseases

The overall CHE incidence was estimated to be 7.96%. The incidence was higher amongst households with chronic diseases members (10.12%) as compared to those without (5.89%). The incidence of CHE was highest for households with cancer at 22.72%, followed by TB (15.19%), diabetes (14.86%), hypertension (12.21%), other cardiac diseases (11.03%), mental disorders (9.68%), asthma (9.12%), other respiratory diseases (9%) and HIV/AIDS (8.26%). The incidence of CHE across all the chronic diseases was higher than the overall CHE, however, for mental disorders, asthma, other respiratory diseases and HIV/AIDS the incidence was lower that the incidence for households with chronic disease members as illustrated in **Figure 8**.

Figure 8: Incidence of CHE across different types of chronic diseases



Source: *Author's computation, KHHEUS 2018*

4.5.2: The intensity of CHE across different chronic diseases

Just like the incidence of CHE, the intensity was higher among households with chronically ill members with a mean positive overshoot of 26.81% as compared to those without whose mean positive overshoot was 14.49%. Households with cancer were the highest intensity of CHE with an MPO of 75.77%. Households with asthma had the least intensity with an MPO of 21.42%.

Table 4: Intensity of CHE across different types of chronic diseases

	Overshoot%	Mean positive overshoot (MPO) %
Cancer	6.03	75.77
TB	3.96	49.71
Diabetes	3.01	37.76
Hypertension	2.4	30.19
Cardiac diseases	2.39	29.97
Mental disorders	2.44	30.71
Asthma	1.71	21.42
Other respiratory diseases	1.76	22.14
HIV/AIDS	1.86	23.4
HH with chronic disease	2.13	26.81
HH without chronic disease	1.15	14.49
Overall	1.63	20.53

Source: *Author's computation, KHHEUS 2018*

4.6: Estimation of the effect of chronic diseases on CHE using the logit model

Using the logistic regression, we estimated bivariate and multivariate models. In bivariate analysis the effect of each independent variable on CHE was estimated. Those independent variables found significant at bivariate analysis were then included in the multivariate models.

4.6.1: Bivariate analysis

All socio-demographic characteristics except household size, were found to have a significant effect on CHE. The likelihood of incurring CHE was increased by an increase in age of household head, and having a female as the head of a household. Households with married household heads, were in urban areas, had employed household heads and had health insurance were less likely to incur CHE. A higher education level for the household head and higher socioeconomic status also decreased the likelihood of incurring CHE.

Households with chronic disease members were more likely to incur CHE. The effect of the individual chronic diseases on CHE was significant for hypertension, diabetes, cancer, TB and other cardiac diseases. Asthma, other respiratory diseases. HIV/AIDs and mental disorders did not have a significant effect on the likelihood of incurring CHE as presented in **Table 5.**

Table 5: Bivariate analysis of factors affecting CHE: Unadjusted logistic models

	Unadjusted OR (95% CI)	Z-value	P-*value*
Socio-demographic characteristics			
Age	1.037 (1.032 - 1.042)	14.81	<0.001
Gender *(ref= male)*	1.274 (1.084 -1.500)	2.952	<0.001
Marital status *(ref = not married)*	0.805 (0.680- 0.953)	-2.518	0.012
Residence *(ref=rural)*	0.658 (0.554- 0.782)	-4.759	<0.001
Household size	0.989 (0.956- 1.020)	-0.734	0.463
Education level (ref=primary)			
Secondary	0.456 (0.369- 0.564)	-7.249	<0.001
Tertiary	0.256 (0.174- 0.377)	-6.910	<0.001
Employment status *(ref= not employed)*	0.584 (0.496- 0.688)	-6.437	<0.001
Wealth index *(ref=poorest)*			
Second	0.714 (0.574- 0.900)	-3.006	0.003
Middle	0.634 (0.509- 0.789)	-4.088	<0.001
Fourth	0.405 (0.317- 0.517)	-7.270	<0.001
Richest	0.19 (0.134- 0.269)	-9.364	<0.001
Insurance *(ref=not insured)*	0.792 (0.654-0.959)	-2.395	0.017
Chronic diseases			
Hypertension	1.821 (1.518 - 2.184)	6.460	<0.001
Diabetes	2.127 (1.618 -2.800)	5.399	<0.001
Cardiac diseases	1.453 (0.986 -2.141)	1.889	0.059
Asthma	1.178 (0.900- 1.543)	1.191	0.234
Respiratory diseases	1.166 (0.926- 1.468)	1.308	0.191
TB	2.130 (1.481- 3.065)	4.075	<0.001
Mental disorders	1.249 (0.860- 1.814)	1.167	0.243
cancer	3.491 (2.220- 5.492)	5.410	<0.001
HIV	1.042 (0.697 - 1.557)	0.201	0.841
Chronic disease	1.800 (1.531- 2.114)	7.136	<0.001

Source: *Author's computation, KHHEUS 2018*

4.6.2: Multivariate analysis

We estimated five models for the chronic diseases that were found to have a significant effect on CHE at bivariate level i.e. hypertension, diabetes, cancer, TB and other cardiac diseases and one model for all chronic diseases in general. Eight covariates i.e. age, gender, marital status, education level and employment status of household head, socio-economic status, residence, and insurance status of the households were adjusted for in the multivariate models as outlined in **Table 6**.

All chronic diseases significantly increased the likelihood of a household incurring CHE. Cancer increased the likelihood of a household incurring CHE by 7.6%, diabetes 3.5%,

TB 3.4%, hypertension 1.9%, and other cardiac diseases by 0.9%. Overall, having a chronic disease member in a household increased the likelihood of household incurring CHE by 2.2%. An increase in the age of the household head also significantly increased the likelihood of a household incurring CHE all the models estimated. A higher wealth index, an increase in education and having employment for the household head significantly decreased the likelihood of a household incurring CHE. The gender and marital status of the household head, and the place of residence of the household did not have a significant effect on CHE. Presence of health insurance within the household increased the likelihood of a household incurring CHE in cancer, TB, other cardiac diseases and chronic diseases models, however, it did not have any significant effect for hypertension and diabetes models.

Table 6: Estimation for likelihood of incurring CHE*: Adjusted logistic models*

		adjusted OR (95% CI)	Marginal effects	Z-value	*p-value*	Goodness of fit statistics
Model 1: Hypertension	**Hypertension**	**1.309 (1.071-1.601)**	**0.019**	**2.631**	**0.009**	LogLik -2115.8 LR Chisq 393.32 pr(<Chisq) 0.000 R2 0.107
	Age	1.029 (1.023 - 1.034)	0.002	10.213	<0.001	
	Gender *(ref= male)*	1.034 (0.828 -1.291)	0.002	0.294	0.769	
	Education level (ref=primary)	0.671 (0.565 - 0.797)	-0.027	-4.548	<0.001	
	Employment status *(ref= not employed)*	0.746 (0.623 -0.892)	-0.020	-3.207	0.001	
	Marital status *(ref = not married)*	1.154 (0.913 -1.461)	0.010	1.201	0.230	
	Residence *(ref=rural)*	1.212 (0.995 - 1.476)	0.013	1.910	0.561	
	Insurance *(ref=not insured)*	1.235 (0.990 - 1.541)	0.015	1.874	0.061	
	Wealth index *(ref=poorest)*	0.775 (0.716 - 0.839)	-0.018	-6.300	<0.001	
Model 2: Diabetes	**Diabetes**	**1.67 (1.241 - 2.250)**	**0.035**	**3.385**	**<0.001**	LogLik -2113.9 LR Chisq 397.1 pr(<Chisq) 0.000 R2 0.108
	Age	1.030 (1.024 -1.035)	0.002	10.737	<0.001	
	Gender *(ref= male)*	1.039 (0.832 -1.298)	0.003	0.339	0.734	
	Education level (ref=primary)	0.670 (0.564 -0.796)	-0.028	-4.562	<0.001	
	Employment status *(ref= not employed)*	0.750 (0.627 - 0.897)	-0.020	-3.153	0.002	
	Marital status *(ref = not married)*	1.142 (0.903 - 1.444)	0.009	1.106	0.269	
	Residence *(ref=rural)*	1.204 (0.989 - 1.467)	0.013	1.848	0.065	
	Insurance *(ref=not insured)*	1.236 (0.990 - 1.541)	0.015	1.875	0.061	
	Wealth index *(ref=poorest)*	0.775 (0.715 - 0.838)	-0.018	-6.318	<0.001	
Model 3: Other cardiac diseases	**Other cardiac diseases**	**1.140 (0764- 1.701)**	**0.009**	**0.642**	**0.521**	**LogLik -2118.9 LR Chisq 386.98 pr(<Chisq) 0.000 R2 0.106**
	Age	1.031 (1.025 -1.036)	0.002	11.355	<0.001	
	Gender *(ref= male)*	1.044 (0.836 - 1.304)	0.003	0.382	0.702	
	Education level (ref=primary)	0.670 (0.564 - 0.796)	-0.028	-4.564	<0.001	
	Employment status *(ref= not employed)*	0.750 (0.627 - 0.898)	-0.020	-3.144	0.002	
	Marital status *(ref = not married)*	1.158 (0.916 - 1.465)	0.010	1.228	0.219	
	Residence *(ref=rural)*	1.210 (0.993 -1.473)	0.013	1.892	0.058	
	Insurance *(ref=not insured)*	1.261 (1.012 - 1.572)	0.016	2.064	0.039	
	Wealth index *(ref=poorest)*	0.783 (0.723 -0.847)	-0.017	-6.075	<0.000	

Model 4: TB	**TB**	**1.628 (1.100- 2.407)**	**0.034**	**2.439**	**0.015**	**LogLik -2116.4 LR Chisq 391.97 pr(<Chisq) 0.000 R2 0.107**
	Age	1.031 (1.026 -1.036)	0.002	11.398	<0.001	
	Gender *(ref= male)*	1.047 (0.838 - 1.306)	0.003	0.402	0.688	
	Education level (ref=primary)	0.673 (0.566 - 0.799)	-0.027	-4.520	<0.001	
	Employment status *(ref= not employed)*	0.751 (0.628 - 0.898)	-0.020	-3.137	0.002	
	Marital status *(ref = not married)*	1.155 (0.914 - 1.460)	0.010	1.205	0.228	
	Residence *(ref=rural)*	1.207 (0.991 - 1.470)	0.013	1.867	0.062	
	Insurance *(ref=not insured)*	1.275 (1.023 - 1.591)	0.017	2.160	0.031	
	Wealth index *(ref=poorest)*	0.784 (0.724 - 0.848)	-0.017	-6.030	<0.001	
Model 5: Cancer	**Cancer**	**3.020 (1.883 - 4.843)**	**0.076**	**4.587**	**<0.001**	LogLik -2110.3 LR Chisq 404.16 pr(<Chisq) 0.000 R2 0.109
	Age	1.030 (1.025 - 1.036)	0.002	11.174	<0.001	
	Gender *(ref= male)*	1.054 (0.844 - 1.317)	0.004	0.463	0.643	
	Education level (ref=primary)	0.667 (0.562 - 0.793)	-0.028	-4.603	<0.001	
	Employment status *(ref= not employed)*	0.751 (0.628 - 0.898)	-0.02	-3.133	0.002	
	Marital status *(ref = not married)*	1.148 (0.908 - 1.452)	0.009	1.151	0.250	
	Residence *(ref=rural)*	1.213 (0.996 - 1.478)	0.013	1.917	0.055	
	Insurance *(ref=not insured)*	1.259 (1.010 -1.570)	0.015	2.045	0.041	
	Wealth index *(ref=poorest)*	0.781 (0.721 -0.845)	-0.017	-6.113	<0.001	
Model 6: Chronic diseases	**Chronic diseases**	**1.38 (1.162- 1.642)**	**0.022**	**3.661**	**<0.001**	LogLik -2112.3 LR Chisq 400.17 pr(<Chisq) 0.000 R2 0.109
	Age	1.029 (1.023 - 1.034)	0.002	10.256	<0.001	
	Gender *(ref= male)*	1.045 (0.836 - 1.306)	0.003	0.386	0.700	
	Education level (ref=primary)	0.673 (0.566 - 0.799)	-0.027	-4.524	<0.001	
	Employment status *(ref= not employed)*	0.741 (0.619 - 0.886)	-0.021	-3.282	0.001	
	Marital status *(ref = not married)*	1.154 (0.911 - 1.462)	0.010	1.191	0.233	
	Residence *(ref=rural)*	1.200 (0.985 - 1.461)	0.013	1.813	0.070	
	Insurance *(ref=not insured)*	1.249 (1.002 -1.558)	0.015	1.978	0.048	
	Wealth index *(ref=poorest)*	0.780 (0.721-0.845)	-0.017	-6.151	<0.001	

Source: *Author's computation, KHHEUS 2018*

CHAPTER 5: DISCUSSION, CONCLUSION AND POLICY RECOMMENDATIONS

5.1: Introduction

In this chapter, we discuss the study findings in chapter four relating them to findings from similar studies and provide conclusions and recommendations.

5.2: Discussion of results

This study used the 2018 KHHEUS to estimate the effect of chronic diseases on CHE. Findings from the study show that chronically ill people incur higher out-of-pocket health payments as compared to those without chronic illnesses. Similar to findings from Barasa et al (2017) and Oyando et al (2019), individuals spent most on out-patient services as compared to inpatient services. The share of out-patient expenses to overall health expenses were higher for people with chronic illnesses. The most expensive treatment was dialysis, a procedure associated with kidney failure. Subramanian et al (2017) also found dialysis to be one of the most expensive treatments in Kenyan hospitals.

The overall CHE incidence was 7.96%, this was higher in households with chronically ill members at 10.12% and lower (5.89%) in households without chronically ill members. These findings are consistent with those of Salari et al (2019) and Barasa et al (2018) that showed that chronic illnesses increased the risk of households incurring CHE. Similar to findings from Choi et al (2015), the incidences of CHE varied across the different chronic illnesses and was highest in households with cancer at 22.72% and lowest in households with HIV at 8.26%. The differences in incidences and intensity can be attributed to differences in severity of diseases and associated treatment costs for the different types of chronic diseases (Choi et al., 2017). For instance the costs for HIV/AIDS are highly subsidized with most people being able to access their basic medication for free as opposed to cancer where most costs have to be borne directly by households. Cancer, TB, diabetes, hypertension and other cardiac diseases significantly increased the risk of households incurring CHE while HIV, asthma, other respiratory diseases and mental disorders did not have a significant effect on CHE. In a similar study conducted by Choi et al (2015) in Korea they found that households with a member who suffered from cerebrovascular disease, diabetes, and chronic kidney disease to be at a significantly higher risk of incurring CHE. Costs for chronic kidney

disease have been found to be high, however, we were not able to estimate its effect on CHE in this study as data were not available for that (Choi et al., 2015; Subramanian et al., 2017). In another study conducted in Kenya, the incidence of CHE for individuals seeking hypertension care in a public hospital in Machakos was estimated to be 43.3%, in our study the incidence that was lower with 12.21% (Oyando et al., 2019). The variability in this findings could be because the KHHEUS 2018 was population based survey, while the former was a hospital-based study hence the higher health expenses.

Despite health insurance coverage being higher among individuals with chronic diseases (Kazungu & Barasa, 2017), we found that presence of health insurance within a household did not protect households with chronic diseases form incurring CHE. This findings are similar to those from the previous wave of a similar survey, KHHEUS 2013, where Barasa et al (2017) found that household with health insurance were actually more likely to incur CHE than those without. In 2015, NHIF enhanced it's benefit package to include outpatient services and some chronic diseases, surgical care, chemotherapy, renal dialysis, kidney transplant (Barasa et al., 2018). However, even after this reform, out-patient costs and procedures such as renal dialysis and surgical care still remain the most costly for the population. Out-patient costs were still found to be a major cost driver for out-of-pocket health payments. This could be attributed to a tendency of health insurance providers to cover more for in-patient than for out-patient services. This implies that health insurance as it is currently constituted in Kenya does not offer financial risk protection to households as it is expected to.

5.3: Limitations

These study findings should be interpreted with these limitations in mind. First, chronic illnesses were self-reported in the survey and therefore there is a potential of them being underreported. Second, there are chances of recall bias especially where respondents were required to recall details on their households' expenditures for longer periods like one year. Lastly, the comparability of this findings may be limited by differences methodological choices in the estimation of CHE.

5.4: Conclusion

In conclusion, this study assessed the effect of chronic illnesses on CHE. We found that households with chronically ill members were exposed to the negative effects of out-of-pocket health spending such catastrophic expenditure which limit spending on other

basic necessities. There is a need for greater financial protection of households with chronically ill members to not only cushion them from out-of-pocket but also to enable them access the much needed healthcare without forgoing other needs.

.5.5: Recommendations

From our findings, we recommend that the government should institute policies that cushion households with chronically ill members from high out-of-pocket payments for healthcare by:

1. Selectively enhancing the NHIF cover for chronic illnesses to be able to reduce out-of-pocket health expenditure especially for out-patient services.
2. Subsidizing treatment costs associated with chronic illnesses such as dialysis, chemotherapy and surgery.
3. Both in- and out-patient insurance coverage should be a comprehensive product package rather than separate products to adequately shield households from high out-patient costs.

5.6: Areas for further research

This study has provided novel insights on the effect of chronic diseases on CHE for Kenyan households' constraint to the limitations listed above. Areas of further research to help broaden this knowledge include:

- Measuring of indirect costs associated with chronic illnesses such as productivity loss from time off work due to chronic illnesses.
- Use of alternative measures of financial hardship to capture households that forgo or discontinue care due to lack of resources to spend on healthcare.

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