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AVAILABILITY AND AFFORDABILITY OF ESSENTIAL MEDICINES FOR NON-COMMUNICABLE DISEASES ACROSS SIX KENYAN COUNTIES

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Submitted in partial fulfilment of the requirements for the award of the degree of Master of Business Administration in Healthcare Management

STRATHMORE UNIVERSITY BUSINESS SCHOOL

November 2021

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the thesis/dissertation itself.

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ABSTRACT

The burden of Non-Communicable diseases (NCDs) is increasing in Kenya and other low-and middle-income countries. Evidence suggests that poorer groups are more affected as they have to incur lifelong costs of treatment associated with NCDs. Typically, out of pocket payment for NCD medicines consumes the largest share of treatment costs for NCDs, exposing households to the risk of catastrophic health spending. This study sought to assess the availability and affordability of three medicines used for management of diabetes, dyslipidemias (problems of poor cholesterol control) and hypertension in pregnancy at public and private hospitals in Kenya, and assess the risk of incurring catastrophic health expenditure due to out of pocket purchase of the medicines. This study used a quantitative approach, analyzing data using the WHO/HAI methodology to determine availability and affordability of Atovarstatin 20mg, Metformin 500mg, Methyldopa 250mg. The study found out that atorvastatin's availability was 32% and 70% in public and private facilities respectively; Metformin (94% and 84% in public and private respectively) and Methyldopa 75 and 82% for public and private facilities respectively. The lowest paid government worker would require a day's wages to purchase a monthly dose of Atorvastatin in public facilities, and three days' wages to purchase at a private facility. However, price differences were minimal for the other two medicines. The medicine price ratio (MPR) for Atorvastatin was nearly four times that of the international reference price list, the ratio was higher in private facilities as compared to public facilities (4.75 vs 1.19). The MPR for Methyldopa was 1.18 times the international reference price for both public and private facilities. The MPR for Metformin was three times the international reference price with the ratio being higher in private facilities. Finally, the study found that the risk of incurring catastrophic health expenditure due to out of pocket purchase of medicines for households was 1.5%, 6.8%, 15.1% and 28.8% for Metformin, Atorvastatin, a combination of two medicines (Atovarstatin and Metformin) and Methyldopa respectively. The study concluded that NCD medicines had low availability, were unaffordable and had a considerable risk of catastrophic health expenditure, especially among the poor.

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DEFINITION OF KEY TERMS AND CONCEPTS

Catastrophic health expenditure - Out of pocket payments for healthcare that are more than 40% of non-subsistence expenditure (i.e. expenditures net of food)

Out of pocket costs - Direct payments made by individuals/households to healthcare providers for services received.

ABBREVIATIONS

CHE	Catastrophic Health Expenditure
GOK	Government of Kenya
HAI	Health action International
KHHEUS	Kenya Household Health Expenditure and Utilization Survey
LMICs	Low- and middle-income countries
LPGW	Lowest paid government worker
NHIF	National Hospital Insurance Fund
NCDs	Non-communicable diseases
OOP	Out of pocket
THE	Total health expenditure
WHO	World Health Organization

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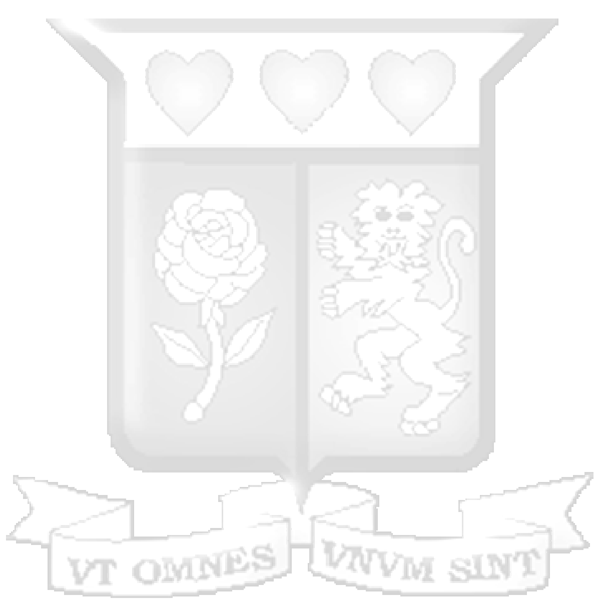
DEDICATION

This research is dedicated to my daughters, Nuseyba and Asmaa, and to my wife for her constant encouragement and perseverance, to my parents for their support and prayers.



CHAPTER ONE:

INTRODUCTION

1.1 Background

Non-communicable diseases (NCDs) typically result from a combination of genetic, physiological, environmental and behavioural factors, and often require lifelong care (WHO factsheet, 2018). They are the leading cause of death globally and considered one of the greatest health risks of the 21st century (WHO, 2018). NCDs, which include heart disease, stroke, cancer, diabetes and chronic lung disease, collectively cause nearly 70% of all deaths worldwide with three quarters of the NCD deaths occurring in low- and middle-income countries (LMICs). Statistics indicate that 82% of the deaths occur prematurely (before age 70)(WHO, 2018).

The rise of NCDs has been driven by four major risk factors: tobacco use, lack of physical activity, harmful use of alcohol and unhealthy eating habits (WHO, 2016). The epidemic of NCDs poses devastating health consequences for individuals, families and communities, and threatens to overwhelm health systems. The socioeconomic costs associated with NCDs make the prevention and control of these diseases a major development imperative for the 21st century (WHO,2016). NCDs threaten progress towards the 2030 Agenda for Sustainable Development, which include the target of reducing premature deaths from NCDs by one-third by 2030.

Poverty is closely linked with NCDs. The rapid rise in NCDs is predicted to impede poverty reduction initiatives in low-income countries, particularly by increasing household costs associated with health care (WHO factsheet, 2018). Vulnerable and socially disadvantaged people get sicker and die sooner than people of higher social positions, especially because they are at greater risk of being exposed to harmful products, such as tobacco, or unhealthy dietary practices, and have limited access to health services (WHO factsheet, 2018). NCDs have a significant impact on development in LMICs due to its adverse effects on productivity (WHO,2019).

Although the health landscape in Kenya continues to be dominated by communicable diseases, the increase in the relative contribution of NCDs to overall health loss is cause for concern (Achoki et

al., 2018). Overall NCDs accounted for 30% of the disease burden in Disability Adjusted Life Years (DALYs) in Kenya with more than half (53%) occurring before the age of 40 (MOH,2018) In terms of mortality, NCDs were responsible for 35% of all deaths in Kenya, and 22% of these occurred before the age of 40 (MOH, 2018). Several studies show that the prevalence of NCDs in the rural population and the urban poor is increasing (Oti, van de Vijver, Agyemang, & Kyobutungi, 2013; van de Vijver, Oti, Agyemang, Gomez, & Kyobutungi, 2013) , the increase of chronic conditions in these majority poor populations, exposes them to double burden of disease and increased risk of further impoverishment.

The increased incidences of NCDs such as hypertension, heart disease, diabetes and cancer have been identified as among the challenges facing Kenya in the Medium-Term Plan III (2018-2022). NCDs represent a significant (and increasing) burden of ill health and death in the country, the most important being cardiovascular disease, cancers, respiratory and digestive diseases, diabetes and psychiatric conditions. Together they represent an estimated 50%-70% of all hospital admissions and up to half of all inpatient mortality (Kenya Health Sector Strategic Investment Plan 2013 to 2017).

In low-resource settings, health-care costs for NCDs quickly drain household resources. The exorbitant costs of NCDs, including often lengthy and expensive treatment and loss of breadwinners, force millions of people into poverty annually and stifle development(WHO factsheet, 2018). It is notable that health expenditure on NCDs has significant economic losses and poverty impact on households in Kenya. NCDs are associated with a 33.16% reduction in household income (Mwai & Muriithi, 2017). Several studies (McRae, Yen, Jeon, Herath, & Essue, 2013; Pati et al., 2014; Schoenberg, Kim, Edwards, & Fleming, 2007) indicate that the financial burden and risk of catastrophic health expenditure is compounded in patients with comorbidities (more than one chronic conditions).

The burden of diabetes is increasing in the developing countries, with about 80% of the estimated 1.5 Million global deaths due to diabetes in 2012 occurring in LMICs (WHO, 2014). In Kenya 872,000 people had diabetes in 2015 as compared to 283,000 in 1990 (Kalra, 2016). Diabetes imposes significant financial burden on individuals either directly due to treatment of the condition and its comorbidities, or indirectly through reduced productivity and disability. It is estimated that

the total cost of diabetes in sub-Saharan Africa in 2015 was about 1.2% of the cumulated GDP of the entire region corresponding to USD19.45 billion and is projected to increase to USD 35.33 billion USD (Atun FRCP et al., 2017). Diabetic individuals have greater out-of- pocket medical expenses and a higher risk of catastrophic medical spending compared with otherwise similar individuals without diabetes (Smith-Spangler, Bhattacharya, & Goldhaber-Fiebert, 2012). Despite higher spending, relatively few diabetic individuals in these settings possess medications to manage their diabetes and prevent serious secondary complications (Smith-Spangler et al., 2012).

The prevalence of dyslipidemia is high in the general adult population in Africa, and much higher in patients with coexisting cardiovascular risk factors such as hypertension, diabetes, or HIV (Noubiap et al., 2018) .Several studies done locally indicate a high prevalence rate of between 83% and 86% of dyslipidemias in diabetic patients (Chamba, Shao, Sonda, & Lyarru, 2017; Kiplagat, Lydia, Jemimah, & Drusilla, 2017). Numerous studies have shown the high burden on morbidity, mortality and medical costs due to dyslipidemias (Smith, 2007).

Access to medicines for NCDs in households in low and middle income countries could be considered to be inadequate. Socio economic conditions and availability of health insurance being the most important determinants of having access to medicines(Vialle-Valentin, Serumaga, Wagner, & Ross-Degnan, 2015) . The out of pocket purchase of medicines for NCDs places a burden on uninsured and resource constrained households and could predispose the households to impoverishment (Cameron et al., 2010)

1.2 Problem statement

Less than 20% of the Kenyan population is covered by any form of health insurance(*2013 KENYA HOUSEHOLD HEALTH EXPENDITURE AND UTILISATION SURVEY*.), leaving the majority at risk of impoverishment due to catastrophic spending on healthcare. Out of pocket (OOP) spending on healthcare remains high, with the National Health Accounts indicating that 26% of total health expenditure (THE) comes directly from clients at the point of use (National Health Accounts FY 2015/16). Incidences of households reporting catastrophic health expenditures due to OOP stood at 6.2% in 2013 (KHHEUS, 2013), with the largest share of spending going towards medicines.

Past studies have similarly indicated that the bulk of healthcare spending goes towards medicine and other healthcare commodities (Niëns & Brouwer, 2013).

Evidence indicates that cost is one of the factors that contribute to non-adherence to treatment among patients, contributing to negative health outcomes. On the other hand adherence to medications for chronic diseases could lead to less hospitalization and significant cost savings (Jha, Aubert, Yao, Teagarden, & Epstein, 2012). Given the long duration treatment required for patients with chronic conditions, the consequent risk of catastrophic spending, and the low insurance coverage, there is value in doing research around affordability of medicines for chronic conditions. That is the purpose of the study.

There are few other studies in Kenya that tackle availability and affordability of medicines for chronic condition. A recent study done in this area focused on Equity of access to non-communicable disease medicines in Kenya (Rockers, Laing, & Wirtz, 2018). The focus of that study was on describing socio-demographic and geographic characteristics of household individuals diagnosed with diabetes and describing medicines available at household level.

The aim of this study was to assess the availability and affordability of essential medicines for NCDs and the financial risk associated with out of pocket purchase of the medicines.

1.3 Research objectives

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1.3.1 General objective

To examine the availability and affordability of essential medicines used for non-communicable diseases and assess the likelihood of catastrophic health spending among communities due to the out of pocket purchase of the medicines.

1.3.2 Specific objectives

i. To determine the availability of Metformin 500mg, Atovarstatin 20mg and Methyldopa 250mg in both public and private facilities in six counties in Kenya.
ii. To determine the affordability of the above medicines used for management of diabetes, dyslipidemias and hypertension in pregnancy respectively.

iii. To determine the likelihood of catastrophic out of pocket expenditures in purchase of the above medicines

1.3.3 Research questions

i. What is the availability of Metformin 500mg, Atovarstatin 20mg and Methyldopa 250mg in both public and private facilities in six counties in Kenya?
ii. How affordable are Metformin 500mg, Atovarstatin 20mg and Methyldopa 250mg used for management of diabetes, dyslipidemias and hypertension in pregnancy respectively?
iii. What is the likelihood of catastrophic out of pocket expenditures in purchase of the above medicines?

1.5 Scope of the study

The study sought to determine the availability and affordability of three selected medicines used for treatment of chronic conditions in Kenya. The medicines included were Metformin 500mg used for the management of diabetes, and Atovarstatin 20mg used for the management of cardiovascular conditions and Methyldopa 250mg used for management of hypertension in pregnancy. These medications were all part of the Kenya Essential Medicines List (KEML) and were recommended for use in the management of the respective conditions. The study also sought to determine whether the OOP purchase of the medicines exposed clients to the risk of catastrophic health spending.

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The study was conducted at six Kenyan counties, namely, Nairobi, Nakuru, Kisumu, Kajiado, Vihiga and Kwale. The six were selected for various reasons, including availability of reliable data, population size, geographical location, and effort to get a rural-urban mix.

1.6 Significance of the study

Access to quality affordable medications is a human right. In Kenya there exists no mechanisms to review and regulate medicine pricing, this leaves the majority poor who have no insurance cover at the mercy of market forces when it comes to purchase of medicines. There is scarcity of information with regards to pricing and affordability of medicines for chronic conditions. The

findings of study will be useful for policy makers in the formulation of policies aimed at increasing access to essential medicines for NCDs. Further, findings will guide insurers in the development of packages for health insurance schemes to increase access to these lifesaving medications. It will also add to the existing body of knowledge on access to medicines.

CHAPTER TWO:

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of empirical literature on access to medicines, price and affordability of medicines for NCDs It also illustrates the link between out of pocket expenditure on medicines for NCDs and risk of catastrophic expenditure due to the same.

2.2 Penchansky and Thomas theory on access

According to Penchansky and Thomas access can be defined as the degree of fit between the consumer and the service. They posited that access can be characterised by five dimensions namely affordability, availability, accessibility, acceptability, accommodation(adequacy). Affordability is defined by how the provider's charges relate to the client's ability or willingness to pay. Availability measures extent to which the provider has the requisite resources to meet the client's needs, Accessibility refers to geographical accessibility i.e. how easily the client can physically reach the provider, Acceptability captures the extent to which client is comfortable with the characteristics of provider and service, Accommodation reflects extent to which provider's operation is organised to meet the preferences and constraints of the client. These dimensions are independent yet interconnected thus each dimension is important in improving access to care. Penchansky and Thomas maintained that access is central to health services and that these dimensions cannot be separated from it(Penchansky & Thomas, 1981)

This study will focus on two dimensions that affect access to medicines, namely availability and affordability.

2.3 Access to medicines

Access to quality, affordable essential medicines is vital for the fulfilment of the right to the highest attainable standards of healthcare, which is enshrined in the Kenyan Constitution. Marks states that "As a component of the right to health, the right to essential medicines depends not only on the production, distribution, and pricing of medicines, but also on the incentives for research and

development of drugs needed to treat diseases in developing countries, functioning health systems so that drugs are part of a rational system of quality treatment and care, as well as on infrastructure" (Marks, 2009, p. 1).

Paul Hunt and Rajat Khosla argue that access to medicines is an indispensable part of the right to health (Hunt & Khosla, 2008).This view is also shared by the UN committee on economic, social and cultural rights. Hogerzeil and Mirza argue that a rights based approached is important in addressing inequalities in access to medicines. They argue that relying on supply of medicines from private sector and financing from out of pocket purchase exclude the poor and vulnerable from access to essential medicines(Hogerzeil & Mirza, 2011).

According to (PÉCOUL, 2001) prices of medicines is one of the most fundamental barriers to access to medicines, with many factors influencing the price e.g. research and development costs, production costs, taxes, tariffs and markups, patents and generic competition. He argues that essential medicines should not be considered as a commodity to be left to market forces, as this negatively affects the health needs of the poorest populations. He argues that access to adequate treatment and healthcare is a human rights issue and that governments have an obligation in ensuring that vulnerable populations have access to essential lifesaving medicines.

Bigdeli et al argued that barriers to access to medicines (ATM) are complex and occur at multiple levels of the health system, thus require a wider health systems perspective (M. Bigdeli et al., 2013).

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A WHO working group report on access to medicines identified six barriers that are important in access to medicines. The barriers were grouped into two: barriers that prevent access to existing medicines and barriers to development of affordable and available new medicines and vaccines. These are (1) Lack of national commitment and prioritization to improving access to medicines (2) Inadequate human resources for health (3) Lack of adequate financing/ fulfilment of existing funding pledges by the international community (4) Lack of coordination of international aid (5) International trade agreements and patent laws may block access to affordable new medicines (6) The current incentive structure is inadequate to promote research and development of medicines and vaccines to address priority health problems of developing countries especially neglected

tropical diseases, for instance, Chagas, trypanosomiasis among others (Leach, Paluzzi, Munderi, & UN Millennium Project. Working Group on Access to Essential Medicines., 2005).

Access to medicines is a key pillar in achieving universal health coverage as envisioned by the Kenyan government as part of the big four agenda. Medicines are indispensable for delivering key aspects of UHC – including coverage, service provision, and risk protection – because they are a requirement for high-quality care, contribute significantly to household health expenditures, and are one of the major cause of health system inefficiency(Maryam Bigdeli, David H. Peters, 2014) "Essential medicines are considered an integral part of UHC (Universal Health Coverage); they are an indispensable element for delivery of good quality health services and careful consideration should be given to ensuring reliable access to quality assured essential medicines when designing benefit packages" (Maryam Bigdeli, Laing, Tomson, & Babar, 2015, p. 1)

2.4 Availability of medicines

The WHO NCD global action plan set ambitious targets of ensuring availability and affordability of essential NCD medicines in both public and private facilities, as part of their strategy to reduce the burden of NCDs by 25% by 2025 (WHO, 2013). The target for availability of medicines for chronic diseases is 80% in both public and private sectors. Evidence indicates that there are significant differences in the availability of essential medicines for chronic and acute conditions, with results indicating poor availability of medicines for chronic conditions especially in the public facilities (Cameron et al., 2011).

A recent survey in Kenya by Novartis Access Initiative indicated the poor availability of medicines in public facilities led to patients seeking the medications at private facilities/pharmacies at considerably higher prices (Onyango et al., 2018). The same study also indicated that patients have to spend time and resources trying to locate affordable medicines, with some resorting to asking relatives in Nairobi and other cities/towns to purchase and send medicines (Onyango et al., 2018).

The same study also showed that when medicines are not available patients go without taking medicines or take partial doses, this can have negative implications on their health.

A study done in the Comoros Islands showed that the median availability of medicines was low across all product types, the median price ratios of branded, most sold generics and lowest priced generics were found to be more than 4 times higher than the international reference price ranges. Medicine prices for the lowest priced generic medicines were found to be 30% higher in private sector as compared to the private sector (Kassim, Alolga, & Assanhou, 2015). The same study also showed different levels of access across the different islands.

A recent study in Uganda, sought to determine the availability and affordability of 37 different medicines used for management of diabetes (DM) and cardiovascular diseases (CVD), study demonstrated that the majority of medicines and diagnostic tests essential in the management of DM and CVD are generally unavailable and unaffordable in Uganda (Kibirige, Atuhe, et al., 2017) A second study in Uganda, to determine access and affordability of medicines for asthma and chronic obstructive pulmonary diseases also demonstrated that a majority of the 17 medicines included in the survey were largely unavailable and unaffordable (Kibirige, Kampiire, et al., 2017) A third study done in Uganda that utilized the WHO-developed Service Availability and Readiness Assessment (SARA) tool to determine availability of essential medicines for NCDs ,indicated large disparities between different health facilities with regards to medicine availability (Armstrong-Hough et al., 2018).

A study was done to establish a baseline (for the 80% target for availability set by WHO) for medicines used to manage NCDs. It entailed secondary analysis of data from 30 LMICs, conducted from 2008–2015 using the World Health Organization (WHO)/Health Action International (HAI) medicine availability and price survey methodology. In low income countries, only 15.2% and 18.9% of lowest-priced generics met WHO's target in the public and private sectors, respectively, and 2.6% and 5.2% of originator brands among the 49 different medicines sampled in the survey. This indicates that very few of the medicines used to treat NCDs achieved the 80% availability target set by the WHO (Ewen, Zweekhorst, Regeer, & Laing, 2017).

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2.5 Affordability of medicines

A study conducted in the UK and Italy to determine the influence of medicine prices and affordability on patient cost reducing behaviour revealed that patients use different strategies to minimize cost burden of prescription charges, the study also supports previous research that showed that patients may be foregoing essential medicines due to burden of prescription charges.

A study that assessed the availability and affordability of 32 essential medicines for chronic diseases across 6 LMICs revealed that Median price ratios varied substantially, from 0.09 for losartan in Sri Lanka to 30.44 for aspirin in Brazil.

"In the private sector in Malawi and Sri Lanka, the cost of innovator products (the pharmaceutical product first given marketing authorization) was three times more than generic medicines. One month of combination treatment for coronary heart disease cost 18.4 days' wages in Malawi, 6.1 days' wages in Nepal, 5.4 in Pakistan and 5.1 in Brazil; in Bangladesh the cost was 1.6 days' wages and in Sri Lanka it was 1.5. The cost of one month of combination treatment for asthma ranged from 1.3 days' wages in Bangladesh to 9.2 days' wages in Malawi. The cost of a one-month course of intermediate-acting insulin ranged from 2.8 days' wages in Brazil to 19.6 in Malawi" (Fukino et al., 2007 , p. 1).

"A study done in Malaysia showed that the cost of a one-month treatment with IB amlodipine (5 mg daily) required about 4.9 days' wages. To buy simvastatin (20 mg daily), the patient had to pay 7.5 days' wages in private pharmacies and 6 days' in dispensing doctors' clinics. Purchasing generic simvastatin cost about 2.3 days' wages in both sectors" (Ud Din Babar et al., 2007 ,p. 469). "A study done in Swaziland, assessing the availability and affordability of 16 medicines for chronic conditions revealed that private sector originator brand (OB) medicines were priced 32.4 times higher than International Reference Price, whilst the Lowest Priced Generic alternatives (LPGs) were 7.32 times higher. OBs cost 473% more than LPGs. The total cumulative mark-ups for individual medicines range from 190.99% – 440.27%. The largest contributor to add-on cost was the retail mark-up (31% – 53%)" (Mhlanga & Suleman, 2014, p.1).

A survey done in the West region of Cameroon, involving 8 health districts (4 urban,4 rural) assessing the availability and affordability of 20 medicines used for the management of diabetes

and cardiovascular diseases revealed that statins were largely unaffordable requiring 30.51 days wages for a month's course of medicine. One month combination treatment for coronary heart diseases costed at least 40.87 days' wages (Jingi, Noubiap, Onana, Nansseu, & Kengne, 2014).

A wide ranging survey conducted among 626 communities living in 20 different countries participating in the Prospective Urban Rural Epidemiological (PURE) study, that assessed availability of different classes of blood pressure lowering medicines and its affordability revealed that a large proportion of communities in low-income and middle-income countries do not have access to more than one blood pressure-lowering medicine and, when available, they are often not affordable. These factors are associated with poor blood pressure control (Attaei et al.,2017.).

Another wide ranging study targeting participants between 35 years to 70 years from 110 803 households, in 604 communities and 22 countries; as part of the Prospective Urban Rural Epidemiological (PURE) study examining availability and affordability of essential diabetes medicines revealed poor availability and affordability of these medicines in low and middle income countries (LMICs), about 27% of households in LMICS could not afford Metformin while 63% of households in the same category could not afford insulin (Chow et al , 2018).

A recent study done in Kenya on the cost and affordability of non-communicable disease screening, diagnosis and treatment in both public and private sectors revealed that annual hypertension medication costs ranged from $26 to $234 and $418 to $987 in public and private facilities, respectively. Cervical and breast cancer treatment cost for stage III (curative approach) was about $1,500 in public facilities and more than $7,500 in the private facilities (Subramanian et al., 2018). The study concluded that there exists substantial variation in patient costs between the public and private sectors. Most NCD diagnosis and treatment costs, even in the public sector, represent a substantial economic burden that can result in catastrophic expenditures.

Another study done in 52 low and middle incomes to assess the availability, pricing and affordability of essential drugs used for management of asthma showed that affordability of a single beclometasone 100 mg inhaler ranged from around half a day's wages in Afghanistan to almost 14 days in Madagascar. The people from El Salvador, Ethiopia, Madagascar and Malawi

had to work more than 5 days to pay for a single beclometasone inhaler in a private retail pharmacy. The result also showed that in India and Kenya the unit cost of generic salbutamol is more expensive than the branded salbutamol (Babar, Lessing, & Bissell, 2013).

A study done to determine the availability, price and affordability of cardiovascular medicines across 36 countries showed that chronic treatment with anti-hypertensive medication cost more than one day's wages in many cases. When more than one medicine was required to manage the condition, treatment became unaffordable. The affordability data showed that on average one month of chronic treatment with one medicine for hyper- tension cost 1.8 day's wages. The study showed that cardiovascular medicines were unaffordable in a significant proportion of the countries surveyed with often more than a days wages required to purchase one month dosage of treatment. Originator brands and medicines purchased from the private sector was deemed most unaffordable. The study also revealed that measures like skipping one or two meals was often not enough to enable the purchase of the said drugs.(Maaike SM van Mourik, Ewen, & Laing, 2010) The same study revealed that in households with a single breadwinner and multiple members with chronic conditions then the cost of treatment becomes unaffordable.

2.6 Catastrophic Health Expenditure

A study in Kenya revealed that households spend over a tenth of their budget on health care payments. The burden of out-of-pocket payments is highest among the poor. The poorest households spent a third of their resources on health care payments each year compared to only 8% spent by the richest households. About 1.48 million Kenyans are pushed below the national poverty line due to health care payments (Chuma & Maina, 2012).

A second study that sought to investigate catastrophic health expenditure and its determinants in Kenyan slums revealed that the proportion of households facing CHE varies widely between 1.52% and 28.38% ,this variation was dependent on the method and the threshold used to calculate CHE. The important determinants of CHE in urban slums were number of working adults in a household, membership in a social safety net scheme ,age of main income earner, number of years household resided in the slum and health seeking behaviours(Buigut, Ettarh, & Amendah, 2015a)

Another study done in Kenya assessing the impoverishing effects, and factors associated with the incidence of catastrophic health care payments, showed that incidence of catastrophic expenditure due to direct costs (consultations, medicines, medical procedures etc.) stood at 4.52%, when transport costs are included 6.58%. Over 453,000 Kenyans are pushed into poverty annually as a result of direct payments for healthcare. When the cost of transport is included, that number increases by more than one third to 619,541. Some of the factors associated with increased risk of incurring catastrophic health expenditure include; unemployment of the household head, presence of an elderly person, a person with a chronic ailment, a large household size, lower household social-economic status, and residence in marginalized regions of the country (Barasa, Maina, & Ravishankar, 2017).

2.7 Catastrophic Health Expenditure due to NCDs

A wide ranging study done across 35 low and middle income countries that sought to assess catastrophic health spending due to diabetes treatment, showed that "diabetic individuals experience differentially higher out-of-pocket medical spending, particularly among individuals with high levels of spending (excess spending of $157 per year) and a greater chance of incurring catastrophic medical spending (17.8 vs. 13.9%; difference 3.9%) compared with otherwise similar individuals without diabetes". (Smith-Spangler et al., 2012 , p. 319).

"Diabetic individuals with insurance do not have significantly lower risks of catastrophic medical spending (18.6 vs. 17.7%), nor were they significantly more likely to possess diabetes medications (22.8 vs. 20.6%; difference not significant) than those who were otherwise similar but without insurance. These effects were more pronounced and significant in lower-income countries" (Smith-Spangler et al., 2012 , p. 319).

A study conducted in 15 European countries that sought to assess catastrophic health expenditure among the elderly with chronic diseases showed that "older people with diagnosed chronic diseases face catastrophic health expenditure even in some of the wealthiest countries in Europe. The effect differs across chronic diseases and countries. This may be due to different socio-economic contexts, but also due to the specific characteristics of the different health systems" (Arsenijevic, Pavlova, Rechel, & Groot, 2016, p.2).

A study conducted in Bangalore India, to assess the impact of OOP payments for chronic conditions on the urban poor determined that Overall, 16% of households suffered financial catastrophe by spending more than 10% of household income on outpatient care. Occurrence and intensity of financial catastrophe were inequitably high among poor. Low household income, use of referral hospitals as place for consultation, and small household size were associated with a greater likelihood of incurring financial catastrophe. The out-of-pocket spending on chronic conditions doubled the number of people living below the poverty line in one month, with further deepening of their poverty (Bhojani et al., 2012). The study also found that households borrowed money (4.2% instances) and sold or mortgaged their assets (0.4% instances) to cope with the financial burden of seeking care.

A study done in Tanzania that reviewed data from 1991 to 2010, on chronic diseases as a driver for health spending showed that the financial burden of healthcare is greater for households affected by chronic disease than those unaffected. Households appear unable to sustain high levels of expenditure over time, likely resulting in both irregular chronic disease treatment and impoverishment (Counts & Skordis-Worrall, 2016).

2.8 Risk of CHE due to OOP purchase of medicines for chronic conditions

Impact of the out of pocket purchase of medicines is profound in LMICs in both the households and the health system in general. Several studies indicate that a significant proportion of total health expenditures goes towards purchasing of pharmaceuticals. On average poor countries spend a higher proportion of their health budgets on medicines than wealthier countries. This figure is as high as 30.4% in low income countries (Lu Y et al., 2011). "In 2006, private expenditure on medicines as a share of total pharmaceutical expenditure in per capita terms was 61.2%, 66.5% and 76.9% in upper middle-income, lower middle-income and low-income countries, respectively. This reflects the reality that out-of-pocket expenditure is the major source of pharmaceutical payments in all but the high-income countries" (Lu Y et al., 2011, p.7).

WHO conducted a study to determine the causes/drivers of catastrophic health expenditure using data from the World Health Surveys from 51 countries, the results indicated that OOP expenditure

on medicines resulted in financial catastrophe for 0% to 19.2% of all households across the different countries, with an average of 6.1%. The comparison between urban and rural locations revealed that households located in rural areas had a bigger burden from OOP expenditure on medicines compared to households living in the urban areas. The study showed that medicines expenditure poses a considerable financial burden. "Spending on medicines causes more households to face financial catastrophe than spending on inpatient or outpatient services in almost all countries included in this study. Indeed, while the cost of medicines may be small as compared to inpatient services, medicines spending can accumulate quickly, especially for people with chronic conditions" (Saksena, Xu, & Durairaj, 2010, p. 11).

A study done in the US on rising out of pocket spending on chronic conditions showed that drugs were the costliest type of medical expenditure for almost all groups. "People over age sixty-five with multiple chronic conditions spent an annual average of $1,292 per person for drugs—more than any other group and more than five times greater than their spending for office visits" (Paez, Zhao, & Hwang, 2009,p.20).

A study across 16 LMICs to quantify the impoverishing effects of purchasing medicines for chronic diseases (Atenolol 50mg, Salbutamol inhaler, Glibenclamide 5mg) showed that purchasing these medicines would impoverish large portions of the population (up to 86%). "Originator brand products were less affordable than the lowest-priced generic equivalents. In the Philippines, for example, originator brand atenolol would push an additional 22% of the population below US$1.25 per day, whereas for the lowest priced generic equivalent this demographic shift is 7%" (Cameron et al., 2010,p.1).

A study done in the US after implementation of Medicare part D that provided coverage for prescription drugs, showed that beneficiaries suffering from diabetes experienced a reduction of out of pocket expenditure by 28% (USD 530) (Li et al., 2019). This indicates that extending coverage for prescriptions of chronic medicines reduces out of pocket spending and cushions against risk of impoverishment.

2.9 Summary of literature review

Studies above indicate that there is poor access to medicines for non-communicable diseases, even when available the medicines are often not affordable. The studies also show that patients with NCDs incur considerable expenses in the out of pocket purchase of these medicines and this could expose them to the risk of impoverishment. Patients employ different coping strategies such as having to borrow or selling belongings leaving them indebted or at further risk of impoverishment, or resort to rationing their medicine use which contributes to non-adherence and suboptimal use of these lifesaving medicines.

2.10 Conceptual framework

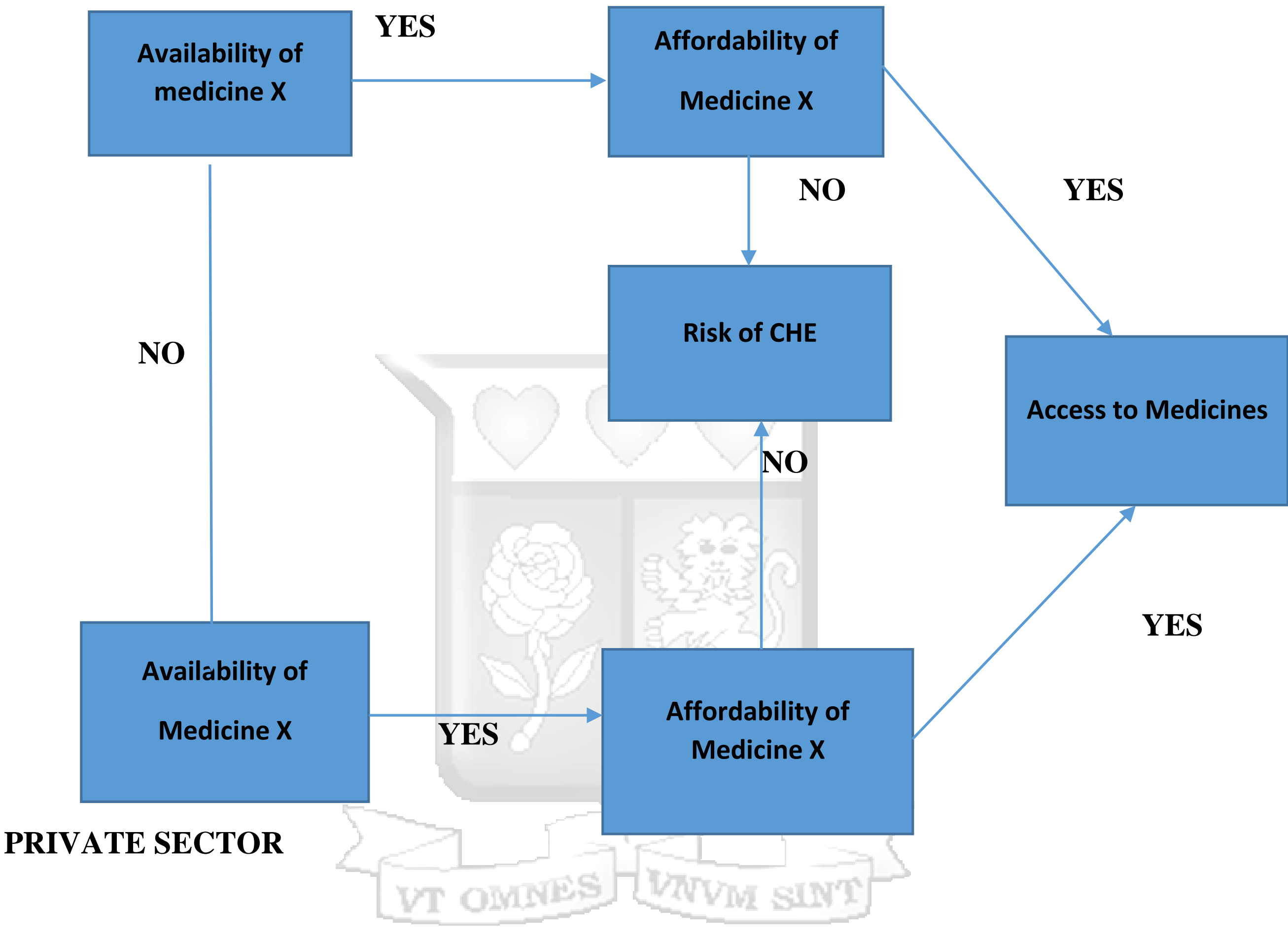

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Figure 2.1 : **Conceptual framework on availability and affordability of medicine adapted from Penchansky and Thomas (1981)**

CHAPTER THREE:

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a brief description of the research design used, data sources, data collection methods, data analysis, assurance for validity and reliability, and ethical considerations that were taken into account.

3.2 Research design and data sources

The study employed a quantitative design that entailed the secondary analysis of two datasets that were publicly available to answer the research questions. The first dataset included data collected on medicine prices across six counties in Kenya, namely Nairobi, Nakuru, Kajiado, Kwale, Vihiga, Kisumu. Data was collected in the public sector (public facility outpatient departments), the private sector (private retail pharmacies) and faith-based facilities using the WHO/HAI (World Health Organization/Health Action International) methodology on medicine prices. A total of 31 medicines, known to be both locally produced and imported, were surveyed. All had pre-set strengths and dosage forms that are included under the Kenya Essential Medicines List.

The second dataset was the Kenya Household Health Expenditure and Utilization Survey (KHHEUS) 2013, which was the most recent nationally representative survey on utilization and expenditure on healthcare. The survey is done every 10 years, collecting data on socio-demographic characteristics, healthcare spending, and outpatient and inpatient attendance at four weeks and twelve months respectively.

3.3 Data collection

From the first dataset, patient prices for three medicines used for management of NCDs were sampled out of the 31 medicine prices collected. The three medicines were Metformin 500mg (used for diabetes) Atovarstatin 20mg (used for dyslipedemias) and Methyldopa 250mg (used for management of hypertension in pregnancy). The reason for this was that the other 28 medicines surveyed were for acute conditions (as opposed to NCDs), yet this study was focused on NCDs.

For the second dataset, quantitative data was extracted from the Kenya Household Health Expenditure and Utilization Survey. This included data on presence of chronic disease among household members, payment by individual members for medicines either as outpatient or inpatient, source of funds for purchase and household expenditure incurred.

3.4 Data analysis

Availability and affordability of the selected medicines were compared across the public and private sectors for the six counties using descriptive analysis. The medicine prices were expressed as median price ratios (MPR) rather than currency units. An MPR is the ratio of the median price in local currency (Kenyan Shilling/KSh) divided by an international reference price converted to KSh, the conversion rate of USD to Kshs at the time of the survey was 1 USD= 101.29 according to economic survey data by the KNBS. The International reference price used was the latest Management Sciences for Health (MSH 2015) International Medical Products Price guide.

Medicine Price Ratio (MPR) = median local unit price/international reference unit price. The ratio is thus an expression of how much greater or less the local medicine price is compared to the international reference price. For instance, an MPR of two would mean that the local medicine price was twice that of the international reference price. Median, rather than means, were used because it is less affected by outliers.

The affordability of the medicine was calculated using the median prices collected during the survey. The treatment costs for a month with a particular medicine was compared to the daily wage of the lowest-paid unskilled government worker to determine the number of days' wages needed to pay for the cost of treatment. The lowest paid unskilled government worker received a daily wage of Kshs 269.40 according to the latest economic survey undertaken by KNBS.

Affordability of medicine x = Costs for a month's course of medicine/ daily wage of an unskilled government worker.

The Independent variables are Public facilities and private facilities, the dependent variables are availability, affordability.

Next the median price of medicine x was compared to household expenditure net of food, the proportion of households whose expenditure on medicine x exceeded 40% threshold was to be divided by the total number of chronic disease households to determine the proportion of these households that were at risk of catastrophic expenditure if they were to purchase a month's course of these medicines out of pocket. The study also further explored some of the household characteristics associated with risk of catastrophic health expenditure, these were household size and wealth quintile. Regression analysis was done to assess for associations between risk of catastrophic health expenditure and household characteristics.

3.5 Research validity and reliability

This study utilized two secondary data from reliable sources, one was the medicine price survey that utilized the widely tested and validated WHO/HAI methodology on measuring medicine prices, the second being the KHHEUS which is a nationally representative survey of household utilization and expenditure on health.

3.6 Study limitations

The medicine prices survey was a point in time study, meaning the prices were as recorded on the day of survey. Using the lowest paid government worker as a benchmark for determining affordability has its limitations given that in most low- and middle-income countries, a significant proportion of the population earn below the lowest paid government worker.

3.7 Ethical considerations

Ethical clearance was sought from the Ethics Review Board (ERB) at Strathmore Business School. Appropriate measures were taken to mitigate against identification of sensitive data and to maintain confidentiality e.g. health facility names, prices etc.

CHAPTER FOUR:

DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter deals with data analysis and presentation of the study results. The results are presented in line with the study objectives.

4.2 Availability of the selected essential medicines for non-communicable diseases

Table 4.1: **Availability of the selected essential medicines for NCDs in private and public hospital**

	County							
	Kwale	**Nakuru**	**Kajiado**	**Nairobi**	**Kisumu**	**Vihiga**		
Medicine	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**χ^2**	**P-Value**
Atorvastatin 20mg tab/cap								
No	5 (38.5)	7 (38.9)	5 (33.3)	9 (50)	6 (40)	8 (50)		
Yes	8 (61.5)	11 (61.1)	10 (66.7)	9 (50)	9 (60)	8 (50)	1.517	0.911
Methyldopa 250mg tab/cap								
No	2 (14.3)	4 (25)	2 (20)	1 (5.9)	5(33.3)	4 (26.7)	4.593	0.467
Yes	12 (85.7)	12 (75)	8 (80)	16 (94.1)	10(66.7)	11 (73.3)		
Metformin 500mg tab/cap								
No	1 (6.7)	1 (5.6)	2 (16.7)	3 (15)	1 (5.9)	1 (5.6)	2.563	0.767
Yes	14 (93.3)	17 (94.4)	10 (83.3)	17 (85)	16 (94.1)	17 (94.4)		

Source: Researcher (2020)

Availability of Atorvastatin 20mg tab/cap was 61.5% in Kwale County, 61.1% in Nakuru County, 66.7% in Kajiado County, 50% in Nairobi County, 40% in Kisumu County and 50% in Vihiga County. There was no difference in availability across the six counties, $\chi^2 = 1.517$, P = 0.911. Availability of Methyldopa 250mg tab/cap was 85.7% in Kwale County, 75% in Nakuru County, 80% in Kajiado County, 94.1% in Nairobi County, 66.7% in Kisumu County and 73.3% in Vihiga

County. There was no difference in availability across the counties, $X^2 = 4.593$, $P = 0.467$. Availability of Metformin 500mg tab/cap was 93.3% in Kwale County, 94.4% in Nakuru County, 83.3% in Kajiado County, 85% in Nairobi County, 94.1% in Kisumu County and 94.4% in Vihiga County. There was no difference in availability across the counties, $X^2 = 2.563$, $P = 0.767$. Figure 4.1 further illustrates these results.

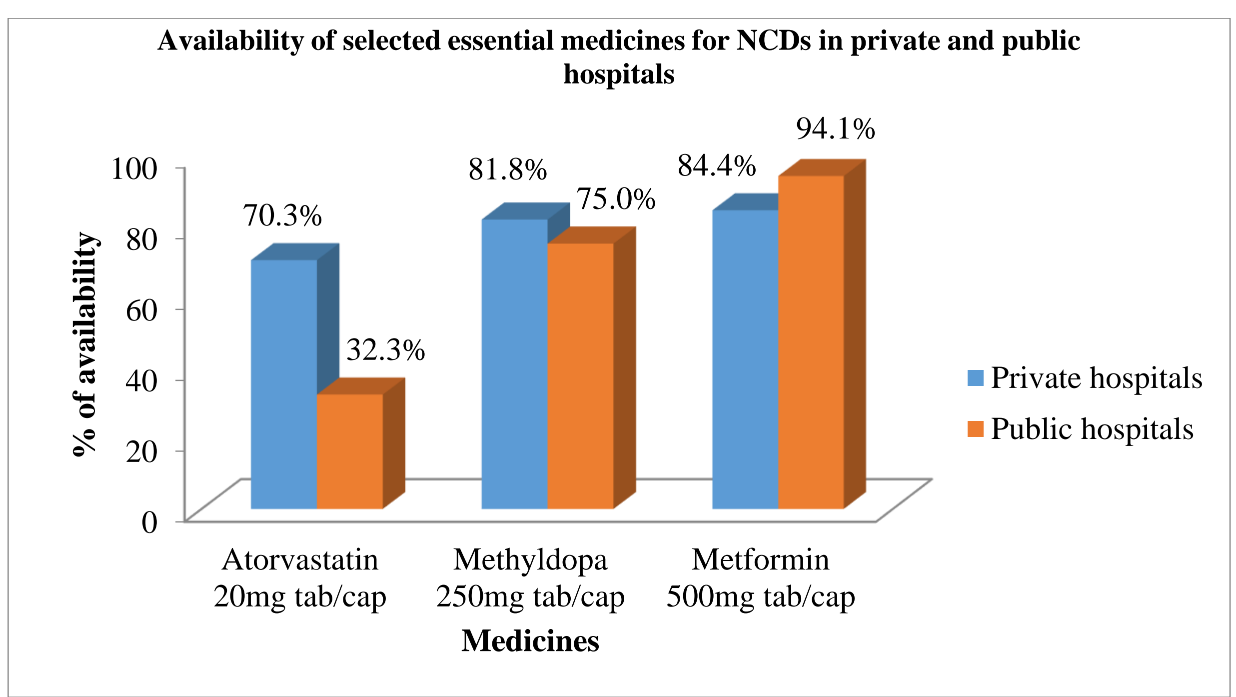

Figure 4.1: Availability of the selected essential medicines for NCDs in private and public hospitals

Source: Researcher (2020)

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Amongst the six selected counties, there was 70.3% availability of Atorvastatin 20mg tab/cap in private hospitals compared to 32.3% in public hospitals. With regard to Methyldopa 250mg tab/cap, there was 81.8% availability in private hospitals compared to 75% in public hospitals. Metformin 500mg tab/cap was 94.1% available in private hospital compared to 84.4% in public hospitals.

Table 4.2: **Availability of the selected essential medicines for NCDs in public and private hospitals of the six counties**

Medicines	Kwale n (%)	Nakuru n (%)	Kajiado n (%)	Nairobi n (%)	Kisumu n (%)	Vihiga n (%)
Atorvastatin 20mg tab/cap						
Public	1 (20)	1 (20)	3 (60.0)	-	2 (40)	3 (50)
Private	7 (87.5)	10 (76.9)	7 (70.0%)	9 (69.2)	7 (70)	5 (50)
Total	8 (61.5)	11 (61.1)	10 (66.7)	9 (50)	9 (60)	8 (50)
Methyldopa 250mg tab/cap						
Public	7 (100)	5 (40)	5 (100)	4 (80.0)	2 (40)	4 (80)
Private	5 (71.4)	10 (90.1)	3 (60.0)	12 (100)	8 (80)	7 (70)
Total	12 (85.7)	12 (75)	8 (80)	16 (94.1)	10(66.7)	11 (73.3)
Metformin 500mg tab/cap						
Public	6 (100)	4 (80)	5 (100)	2 (40)	4 (80)	6 (100)
Private	8 (88.9)	13 (100)	5 (71.4)	15 (100)	12 (100)	11 (91.7)
Total	14 (93.3)	17 (94.4)	10 (83.3)	17 (85)	16 (94.1)	17 (94.4)

Source: Researcher (2020)

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In Kwale County, availability of Atorvastatin 20mg tab/cap in public hospital was 20% compared to 87.5% in private hospitals. Methyldopa 250mg tab/cap was 100% available in public hospitals compared to 71.4% in private hospitals. Likewise, Metformin 500mg tab/cap was 100% available in public hospitals compared to 88.9% in private hospitals. In Nakuru County, availability of Atorvastatin 20mg tab/cap in public hospital was 20% compared to 76.9% in private hospitals. Methyldopa 250mg tab/cap was 40% available in public hospitals compared to 90.1% in private hospitals.

On the other hand, Metformin 500mg tab/cap had 80% availability in public hospitals compared to 100% in private hospitals. In Kajiado County, availability of Atorvastatin 20mg tab/cap in public hospital was 60.0% compared to 70% in private hospitals. Methyldopa 250mg tab/cap was

100% available in public hospitals compared to 60% in private hospitals. Metformin 500mg tab/cap was 100% available in public hospitals compared to 71.4% in private hospitals. In Nairobi County, availability of Atorvastatin 20mg tab/cap in public hospital was 0% compared to 69.2% in private hospitals. Methyldopa 250mg tab/cap was 80% available in public hospitals compared to 100% in private hospitals.

Similarly, Metformin 500mg tab/cap was 40% available in public hospitals compared to 100% in private hospitals. In Kisumu County, availability of Atorvastatin 20mg tab/cap in public hospital was 40% compared to 70% in private hospitals. Methyldopa 250mg tab/cap was 40% available in public hospitals compared to 80% in private hospitals. Metformin 500mg tab/cap was 80% available in public hospitals compared to 100% in private hospitals. In Vihiga County, availability of Atorvastatin 20mg tab/cap in public and private hospital was 50%. Methyldopa 250mg tab/cap was 80% available in public hospitals compared to 70% in private hospitals. On the other hand, availability of Metformin 500mg tab/cap was 100% in public hospitals compared to 91.7% in private hospitals.

4.3 Source of the medicines

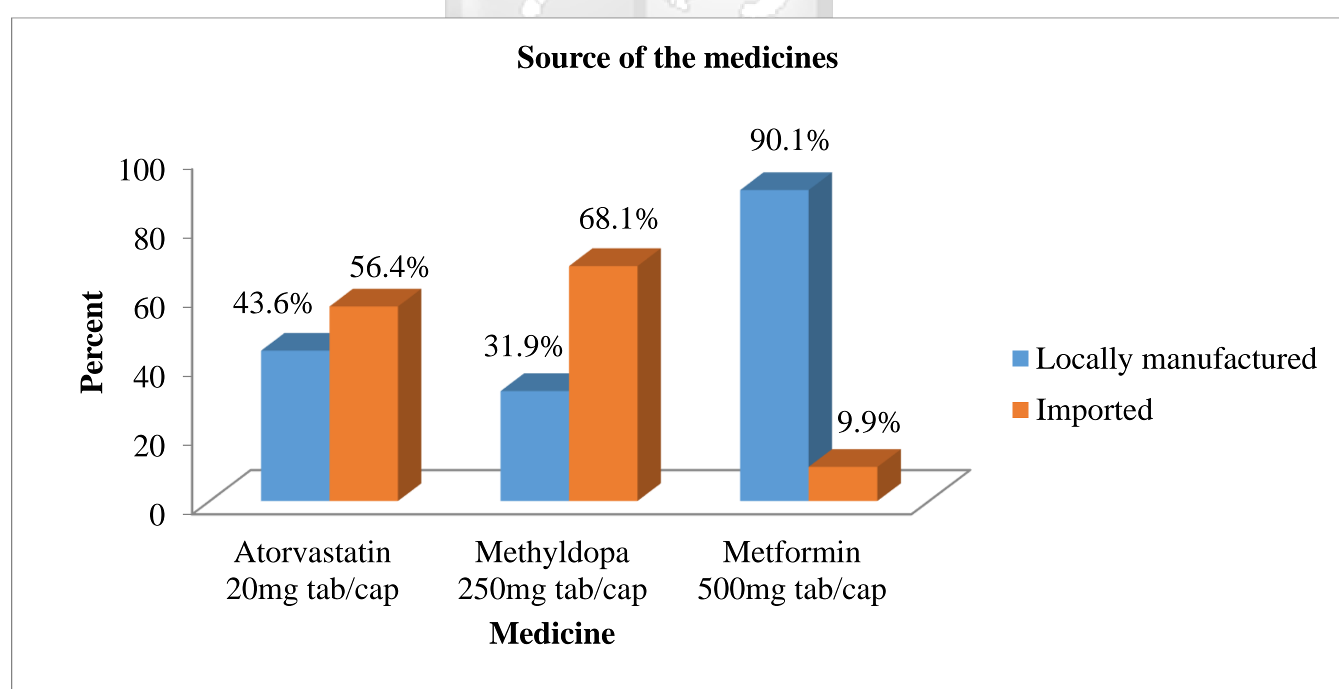

Figure 4.1: **Availability of medicines by place of manufacture**

Source: Researcher (2020)

Amongst the six selected counties, about 56.4% of the available Atorvastatin 20mg tab/caps were imported while 43.6% were locally manufactured. 68.1% of the available Methyldopa 250mg tab/caps were imported while 31.9% were locally manufactured. Significantly greater proportion (90.1%) of the available Metformin 500mg tab/caps was locally manufactured while a small proportion 9.9% was imported as shown in Figure 4.2.

4.3 Affordability of the selected essential medicines for NCDs Medicines

Table 4.3 **: Affordability of selected essential medicines for NCDs by place of manufacture**

	Total	**Locally manufactured**	**Imported**
Medicine	**Median (Q1 - Q3)**	**Median (Q1 - Q3)**	**Median (Q1 - Q3)**
Atorvastatin 20mg tab/cap	16.00 (7.00 – 20.00)	9.50 (5.00 -23.75)	20.00 (10.00 - 20.00)
Methyldopa 250mg tab/cap	5.00 (5.00 – 7.00)	5.00 (5.00 -10.00)	5.00 (5.00 – 10.00)
Metformin 500mg tab/cap	5.00 (4.91 – 10.00)	5.00 (4.41 -10.00)	5.00 (5.00 -7.39)

Source: Researcher (2020)

The median unit price of a locally manufactured Atorvastatin 20mg tab/cap was Kshs.9.50 while the median price of same imported medicine was Kshs. 20. On the other hand, the median unit price of locally manufactured or imported Methyldopa 250mg tab/cap was Kshs. 5. Likewise, the median unit price of locally manufactured or imported Metformin 500mg tab/cap was Kshs. 5.

Table 4.4**: Affordability of the selected medicines by place of manufacture per daily wage of an unskilled government worker**

	Total	**Locally manufactured**	**Imported**
Medicine	No. of Days	No. of Days	No. of Days
Atorvastatin 20mg tab/cap	1.8	1.1	2.2
Methyldopa 250mg tab/cap	3.3	3.3	3.3
Metformin 500mg tab/cap	0.6	0.6	0.6

Source: Researcher (2020)

An unskilled government worker would require a days wages to acquire monthly dose of locally manufactured Atorvastatin 20mg tab/cap compared to 2 – 3 days wages to acquire the same imported medicine. Whether locally manufactured or imported, an unskilled government worker would require 3 - 4 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap while requiring a days wage to acquire a monthly dose of Metformin 500mg tab/cap.

Table 4.5**: Affordability of the selected essential medicines for NCDs in public and private hospitals per daily wage of an unskilled government worker**

Medicines	Total No. of Days	Public hospital No. of Days	Private hospital No. of Days
Atorvastatin 20mg tab/cap	1.8	0.6	2.2
Methyldopa 250mg tab/cap	3.3	3.3	3.3
Metformin 500mg tab/cap	0.6	0.3	0.6

Source: Researcher (2020)

In general, an unskilled government worker would need 1 - 2 days wages to acquire a monthly dose of Atorvastatin 20mg tab/cap. If he/she purchases it from a public hospital he/she would require only a days wages to acquire the monthly dose as compared to 2 - 3 days wages to acquire the monthly dose from a private hospital.

Regardless of the hospital facility, an unskilled government worker would require to work 3 – 4 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap. He/she would need a days wages to acquire a monthly dose of Metformin 500mg tab/cap from either a public or a private hospital.

Table 4.6. **Affordability of the selected essential medicines for NCDs in private and public hospitals per daily wage of an unskilled government worker across the counties**

County	Medicines	Total No of Days	Public hospital No of Days	Private hospital No of Days
Kwale	Atorvastatin 20mg tab/cap	1.5	0.6	2.2
	Methyldopa 250mg tab/cap	3.3	6.7	3.3
	Metformin 500mg tab/cap	1.0	0.4	1.1
Nakuru	Atorvastatin 20mg tab/cap	2.2	2.2	2.2
	Methyldopa 250mg tab/cap	3.3	2.7	3.3
	Metformin 500mg tab/cap	0.6	0.4	0.8
Kajiado	Atorvastatin 20mg tab/cap	1.9	0.2	3.7
	Methyldopa 250mg tab/cap	3.2	2.7	3.2
	Metformin 500mg tab/cap	0.6	0.2	0.6
Nairobi	Atorvastatin 20mg tab/cap	2.2	0.0	2.2
	Methyldopa 250mg tab/cap	3.3	3.3	3.3
	Metformin 500mg tab/cap	0.6	0.2	0.6
Kisumu	Atorvastatin 20mg tab/cap	1.1	0.5	1.5
	Methyldopa 250mg tab/cap	3.3	1.7	3.3
	Metformin 500mg tab/cap	0.6	0.7	0.6
Vihiga	Atorvastatin 20mg tab/cap	0.9	0.6	2.2
	Methyldopa 250mg tab/cap	3.3	4.3	3.3
	Metformin 500mg tab/cap	0.6	0.2	0.6

Source: Researcher (2020)

In Kwale County, an unskilled Government worker would need a days wages to acquire a monthly dose of Atorvastatin 20mg tab/cap from a public hospital or 2 -3 days wages to acquire the same monthly dose from a private hospital. He/she would require 6 – 7 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap from a public facility and 3 – 5 days to acquire the same dose from private facility. Likewise, he/she would require a days wages to acquire a monthly dose of Metformin 500mg tab/cap from either public or private hospital.

In Nakuru County, an unskilled Government worker would require 2 - 3 days wages to acquire monthly dose of Atorvastatin 20mg tab/cap from both public and private hospital. He/she would

require 2 - 3 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap from a public hospital or 3 – 4 days to acquire the same dose from a private hospital. With regards to Metformin 500mg tab/cap, an unskilled government worker would require a single days wages to acquire a monthly dose from either public or private hospital.

In Kajiado County, an unskilled Government worker would require a days wage to acquire monthly dose of Atorvastatin 20mg tab/cap from a public hospital as compared to 3 – 4 days wages to acquire the same medicine from a private hospital. He/she would require 2 – 3 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap from public hospital as compared to 3 – 4 days wages to acquire the same dose from a private hospital. Likewise, he/she would need a single days wages to acquire a monthly dose of Metformin 500mg tab/cap from either public or private hospital.

In Nairobi County, an unskilled Government worker would require 2 days wages to acquire a monthly dose of Atorvastatin 20mg tab/cap from a private hospital. He/she would require 3 - 4 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap from either public or private hospital. With regard to Metformin 500mg tab/cap, an unskilled government worker would require a days wages to acquire it from either public hospital or private hospital.

In Kisumu County, an unskilled Government worker would require less than a days wages to acquire a monthly dose of Atorvastatin 20mg tab/cap from a public hospital as compared to 2 days wages to acquire the same monthly dose from a private hospital. He/she would need 1 – 2 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap from public hospital or 3 - 4 days wages to acquire the same dose from a private hospital. Likewise, he/she would require a single days wages to acquire a monthly dose of Metformin 500mg tab/cap from either public or private hospital.

In Vihiga County, an unskilled Government worker would require a days wages to acquire a monthly dose of Atorvastatin 20mg tab/cap from a public hospital or 2 – 3 days to acquire the same monthly dose from a private hospital. He/she would require 4 - 5 days wages to acquire a monthly dose of Methyldopa 250mg tab/cap from public hospital or 3 – 4 days wages to acquire

the same dose from a private hospital. Likewise, he/she would need a days wages to acquire Metformin 500mg tab/cap from either public hospital or private hospital.

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Table 4.7: **Median prices (Kshs.) of Medicines in Private and public hospitals by county**

		Total	Public hospital	Private hospital
County	**Medicines**	**Median (Q1 - Q3)**	**Median (Q1 - Q3)**	**Median (Q1 - Q3)**
Kwale	Atorvastatin 20mg tab/cap	13.50 (5.00 -25.50)	5	20.00 (5.00 - 27.33)
	Methyldopa 250mg tab/cap	5.00 (4.40 – 8.75)	10 (1.8 -)	5.00 (4.60 - 5.00)
	Metformin 500mg tab/cap	8.72 (3.75 -10.00)	3.50 (1.25 -16.25)	9.70 (5.75 - 10.00)
Nakuru	Atorvastatin 20mg tab/cap	20 (14.63 -25.00)	20	20.00 (12.97 -25.00)
	Methyldopa 250mg tab/cap	5.00 (3.00 -8.75)	4.00 (3.00 -)	5.00 (2.88 -9.25)
	Metformin 500mg tab/cap	5.00 (5.00 -10.00)	4.00 (3.00 -)	7.10 (5.00 -10.00)
Kajiado	Atorvastatin 20mg tab/cap	17.5 (6.50 – 40.00)	2.00 (5.00 -)	33.33 (15.00 - 40.00)
	Methyldopa 250mg tab/cap	4.75 (3.38 - 5.00)	4.00 (3.00 -)	4.75 (4.50 -)
	Metformin 500mg tab/cap	5.00 (2.25 - 6.25)	2.00 (0.20 -)	5.71 5.00 - 7.21)
Nairobi	Atorvastatin 20mg tab/cap	20.00 (9.15 - 37.5)	-	20.00 (9.15 -37.5)
	Methyldopa 250mg tab/cap	5.00 (5.00 - 8.50)	5.00 (5.00 - 5.00)	5.00 (5.00 - 9.50)
	Metformin 500mg tab/cap	5.00 (5.00 – 9.00)	2	5.00 (5.00 - 9.00)
Kisumu	Atorvastatin 20mg tab/cap	10.00 (6.67 - 18.00)	4.30 (0.30 – 8.33)	13.30 (10.00 - 20.00)
	Methyldopa 250mg tab/cap	5.00 (4.58 - 6.25)	2.50 (1.67 -)	5.00 (5.00 - 8.75)
	Metformin 500mg tab/cap	5.00 (5.00 – 10.00)	6.65 (2.08 - 10.00)	5.00 (5.00 - 9.00)
Vihiga	Atorvastatin 20mg tab/cap	7.86 (5.00 - 20.00)	5.00 (5.00 - 5.00)	20.00 (7.86 - 20.00)
	Methyldopa 250mg tab/cap	5.00 (4.00 - 7.50)	6.50 (3.00 -)	5.00 (5.00 - 5.00)
	Metformin 500mg tab/cap	5.00 (2.00 – 10.00)	1.67 (1.08 - 15.50)	5.00 (5.00 - 10.00)

Data source: Data collected on medicine prices across six counties in Kenya, Q1 = 1st quartile; Q3 =3rd quartile

In Kwale County, the median unit price of Atorvastatin 20mg tab/cap is Kshs.13.50. In public hospitals, a unit price of Atorvastatin 20mg tab/cap was sold at Kshs. 5 and Kshs. 20 in private hospitals. The median unit price for Methyldopa 250mg tab/cap was Kshs.5. In public hospitals, the price was Kshs.10 while in private hospitals the median unit price was Kshs.5. The median unit price for Metformin 500mg tab/cap was Kshs.8.72. In public hospitals, the price was Kshs.3.50 while in private hospitals the median unit price was Kshs.9.7.

In Nakuru County, the median unit price of Atorvastatin 20mg tab/cap is Kshs.20. In both public and private hospitals, it was sold at Kshs. 20. The median unit price for Methyldopa 250mg tab/cap was Kshs.5. In public hospitals the price was Kshs.4 while in private hospitals the median unit price was Kshs.5. The median unit price for Metformin 500mg tab/cap was Kshs.5. In public hospitals, the price was Kshs.4 while in private hospitals the median unit price was Kshs.7.10.

In Kajiado County, the median unit price of Atorvastatin 20mg tab/cap is Kshs.17.5. In private hospitals it was sold at Kshs. 33.33 while in public hospitals the median price was Kshs. 2.00. The median unit price for Methyldopa 250mg tab/cap was Kshs.4.75. In private hospitals it was sold at Kshs.4.75 while in public hospitals the median unit price was Kshs.4.00. The median unit price for Metformin 500mg tab/cap was Kshs.5. In public hospitals, the price was Kshs.2.00 and Kshs. 5.71 in private hospitals.

In Nairobi County, the median unit price of Atorvastatin 20mg tab/cap is Kshs.20.0. This medicine was not available in the sampled public hospitals while in private hospitals the median price was Kshs. 20. The median unit price for Methyldopa 250mg tab/cap was Kshs.5. In public hospitals, the price was Kshs.5 while in private hospitals the medicine was not available. The median unit price for Metformin 500mg tab/cap was Kshs.5. In public hospitals, the medicine was not available while in private hospitals the median unit price was Kshs.5.

In Kisumu County, the median unit price of Atorvastatin 20mg tab/cap is Kshs.10.00. In private hospitals it was sold at Kshs. 13.30 while in public hospitals the median price was Kshs. 4.30. The median unit price for Methyldopa 250mg tab/cap was Kshs.5.00. In private hospitals it was sold at Kshs.5.00 while in public hospitals the median unit price was Kshs.2.50. The median unit price

for Metformin 500mg tab/cap was Kshs.5. In public hospitals, the price was Kshs. 6.65 and Kshs. 5.00 in private hospitals.

In Vihiga County, the median unit price of Atorvastatin 20mg tab/cap is Kshs.7.86. In private hospitals it was sold at Kshs. 20.00 while in public hospitals the median price was Kshs. 5.00. The median unit price for Methyldopa 250mg tab/cap was Kshs.5.00. In private hospitals it was sold at Kshs.5.00 while in public hospitals the median unit price was Kshs.6.50. The median unit price for Metformin 500mg tab/cap was Kshs.5.00. In public hospitals, the price was Kshs.1.67 and Kshs. 5.00 in private hospitals.

4.4 Medicine price ratios

Table 4.8**: Medicines Price Ratio (MPR) of the selected essential medicines for NCDs in public and private hospitals**

	Total	**Public hospital**	**Private hospital**
Medicines	**MPR**	**MPR**	**MPR**
Atorvastatin 20mg tab/cap	3.80	1.19	4.75
Methyldopa 250mg tab/cap	1.18	1.18	1.18
Metformin 500mg tab/cap	3.05	1.52	3.38

MPR = Medicines Price Ratio

Source: Researcher (2020)

The local medicine price of Atorvastatin 20mg tab/cap was almost four times that of the international reference price. In public hospitals, the medicine price ratio was almost similar to that of the international reference price while the price in private hospitals was almost five times that of the international reference price. The local medicine price of Methyldopa 250mg tab/cap was almost equal to that of the international reference price in both public and private hospitals. The local medicine price of Metformin 500mg tab/cap was thrice that of the international reference price. In public hospitals, the medicine price ratio was one and half that of the international reference price while the price in private hospitals was thrice that of the international reference price.

Table 4.9**: Medicine Price Ratio (MPR) by public and private hospital across the counties**

County	Medicines	Total MPR	Public hospital MPR	Private hospital MPR
Kwale	Atorvastatin 20mg tab/cap	3.20	1.19	4.75
	Methyldopa 250mg tab/cap	1.18	2.35	1.18
	Metformin 500mg tab/cap	5.31	2.13	5.91
Nakuru	Atorvastatin 20mg tab/cap	4.75	4.75	4.75
	Methyldopa 250mg tab/cap	1.18	0.94	1.18
	Metformin 500mg tab/cap	3.05	2.44	4.33
Kajiado	Atorvastatin 20mg tab/cap	4.15	0.47	7.91
	Methyldopa 250mg tab/cap	1.12	0.94	1.12
	Metformin 500mg tab/cap	3.05	1.22	3.48
Nairobi	Atorvastatin 20mg tab/cap	4.75	-	4.75
	Methyldopa 250mg tab/cap	1.18	1.18	1.18
	Metformin 500mg tab/cap	3.05	1.22	3.05
Kisumu	Atorvastatin 20mg tab/cap	2.37	1.05	3.16
	Methyldopa 250mg tab/cap	1.18	0.59	1.18
	Metformin 500mg tab/cap	3.05	4.05	3.05
Vihiga	Atorvastatin 20mg tab/cap	1.87	1.19	4.75
	Methyldopa 250mg tab/cap	1.18	1.53	1.18
	Metformin 500mg tab/cap	3.05	1.02	3.05

Data source: Data collected on medicine prices across six counties in Kenya

In Kwale County, the local medicine price of Atorvastatin 20mg tab/cap in public hospital was almost same as that of the international reference price while in private hospitals the local medicine price was almost 5 times that of the international reference price. The local medicine price of Methyldopa 250mg tab/cap was twice that of the international reference price in public hospitals and almost equal to international reference price in private hospitals. The local medicine price of Metformin 500mg tab/cap was 15 times that of the international reference price in public hospitals and 6 times in private hospitals.

In Nakuru County, the local medicine price of Atorvastatin 20mg tab/cap in private hospital was 5 times that of the international reference price in both public and private hospitals. The local medicine price of Methyldopa 250mg tab/cap was 0.9 times that of the international reference price in public hospitals and 1.2 times equal to international reference price in private hospitals. The local medicine price of Metformin 500mg tab/cap was twice that of the international reference price in public hospitals and 4 times in private hospitals.

In Kajiado County, the local price of Atorvastatin 20mg tab/cap, Methyldopa 250mg tab/cap and Metformin 500mg tab/cap was 4 times, 1.1 times and 3 times equal to international reference price in public hospitals respectively. The local medicine price of Atorvastatin 20mg tab/cap in public hospital was 0.47 times that of the international price and 8 times that of the international reference price in private hospitals. The local medicine price of Methyldopa 250mg tab/cap was 0.9 times that of the international reference price in public hospitals and 1.2 times equal to international reference price in private hospitals. The local medicine price of Metformin 500mg tab/cap was 1.2 times that of the international reference price in public hospitals and three times the international reference price in private hospitals.

In Nairobi County, the local price of Atorvastatin 20mg tab/cap was 5 times that of the international reference price in private hospitals. The local price of Methyldopa 250mg tab/cap was equal to that of the international reference price in both public and private facilities. The local price of Metformin 500mg tab/cap was 3 times that of the international reference price in private hospitals.

In Kisumu County, the local price of Atorvastatin 20mg tab/cap was equal to that of international reference price in public hospitals and three times the international reference price in private hospitals. The local price of Methyldopa 250mg tab/cap was half that of international reference price in public hospitals and equal to international reference price in private hospitals. The local price of Metformin 500mg tab/cap was 4 times that of international reference price in public hospitals and three times that of international reference price in private hospitals.

In Vihiga County, the local price of Atorvastatin 20mg tab/cap was equal to that of international reference price in public hospitals and 5 times in private hospitals. The local price of Methyldopa 250mg tab/cap was 1.5 times that of international reference price in public hospitals and equal to international reference price in private hospitals. The local price of Metformin 500mg tab/cap was equal to that of international reference price in public hospitals and thrice that of international reference price in private hospitals.

4.5 Risk of Catastrophic Health Expenditure (CHE)

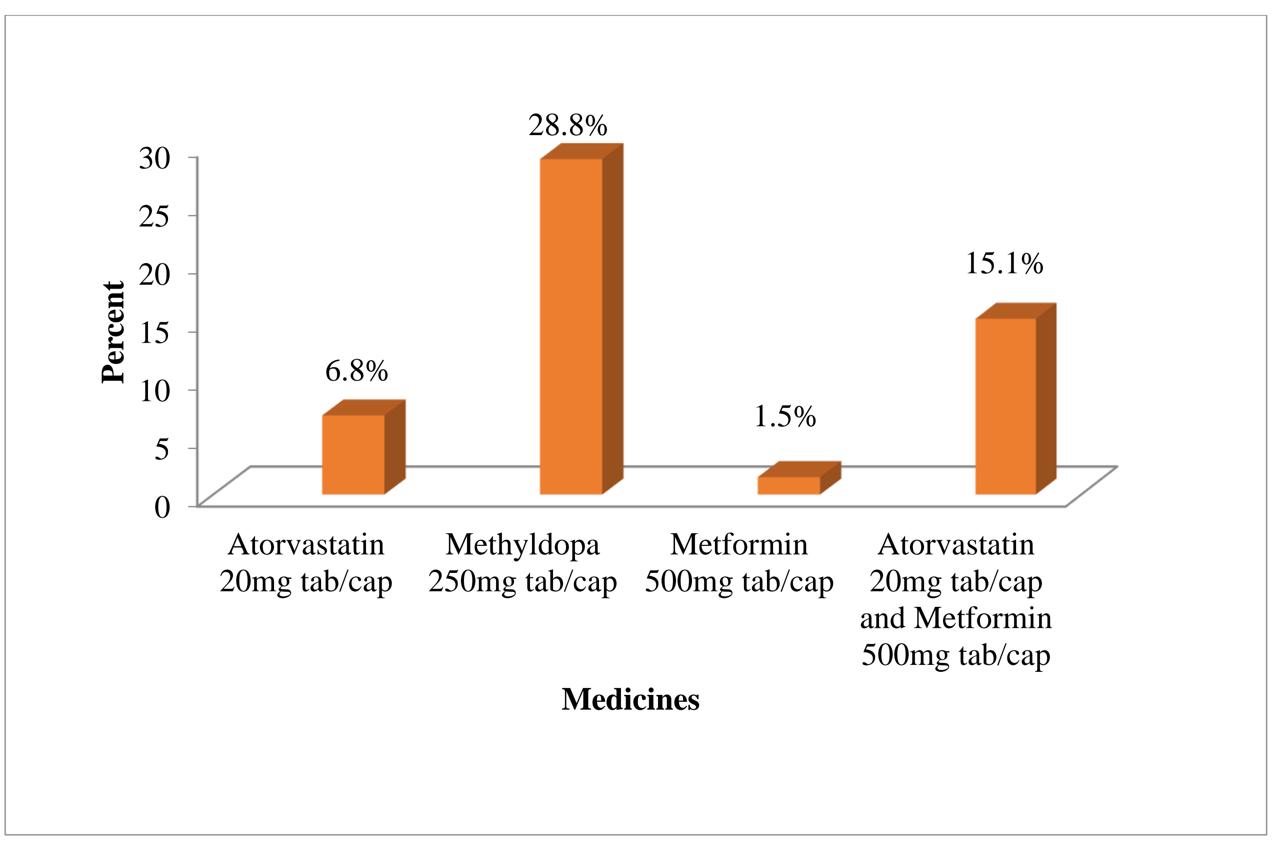

Figure 4.2: **Risk of Catastrophic Health Expenditure (CHE)**

Data source: Kenya Household Health Expenditure and Utilization Survey (KHHEUS) (2013)

About 6.8% of all households in the six counties with chronic conditions would be at risk of catastrophic health expenditure if they were to purchase Atovarstatin 20mg out of pocket. 28.8% would be at risk if they were to purchase Methyldopa 250mg out of pocket, while only 1.5% of households would be at risk if they were to purchase Metformin 500mg out of pocket. The figure rises to 15.1% of all households at risk if they were to purchase a combination of Metformin 500mg and Atorvastatin 20mg.

Table 4.10**: Association between risk of CHE (Atorvastatin 20mg tab/cap) and selected demographic characteristics of the households**

Bivariate Analysis					**Multivariable regression**	
Characteristics	**At CHE risk n (%)**	**Not at Risk n (%)**	**95% CI cOR (L - U)**	**P-Value**	**aOR (L - U)**	**P-Value**
Household Size						
1 - 3 people	385 (10.3)	3362 (89.7)	1.22 (0.97 - 1.54)	0.095	3.15 (2.47 - 4.03)	**<0.001**
4 - 6 People	487 (5.0)	9291 (95.0)	0.56 (0.45 - 0.69)	**<0.001**	0.89 (0.71 - 1.13)	0.335
7 - 9 People	332 (7.4)	4153 (92.6)	0.85 (0.67 - 1.08)	0.175	0.93 (0.73 - 1.18)	0.532
10 or more people	99 (8.6)	1053 (91.4)	Reference		Reference	
Wealth Index						
Poorest	719 (16.2)	3707 (83.8)	57.51 (33.82 - 97.78)	**<0.001**	81.32 (47.64 - 138.80)	**<0.001**
Second	381 (9.5)	3644 (90.5)	31.00 (18.15 - 52.94)	**<0.001**	40.09 (23.42 - 68.62)	**<0.001**
Middle	147 (5.7)	2444 (94.3)	17.83 (10.28 - 30.92)	**<0.001**	22.37 (12.88 - 38.87)	**<0.001**
Fourth	42 (1.1)	3913 (98.9)	3.18 (1.73 - 5.84)	**<0.001**	3.33 (1.81 - 6.10)	**<0.001**
Richest	14 (0.3)	4151 (99.7)	Reference		Reference	

Data source: Kenya Household Health Expenditure and Utilization Survey (KHHEUS) 2013

cOR =Crude Odds Ratio; aOR = adjusted Odds Ratio; L = Lower limit, U =Upper limit, CI = Confidence Interval; P-Value = Probability Value

Greater proportion of Catastrophic Health Expenditure risk was observed in households whose household size has 1 – 3 people (10.3%) compared to those with household size of 10 or more people (8.6%). Households with 4 – 6 people were 3.15 (95%CI = 2.47 – 4.03, P<0.001) times more likely to experience Catastrophic Health Expenditure compared to households with household size of 10 or more people.

Significantly high proportion of Catastrophic Health Expenditure risk was observed in households whose wealth index is poorest (16.2%), second (9.5%), middle (5.7%) and fourth (1.1%) compared to those in the richest wealth index (0.3%). Households in poorest, Second, middle and fourth were 81.32 (95%CI = 47.64 – 138.80, P<0.001), 40.09 (95%CI = 23.42 – 68.62, P<0.001), 22.37 (95%CI = 12.88 – 38.87, P<0.001) and 3.33 (95%CI = 1.81 – 6.10, P<0.001) respectively, times more likely to experience Catastrophic Health Expenditure compared to households in the richest wealth index

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Table 4.11**: Association between risk of CHE (Methyldopa 250mg tab/cap) and selected demographic characteristics of the households**

Bivariate Analysis					**Multivariable regression**	
	At CHE risk	**Not at Risk**	**95% CI**			
Characteristics	**n (%)**	**n (%)**	**cOR (L - U)**	**P-Value**	**aOR (L - U)**	**P-Value**
Household Size						
1 - 3 people	1028 (27.4)	2719 (72.6)	0.98 (0.84 – 1.13)	0.732	3.05 (2.58 – 3.61)	**<0.001**
4 - 6 People	2689 (27.5)	7089 (72.5)	0.98 (0.85 – 1.12)	0.746	1.77 (1.52 – 2.05)	**<0.001**
7 - 9 People	1474 (32.9)	3011 (67.1)	1.26 (1.09 - 1.46)	**0.001**	1.41 (1.21 - 1.65)	**<0.001**
10 or more people	322 (28.0)	830 (72.0)	Reference		Reference	
Wealth Index						
Poorest	2393 (54.1)	2033 (45.9)	65.07 (51.32 – 82.51)	**<0.001**	83.65 (65.75 – 106.44)	**<0.001**
Second	1989 (49.4)	2036 (50.6)	54.01 (42.57 – 68.52)	**<0.001**	64.58 (50.78 – 82.12)	**<0.001**
Middle	748 (28.9)	1843 (71.1)	22.44 (17.56 – 28.67)	**<0.001**	26.19 (20.47 – 33.52)	**<0.001**
Fourth	309 (7.8)	3646 (92.2)	4.69 (3.62 – 6.06)	**<0.001**	4.93 (3.81 – 6.39)	**<0.001**
Richest	74 (1.8)	4165 (98.2)	Reference		Reference	

Data source: Kenya Household Health Expenditure and Utilization Survey (KHHEUS) 2013

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cOR =Crude Odds Ratio; aOR = adjusted Odds Ratio; L = Lower limit, U =Upper limit, CI = Confidence Interval; P-Value = Probability Value

The risk of catastrophic health expenditure was 27.4%, 27.5%, 32.9% and 28.0% for households with household size of 1 - 3 people, 4 - 6 people, 7 – 9 people and 10 or more people respectively. Households with 1 – 3 people, 4 – 6 people, 7 – 9 people were 3.05 (95%CI = 2.58 – 3.61, P<0.001), 1.77 (95%CI = 1.52 – 2.05, P<0.001) and 1.41 (95%CI = 1.21 – 1.65, P<0.001) respectively, likely to experience Catastrophic Health Expenditure compared to households with household size of 10 or more people.

Significantly high proportion of risk to Catastrophic Health Expenditure were observed among households whose wealth index was poorest (54.1%), second (49.4%), middle (28.9%) and fourth (7.8%) compared to those in the richest wealth index (1.8%). Households in poorest, Second, middle and fourth were 83.65 (95%CI = 65.75 – 106.44, P<0.001), 64.58 (95%CI = 50.78 – 82.12, P<0.001), 26.19 (95%CI = 20.47 - 33.52, P<0.001) and 4.93 (95%CI = 3.81 – 6.39, P<0.001) respectively, times more likely to experience Catastrophic Health Expenditure compared to households in the richest wealth index.

Table 4.12**: Association between risk of CHE (Metformin 500mg tab/cap) and selected demographic characteristics of the households**

Bivariate Analysis					**Multivariable regression**	
	At CHE risk	**Not at Risk**	**95% CI**			
Characteristics	**n (%)**	**n (%)**	**cOR (L - U)**	**P-Value**	**aOR (L - U)**	**P-Value**
Household Size						
1 - 3 people	97 (2.6)	3650 (97.4)	0.87 (0.59 - 1.30)	0.505	2.20 (1.46 – 3.31)	**<0.001**
4 - 6 People	98 (1.0)	9680 (99.0)	0.33 (0.22 - 0.49)	**<0.001**	0.56 (0.37 – 0.84)	**0.005**
7 - 9 People	62 (1.4)	4423 (98.6)	0.46 (0.30 – 0.70)	**<0.001**	0.51 (0.33 – 0.78)	**0.002**
10 or more people	34 (3.0)	1118 (97.0)	Reference		Reference	
Wealth Index						
Poorest	194 (4.4)	4232 (95.6)	11.29 6.77 – 18.83)	**<0.001**	15.10 (8.99 – 25.39)	**<0.001**
Second	73 (1.8)	3952 (98.2)	4.55 (2.64 – 7.83)	**<0.001**	5.64 (3.27 – 9.74)	**<0.001**
Middle	8 (0.3)	2583 (99.7)	0.76 (0.32 – 1.78)	0.532	0.92 (0.39 – 2.15)	0.841
Fourth	16 (0.4)	3939 (99.6)	Reference		Reference	
Richest	0 (0.0)	4165 (100)	UD	0.999	UD	

Data source: Kenya Household Health Expenditure and Utilization Survey (KHHEUS) 2013

cOR =Crude Odds Ratio; aOR = adjusted Odds Ratio; L = Lower limit, U =Upper limit, CI = Confidence Interval; P-Value = Probability Value.

The risk of catastrophic health expenditure was 2.6%, 1.0%, 1.4% and 3.0% for households with household size of 1 - 3 people, 4 - 6 people, 7 – 9 people and 10 or more people respectively. Households with 1 – 3 people, 4 – 6 people, 7 – 9 people were 2.20 (95%CI = 1.46 – 3.31, P<0.001), 0.56 (95%CI = 0.37 – 0.84, P<0.001) and 0.51 (95%CI = 0.33 – 0.78, P=0.002) respectively, likely to experience Catastrophic Health Expenditure compared to households with household size of 10 or more people.

Significantly high proportion of Catastrophic Health Expenditure risk was observed among households whose wealth index is poorest (4.4%), second (1.8%), middle (0.3%) and fourth (0.4%) compared to those in the richest wealth index (0.0%). Households in poorest, Second and middle were 15.10 (95%CI = 8.99 – 25.39, P<0.001), 5.64 (95%CI = 3.27 – 9.74, P<0.001) and 0.92 (95%CI = 0.39 – 2.15, P=0.891) respectively, times more likely to experience Catastrophic Health Expenditure compared to households in the fourth wealth index.

Table 4.13**: Association between risk of CHE (Metformin 500mg tab/cap + Atorvastatin 20mg tab/cap) and selected demographic characteristics of the households**

Bivariate Analysis					**Multivariable regression**	
	At CHE risk	**Not at Risk**	**95% CI**			
Characteristics	**n (%)**	**n (%)**	**cOR (L - U)**	**P-Value**	**aOR (L - U)**	**P-Value**
Household Size						
1 - 3 people	597 (15.9)	3150 (84.1)	0.79 (0.67 – 0.94)	**0.007**	2.26 (1.87 – 2.73)	**<0.001**
4 - 6 People	1282 (13.1)	8496 (86.9)	0.63 (0.53 - 0.74)	**<0.001**	1.07 (0.90 - 1.27)	0.432
7 - 9 People	795 (17.7)	3690 (82.3)	0.89 (0.76 - 1.03)	0.199	0.93 (0.83 - 1.18)	0.927
10 or more people	223 (19.4)	929 (80.6)	Reference		Reference	
Wealth Index						
Poorest	1601 (36.2)	2825 (63.8)	97.51 (65.16 – 146.74)	**<0.001**	122.02 (81.09 – 183.60)	**<0.001**
Second	839 (20.8)	3186 (79.2)	45.43 (30.20 – 68.35)	**<0.001**	53.48 (35.49 – 80.58)	**<0.001**
Middle	325 (12.5)	2266 (87.5)	24.75 (16.30 – 37.58)	**<0.001**	28.58 (18.79 – 43.46)	**<0.001**
Fourth	108 (2.7)	3847 (97.3)	4.84 (3.11 – 7.56)	**<0.001**	5.01 (3.21 – 7.82)	**<0.001**
Richest	24 (0.6)	4141 (99.4)	Reference		Reference	

Data source: Kenya Household Health Expenditure and Utilization Survey (KHHEUS) 2013

cOR =Crude Odds Ratio; aOR = adjusted Odds Ratio; L = Lower limit, U =Upper limit, CI = Confidence Interval; P-Value = Probability Value

The risk of catastrophic health expenditure was 15.9%, 13.1%, 17.7% and 19.4% for households with household size of 1 - 3 people, 4 - 6 people, 7 – 9 people and 10 or more people respectively. Households with 1 – 3 people, 4 – 6 people, 7 – 9 people were 2.26 (95%CI = 1.87 – 2.73, P<0.001), 1.07 (95%CI = 0.90 – 1.27, P=0.432) and 0.93 (95%CI = 0.83 – 1.18, P=0.927) respectively, likely to experience Catastrophic Health Expenditure compared to households with household size of 10 or more people.

Significantly high proportion of Catastrophic Health Expenditure risk was observed in households whose wealth index is poorest (36.2%), second (20.8%), middle (12.5%) and fourth (2.7%) compared to those in the richest wealth index (0.6%). Households in poorest, Second, middle and fourth were 122.02 (95%CI = 81.09 – 183.60, P<0.001), 53.48 (95%CI = 35.49 – 80.58, P<0.001), 28.58 (95%CI = 18.79 – 43.46, P<0.001) and 5.01 (95%CI = 3.21 – 7.82, P<0.001) respectively, times more likely to experience Catastrophic Health Expenditure compared to households in the richest wealth index.

CHAPTER FIVE:

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a discussion of the findings in line with past literature. It finishes by providing the conclusion and recommendations from the study.

5.2 Discussion of findings

5.2.1 Availability of medicine

Availability of Atovarstatin 20mg, Methyldopa 250mg and Metformin 500mg were found to be higher in private facilities as compared to public facilities in all the six counties. Only Metformin 500mg was found to have availability rates of more than 80% in both public and private facilities across the six counties. These findings correspond with several studies (Beran, Ewen, Lipska, Hirsch, & Yudkin, 2018; Chow et al., 2018; Ewen et al., 2017) that indicate low availability of medicines for non-communicable diseases in LMICs.

More than half of the available Atorvastatin 20mg and Methyldopa 250mg in both public and private facilities across the six counties was imported (56.4% and 68.1% respectively) while 90% of all Metformin 500mg available in both public and private facilities was locally produced.

5.2.2 Affordability

The lowest paid government worker would require a single day's wages to purchase locally manufactured Atorvastatin 20mg, while the same worker would require 2 to 3 days wages to purchase the imported brand of Atorvastatin. The lowest paid government worker would require 3 to 4 days wages to purchase Methyldopa 250mg, for both locally produced and imported brands. The lowest paid government worker would require a day's wages to purchase Metformin 500mg, for both locally produced and imported brands.

The lowest paid government worker would require a days wages to purchase a monthly dose of Atorvastatin 20mg in public facilities while the same worker would require about three (3) days wages to purchase the same medicine in private facilities (0.6 days vs 2.2 days respectively). The lowest paid government worker would require a days wages to purchase a monthly dose of Metformin 500mg in both public and private facilities (0.3 days vs 0.6 days respectively) while the same worker would require 3 to 4 days wages to purchase Methyldopa 250mg in both public and private facilities (3.3 days vs 3.3 days). These results correspond with studies that indicate unaffordability of medicines for NCDs in LMICs, with private facilities being more unaffordable than public facilities (Chow et al., 2018; Fukino et al., 2007)

A recent study done in Kenya on access to antihypertensive medicines in Kenya revealed that the biggest barrier to access of medicines was affordability (Syed et al., 2018). A second study on access to diabetes medicines in households in Kenya indicated that 26.1% of respondents did not have diabetes medicines and cited unaffordability as the reason for their lack of medicines (Hailu et al., 2018).

5.2.3 Medicine Price Ratios

The MPR for Atorvastatin 20mg was almost four times that of the international reference price list, the ratio was higher in private facilities as compared to public facilities (4.75 vs 1.19). The MPR for Methyldopa 250mg was 1.18 times the international reference price for both public and private facilities. The MPR for Metformin 500mg was three (3) times the international reference price with the ratio being higher in private than public facilities (3.38 as compared to 1.52). These results are consistent with several studies that indicate that people in LMICs pay much more for essential medicines than the international reference price (Mhlanga & Suleman, 2014; Rachel Silverman, Janeen Madan Keller & Chalkidou, 2019)

5.2.4 Catastrophic Health Expenditure (CHE)

The risk of incurring Catastrophic Health expenditure due to out of pocket purchase of medicines for households was 1.5%, 6.8%, 15.1% and 28.8% for Metformin 500mg, Atorvastatin 20mg, a combination of Metformin 500mg and Atorvastatin 20mg and Methyldopa 250mg respectively.

Several studies have been done in Kenya to assess the level of catastrophic health expenditure due to out of pocket payments for health. The incidence of CHE was found to be between 4.52% and 6.58 % depending on whether direct or indirect costs were considered (Barasa et al., 2017). A second study estimated the incidence CHE to be 5.8% and 6.1% for inpatient and outpatient services respectfully (Chuma & Maina, 2012). Both of these studies employed the higher threshold of 40% of non-food expenditure in calculating the incidence of CHE. While these studies dealt with payments for healthcare in general, a third study indicated that the odds for incurring CHE are 51.35% higher for non-communicable diseases as opposed to communicable diseases (Mwai & Muriithi, 2016). This could possibly explain the higher rates of CHE in the findings despite using the higher threshold of 40% in calculating CHE.

A study done in Kenya on the cost of hypertension care indicated that the costs were catastrophic for 59% of the households in the study if all direct costs were considered, with medicines accounting for 42.4% of direct costs (Oyando et al., 2019). Another study done in Kenya on the cost of diabetes care indicated that the cost of care was catastrophic to 75.5% of patients while using the 10% threshold in calculating CHE, with cost of medicines contributing the highest proportion of direct costs (Oyando et al., 2020).

A higher risk of catastrophic health expenditure due to the out of pocket purchase of the medicines was observed in the poorest quintile, with the lowest risk observed in the richest quintile. These findings are consistent with several studies that indicate that the poorest households are at the highest risk of experiencing CHE due to OOP purchase of medicines for NCDs (Bhojani et al., 2012; Oyando et al., 2019, 2020; Subramanian et al., 2018)

An analysis of the household characteristics indicated that the risk of catastrophic health expenditure due to out of pocket purchase of the medicines were higher in households of 1-3 people as compared to households with 10 or more people. This finding is counterintuitive as one would ordinarily expect household with more members to be more at risk of CHE. However, the finding could be partially explained by the likelihood of more than one breadwinner in large households thus mitigating against effects of CHE.

A study done on catastrophic health expenditures and its determinants in Kenyan slums indicated that the number of working adults in a household reduced the risk of incurring CHE(Buigut, Ettarh, & Amendah, 2015b). The finding could also be explained by presence of other confounding factors that could lead to a lower risk of CHE for larger households. There exists a need for further research to expound on which factors specifically explain this particular finding.

5.3 Conclusion

It is evident from the results of this study that there is low availability of medicines for management of NCDs in both public and private facilities in Kenya. And that the medicines are generally unaffordable. It is clear from the results of this study that citizens of Kenya like others in countries in the LMICs pay more for their medicines than the international reference price guide. It is also important to note that the results indicate a significant number of households at risk of incurring catastrophic health expenditure due to out of pocket purchase of medicines for NCDs. This risk is higher in the poorest households as opposed to the richest households.

5.4 Recommendations

This study recommends that emphasis be placed in increasing availability of medicines for NCDs particularly in the public sector. This should be done by streamlining the procurement and supply pipelines in the public sector to ensure that the WHO/HAI threshold for availability of 80% availability is attained and maintained.

The GOK should incentivize local production of all essential medicines to ensure increased availability and affordability of these medicines. As this study shows, Metformin 500mg had availability rates of 84.4% and 94.1% in private and public facilities respectively. And that 90.1% of all Metformin available was locally manufactured as opposed to 9.9% imported. Metformin 500mg was found to be affordable, the lowest paid government worker would require less than a day's wages to acquire a month's dose of medicine (0.3 public vs 0.6 private) and had the lowest risk of incurring catastrophic health expenditure (1.5%).

The National Health Insurance Fund and other insurance schemes should review packages for NCDs and increase coverage for medicine purchases as they contribute a significant proportion of out of pocket costs and have a substantial risk of incurring catastrophic health expenditure. Increasing coverage could also contribute to increased adherence to treatment and could lessen complications and hospitalizations which would translate to significant cost savings.

APPENDICES-ETHICS APPROVAL

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **951460**

Date of Issue: **20/August/2020**

RESEARCH LICENSE

This is to Certify that Dr.. Ahmed Mohamud Mire of Strathmore University, has been licensed to conduct research in Nairobi on the topic: A study on the Availability and Affordability of selected medicines for Non communicable diseases in Kenya for the period ending : 20/August/2021.

License No: **NACOSTI/P/20/6331**

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30th June 2020

Dr Mire Mohamud Khalif Ahmed
ahmed.mohamud@strathmore.edu

Dear Dr Mire,

RE: A Study on The Availability and Affordability of Selected Essential Medicines for Non-Communicable Diseases in Six Counties in Kenya

This is to inform you that SU-IERC has reviewed and **approved** your above research proposal. Your application approval number is **SU-IERC0819/20.** The approval period is **30th June 2020 to 29th June 2021.**

This approval is subject to compliance with the following requirements.

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-IERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-IERC within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-IERC within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to SU-IERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

for Dr Virginia Gichuru,
Secretary; SU-IERC

Cc: Prof Fred Were,
Chairperson; SU-IERC

STRATHMORE UNIVERSITY INSTITUTIONAL ETHICS REVIEW COMMITTEE (SU-IERC)
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Tuesday, 30 June 2020

To whom it may concern,

RE: FACILITATION OF RESEARCH – MOHAMUD AHMED MIRE

This is to introduce Ahmed Mire, admission number **MBA HCM/93634/2016** who is an MBA in Healthcare Management (MBA HCM) student at Strathmore University Business School (SBS). As part of our SBS MBA HCM Master's Program, Ahmed is expected to do applied research and to undertake a project. This is in partial fulfilment of the requirements of the Master of Business Administration. He would like to request for appropriate data from your organization to help him finalize his research.

Ahmed is undertaking a research project on **"Availability and Affordability of Essential Medicines for Non-Communicable Diseases Across Six Kenyan Counties."** The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

Our MBA seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct usefulness to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest, if not of practical value to your organization.

Any assistance you can provide to him will be greatly appreciated and we shall be willing to provide any further information required.

Yours Faithfully,

Veronica Muniu,
Manager – Programs.

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