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# An Assessment of the cost of diabetes disease among patients attending a level four facility in Nyeri Town Sub- County

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# An Assessment of the Cost Of Diabetes Disease Among Patients Attending A Level Four Facility In Nyeri Town Sub- County



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# 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 thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.



May 2019

**Approval**

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## DEDICATION

I dedicate this work to my mother whose deep love, inspiration and support live on even after she's gone.

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I am thankful to my husband, daughter, extended family and friends for their immense support throughout my MBA journey. I also thank my supervisor Dr. Ben Ngoye for the exemplary guidance, the Strathmore Business School faculty for their consistent commitment towards their students and my fellow MBA students for the encouragement and support. I also thank God for seeing me through this master's program.

# ABSTRACT

Diabetes is a life- long illness that requires close monitoring. The increasing cost of care could hinder access to quality care consequently leading to high morbidity, mortality and productive losses. The main objective of this study was to estimate the cost of illness of diabetes for patients receiving medical care at Mt. Kenya Sub County Hospital, Kenya. The specific objectives were to determine the direct healthcare and non- healthcare cost of diabetes and their impact on health and economic well- being on diabetic patients in a level four facility in Nyeri County. The study employed a descriptive design. The total direct healthcare costs were estimated to be Kshs. 13,261 per month while total direct non- healthcare costs were estimated to be Kshs. 3,088 per month, against an average monthly income of Kshs. 6,498. Due to the high cost of care in relation to income, patients developed coping mechanisms such as non- compliance to the recommended lifestyle and consequently were at risk of adverse health outcomes. The results of the study will be useful for the hospital administration to ensure comprehensive health promotive and preventive education on diabetes to patients. For patients and their families, the results of the study may be used to lobby for better home based care, fidelity to treatment and a health- promotive regimen and reconsideration of options for payment of health services. Finally, for policy makers the results of the study offer an opportunity to revisit and strengthen policies on diabetes prevention, and financing for non-communicable diseases in general and diabetes in particular.

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## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| COI | Cost of illness |
| IDF | International Diabetes Foundation |
| NCD | Non- communicable disease |
| NGO | Non- governmental organization |
| NHIF | National Hospital Insurance Fund |
| SDG | Sustainable Development Goal |
| UHC | Universal Health Coverage |
| USD | United States Dollar |
| WHO | World Health Organization |

# CHAPTER ONE

## 1.1 Introduction

This chapter presents a background to the study, the research gap, research objectives, research questions, rationale and scope of the study.

## 1.2 Background of the study

Diabetes is among the top 10 causes of death globally and accounts for over 80% of all premature deaths due to non-communicable diseases together with cardiovascular diseases, cancer and respiratory diseases (Murray, 2017). Diabetes mellitus refers to a group of chronic, non-communicable, metabolic disorders that manifest as hyperglycemia- raised levels of glucose in blood (Fauci et al,2001). Diabetes occurs when the body cannot produce enough insulin or is unable to utilize insulin. Insulin, a hormone produced by the pancreas, is required to drive in glucose from the bloodstream to the body's cells to produce energy. There are 4 broad categories of this disease: type 1, type 2, gestational and other types of diabetes (IDF, 2017).

Type 1 diabetes is characterized by an autoimmune reaction of the body towards insulin producing cells of the pancreas which results in a relative or absolute deficiency of insulin (Fauci et al, 2001). It can occur at any age but most commonly affects children and adolescents (Fauci et al, 2001). People with type 1 diabetes require daily insulin injections to maintain normal glucose levels.

Type 2 diabetes results from failure of the pancreas to produce adequate insulin or inability of the body to utilize insulin or both (Fauci et al, 2001). It is the most common type of diabetes accounting for 85% of all diabetic cases in developed countries and a higher percentage in developing countries (Mwangi & Gitonga, 2014). It is mostly seen in older adults but is increasingly being diagnosed in children, adolescents and younger adults due to rising levels of obesity, poor diet and physical inactivity (Fauci et al). The onset of type 2 diabetes is often slow and gradual making the actual time of onset difficult to determine (IDF, 2017). Consequently, half to a third of type 2 diabetes cases in the population may be undiagnosed because they remain without symptoms for many years (IDF, 2017). The cause of type 2 diabetes is strongly linked to obesity and being overweight, increasing age, ethnicity and family history (IDF, 2017). Modes of treatment for type

2 diabetes are adoption of a healthy lifestyle, oral medication and insulin to control blood glucose levels (Fauci et al; IDF, 2017).

Gestational diabetes occurs in women with no prior history of diabetes diagnosed with high blood sugar levels during pregnancy (Fauci et al, 2001). These women are at risk for adverse pregnancy outcomes such as high blood pressure and a large baby which can make normal delivery very difficult and risky (IDF, 2017). Babies born to mothers with gestational diabetes have a higher risk of obesity and developing type 2 diabetes later in life (IDF, 2017). Other specific types of diabetes such as secondary diabetes which results as a complication of other diseases and monogenic diabetes which arises from a single genetic mutation, are less common (Fauci et al, 2001; IDF, 2017). The lack, or ineffectiveness of insulin causes a high level of blood glucose which over the long term causes damage to body organs leading to life-threatening and/or disabling complications such as cardiovascular diseases, neuropathy, nephropathy and eye disease leading to blindness (International Diabetes Federation, 2011). However, if appropriate and timely management of diabetes is achieved, these complications can be delayed or prevented.

Globally, 4 million people aged 20- 79 years were estimated to die from diabetes in 2017(IDF, 2017). This was higher than the combined number of deaths caused by communicable diseases (1.1 million deaths from HIV/AIDS, 1.8 million form tuberculosis and 0.4 million from malaria in 2015)(IDF, 2017). Diabetes alone accounted for 10.7% of all- cause deaths among people aged 20-79 years old in 2017, 46.1% of whom were below the age of 60 (IDF, 2017). An increasing prevalence and mortality of diabetes among the economically active negatively impacts the economic development of a household.

Additionally, the majority of people with diabetes live in low and middle income countries, in which the greatest increase of new diabetes cases will occur in the next 17 years (Guariguata et al., 2014). Low income countries are projected to have a 92% increase in diabetes prevalence, lower- middle income countries 57%, upper-middle income countries 46% and higher income countries 25% (Ezzati, 2008; Whiting, Guariguata, Weil, Shaw, 2011). The prevalence of diabetes in the WHO African region increased by 129%- from 3.1% in 1980 to 7.1% in 2014- (Atun et al., 2017). In developed countries, most people with diabetes are above the age of retirement

while in developing countries those most frequently affected are between 35-64 years, therefore impacting people in their most economically productive years (World Health Organization, 2004).

Diabetes is a costly disease to manage due to its chronic nature and complexity of complications that arise from it. Global expenditure by people with diabetes aged 20-79 years was estimated to be USD 232 billion in 2007 and USD 727 billion in 2017 (IDF, 2017). It is estimated that 75% of this amount is from developing countries because of urbanization and rapid cultural and social changes (Zhang et al., 2010). Moreover, the healthcare cost of diabetes for a patient varies widely between countries e.g. USD 11,638 in the United States, USD 87 in Madagascar and USD 44 in the Central African Republic per year (IDF, 2017). Indeed, every year, more than 150 million people or approximately 44 million households worldwide face financial catastrophe and 100 million people are pushed into poverty as a direct result of paying for healthcare (Mylena, Carrin, Evans, & Xu, 2005). This could be worse for people living with diabetes in Kenya who receive frequent treatment paid out of pocket coupled with increased healthcare costs. The cost of managing diabetes includes direct costs incurred in managing the disease and indirect costs due to loss of productivity brought on by premature mortality, disability and time spent seeking care at healthcare facilities (World Health Organization, 2016). People living with diabetes have more outpatient visits, use more medications, have a higher chance of being hospitalized and are more likely to require emergency treatment and long- term care than people without the disease (Kirigia, Sambo, Sambo, & Barry, 2009b).

People living with diabetes in Kenya are at a high risk for high economic burden and catastrophic expenditure. Catastrophic health expenditure occurs when three factors are present: healthcare cost paid out- of- pocket, low household capacity to pay and lack of pre- payment mechanisms to pool financial risks (Mylena et al., 2005). When this expenditure is too high in relation to income, households are forced to cut down expenses on basic needs such as food and clothing and are unable to cater for their children's education (Mylena et al., 2005). Many people may decide not to use healthcare services simply because they are unable to cater for the direct costs such as consultation costs, cost of drugs and laboratory tests, or the indirect costs such as transport or recommended special diet. This may lead to adverse effects of illness

which have the potential of sinking poor households further into poverty (Mylena et al., 2005).

### 1.3 Burden of Diabetes in Kenya

Prevalence of diabetes in Kenya was 3.3% in the year 2000 and was projected to rise to 4.5% by the year 2025 (Maina et al., 2010) (J. Brown, 2008). There is however a disparity in distribution as the prevalence among urban dwellers is approximately 10.7% and 2.7% among rural dwellers (Amin et al., 2015). The National Diabetes Strategy states that these figures are an underestimate because about 60% of the population with diabetes are undiagnosed and present to health facilities with unrelated complaints (Maina et al., 2010). It is also estimated that 14% of the Kenyan population have impaired glucose tolerance, which is a precursor for developing diabetes (Amin et al., 2015).

Non- communicable diseases represent an increasing burden of ill health and death in the country (Ministry of Health, 2014). They accounted for 50-70% of all hospital admissions and up to half of all in- patient mortality in the year 2010 (Ministry of Health, 2014). Despite successes in controlling communicable diseases, the national health status has stagnated largely due to the increase of non- communicable diseases (World Health Organization, 2019) (Wake et al., 2006). Currently, there is lack of population based data on the burden and trends of diabetes and lack of comprehensive research that can inform policy on the best practices for the control of diabetes (Maina et al., 2010). However, in 2015 a STEPwise survey was conducted in the country to provide baseline data on prevalence of non- communicable diseases (Amin et al., 2015). It revealed that while 41% of the population with diabetes had been diagnosed, effective treatment coverage was only 7% (Amin et al., 2015).

Most people with diabetes do not die as a result of causes uniquely related to diabetes but of associated cardiovascular complications such as heart attack and stroke (World Health Organization, 2014). Diabetes was the 9$^{th}$ leading cause of death in Kenya in 2017, 14$^{th}$ in 2007 representing a 31.2% rise (IHME, 2019). It ranked 4$^{th}$ among non-communicable diseases namely: ischemic heart disease, stroke and cirrhosis that caused the highest mortality among persons of all ages (IHME, 2019). In 2017, diabetes ranked 7$^{th}$ among medical conditions that cause the most disability, a 51.7% rise from 2007 where it ranked 11$^{th}$ (IHME, 2019). Diabetes poses a risk of

development of cardiovascular complications such as stroke ischaemic heart disease which respectively were the 7th and 8th leading causes of highest mortality and morbidity combined (IHME, 2019)

Nyeri County is located in the central region of Kenya and has a population of about 693,558 people as of the year 2009 (KNBS, 2018)It comprises six sub counties, namely: Nyeri Town, Mukurwe-ini, Othaya, Mathira, Kieni and Tetu (KNBS, 2013). There are four level four hospitals in the county, namely: Karatina, Othaya, Mukurwe-ini, Mt. Kenya and one level five hospital, Nyeri County Referral (NyeriCounty, 2018). Nyeri County is considered as having the highest sub- national prevalence of diabetes which stands at 11.6% and as high as 20% among the richer families in the major urban centers (Masemiano, 2010).

### 1.4 Problem Statement

Diabetes has created a global problem due to the rising number of cases and complications associated with the disease. Four broad reasons explain the rise of lifestyle diseases in Africa (of which diabetes may be considered one): unplanned urbanization, little understanding of the risks that are associated with chronic disease, lack of access to healthcare and cost of treatment (Kirigia, Sambo, Sambo, & Barry, 2009a). Diabetes exerts a heavy burden on society in terms of health system costs incurred by society in managing the disease, indirect costs as a result of loss of productivity due to patient morbidity and premature mortality (Kirigia et al., 2009a).

Moreover, the proportion of Kenyans living on less than the international poverty line (USD 1.90 per day in 2011 purchasing power parity) was 35.6% in 2015/6 (The World Bank, 2018). For this group, meeting healthcare costs is likely to be a challenge. Additionally, health insurance coverage in Kenya is low, with only 17.1% of households reported to be in some form of pre-payment health scheme (KDHS, 2014). Indeed, health insurance coverage among the lowest wealth quintile was 3% compared to 42% in the highest income quintile in 2014 (KDHS, 2014). About 88.4% of households with health insurance are covered through NHIF, the other 11.6% through private health insurance (Mwai, 2017). Finally, on health financing, the national total health expenditure was Kshs346 billion in the financial year 2015/6, of which 26.1% was through household out-of-pocket payments (Mwai, 2017). Kenya does not have adequate funds for diabetes prevention or care. Kenyans

who can, independently fund their care- which places them and their families at a risk of poverty and poorer health should they not have adequate funds to finance chronic ailments such as diabetes. Some save money through non- compliance, increasing the risk of complications (Wake et al., 2006).

The lack of comprehensive research on diabetes cost of illness from a patient/ family perspective makes it hard for policy makers to realize the need to channel more effort towards diabetes prevention and emphasis on enrollment in pre- payment mechanisms to cushion families against out- of- pocket payments. Consequently, to address this gap, this study seeks to assess the cost faced by patients and their families in managing diabetes. The geographic area of study will be Nyeri County that has been determined as having the highest sub- national prevalence of the disease.

## 1.5 Research Objectives

### 1.5.1 Main Objective

The broad objective was to determine the cost of diabetes among patients at a level four healthcare facility in Nyeri Town Sub County.

### 1.5.2 Specific Objectives

i. To estimate the direct costs borne by patients in addressing diabetes at a level four facility in Nyeri Town Sub County.
ii. To determine the impact of direct costs of diabetes on the health and economic well- being of patients at a level four facility in Nyeri Town Sub County.

## 1.6 Research Question

The study sought to answer the following questions:

i. What is the direct cost of diabetes for patients at a level four facility in Nyeri Town Sub County?
ii. What is the impact of cost on the health and economic well- being of diabetes patients attending at a level four facility in Nyeri Town Sub County?

## 1.7 Rationale of the study

Given the increasing burden of diabetes in terms of prevalence, morbidity and mortality, this study estimated the cost of illness among diabetes patients in Nyeri

Town Sub County at a level four facility, namely_ the Mt. Kenya Sub County Hospital, which will be of importance to several key players.

The study challenges Mt. Kenya Sub County Hospital to introduce screening programs and provide comprehensive patient education on diabetes and its complications. This will help in early diagnosis of diabetes and consequently prevent or delay the onset of complications. Additionally, patient education will hopefully challenge the population to adopt healthier lifestyles to prevent diabetes onset.

This study will also hopefully inspire introduction of more robust programs at the Nyeri County Government policy level to reduce the incidence of diabetes in the county which may be replicated country wide.

### 1.8 Scope of the study

This study was limited geographically to Mt. Kenya Sub County Hospital thereby leaving out the other health facilities in the county. The respondents of the study were patients living with diabetes for up to five years and attending diabetes outpatient clinic at the facility. Chronic illnesses in Kenya are mostly managed at tertiary healthcare facilities which are mostly owned by government. Patients with advanced disease and complications are mostly managed at the Nyeri County Referral Hospital, while the rest are managed at level four facilities. The study was limited to determining the cost of managing diabetes among patients attending diabetes outpatient clinic at the level four hospital.

### 1.9 Limitations

To circumvent the possibility of respondents not giving information freely, any personal information was anonymized, respondents were presented with a signed confidentiality agreement and were continually assured that their information would be treated with utmost confidentiality. I also highlight that due the one year recall, some cost items were missed due to forgetfulness. Furthermore, self-report of costs may give an underestimation or exaggeration of the problem. Access to multiple points of care within the period of study also complicated my ability to determine all unit costs incurred by the patient for the year under study.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

This chapter presents a background of the literature review, an overview of cost of illness studies, a review of published articles and the conceptual framework

## 2.2 Background

The burden of diabetes, cardiovascular diseases and related risk factors is rapidly growing in Africa and the group mostly affected is young adults and especially those in the lower socio-economic strata. Moreover, African health systems are not strong enough to cope with the existing double burden of communicable and non-communicable diseases (Kengne, McHiza, Amoah, & Mbanya, 2013). Given the double burden of disease and limited resources, diabetes must compete for political attention and financial investment. In previous centuries, non- communicable diseases were referred to as 'prosperity diseases', in that they were a reserve for the rich and elite in society. The majority of the population at the time lived in rural set-ups and languished in poverty and diseases such as diabetes were largely unheard of in Africa (Jakovljevic & Milovanovic, 2015). However, the adoption of new lifestyles and dietary practices coupled with epidemiological transition and demographic changes have led to a rapid increase in the number of individuals with diabetes in Africa (Azevedo & Alla, 2008). It was estimated that in 2017, five million deaths worldwide were attributed to diabetes in persons aged 20-99 years (Cho et al., 2018). Over a third of these deaths (1.8 million or 36.5%) occurred in people under the age of 60 years. The largest proportion of deaths attributed to diabetes in those below the age of 60 was in the African region at 73.7% (Cho et al., 2018). The International Diabetes Federation (IDF) estimated that 15.5 million adults aged 20-79 years had diabetes in 2017 in Africa and the number is expected to rise to 40.7 million adults aged 20-79 years by 2045 (IDF, 2017).

In 2017, USD 3.3 billion was spent on healthcare by people with diabetes in Africa. This amount is projected to reach USD 6 billion by the year 2045 (IDF, 2017). These figures are however an under-estimate because about 69.2% of adults aged 20-79 years living with diabetes are undiagnosed. This unmet need for diabetes diagnosis is

due to weak health systems that fail to screen the population for diabetes (Manne-Goehler & Atun, 2016). Individuals with diabetes are risk of developing chronic complications such as heart disease, eye complications and kidney disease (IDF, 2017). These complications, in addition to the rise in diabetes prevalence will make it a very expensive disease to manage.

The increase in diabetes prevalence and mortality places a strain on the already over-stretched African health systems. The need to address the non- communicable disease pandemic is now enshrined in the 17 Sustainable Development Goals. The target of SDG 3 is to reduce by one third, premature mortality from non-communicable diseases through prevention and treatment by the year 2030 (UN, 2019). The successful accomplishment of this goal will lead to a decrease in prevalence of non- communicable diseases and consequently a reduction in the cost of managing the condition.

In response to the increasing burden of non- communicable diseases, in 2015 the government of Kenya launched a five year National Strategy for the Prevention and Control of Non- communicable Diseases (M.o.H., 2015). Similarly, a five year National Diabetes Strategy was launched in 2010 (Maina et al., 2010).The common goal of these strategies is to guide the implementation of interventions to reduce the morbidity and mortality due to non- communicable diseases.

Cost of illness studies have been used in conducting research on a wide array of diseases and continue to inform on economic evaluations of treatments and other healthcare interventions despite the fact that their usefulness has been questioned (Rice, 2000). An assessment of diabetes cost in Kenya is of importance because the disease incidence is on a rapid increase and mostly affects young people thus has the potential to affect economic productivity and threaten the lives of many families. An estimation of costs attributed to diabetes can give insight on importance of diabetes prevention and facilitate adoption of cost- effective treatment options

## 2.3 Overview of cost-of-illness studies

### 2.3.1 Definition of costs

Cost of illness studies (COI) classify costs into three categories: direct costs, indirect costs and intangible costs.

**Direct costs**

Direct costs are the resources used to treat the disease, that is, expenditure for medical care and treatment (Segel, 2006; Jo, 2014). Direct costs has two sub-categories: a) direct medical costs which include hospitalization costs, medication, laboratory tests, emergency services, medical supplies, outpatient visits and traditional medicine services; and b) direct non- medical costs which include transport cost to health facility and cost of meals en- route to hospital (Segel, 2006; Jo, 2014).

**Indirect costs**

Indirect cost refers to the productivity losses due morbidity, disability or premature mortality borne by the individual, family society or by the employer (Segel, 2006; Jo, 2014). There are three methods of measuring indirect costs:

Human capital method: The productivity losses associated with the morbidity and mortality of an individual are the market value of that individual's future contribution in society if s/he had continued to work in full health (Jo, 2014). Thus, the human capital method (HCM) is designed to estimate the value of human capital as the present value of his/ her future earnings under the assumption that we use future earnings as a proxy for future productivity(Jo, 2014).

Friction cost method: The friction cost method (FCM) estimates the value of human capital when a person from the unemployment pool replaces the present value of a worker's future earnings until the sick worker returns or is eventually replaced (Jo, 2014). Hence, the friction cost (initial disruption costs plus training costs) is limited to the illness or death over a short- term period defined as 'friction period'(Jo, 2014).

Willingness to pay method: The willingness to pay method (WTP) measures the amount that an individual is willing to pay in order to reduce the probability of illness or mortality (Jo, 2014).

**Intangible costs**

These costs cannot be converted to money and are immeasurable (Segel, 2006). They include social and emotional costs like pain, suffering, and lack of quality of life, lack of participation in social events or poor emotional health (Segel, 2006).

### 2.3.2 Perspective of COI studies

The perspectives used are societal (loss if income while caring for the sick), participants and their families (for example out- of- pocket payments), healthcare system, third- party payers, business sector (loss of productivity) and the government (infrastructure, support program costs (Jo, 2014)). Each of these categories include marginally different sets of cost of items and thus each perspective gives rise to different kinds of results for the same disease (Hodgson, 1994; Segel, 2006). Table 1 presents the cost categories included in each perspective. The societal perspective is the most comprehensive because it includes all direct medical costs and indirect costs for all members in each society where they are all involved. It however requires the largest sizeable data making it difficult to use in specific cases with less prevalent diseases. In the business perspective, the friction method is dominant (Jo, 2014).

Table 1. 1: Costs included in cost- of- illness studies by perspective

| Perspective | Medical cost | Morbidity cost | Mortality cost | Transportation / non-medical cost | Transfer payment |
|---|---|---|---|---|---|
| Societal | All costs | All costs | All costs | All costs | - |
| Healthcare system | All costs | - | - | - | |
| Third party payer | Covered costs | - | Covered costs | - | - |
| Business | Covered costs (self-insured) | Productivity losses (absenteeism) | Productivity losses | - | - |
| Government | Covered (medical aid) | - | - | Criminal justice costs | Attributable to illness |
| Participants and families | Out-of-pocket costs | Wage losses/ household production | Wage losses/ household production | Out-of-pocket costs | Amount received |

Source: Luce & Manning, 1996 (Luce & Manning, 1996)

### 2.3.3 Approaches to COI studies

**Prospective vs. retrospective approaches**

The approach of a COI study can either be prospective or retrospective (Jo, 2014). For a prospective approach, all relevant cost components are followed up over a certain period of time in the future (Jo, 2014). This makes this approach expensive in terms of time and resources. In a retrospective approach, all relevant cost components are followed up from previous records. It is thus less time consuming and less expensive (Jo, 2014).

**Prevalence vs. incidence approaches**

Common epidemiological approaches in COI are prevalence based and incidence based approaches (Segel, 2006 ; Jo, 2014). The prevalence approach is used to estimate the economic burden of a disease over a specified length of time, commonly six months to a year (Segel, 2006; Jo, 2014). The incidence approach involves analysis of cost of a case within a given period and usually follows people at similar stages of disease or diagnosis. It estimates the life- time cost of a condition from its onset until its disappearance (cure or death). The prevalence- based approach is the most practicable method to measure the nature of long- lasting conditions that require considerable lengthy follow- up periods. Both prevalence- based and incidence- based COI studies can be organized either in a prospective or retrospective way (Tarricone, 2006).

**Top- down vs. Bottom- up vs. Econometric approaches**

1) Top-down approach: The top-down approach, also referred to as the epidemiological or attributable risk approach measures the proportion of a disease that is attributable to exposure to the disease or risk factors (Jo, 2014)
2) Bottom- up approach: In bottom- up approach, the estimation of costs is stratified into two steps. The first step is to measure and quantify the health inputs used and the second step is to estimate the unit cots if the inputs used to produce and confer specific medical and healthcare services. The total cost is a result of the multiplication of the unit cost and units used (Jo, 2014)
3) Econometric approach: The econometric approach tries to estimate the difference in cost between a cohort with the disease and another cohort without the disease (Jo, 2014).

Consequently, and based on the attributes discussed above, this study takes on a bottom- up, retrospective, prevalence-based approach.

### 2.3.4 Defining the disease and population

Most of the studies focused on the cost of diabetes type 2, five focused on both type 1 and 2, six did not specify on the type of diabetes while none considered the cost of type 1 diabetes in isolation. 75% of the studies focused on general costs of diabetes, 10% on cost of drugs while the remaining 15% focused on cost of the diabetic complication of foot ulcer. In addition to discussing the general costs of diabetes, three studies also estimated the costs of diabetes complications such as hypertension,

stroke and nephropathy (Alouki et al., 2015; Suleiman & Festus, 2014; Mutowo et al., 2016). Most studies included had sample sizes ranging from 101-1000 (n=8), followed by 0-100 (n=5). Two studies had sample sizes of over one million and five studies were hypothetical and costs were calculated without utilizing any samples (Alouki et al., 2015; Lamlili, & Boutayeb, 2013; Cavanagh, Attinger, Bal, Rojas, & Xu, 2012; Jingi et al., 2014; Subramanian et al., 2018). In selecting the samples to be included in the studies, five specified the age of the individuals (Basu, Shankar, & Yudkin, 2017; Eliadarous et al., 2010; Fadare, Olamoyegun, & Gbadegesin, 2015; Okediji et al., 2017; Okoronkwo, Ekpemiro, Okwor, Okpala, & Adeyemo, 2015) and two studies specified the duration of illness (Eliadarous et al., 2010; Okediji et al., 2017).

This study will focus on the general cost of both type 1 and 2 diabetes of a total of sixty patients.

### 2.3.5 Epidemiological Approach

Only one study used the incidence approach whereby a life course of new and present diabetes cases was simulated over the period of 2016-2025 (Basu et al., 2017). The others studies utilized the prevalence approach where they estimated the economic impact of existing diabetes cases over a period of one month to two years. This study will utilize the prevalence approach where the cost of diabetes from 1st November 2017 to 30th November 2018 will be estimated.

### 2.3.6 Study perspective

The most commonly utilized perspective was the patient perspective, followed by the societal perspective then combined patient and health system perspective. Some studies did not specify the perspective, but the reviewer was able to interpret and classify them. This study will utilize the patient perspective.

### 2.3.7 Data resources

A majority of the studies reviewed used hospitals/ medical centers as their sources of data, some studies conducted patient interviews while others studies employed various sources such as healthcare providers and suppliers catalogues, international drug price indicators, non-governmental organizations and health insurance data. This study will use patient interviews and hospital data records

### 2.3.8 Resource quantification

Resource consumption can either be estimated prospectively or retrospectively (Tarricone, 2006). Prospective cost of illness studies require one to follow up patients over time while in retrospective studies the relevant costs are retrieved from previous records. Two studies estimated costs prospectively (Basu et al., 2017; Pepper, Burch, Levitt, & Cleary, 2014), two studies were hypothetical(Cavanagh et al., 2012; Basu et al., 2017) and the rest employed a retrospective approach. Sixteen studies used the bottom- up approach in which either patient interviews were conducted (Eliadarous et al., 2010; Fadare et al., 2015; Okediji et al., 2017; Okoronkwo et al., 2015; Bermudez-tamayo, Johri, & Assa, 2017; Mwavua, Ndungu, Mutai, & Joshi, 2016) or hospital/ health centre records were reviewed (Alouki et al., 2015; Suleiman & Festus, 2014; Mutowo et al., 2020; Cavanagh et al., 2012; Jingi et al., 2014; Subramanian et al., 2018; Pepper et al., 2014; Danmusa, Terhile, Nasir, Ahmad, & Muhammad, 2016; Ipingbemi & Erhun, 2015; Quaye, Amporful, Akweongo, & Aikins, 2015) to gather activity data. One study used the econometric approach whereby direct and indirect costs between diabetic and non- diabetic patients were compared (Bermudez-tamayo et al., 2017). Expert opinion or standard practice was used to estimate cost of illness in tow studies (Basu et al., 2017; Volmink, Bertram, Jina, Wade, & Hofman, 2014). Resource consumption was estimated using various national indicators, national surveys and published studies in two studies (Kirigia et al., 2009a; Boutayeb et al., 2013). One study estimated resource consumption based on price data form tenders from the ministries of health at the point of entry to the given countries (Atun et al., 2017).

### 2.3.9 Cost of diabetes mellitus

There has been growing concern over the increase in prevalence of diabetes in Africa and a growing need for the need to address the burden associated with the disease by prioritizing interventions that prevent or delay the onset of the illness. For this to be achieved, in depth knowledge on the cost of managing the illness needs to be realized in order to grasp the magnitude of the problem on society.

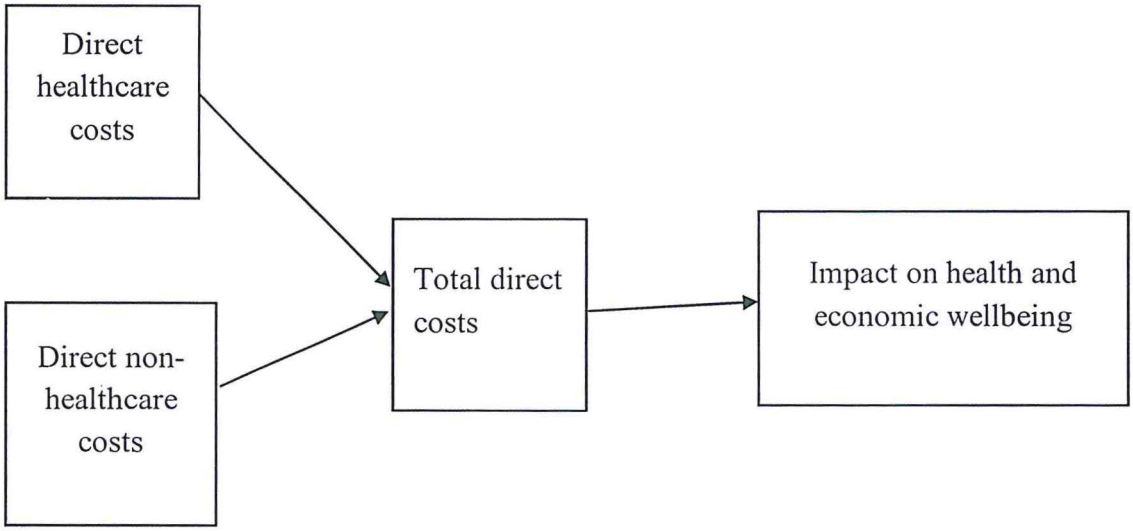
All the studies reviewed provided sufficient information to calculate the per capita costs of diabetes and two studies extended the national cost of diabetes (Suleiman & Festus, 2014; Boutayeb et al., 2013). The per capita direct cost of diabetes in Morocco in 2013 was estimated to be between USD 259 and USD 830 per year

which represented a 1.75 to 5.6 times the per capita health expenditure (USD 148) (Boutayeb et al., 2013). Indirect cost per capita was USD 1113 per year. . Indirect costs accounted for 57% to 81% of the total economic cost of diabetes in Morocco. The study found a large variability in the costs related to treatment of diabetes between NGOs, government and private health sectors. To overcome this, three scenarios were used: high, low and medium price. Prevalence of diabetes was based on values provided by the International Diabetes Federation, World Health Organization and the Moroccan ministry of health. Indirect costs were estimated using the human capital method whereby the lifetime foregone earnings caused by premature death and disability due to diabetes are calculated. The study estimated all the costs from as patient perspective. Boutayeb and colleagues (2013) recommend that given the economic and sustainable development issue caused by diabetes, health decision makers should consider diabetes in its integrated context, requiring health education and sensitization, early diagnosis and treatment avoid complications or at least delay them as far as possible.

### 2.4 Conceptual framework

The figure below presents a conceptual framework of the cost of illness of diabetes. The figure illustrates the various components of cost related to diabetes. Various approaches can be used to determine the economic burden of a public health problem such as diabetes. These include: the willingness- to- pay approach (Kirigia, Sambo, & Kainyu, 2000), the macroeconomic/ production function approach (Kirigia, Sambo, Aldis, & Mwabu, 2004) and the cost-of- illness approach (Kirigia & Sambo, 2003). This study employed the latter approach because it highlights the magnitude of the impact of an illness on a society. Due to the complexity in determining indirect costs of illness, this study will focus on the direct costs only.

Figure 2. 1: conceptual framework of the costs of illness of diabetes



# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter presents the research design used, target population, sampling method and size, inclusion and exclusion criteria, data analysis, research quality and ethical issues faced in the research.

## 3.2 Research design

This was a descriptive study. This design is appropriate for this kind of study that attempts to retrospectively determine costs incurred over a period of time and results in credible information (Ruspini, 2002). Data was collected through patient interviews and through reviews of secondary data- most notably, patient files.

## 3.3 Target population

Respondents in the study were patients living with diabetes for the last five years and who attended diabetic outpatient clinics between January 2018 and November 2018. The period was limited to one year due to the limitation in recall of information by respondents. The month of December was also excluded from the study because since the Universal Health Coverage (U-H-C) programme was launched in that month, patients in Nyeri County have been accessing health services free of charge in all government facilities. Patients living with diabetes for more than five years were excluded from the study due to the higher prevalence of diabetes- related complications and co- morbidities which may not give a true picture of cost of diabetes management in isolation.

## 3.4 Sampling and samples size

A total of 921 diabetes outpatient clinic visits were made between the month of January 2018 and November 2018, with an average of 83.7 visits. Using this average, a sample size of 83 patients who satisfied the inclusion criteria was selected randomly.

## 3.5 Inclusion Criteria

Patients living with diabetes for up to five years and attended diabetes outpatient clinic between January 2018 and November 2018.

### 3.6 Exclusion Criteria

a. All patients who decline consent and patients under the age of 18 without a parent/guardian with them at the time of the study.
b. Patients who cannot be traced at the time of study.
c. Patients who have lived with diabetes for more than five years.
d. Patients who have not attended diabetes outpatient clinic between January 2018 and November 2018.

### 3.7 Data collection methods

Primary and secondary data will be collected in this study. Primary data was collected using a structured questionnaire, while secondary data was collected from patient files. Data collected from questionnaires comprised of consultation cost, hospitalization cost, cost of health insurance, cost of transport and cost of hiring an extra caregiver. The patient files were used to collect data on type of diabetes, comorbidities, types and quantity of medication used, laboratory and radiological tests done. The unit costs of drugs and tests was sought from the hospital software-*medboss*. The cost of drugs and tests was obtained by multiplying the unit costs by the number of the respective commodities.

### 3.8 Data Analysis

After questionnaires were collected, they were checked for completeness and accuracy. Only complete and accurately filled questionnaires were considered for the study. Data from the questionnaires was analyzed using excel. Descriptive statistical tools such as mean and frequency were adopted. Cross tabulation using excel was used to establish the relationship between certain characteristics of the respondents.

### 3.9 Research Quality

#### 3.9.1 Validity

Validity determines whether the research truly measures that which it was intended to measure (Golafshani, 2003). Tools that researchers use are valid if their contents are relevant to the study's objectives. Consequently, experts reviewed the questionnaire to establish both face and construct validity.

#### 3.9.2 Reliability

Reliability is the extent to which the results of a study are consistent over time, are an accurate representation of a population and can yield the same results on repeated

trials (Golafshani, 2003). First, the researcher structured questions in the survey following those used in prior studies that have been tested and validated. Second, the researcher pretested questionnaires with five patients, who did not participate in the main study. The researcher then evaluated the completed research instruments to test for reliability following which the revised tools were applied to the main study.

### 3.10 Ethical Issues in Research

Ethical considerations regarding the research process were dealt with by obtaining ethical clearance to legitimize the study from the Ethics Review Committee and the Nyeri County Government. Informed consent was sought from all respondents and their responses held in confidence. For the respondents under the age of eighteen, informed consent was obtained from the parent or guardian. During the study, the researcher followed ethical guidelines to ensure that no participant faced physical, psychological or emotional harm. Ethical considerations regarding the researcher were dealt with by ensuring that no unauthorized person(s) gained access to the research data.

# CHAPTER FOUR

# PRESENTATION OF RESEARCH FINDINGS

## 4.1 Introduction

This chapter presents data findings from the field, its analysis and interpretation thereof. The data was collected through patient interviews, information from the patients' files and price data list from the hospital. The data findings were on the cost of diabetes disease among patients at a level four facility in Nyeri town Sub County. There was a 100% response rate which was achieved after the researcher explained the nature and purpose of the study to the interviewees.

## 4.2 Demographic characteristics

The study examined the background information of the respondents regarding age, gender, marital status, education level and work status. The results are discussed below.

### 4.2.1 Age category

Table 4. 1: Distribution of respondents by age category

| Age | Frequency | Percentage |
|---|---|---|
| 18-25 | 2 | 2.5 |
| 26-35 | 4 | 4.8 |
| 36-45 | 9 | 10.8 |
| 46-55 | 16 | 19.3 |
| 56-65 | 20 | 24.1 |
| 66-75 | 25 | 30.1 |
| Over 75 | 7 | 8.4 |
| Total | 83 | 100 |

The results of age distribution shows that majority of the respondents attending diabetes outpatient clinic at Mt. Kenya Sub County Hospital are in the 66-75 years age bracket, followed by those in the 56-65 years age bracket. 73.5% of the respondents are between the ages 46-75. This is the category of patients more likely to develop diabetes in the population.

### 4.2.2 Gender

The distribution of the respondents according to gender is shown in the table below

Table 4. 2: Gender of the respondents

| Gender | Frequency | Percentage |
|---|---|---|
| Male | 32 | 38.6 |
| Female | 51 | 61.4 |
| Total | 83 | 100 |

Results from the respondents sampled indicated that the majority were female at 61.4% whereas male comprised of 38.6%.

### 4.2.3 Marital Status

Table 4. 3: Distribution of respondents as per marital status

| Marital Status | Frequency | Percentage |
|---|---|---|
| Married | 40 | 48.2 |
| Single | 10 | 12 |
| Divorced/ separated | 12 | 14.5 |
| Widow/ widower | 21 | 25.3 |
| Total | 83 | 100 |

From the findings, 48.2% of the respondents were married, 25.3% widowed, 14.5% were separated/ divorced and 12% were single.

### 4.2.4 Education level

Table 4. 4: Distribution of education level of the respondents

| Highest education level attained | Frequency | Percentage |
|---|---|---|
| No formal education | 18 | 21.7 |
| Primary | 27 | 32.5 |
| Secondary | 29 | 35 |
| University/college/ polytechnic | 8 | 9.6 |
| Postgraduate | 1 | 1.2 |
| Total | 83 | 100 |

From the findings, 35% of the respondents had attained secondary education, 32.5% primary education, 21.7 % had no formal education, and 9.6% had reached university / college / polytechnic level while 1.2% had attained postgraduate level. This is representative of the results by the Kenya National Bureau of Statistics which in 2013 estimated that 34% of Nyeri County residents had a secondary level of education and above, 54% had primary level of education only and 12% had no formal education (KNBS, 2013).

### 4.2.5 Work Status

Table 4. 5: Work status

| Current work status | Frequency | Percentage |
|---|---|---|
| Unemployed | 32 | 38.6 |
| Employed | 51 | 61.4 |
| Total | 83 | 100 |

At the time of study, 61.4% of the respondents were unemployed and 38.6% were employed.

### 4.2.6 Source of Income for the Unemployed

Table 4. 6: Source of income for the unemployed

| Source of income | Frequency | Percentage |
|---|---|---|
| Support from family members | 3 | 9.4 |
| Pension | 9 | 28.1 |
| Farming | 15 | 46.9 |
| Other businesses | 5 | 15.6 |
| Total | 32 | 100 |

46.9% of the unemployed earned income from selling their farm produce, 28.1% were retired and relied on pension, 15.6% relied on income from other businesses other than farming while 9.4% wholly depended on family members for upkeep.

### 4.2.7 Active Health Insurance enrollment

Table 4. 7: Health insurance enrollment

| | Frequency | Percentage |
|---|---|---|
| Yes | 25 | 30.1 |
| No | 58 | 69.9 |
| Total | 83 | 100 |

69.9% of the respondents were not actively enrolled in any health insurance scheme, 30.1% were enrolled.

### 4.2.8 Hiring of an extra housekeeper

Table 4. 8: Hiring of an extra housekeeper

| | Frequency | Percentage |
|---|---|---|
| Yes | 16 | 19.3 |
| No | 67 | 80.7 |
| Total | 83 | 100 |

80.7% of the respondents did not require hiring an extra housekeeper while 19.3% did.

## 4.3 Descriptive findings

This section presents findings in accordance to the objectives of the study.

### 4.3.1 Duration of illness

Table 4. 9: Duration of illness

| Duration of illness in years | Frequency | Percentage |
|---|---|---|
| 1 | 17 | 20.5 |
| 2 | 22 | 26.5 |
| 3 | 13 | 15.7 |
| 4 | 25 | 30.1 |
| 5 | 6 | 7.2 |
| Total | 83 | 100 |

30.1% of the respondents had lived with diabetes for four years, 26.5% for two years, 20.5% for one year, 15.7% for three years and 72% for five years.

### 4.3.2 Type of diabetes

Table 4. 10: Type of diabetes

| Diabetes type | Frequency | Percentage |
|---|---|---|
| 1 | 4 | 4.8 |
| 2 | 79 | 95.2 |
| Total | 83 | 100 |

95.2% of the respondents had type two diabetes and 48%had type one diabetes. This information was sourced from their files.

### 4.3.3 Number of years attending clinic

Table 4. 11: Number of years attending clinic

| Years | Frequency | Percentage |
|---|---|---|
| 0-2 | 30 | 36.1 |
| 3-5 | 53 | 63.9 |
| Total | 83 | 100 |

63.9% of the respondents had been attending diabetes outpatient clinic for three to five years and 36.1% for zero to two years.

### 4.3.4 Frequency of attendance between January 2018 and November 2018

Table 4. 12: Frequency of clinic attendance

| No. of visits | Frequency | Percentage |
|---|---|---|
| 1-5 | 72 | 86.7 |
| 6-10 | 11 | 13.3 |
| 11-15 | 0 | 0 |
| Total | 83 | 100 |

86.7% of the respondents had attended diabetes outpatient clinic between one to five times over the study period of January 2018 and November 2018 and 13.3% had six to ten visits.

### 4.3.5 Co- morbidities

Table 4. 13: Co- morbidities

| Co- morbidity | Frequency | Percentage |
|---|---|---|
| Hypertension | 51 | 61.44 |
| Arthritis | 17 | 20.48 |
| COPD | 7 | 8.43 |
| Others | 23 | 27.71 |

Majority of the respondents had hypertension as a co- morbidity, followed by arthritis and COPD. Some respondents had more than one comorbidity. This information was obtained from their medical files.

### 4.3.6 Cross tabulation of type of drugs used and average cost per month

Table 4. 14: Cross tabulation of type of drugs used and average cost per month

| Drug | Frequency | Percentage | Average cost incurred (Kshs.) |
|---|---|---|---|
| Oral drugs only | 53 | 63.8 | 474 |
| Insulin only | 11 | 13.3 | 673 |
| Both insulin and oral drugs | 19 | 22.9 | 948 |
| Total | 83 | 100 | 2095 |

The majority of respondents, 63.8% were on oral diabetes drugs only, 22.9% were on both oral drugs and insulin while 13.3% were on insulin only. This data was obtained from the respondents' files. Patients who were on both insulin and oral drugs spent the highest amount on drugs per month, Kshs. 948 while patients on oral drugs only spent the least amount, Kshs. 474. Patients on insulin only spent Kshs. 673.

### 4.3.7 Hospitalization between January 2018 and November 2018

Table 4. 15: Hospitalization within study period

| | Frequency | Percentage |
|---|---|---|
| Yes | 13 | 15.7 |
| No | 70 | 84.3 |
| Total | 83 | 100 |

84.3% of the respondents had not been hospitalized between January and November 2018, 15.3% had been hospitalized at least once due to diabetes.

### 4.3.8 Reasons for hospitalization

Table 4. 16: Reasons for hospitalization

| | Frequency | Percentage |
|---|---|---|
| Hyperglycemia | 8 | 61.5 |
| Respiratory illness | 2 | 15.4 |
| Others | 3 | 23.1 |
| Total | 13 | 100 |

Of the respondents who had been hospitalized, 61.5% were due to hyperglycemia, 15.4% due to respiratory illnesses and 23.1% due to other illnesses.

### 4.3.9 Cross tabulation of adherence to diabetes- specific diet and total direct cost per month

Table 4. 17: Cross tabulation of adherence to diabetes- specific diet and total direct cost per month

| | Frequency | Percentage | Total direct cost per month (Kshs.) |
|---|---|---|---|
| Yes | 27 | 32.5 | 15, 649 |
| No | 56 | 67.5 | 17, 836 |
| Total | 83 | 100 | 33,485 |

67.5% of the respondents did not adhere to a diabetes- specific diet and spent Kshs. 17, 836 per month on healthcare. 32.5% adhered to a diabetes specific diet and spent Kshs. 15,649 per month on seeking healthcare.

### 4.3.10 Reasons for not being on diabetes- specific diet

Table 4. 18: Reasons for not being on diabetes- specific diet

| Reasons | Frequency | Percentage |
|---|---|---|
| Financial constraints | 29 | 51.8 |
| Lack of knowledge | 12 | 21.4 |
| Disregard of nutritional advice | 10 | 17.9 |
| Others | 5 | 8.92 |
| Total | 56 | 100 |

Of the 56 respondents who did not adhere to a diabetes-specific diet, 51.8% cited financial constraints as the reason, 21.4% reported they had no knowledge on such a diet, 17.9% had the knowledge but chose to not comply while 8.92% had a wide variety of reasons as to why they did not adhere to a diabetes- specific diet.

### 4.3.11 Direct Healthcare Costs

Table 4. 19: Direct Healthcare costs per capita per month

| Healthcare costs | Average cost in Kshs | Percentage of total | |
|---|---|---|---|
| Oral drugs | 306 | 2.3 | n= 53 |
| Insulin and syringes | 550 | 4.1 | n=11 |
| Consultation | 132 | 1 | n= 58 |
| Cost of hospitalization | 6,783 | 51.1 | n= 13 |
| Cost of laboratory tests | 2,610 | 19.7 | n= 69 |
| Cost of radiological tests | 2,380 | 18 | n= 12 |
| Cost of insurance premium | 500 | 3.8 | n= 58 |
| Total | 13,261 | 100 | |

The total direct healthcare cost was Kshs. 13,261 per capita per month. The cost of hospitalization accounted for the largest share of this cost, at 51.1%, followed by laboratory tests at 19.7%, radiological tests at 18%, insulin and syringes 4.1%, insurance premium 3.8%, oral drugs 2.3% and lastly consultation 1%.

### 4.3.12 Direct non- healthcare costs

Table 4. 20: Direct non- healthcare costs per capita per month

| Non- healthcare costs | Average cost in Kshs. | Percentage of total | |
|---|---|---|---|
| Transport | 564 | 18.3 | n= 83 |
| Changes in diet | 1,250 | 40.5 | n= 43 |
| Extra housekeeper | 1,274 | 41.2 | n= 16 |
| Total | 3,088 | 100 | |

The total direct non- health care cost was Kshs. 3,088 per capita per month. 41.2% of this amount was spent on hiring of an extra housekeeper, 40.5% on cost of making changes to diet and transport comprised 18.3%

### 4.3.13 Total Direct cost

The total direct cost was obtained by adding total direct healthcare costs to total direct non- healthcare costs:

Total direct cost= Total direct healthcare cost + total non- healthcare direct cost

=13,261+3, 088

= Kshs. 16,349

Kshs. 16,349 was the total direct cost incurred per capita per month. Direct healthcare costs comprised 81.1% of this amount while direct non- healthcare costs accounted for 18.9% of the total.

# CHAPTER FIVE

# DISCUSSION

Diabetes exerts a heavy economic burden on individuals. Consequently, they need comprehensive healthcare insurance coverage to cushion them against catastrophic health expenditure. Majority of the respondents in this study, 69.9% did not have health insurance and thus catered for their healthcare costs out- of- pocket.

The total direct cost of managing diabetes was Kshs. 16,349 per capita per month. The World Health Organization estimated the total health expenditure per capita per year in Kenya in 2014 was USD 169 (WHO, 2019), which represents about a tenth of the amount spent by diabetes patients in this study. People with chronic illness such as diabetes use healthcare services more than those without chronic illnesses. A case control study done in Mali in 2017 compared the healthcare costs between diabetic and non- diabetic patients over a ninety- day period. The results showed that while non- diabetic patients spent a total of USD 88.7 on healthcare, diabetic patients spent USD 314.8 which was almost four times higher than that incurred by non- diabetic patients (Bermudez-tamayo et al., 2017). A similar study done in the United States in 1999 estimated the annual medical cost of non- diabetic patients to be USD 1,991 while that of diabetic patients was USD 4,248 (J. B. Brown & Nichols, 1999). In Morocco, the per capita direct cost of diabetes in 2013 was between USD 259 and USD 830 per year, representing 1.75 to 5.6 times the per capita health expenditure- USD 148 (Boutayeb et al., 2013). The ratio between the cost in this study and Kenya's total health expenditure provided by WHO is higher than in the studies done in Mali, USA and Morocco possibly because persons diagnosed with diabetes in Kenya are much sicker and need more services and medication than their counterparts in the aforementioned countries.

Direct healthcare costs comprised the largest portion of total direct costs- Kshs. 13,261, which represented 81.1% of the total. Direct non- healthcare costs stood at Kshs. 3,088 per capita per month, which represented 18.9% of the total. The high proportion of direct healthcare costs as a percentage of total direct costs calls for an elaborate analysis into the modes of treatment used and a deeper emphasis on diabetes prevention. The cost of hospitalization comprised the largest share of this costs at 51.1%. It is worth noting that the respondents in this study did not have

diabetes- related complications which are bound to escalate this cost further. Hospital admissions are the largest single item of diabetes expenditure in most countries, whereby hyperglycemic emergencies account for the largest share of reasons for admission (Pepper et al., 2014). In this study, of the respondents who had been admitted between January 2018 and November 2018, 61.5% of them were admitted due to hyperglycemia. In 2014, a survey of medical admissions to a South African secondary level hospital's high care unit over a twelve month period indicated that 25.6% of admissions were due to hyperglycemic emergencies (Smit, Burch, & Willcox, 2007). The high frequency of hyperglycemia-related admissions is despite the fact that they are potentially preventable with prompt diabetes diagnosis, effective patient and health professional education. The cost of drugs was found to be highest among patients on both oral drugs and insulin, Kshs. 948 per month per person. Those on insulin only spent Kshs. 673 while those on oral drugs only spent Kshs. 474 per month. All over Africa patients struggle to afford insulin despite government subsidies (Azevedo & Alla, 2008). The high cost of insulin coupled with perennial shortages are considered the major reasons for poor control of blood sugar levels in diabetic patients (Azevedo & Alla, 2008). In Kenya, insulin is subsidized by the government and sold to patients at a lower price. However, these subsidized supplies often run out or are not well distributed, forcing patients to purchase insulin from private entities where the price is much more than at public facilities. High morbidity and mortality are likely to result from such inaccessibility, more so for patients who have an absolute deficiency of insulin.

Of direct non- healthcare costs, the cost of hiring an extra housekeeper accounted for the largest proportion at 41.2%. This could be attributed to the higher prevalence of diabetes among older individuals who may not be able to handle all household chores on their own. This is coupled by the fact that majority of the population in Nyeri lives in the rural areas where chores are more physically demanding than they are in urban areas. 40.5% of direct non- healthcare costs went into making changes in the diet of the diabetic individuals. Proper nutrition is a cornerstone of diabetes management without which diabetes often becomes uncontrolled in terms of blood glucose levels. Given the high of cost of healthcare in relation to income, 51.8% of the respondents who were not on a diabetes specific diet cited financial constraints as the reason for not adhering to the recommended nutritional regimen while 21.4%

cited lack of knowledge on what diabetes- specific diet comprised of. This lack of compliance to a diabetes- specific diet places them at a risk of developing uncontrolled diabetes which over time leads to organ damage that is characteristic of diabetes complications. A lot of focus needs to be placed on patient education in terms of proper nutrition to prevent or delay the onset of these complications.

While not all the respondents had been hospitalized, almost all had to pay for drugs and investigations. Lab investigations and drugs are essential parts of any disease management which should be common to chronic illnesses such as diabetes. The most frequently prescribed laboratory test was random blood glucose which was done on every clinic visit and is usually used as a screening tool for diabetes. According to a study done in Kenya in 2018 on the cost and affordability of screening, diagnosis and treatment of NCDs, screening costs were generally inexpensive with many tests available for about USD 4 (Subramanian et al., 2018). However, the diagnostic procedures for follow- up of abnormal screening results were substantially higher (Subramanian et al., 2018). The payments required to undergo many diagnostic tests specifically those related to cancer and diabetes are beyond the reach of the average Kenyan, as the annual household expenditure per adult is about USD 413 (Subramanian et al., 2018). Price data for the investigations was obtained from the study hospital. However, the respondents cited that they frequently sourced these investigations from private facilities due to frequent stock-outs at the study hospital and other government facilities. It was difficult to obtain these prices as there were multiple points of care that respondents accessed these services. However, payments for tests are consistently lower in public- sector than in private- sector facilities.

The health insurance information presented in this study shows that most respondents, 69.9%, were not covered and therefore had to use savings or borrow funds to pay for healthcare services. The Kenya Demographic Health Survey (KDHS) in 2014 estimated that only 17.1% of households reported to be in some form of pre- payment health scheme. Additionally, the Association of Kenya Insurers (AKI) 2014 annual report showed that about 88.4% of households with health insurance are covered through NHIF. Social protection, one of the main priorities for the Kenyan government, is outlined in the National Social Protection Policy 2011 and is also a major goal towards realizing universal health coverage for the country

(Mwai, 2017). Cost of care remains a barrier to healthcare utilization as 44% of Kenyans who fell ill but never sought treatment cited it as the reason (Wamai, 2009). This is likely to bring about undesirable outcomes for those with chronic illnesses such as diabetes which requires prompt care to avoid or delay onset of complications.

The average wage in Kenya is Kshs. 6,498 per month (Reuters, 2013). Moreover, 46% of Kenyans live below the poverty line (UNICEF, 2018). This study estimated the total direct costs of diabetes to be Kshs. 16,349 which presents a big disparity between healthcare cost and income level. This may imply that individuals are either forced to sell off property or borrow money to cater for healthcare costs. The effect of this is loss of valuable household assets and increase in debt level which may affect access to basic needs such as food, healthcare and education. It is worth noting that patients who adhered to a diabetes- specific diet spent less in terms of total direct costs than those who did not adhere to a diabetes- specific diet- Kshs. 15,649 and Kshs. 17,836 respectively. This is likely due to the need for more medication, tests and regular follow- up in the latter group. It is however ironical that about half of patients not on a diabetes- specific diet cited financial constraints as the reason for not complying to the diet yet they generally spent more on healthcare than those who complied to a diabetes- specific diet. Coping mechanisms adopted by patients to contain cost such as non- adherence to the recommended lifestyle have a detrimental effect on their health and raise the risk of developing complications in the long term which are much more expensive to treat than the primary disease. Unemployment level in Nyeri County is 17.5% and the dependence rate stands at 51% of the total population (NyeriCountyGovernment, 2018). 38.6% of the respondents in this study were unemployed and were more likely to face further impoverishment due to healthcare expenditure incurred in managing diabetes. The Kenya Demographic Health Survey 2014 estimated that 65% of women were employed all year round and 28% were employed on a seasonal basis (KDHS, 2014). The individuals employed on a seasonal basis are similarly vulnerable to spiraling into poverty due to the unstable flow of income. Moreover, the cost of treatment and productivity losses stunt economic growth and negatively impact on the realization of the vision 2030 targets and other national development targets.

# CHAPTER SIX

# CONCLUSIONS AND RECOMMENDATIONS

There is need to realize the devastating economic effects of diabetes on patients and families in Kenya and in low income countries in general. Without formal financial support to the affected families, they continue to bear the full burden of costs and at times result to coping mechanisms that have detrimental effects to their health and well- being in general.

The UHC program which is about to be rolled out to all counties in the country in the 2019/ 2020 financial year will help cushion cost of healthcare in public health facilities. This will hopefully enable patients to adhere to treatment regimen that have previously placed a financial strain on them and thus lead to better health outcomes. However, given the chronic nature of diabetes and other non- communicable diseases, the cost of managing the illness has the potential of taking a large share of the allocated funds and may compromise funding of other health programs. Additionally, the high cost incurred by government in providing free healthcare services may become unattainable and as such require introduction of mechanisms to raise revenue such as increase in taxes given donor funding is not always sustainable. This may put a further strain on Kenyans, 46% of whom live below the poverty line. Knowledge on the actual cost of diabetes on patients will help the government realize the money that can be potentially be saved when prevention of the illness is achieved in the population. The UHC program only caters for patients attending government facilities, leaving out those in faith- based and private facilities. The cost of care in these facilities is higher than in government and thus the need to encourage enrollment to health insurance schemes to protect the patients against out- of- pocket expenditure.

The government of Kenya, through the Ministry of Health should encourage rigorous screening of the population for diabetes to ensure diabetes is diagnosed early and put under prompt and appropriate management. Early diagnosis and follow- up may lead to a reduction in healthcare costs as patients are identified before onset of complications whose onset can be prevented entirely or delayed. A campaign to

educate diabetic patients on the ways to manage diabetes, importance of compliance to treatment and information on diabetes complications should be instituted. With education and awareness, a positive attitude may develop and equip patients to battle with diabetes and its complications. Training of medical personnel on diabetes management is also critical to ensure high compliance rates among patients and identification of those at risk of developing complications.

All vital drugs and tests should be made available always times in public facilities to reduce the incidence of seeking these commodities at private facilities whose cost is beyond the reach of many patients, especially those with no health insurance.

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# APPENDICES

## APPENDIX 1: QUESTIONNAIRE

I am a student of Masters of Business Administration in Healthcare Management at Strathmore University. I am conducing a research which aims to determine the cost of illness of diabetes among patients attending level four and five facilities in Nyeri Town Sub County. This research is purely for academic purposes. I assure you that all the information provided in this survey will be kept anonymous and confidential. Please provide honest responses. Your co-operation in this regard is highly appreciated.

## SECTION 1: RESPONDENTS DEMOGRAPHIC CHARACTERISTICS

1. **Age**
   - 18-25 ( )
   - 26-35 ( )
   - 36-45 ( )
   - 46-55 ( )
   - 56-65 ( )
   - 66-75 ( )
   - Above 75 years ( )
2. **Gender**
   - Male ( )
   - Female ( )
3. **Marital status**
   - Married ( )
   - Single ( )
   - Divorced/ separated ( )
   - Widow/ widower ( )
4. **Highest education attained**
   - No formal education ( )
   - Primary ( )
   - Secondary ( )
   - University/ college/ polytechnic ( )
   - Postgraduate ( )

5. **Current work status**

   Unemployed ( )

   Employed ( )

6. **If unemployed, how do you earn income?**

   Support from family members ( )

   Pension ( )

   Farming ( )

   Other businesses ( )

## SECTION 2: DIRECT COST OF DIABETES

1. When were you diagnosed with diabetes?

   What type?

   How long have you been attending clinic?

   ( ) 0-3 years ( ) 4-6 years

2. In the past one year, how many times have you attended diabetic outpatient clinic?

   ( ) 1-5 ( ) -10 ( ) 15-20 ( ) over 20

3. How much did you spend on oral drugs for diabetes in a month?

   ( ) 0-1000 ( ) 1001-2000 ( ) 2001-3000 ( ) 3001-4000 ( ) 4001-5000 ( ) over 5000

4. How much did you spend on insulin and syringes in a month?

   ( ) 0-1000 ( ) 1001-2000 ( ) 2001-3000 ( ) 3001-4000 ( ) 4001-5000 ( ) over 5000

5. How much did you spend on outpatient consultation in a month?

   ( ) 0-1000 ( ) 1001-2000 ( ) 2001-3000 ( ) 3001-4000 ( ) 4001-5000 ( ) over 5000

6. For what reasons were you hospitalized in the past one year?

7. How much did you spend on hospitalization within that period?

   ( ) 0-5,000 ( ) 5001-10,000 ( ) 10001-15000 ( ) 15001-20000 ( ) 20001-25000 ( ) over 25000

8. How much did you spend on insurance premium per month?

   ( ) 0-1,000 ( ) 1,001-2000 ( ) 2001-3000 ( ) 3001-4000 ( ) 4001-5000 ( ) over 5000

9. How much do you spend on transport per clinic visit?

   ( ) 0-500 ( ) 501-1000 ( ) 1001-1500 ( ) 1501-2000 ( ) 2001-3000 ( ) over 3000

10. Do you maintain a diabetes- specific diet? If no, why are you not on a diabetes- specific diet? If yes, what does it comprise of? Is it different from what the rest of your family/ people you live with eat? If yes, how much more do you think you spend per week on the special elements of your diet?
11. How much do you spend to hire an extra housekeeper in a month?

## APPENDIX 2: PARTICIPANT INFORMATION SHEET AND CONSENT FORM

## COST OF DIABETES DISEASE AMONG PATIENTS AT A LEVEL FOUR FACILITY IN NYERI TOWN SUB COUNTY

### SECTION 1: INFORMATION SHEET

**Investigator: Lucy Wamuyu Githua**

**Institutional affiliation: Strathmore University Business School**

### SECTION 2: THE STUDY

#### 2.1: Purpose of the study

This study is an academic research in partial fulfillment towards Masters of Business Administration in Healthcare Management at Strathmore University Business School.

#### 2.2: Do I have to take part?

No. Taking part in this study is voluntary. You are free to opt out of this study at any time without giving any reasons. If you decide to take part, you will be asked a series of questions form a questionnaire to get information on your demographics and cost of managing diabetes. If you are unable to answer all questions successfully the first time, you will be requested to sit through a second session.

#### 2.3 Who is eligible to take part in this study?

Patients who have lived with diabetes for up to five years and have attended diabetes outpatient clinic between January 2018 and November 2018. This study will target 83 willing patients.

#### 2.4: Who is not eligible to take place in this study?

Participants under the age of eighteen without a parent or guardian accompanying them at the time of study.

Patients who have lived with diabetes for more than five years

Patients who have not attended diabetes outpatient clinic between January 2018 and November 2018.

**2.5: What will taking part in this study involve me?**

You will be approached and requested to take part in the study after which you will be requested to sign an informed consent form and taken through a questionnaire after you fully understand the purpose of this study.

**2.6: Are there any dangers or risks in taking part in this study?**

No, there are no risks. All your information will be held in utmost confidentiality and will not be shared with any unauthorized persons.

**2.7: Are there any benefits of taking part in this study?**

The information you provide will be used to inspire establishment of more robust diabetes screening programs and provide comprehensive patient education on diabetes prevention and management.

**2.8: What will happen to me if I refuse to take part in this study?**

Participation in this study is voluntary. You have the free will to decline participation in the study at any time.

**2.9: Who will have access to my information during this research?**

All your information will be kept confidential. All study records will be safely stored in locked cabinets. Only persons closely concerned with this study will have access to your information.

**2.10: Will there be any compensation for taking part in this study?**

No, there will not.

**2.11: Who can I contact in case I have further questions?**

You can contact me, Lucy Wamuyu Githua at Mt. Kenya Sub County Hospital, by email wamuyug@gmail.com or by phone number 0726744421. You can also contact my supervisor, Dr. Ben Ngoye, at the Strathmore Business School, Nairobi or by email BNgoye@strathmore.edu.

**In case you want to contact an independent person anything about this research please contact:**

The Secretary- Strathmore University Institutional Ethics Review Board, P.O. BOX 59857, 00200, Nairobi. Email: ethicsreview@strathmore.edu, Telephone number: +254703034375

I, have had the study explained to me. I have understood all that has been explained to me, read and all my questions were answered satisfactorily. I understand that I am free to change my mind at any stage.

Please tick the boxes that apply to you:

**Participation in the research study**

- o I AGREE to take part in this research
- o I DO NOT AGREE to take part in this research

**Storage of information on the completed questionnaire**

- o I AGREE to have my completed questionnaire stored for future data analysis
- o I DO NOT AGREE to have my complete questionnaire stored for future data analysis

**Participant's Signature:** **Date**

_____ _____

**Participant's Name:** **Time**

_____ _____

I, Lucy Wamuyu Githua, certify that I have followed the SOP for this study and have explained the study information to the study participant named above, and that s/he has understood the nature and purpose of the study and consents to the participation in the study. S/he has been given opportunity to ask questions which have been answered satisfactorily.

**Investigator's Signature:** **Date**

_____ _____

**Investigator's Name:**

**Lucy Wamuyu Githua**

**Time**

_____

**APPENDIX 3: PRICE LIST**

| Drugs | Price per tablet/ vial (Kshs) |
|---|---|
| Metformin 500mg | 2 |
| Metformin 850mg | 3 |
| Glibenclamide | 3 |
| Pioglitazone | 5 |
| Gliclazide | 7 |
| Insulin | 200 |
| Insulin syringes | 10 |

| Lab investigations | Price per test (Kshs) |
|---|---|
| Lipid profile | 1,200 |
| Thyroid function test | 1,200 |
| Urinalysis | 200 |
| Full hemogram | 300 |
| Urea, creatinine and electrolytes | 1,000 |
| HBA1c | 1,000 |
| Random blood sugar | 100 |
| Prick hemogram | 180 |
| Radiological tests | Price (Kshs) |
| Xray | 600 (average) |
| ECG | 1,000 |

**APPENDIX 4: TIME SCHEDULE**

| ACTIVITY | WEEKS | | | | |
|---|---|---|---|---|---|
| | WK 1 | WK2 | WK3 | WK4 | WK5 |
| Piloting | | | | | |
| Debriefing of research assistants | | | | | |
| Data collection | | | | | |
| Data preparation | | | | | |
| Data entry | | | | | |
| Data analysis | | | | | |
| Report writing | | | | | |
| Corrections and submissions | | | | | |

**APPENDIX 5: BUDGET ESTIMATES**

| ITEM | KSHS. |
|---|---|
| A) Cost of proposal development | |
| Stationery, printing and photocopies | 5,000 |
| Telephone and travelling expenses | 3,000 |
| Subtotal | 8,000 |
| B) Cost of Data Collection and Analysis | |
| Research assistants- 2 | 30,000 |
| SPSS data processing | 25,000 |
| Local transport costs | 3,000 |
| Communication | 3,000 |
| Subtotal | 61,000 |
| C) Compilation and production of final document | |
| Printing | 5,000 |
| Binding 5 copies @ Kshs. 600 | 3,000 |
| Subtotal | 8,000 |
| Grand total | 77,000 |