THE IMPACT OF HEALTH FINANCING SOURCES ON CHILD MORTALITY IN KENYA

MASTER OF ARTS (ECONOMICS)

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UNIVERSITY OF MALAWI
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Thesis submitted to the Department of Economics ,Faculty of Social Science, in partial fulfillment of the requirements for the award of a Master of Arts degree (Economics)

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DECLARATION

I declare that this is my original work and that it has not been presented for a degree at this or any other University. Work of others used in this study has been duly acknowledged. Any errors contained herein are entirely mine.

KARANJA MARTIN KURIA

_____

FULL LEGAL NAME

_____

Signature

_____

Date

CERTIFICATE OF APPROVAL

We declare that this thesis is from the student's own work and effort and where he has used other sources of information, it has been acknowledged. This thesis is submitted with our approval.

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DEDICATION

To My Mum, dad, brothers and my only Sister, Mercy.

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To God be the Glory and honor for making all things possible.

ABSTRACT

In Kenya health financing as a percentage of GDP has increased over the years although health outcomes especially child mortality seem to have not followed the same trend. The aim of the study was to determine the impact of public, private and donor health financing on childhood mortalities in Kenya. The study approach was based on (Grossman, 1972) theoretical model that applies a vector of inputs in production of health outcomes. The study used time series data from 1980-2014 applying an ARDL analysis method. The empirical findings revealed that in the short-run health financing, Per capita GDP, Doctors population, Measles immunization and Women's literacy level had no influence on infant mortality but in the long-run public health financing, Per capita GDP and Doctor's population improved infant mortality. Analysis of under-five mortality model revealed that in the short-run health financing, Per capita GDP, Doctors population, Measles immunization and Women's literacy level had no influence on under five mortality rates but in long run child immunization against measles, Women's literacy level and per capita GDP improved under five mortality. Based on the findings the study recommends an increase in the allocation of funds by the government to the health sector, improve socio-economic status of Women and government to educate the populace on the importance of child immunization to reduce childhood mortalities in Kenya.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIDs	Acquired Immunodeficiency Syndrome
DFID	Department for International Development
EU	European Union
FER	Fixed Effects Regression
GDP	Gross Domestic Product
GLS	Generalized Least Squares
HIV	Human Immunodeficiency Virus
KDHS	Kenya Demographic and Household Survey
KEMRI	Kenya Medical Training Institute
KEMSA	Kenya Medical Supplies Authority
KHP	Kenya Health Policy
KIPPRA	Kenya Institute of Public policy Research and Analysis
KMTC	Kenya Medical Training College
MoH	Ministry of Health
NGO	Non-Governmental Organization
NHIF	National Health Insurance Fund
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
SDGs	Sustainable Development Goals
UNDP	United Nations Development Program
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Chapter Overview

This chapter outlines the background of the study, problem statement, objectives, hypotheses to be tested and a conclusion that gives a brief description of how the rest of the chapters are organised.

1.2 Background

Health financing is the totality of financial commitment to health of a country, state, or community as the case may be. Health expenditure includes outlays for prevention and promotion activities, rehabilitation and care, population and nutrition activities, programs on food and emergency aid, particularly for health, but not water and sanitation activities.

The Food and Health Bureau of Hong Kong (2006) states that "health financing consists of all expenditures or outlays for medical care, prevention, promotion, rehabilitation, community health activities, health administration and regulation and capital formation with the predominant objective of improving health." In this regard, differences in terms of how much countries commit to health are due to factors such as population size and distribution, political commitment, level of income and other factors.

Sources of health financing in every economy may be different, mainly peculiar to the country's pattern and characteristics. Nonetheless, the most common sources of financing include public financing through tax, user charges, health insurance scheme, managed care organization, international donors (Rotary International), private not-for-profit agencies, direct health tax system and voucher for health.

Internationally, there have been huge disparities on the amount that nations spend on health financing. Annually in developed economies, health financing is typically over 3000 US dollars per capita while in the developing and resource-deficient countries it is only 30 US dollars per capita, on average ,for example, Tanzania and Ethiopia spend only 4 US dollars per capita on health . Some countries' health financing accounts for more than 12 percent of gross domestic product (GDP), while others have less than 3 percent (Ke & Priyanka, 2011). For the United Kingdom, Commons (2009) argues that health status is heavily dependent on economic welfare status of households.

In Africa in order to realize health benefits purposive investments in health have to be made. Contrary in many African nations per capita expenditure on health has continually been below worldwide levels. Low-income in most African countries negatively impacts on health outcomes. A 2010 UNDP report indicated that in 2010 almost 1.75 billion people in 104 countries lived in poverty with at least 30 percent of welfare indicators showing acute deprivation in education, standards of living and health. (UNDP & GoK, 1999)While the amount, size and distribution of health financing varies from one country to another, the basic question is how much of the financing is productive and effective (AKram, 2007).

In Kenya on yearly basis the government spends relatively huge sums of money in health care provision although private contributions have consistently been higher than the government contribution for the period before 2010.

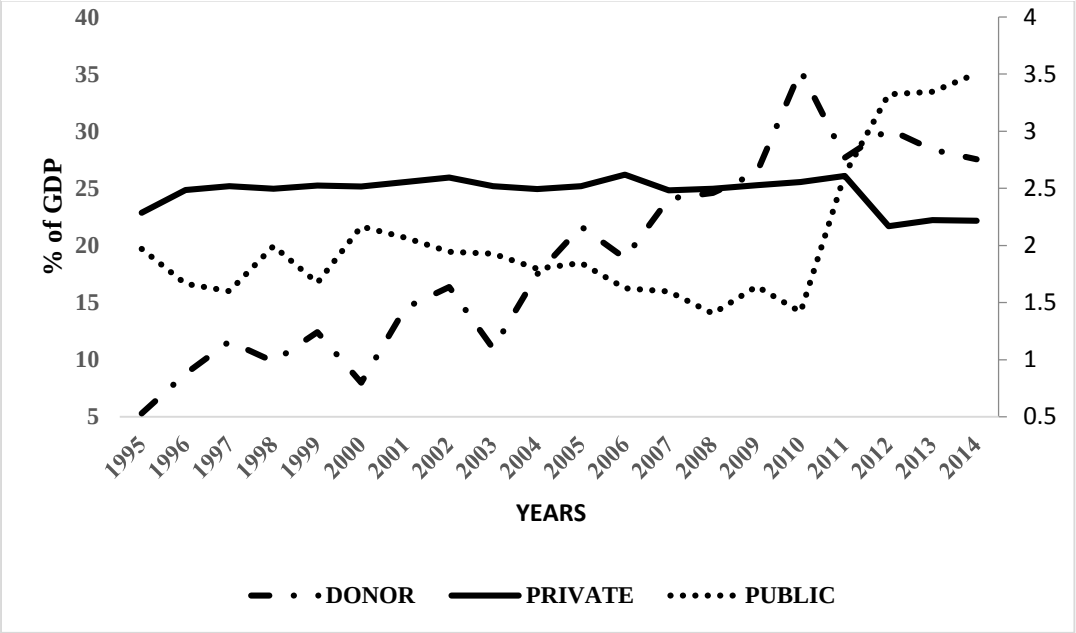
This implies that a bigger proportion of the population faces challenges accessing health care since a higher contribution is squarely borne by private sector. This could lead to catastrophic health expenditures.

In addition, the high private financing means more and more cost burden is borne by the households this is due to the change of government policies from free health care provision to a cost sharing policy whereby households pay to access health care per hospital visit.

There are also fixed charges that are required in both private and government hospitals and this also makes households remain biggest health financiers of health care.

Figure 1 below shows the progress of private, donor and public health financing in Kenya.

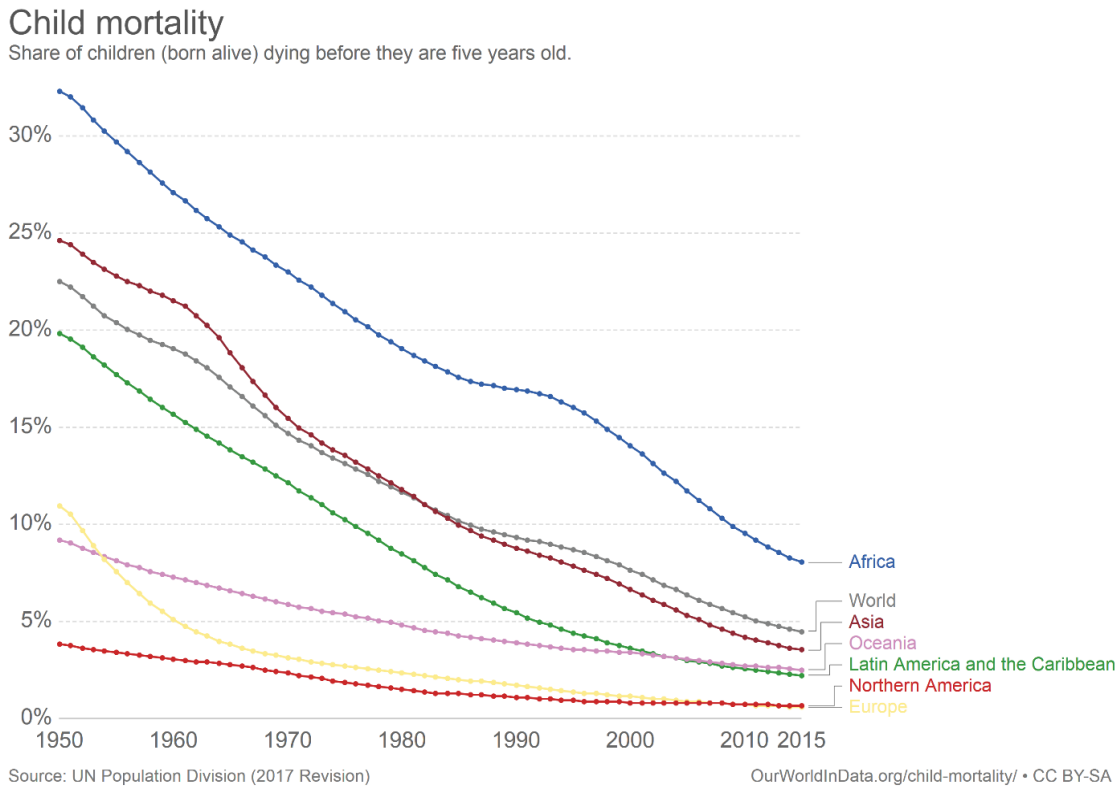
Figure 1: Health Financing in Kenya



Source: World development indicators (2017)

On child mortality, to begin with, at the global level child mortality rates have declined from 18.2 percent in the 1960s to about 4.3 percent by 2015. In this line, some rich countries have recorded child mortality rates of 1 percent while rates for developing countries have ranged from 30 to 50 percent. This substantial improvement especially for developed economies is mainly due to increasing knowledge and technology, a decrease in poverty levels and better services in the health sector. This is shown by Figure 2 below:

Figure 2: Worldwide Child mortality levels



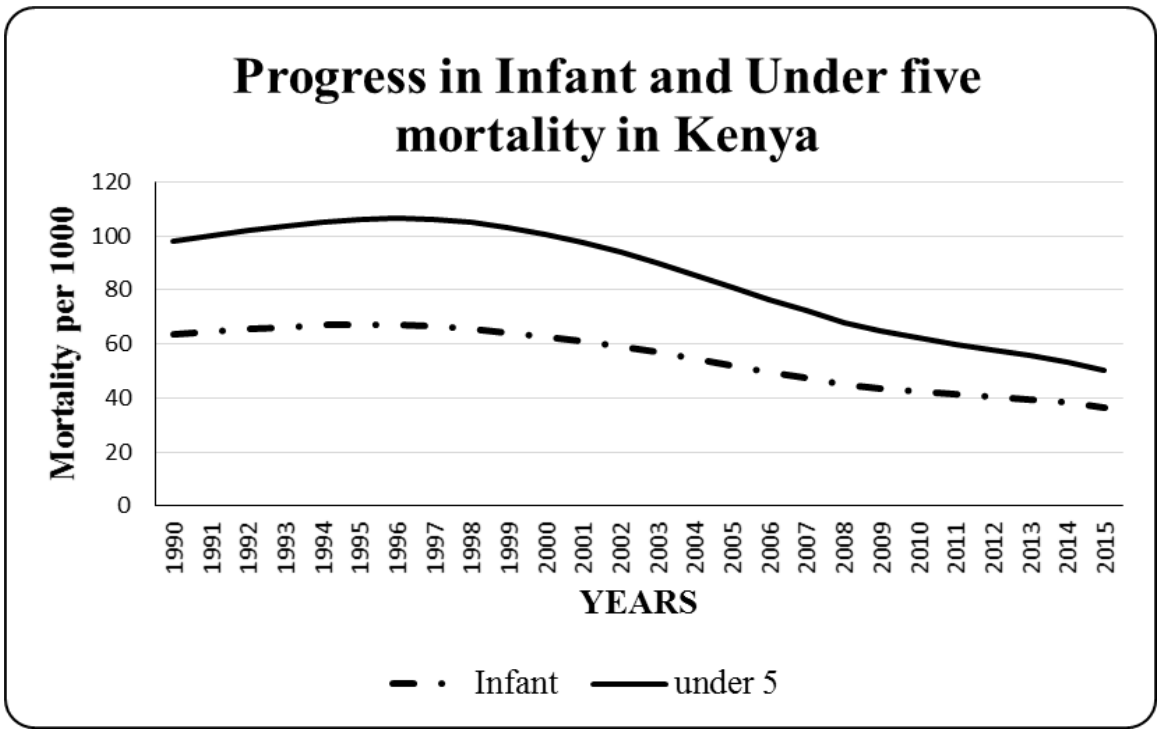
Source: UN population Division (2017 Revision)

In Africa, child mortality rates are still higher than the world target of 12 deaths per 1000 live births of infants and 25 deaths per 1000 live births of under-five. Regionally, in Sub-Saharan Africa it is estimated that 1 child out of 13 dies before celebrating the 5th birthday while in developed countries child mortality stands at 1 death per 189 (Germano, et al., 2004). For each year in Africa, lives of millions of under-five children are lost as a result of preventable conditions such as diarrhoea, pneumonia and malaria. Therefore, child mortality does not only indicate child health and well-being but it is a reflection of overall progress towards the realization of the SDGs, in which by 2030 each country should have reduced the under-five mortality rate (U5MR) to 25 per 1000 live births and the infants mortality rate to 12 per 1000 live births .

According to Nicoll et al. (1994), HIV/AIDs is the biggest challenge towards reduction of child mortality in Africa as it threatens to reverse 30 years of child mortality in Sub-Saharan Africa (SSA). Nevertheless, Africa experiences other socio-economic challenges which threatens chances of child survival.

After independence child mortality rates in Kenya dropped quickly since the early 1960s until 1980s when the rate of decline slowed down to about 2 percent per annum from 4 percent per annum (Kyalo, 2013).This decline was in line with decreasing immunization levels, a drop in school enrolment, stagnation of per capita income and the emergence of HIV/AIDS epidemic. Figure 3 below shows the child mortality situation in Kenya:

Figure 3: Child Mortality Situation in Kenya



Source: World development Indicators (2016)

As shown in Figure 3, childhood mortality rates in Kenya have been decreasing at a lower rate than expected despite high health financing. Globally, it has been a priority to reduce under five mortality. In Kenya since 1990s under five mortality has reduced

by 24 percent which is less than global target of over 50 percent as well as regional averages reflecting that there still exists a high childhood mortality rate in Kenya.

Globally, there has been a lot of attention to child mortality. In Kenya there has been several stratagems to make sure that health goals are realized. This was evident in its being a signatory of the Millennium Development Goals (MGDs) in which 3 goals were about health: to decrease infant mortality rates, to ameliorate maternal health and to reduce HIV/AIDS, Malaria and other ailments. The MDGs came to an end in 2015 and a post-2015 agenda containing 17 Sustainable Development Goals (SDGs) came into place to be realized by 2030.The country is also a signatory of the Abuja Declaration of 2001 for which nations agreed to expand health budget to 15 percent of the total country's budget for healthcare provision and health outcomes improvement.

Child mortality in Kenya remains high and is heavily attributed to high levels of poverty and a decrease in immunization levels caused by cultural and religious beliefs (Ichere, 2013). This is exacerbated by diseases such as measles, malaria and diarrhoea which are projected to have accounted for 60 percent of the disease burden and remain among the highest causes of death among under five children in modern Kenya.

1.3 Problem Statement

It is generally expected that high health spending will reduce poverty and improve human capital; hence it is important to assess the effectiveness of health financing on health outcomes such as childhood mortality (AKram, 2007). In Kenya, health financing as a percentage of GDP has increased over the years though child mortality seems not to have followed the same trend. The emerging question is whether or not high health spending affects childhood mortality in Kenya. There have been studies that have tried to analyze the impact of health financing on various health outcomes in Kenya such as infant mortality, under five mortality, life expectancy and many others (Kyalo, 2013 & Ichere, 2013)

However, most of the studies have taken an approach where they analyze the impacts of each separate means of financing (public financing, private financing or donor support) on health outcomes. Therefore, the studies cannot be used to examine how private, donor or public financing affect child health. The results from such studies as claimed, for example, by Kittur (2014) and Kyalo (2013) may not necessarily be trusted because these components of health financing are highly interlinked such that singling out only one (leaving out others) may result in omission biases.

The study is further justified by the fact that people consume health care which is provided via public, donor and public financing and hence the need to analyze joint impacts of these financing sources. This study assesses how private, public and donor health financing affect health outcomes specifically child mortality in Kenya.

1.4 Research Objectives

The main objective of this study is to analyze the impact of health financing (public, private and donor) on childhood mortality in Kenya.

To achieve this objective, the following specific objectives were pursued:

1. To examine the impact of health financing on infant mortality in Kenya
2. To assess the impact of health financing on under five mortality in Kenya

1.5 Hypotheses tested

The following Hypotheses were tested;

1. Health Financing does not affect infant mortality in Kenya
2. Health Financing does not affect under five mortality in Kenya

1.6 Organization of the Thesis

The rest of the paper has been arranged as follows, Chapter two covers overview of Kenya Health system, Chapter three analyzes theoretical and empirical literature, Chapter four outlines methodology adopted for the study, Chapter five discusses empirical findings and Chapter six highlights summary, conclusion and policy implications.

CHAPTER TWO

OVERVIEW OF THE KENYAN HEALTH CARE SYSTEM

2.1 Introduction

This chapter gives an overview of the Kenyan healthcare system. It is divided into 4 sub-sections: a brief introduction of Kenya, overview of the Kenyan health sector, health inputs, health outcome trends in Kenya and lastly a conclusion of the chapter.

2.2 Brief Introduction of Kenya

Kenya is among the six nations that constitute the East African Community (EAC) whose headquarters is in Arusha, Tanzania. Kenya's estimated population as at 2017 stood at 49 million with a growth rate of 2.65 percent (1.2 million) per year with urban population of 44.6 percent of the total population.

In terms of the Kenyan economy, in 2016 GDP was worth 70.53 billion USD, inflation stood at 6.45 percent with 42.5 percent of the population living below the poverty line. The major economic sectors are agriculture at 75 percent, and industry and service 25 percent. Exports account for 5.705 billion USD with main exports being agricultural products such as tea, horticultural products and coffee. Imports stand at 12.651 billion USD with main imports being machinery, motor vehicles, petroleum products, plastics and resins. Table 1 below shows economic indicators for the past five years for Kenya.

Table 1: Kenya Economic Indicators

Indicator	2012	2013	2014	2015	2016
GDP (current US$, million)	50413	55097	61445	63768	70529
Gross National Expenditure (% GDP)	113.310	113.282	114.705	111.705	108.790
Inflation, CPI (annual %)	9.378	5.718	6.877	6.582	6.298
Exports (BOP, Current US$, million)	11205	10951	11290	7567	8467
Imports (% GDP)	35.538	33.207	33.003	27.723	23.360
Exchange Rate (US$ to Ksh)	84.5296	86.1229	87.9221	98.1785	98.7458
FDI, net flows (% of GDP)	0.3241	0.6748	1.5368	0.9718	0.5586

***Source**: World development Indicators (2017)*

2.3 Kenya's Health Sector

Kenya gained independence in 1963 and since then various reforms, policies and targets have been pursed all geared towards free provision of healthcare to the populace to improve welfare, productivity and to reduce poverty.

The Government of Kenya in 1965 abolished user charges for citizens seeking medical services in the public local clinics and by 1970 a costless healthcare for everyone was extended in every public health center. Nevertheless, the economy stagnated around 1973 and the government had to re-introduce the user charges in 1989 in order to continue operating the public health facilities. To ensure cost-sharing and funds availability for medical services in peripheral regions, the government in 1992 introduced the District Health Management Board.

An affordable, acceptable and accessible healthcare to all was formulated through a government publication, the Kenya's Health Policy Framework (Ministry of Health, 1994a), whose implementation was to be done through two 5-year plans which are:

The National Health Sector Strategic Plan I (NHSSP I, 1999-2004) and the NHSSP II (2005-2010). The two frameworks set the public health in a hierarchical pyramid with rural dispensaries which are the majority at the bottom of the pyramid, followed by District and provincial hospitals. At the top of the pyramid there is Kenyatta National Hospital (KNH), the largest public referral hospital in Kenya, and Moi Teaching and Referral Hospital (Eldoret).

After promulgation of the new constitution in 2010 and its implementation in 2013 the public decision making process and its implementation fell under the regional administrative authorities. Primary and secondary health services were devolved to the 47 counties to enhance resource allocation, improve delivery of health services to the Kenyans in the long-run and bring the decision making power and ownership to the local authorities.

The National government on a periodic basis releases funds to the counties depending on the integrated development plan prepared by each county. The 2012-2030 Kenya Health Policy plan required each county to establish a health department to coordinate and run health care provision for the county and it also sets out the formulation of county health management teams whose role is provision of professional and technical support to coordinate and run health delivery via health care facilities in each county.

Table ***2*** below shows how responsibilities in the Kenyan health sector

Table 2: Kenyan Health Sector Responsibilities: National and County Governments

National Government (MoH)	**County Departments of Health**
Financing	County health facilities and pharmacies
National referral hospitals	Ambulance services
National public health laboratories	Disease surveillance and response
Major disease control(malaria,TB,Leprosy)	Disaster management
Health policy	Public health and sanitation
Public-private partnerships	Veterinary services(except veterinary profession regulation)
Services provided by Kenya Medical supplies Agency (KEMSA, NHIF, KMTC and KEMRI)	Control of drug abuse and pornography
Planning and budgeting for national health services	
Health information , communication and technology	
Quality assurance and standards	

Source: *Author's Summary*

2.4 Kenya's Health System

According to WHO, a health system consists of all the organizations, personnel and actions whose primary objective is to maintain, restore and promote health. The strengths of a well-developed health system are: ensuring competent health workforce, researching solutions to health problems, to inform and educate the populace on health matters and also to diagnose and investigate health problems and hazards in the community.

On the other hand, health systems faces challenges such as rising health costs due to inefficient utilization of health resources, large proportion of the population not able

to access health services due inequitable patterns of social protection and low health outcomes such as life expectancy across the globe.

This section covers Kenya's health system .To achieve this, the distribution of health facilities in Kenya, health personnel and health financing over the years are discussed.

2.4.1 Distribution of Health Facilities in Kenya

After independence, the Kenyan government made a zeal to continue expanding and growing the health facilities in the country since its aim was to reduce poverty, illiteracy and diseases. After independence, the country inherited a three-tier health system through which the central government provided health services at district, provincial and national level while the missionaries were providing services at sub-district levels, and local governments were providing services in urban areas. This trend continued until the 1970s when it was abolished and the government established a comprehensive coverage system in the rural areas that acted as a focal point in the provision of preventive and curative health services.

By 2018 there are three major types of health facilities in Kenya: hospitals, health centers and health sub-centers including dispensaries and the newly introduced mobile clinics in all the 47 counties. The hospitals, such as Kenyatta National and Moi Referral, form the tertiary level of health care and handle referral and special cases. They are the most financed and are controlled by the central government.

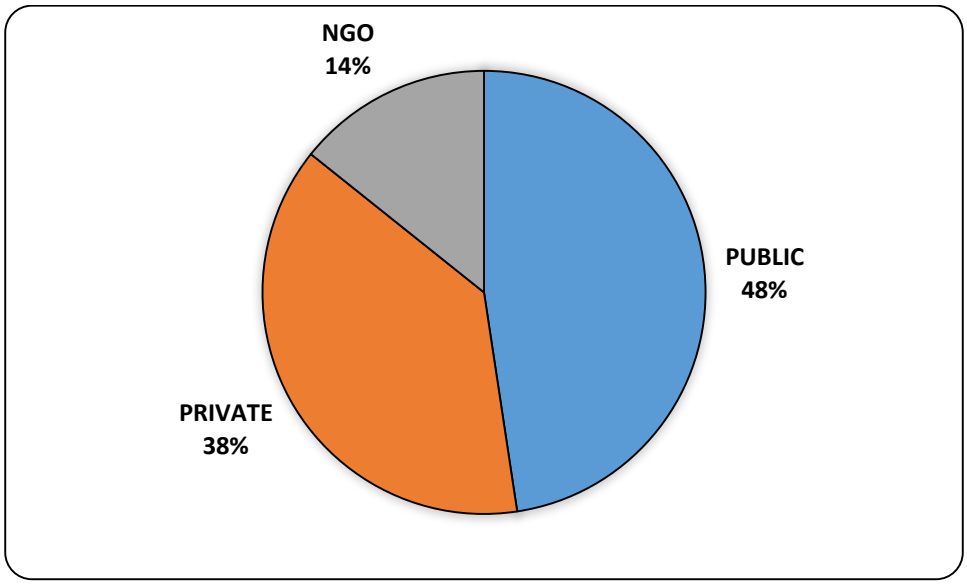
The health centers include district hospitals and form the secondary level, handling cases of injury and treatment that do not need much specialized attention. The clinics and health sub-centers are controlled by the local government and they handle a

certain proportion of the population and they form the first part of contact between the client and the facility.

Basically Kenyan health sector has broadly been identified into three major categories. First is the public sector which is made up of all the government health providers (that is, hospitals, dispensaries) and public pharmaceutical supply chain such as KEMSA. Second is non-commercial private sector, including the NGOs, Faith based organizations and mission health facilities. Last is the private for-profit sector and it includes medical distributors and medical manufacturers.

There are about 9,696 registered medical facilities in Kenya out of which about 4,616 are publicly owned, 3,696 private owned and about 1,384 owned by NGOs or Community based organizations (CBO). Figure 4 below shows the percentage ownership of health facilities in Kenya, indicating that public sector accounts for 48 percent, private sector 38 percent while the NGOs account for 14 percent of the registered health facilities in Kenya.

Figure 4: Ownership of Registered Health Facilities in Kenya



Source: *Government of Kenya, Statistical Abstracts (various issues)*

2.4.2 Healthcare Personnel

The presence of skilled medical personnel is a key factor to the reduction of child mortality as well as to improve health outcomes. For efficient and effective health delivery there is need to train and equip the health care personnel; that is, physicians, nurses, pharmacists, hospital administrators as they influence the utilization, quality, efficiency and nature of healthcare services.

In 2006 the MoH formulated human resource norms whose mandate was to ensure enough and appropriate personnel for the workload and the norms determines the distribution of health workers across the country (MoH, 2009b). Hence, healthcare workers are distributed depending on facility levels. Specialized clinics are run by doctors at district hospitals (level 4); provisional hospitals are run by specialist doctors (level 5); dispensaries are mostly run by nurses who provide first line contact services (level 2).

It is due to this fact that the Kenyan government has heavily invested in enlargement of health infrastructure and personnel through training. In 1965, Kenya had 734 doctors, 26 dental personnel and 148 pharmacists. By 1999 the number had risen to 4,411 doctors, 734 dentists and 1,650 pharmacists, showing a ratio improvement from 7.8 doctors, 1.6 pharmacists and 0.3 dentists to 14.1 doctors, 5.1 pharmacists and 2.4 dentists per 100,000 population. And by 2010 the number had increased further to 7,129 doctors, 898 dentists and 3,097 pharmacists. But the majority of health workers works in the private sector.

The statistics imply that the country has deficit of health workers. Therefore it is likely to continue recording poor health outcomes. As such for the country to effectively and efficiently provide health services to the populace there is need to expand and grow the number of health workers.

2.4.3 Kenya Health Financing

In Kenya, there are several sources of health financing: household (37 percent), donor (31 percent), public (29 percent) and health insurance and its executed directly to the health ministry and indirectly to other sectors related to health provision and private companies (3 percent) according to the Ministry of Health (2009a).

The Ministry of Health remains the biggest provider of health services in the country through health centers, district, provisional and referral hospitals. That said, the socio-economic analysis of poverty proved that the major problem facing the poor is affordability of medical care (MoH, 2009b) which called for government intervention in the provision of quality, adequate and improved health care to its citizens.

Kenya adopted and pursued features of primary healthcare all aimed at slowing the main morbidity and mortality causes. As a result it has received donor financing to facilitate its implementation. But recurrent financing allocations still favors more of curative than preventive care as it accounts for about 70 percent while the latter only accounts for 19 percent and this financing trend has led to poor quality of health service, inadequacy of important inputs such as drugs and therefore the existing health facilities, lacks the capacity to handle even simple illnesses.

Reports show that in Kenya high cost of health resources, inadequate health facilities as some of the challenges facing health financing. Since 2013 health financing was devolved from National to County government which have different health policies this had been the main challenge facing health financing as County's have different ways of raising their revenues which in some cases is not enough to remunerate the health personnel which has resulted to persistent work boycott by the health personnel at County level forcing the ordinary citizens seek medical services from private sector which is expensive.

In terms of the trend in budgetary allocation, health allocation stands at an average of 6 percent of the GDP which falls short of the Abuja Declaration in 2001 that required Kenya and other African countries to allocate at least 15% of the total GDP to improve the health sector. While the Kenyan government has several methods to raise finances for health services, the main challenge is that some of the methods have not been able to fully realize the anticipated objectives.

2.5 Health Outcomes Trend in Kenya

The health outcomes of a country are indicated using various health indicators such as infant mortality, under five mortality and life expectancy. It has been argued that these indicators are a reflection of the status of healthcare provision in any nation and they are a reflection of a developed health system. Kimalu, et al. (2004) showed that infant mortality is influenced by quality as well as quantity of available healthcare.

Ichere (2013) argued that child mortality is considered a good indicator of health outcomes because low levels of infant and under five mortality rates reflect a well-developed health system due to the assumption that the priority of a developed health system is health provision to the vulnerable specifically children, therefore high levels of infant mortality will be a reflection of a poorly developed system. For these health outcomes to be realized there are other health inputs such a personnel, hospitals, drugs and supplies, that after they are invested well, it's expected that a country will realize positive effects on the health outcomes.

Kenya's vision 2030 outlined an extensive guideline geared towards the attainment of long term health outcomes as contained in Kenya's healthy policy of 2010. Kenya Health Policy (KHP) indicated the health outcomes target will be measured by life expectancy at birth, neonatal deaths per 1,000 live births, Under-five births per 1,000, maternal deaths per 100,000, elderly deaths per 1,000, youth and adolescent death per 1,000 and the number of years lived with disabilities.

But according to Gani (2009), the study argued that the impacts of health financing are better measured using child mortality. After the adoption of the New Constitution

in 2010, and the subsequent devolving of the health services to the county government the Kenyan government set out the following health indicators targets to be achieved in line with the Country's Vision 2030 blueprint, as shown in Table 3 below:

Table 3: Progress in health Outcomes in Kenya

Health Outcome	**2010 Estimate**	**2030 Target**
Under 5 mortality rate (per 1000 birth)	74	24
Infant Mortality rate (per 1000 births)	52	20
Life Expectancy at birth (years)	60	72
Maternal mortality rate (per 100,000 births)	488	113
Annual death (per 1,000 persons)	10.6	5.4

Source: *Kenya health policy 2012-2030 (AKram, 2007)*

2.6 Conclusion

This chapter covered the general outlook of the Kenyan economy and the health system, as well as health inputs and the progress of health indicators over the years. From the chapter it can be noted that the public financing aspect of health care is mainly through revenues generated through taxation; the private aspect is through households who pay fee-for-service. While donor financing remains the largest financier in the health sector, the main donors are the United States, DFID, Global Fund and World Bank according to (Germano, et al., 2004). Although it may not be possible to track donor financing specific to child mortality, most of the donor programs contribute towards child mortality reduction through programs aimed at HIV reduction and malaria control. Over the years child mortality trend has not been in line with the financing, as they have been improving at a rate lower than the target rates. This can be attributed to HIV pandemic, low immunization coverage, high poverty levels.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter is divided into three sub-sections. The first part contains theoretical literature of the association between health financing, health outcome indicators as well as socio-economic variables. The second part reviews the empirical literature while the last and third part is a conclusion drawn from the reviewed literature showing gaps filled by the study

3.2 Theoretical literature review

3.2.1 The Grossman Theoretical Model

The traditional theory of consumer demand assumes that consumers buy goods and services to maximize their utility, that is;

$$U = f(X_1, \dots X_n) \tag{3.1}$$

Where U represents the consumer's utility

$X_1, \dots X_n$, represents the consumers consumption bundles

Therefore demand for goods X_1 is as a result of maximizing consumer utility. Supposing that one of the inputs of the utility function is health good, it therefore shows that the factors affecting health good will indirectly feature in the unitary model. Therefore, the model implies that if good health is the commodity demanded, then health can be generated via goods and services bought in the market and allocated time to preventive measures. A health production function shows the

maximum level of health that a consumer can produce from a definite set of inputs in a given time period.

This framework of demand for health and health care was elaborated by Michael Grossman (1972) where economic, environmental and social factors are considered as inputs of the health generation system. The Grossman model treats health as a durable capital stock that generates an outcome of healthy time and treats endogenously individual's level of health. According to Grossman (1972), an individual demands inputs so as to obtain good health hence good health was regarded as a fundamental good. The Grossman model is built on the assumptions that people have adequate knowledge about their stock of health; individuals are aware of their health depreciation rate and that individuals know their health production function.

The model assumes further that in usual inter-temporal utility function, the length of life as of the planning date is fixed and that death occurs when the stock of health drops beneath a certain level. Thus life duration depends on the amount of stock of health that maximizes utility given certain production and resource constraints. Grossman (1972) analyzed the demand for health in an intertemporal framework, where stock of health was for more than one period, and for a typical consumer the intertemporal utility function is given as;

$$U = f\ (H_0, \dots, H_n, Z_0, \dots, Z_n) \tag{3.2}$$

Where U is the utility to be maximized

H_0 is the inherited health stock

H_n is stock of health in the i^{th} period

Z_0 is the initial consumption of other goods

Z_n is the consumption of other goods in the ith period.

The model allows one come up with the optimal stock of health that is required by the individuals by use of an intertemporal choice model.

The health production function can therefore be summarized and specified as following:

$$H = F(X) \quad (3.3)$$

Where: H – Measure health status of a person

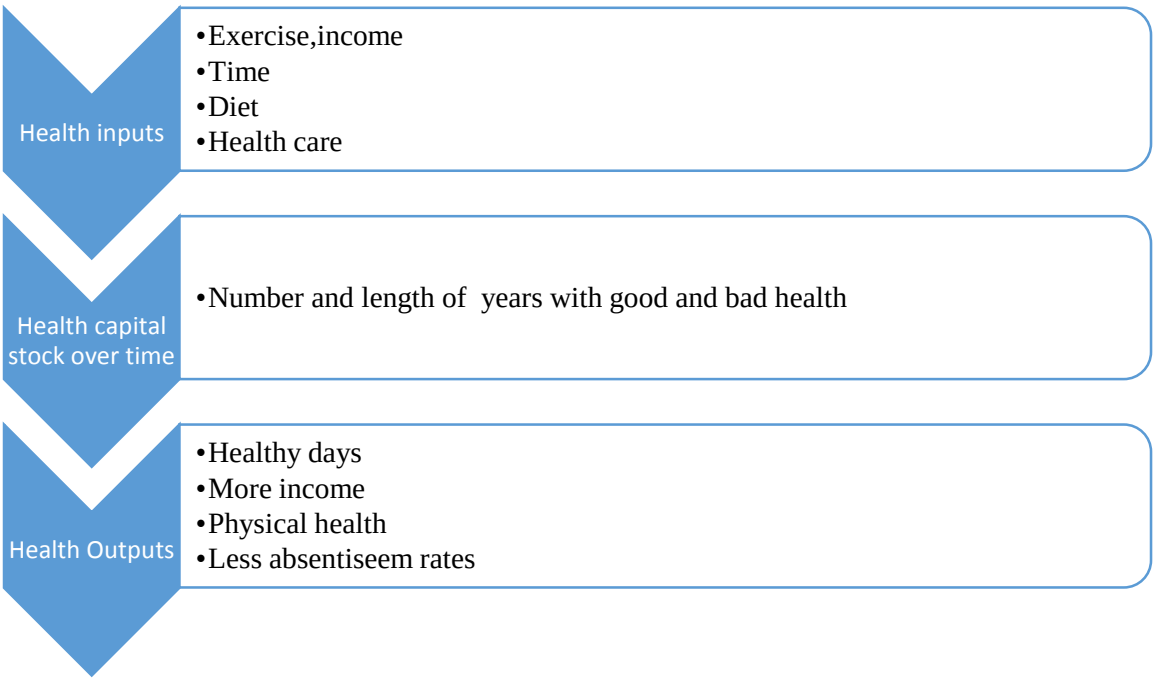
X- Is a vector of individual inputs to the health production function

The vector elements includes: the inherited stock of health such as genes, income, nutrient intake, time devoted to health related procedures, environment, education etc. Grossman in his analysis wanted to know why individuals demand good health and in his findings he concluded that individuals demand health both as investment and consumption good. As an investment good health permits people work and reduces absenteeism rates thus more earnings as a consumption good, it stipulates that healthy people are happier i.e. reduces shame. He also used human capital theory which alludes that individuals invest in themselves via education, training and health to increase their earnings.

The scheme below expounds human capital concept. It demonstrates that consumer apply health inputs as investment in health capital. These investments ameliorates consumer's stock of health. The second row expounds that over time consumer's health stock may grow, remain constant or decline due to illness or physical injury. Last row expounds the aim of a consumer as health outputs governed by healthy days

and they inform consumer how much time and money to invest in health stock. Figure 5 below shows how one invests in heath capital:

Figure 5: Investing in heath capital



Source: Author's summary

The model conclusively suggests that as people get old their health stock depreciates and hence there is need to invest more in health care among the old as compared to younger generation. Secondly higher wages are a reflection of how costly time spent in unhealthy state is and therefore health spending is directly proportional to wages and income. Last but not least the model tells us that more educated people are efficient at producing health and as such the more educated one is the less spending on health care.

Zweifel (2012) highlighted that the Grossman model is very encouraging to health economists. As a production function it is appealing since it concentrates on allocative efficiency in factor inputs use in production and subsequently distribution of income

to those factors. This will assist this study to measure the effects and significance of health inputs on health outcomes

3.3 Empirical Framework

This section reviews previous literature on health financing and health outcomes. While most studies have focussed on the impact of public financing on health outcomes, little attention was paid to the joint impact of donor and private financing on health outcomes. While a lot of research studies have discovered a positive impact of health financing on child mortality, some studies found no impact and yet still other studies found a significant negative impact of health financing on infant mortality.

To begin with, studies that showed that there is the expected negative relationship between health financing and childhood mortality include Nixon and Ulman (2006), Gupta et al. (1999), Kyalo (2013), Cremieux (1999), Bokari and Gottret (2007) and Marwa et al. (2012).

Using time series data, Nixon and Ulman (2006) did an analysis for the EU countries covering a period from 1980 up to 1995. It was found that health expenditures and physician population reduced infant mortality. Gupta et al. (1999) used data for 50 developing and developed nations and found out that higher government expenditures in health reduce child mortality rates. Similarly, Kyalo (2013) carried out a research aimed at finding out the relationship between public health expenditures on health outcomes in Kenya for the period 1980-2011 using the OLS regression model. He found out that government expenditures improved under five and infant mortality

rates. Cremieux (1999) used province level data to investigate the relationship between health spending and health outcomes in Canada. The authors found evidence that a 10 percent decrease in health spending led to 0.5 percent increase in male's infant mortality and 0.4 percent among females.

Bokari and Gottret (2007) estimated the relationship between government health spending and health outcomes using generalized method of moments. From this study, an elasticity of 0.33 of under-five mortality with respect to government spending was found for developing countries. In a similar study by Marwa et al. (2012) who used 1995, 2000, 2005 and 2006 data for 133 developing and middle-income countries, the effect of health spending on infant and child mortality was examined. A fixed effects model was adopted and it was found that health spending significantly reduces both infant and child mortality with elasticity of 0.13 to 0.33 and 0.15 to 0.38 respectively. It was also noted that health spending by the government had a significant contribution towards reducing infant and child mortality and coefficient size depended on good governance level attained by the nation. The reviewed papers, however, only emphasize on the importance of public spending on health. The study will adopt public health financing as a primary variable and the Grossman model to develop methodology as used by Kyalo (2013).

Aside from the discovered negative relationship, other studies have shown that there is no impact of health financing on health outcomes. These include Zakir and Wunnava (1999), Filmer and Pritchett (1999), Kaushalendra et al. (2013), World Bank (2004) and Wagstaff and Cleason (2004). Zakir and Wunnava (1999), using cross-sectional data for 117 nations for the year 1993, found that health spending

specifically by government as a percentage of gross national product had no impact on infant mortality rates.

Similar studies by Filmer and Pritchett (1999) analyzed effect of health spending on health outcomes using OLS for cross national data of 98 developed and developing nations. The study found that public spending had no impact on infant and under five mortality but variables such as literacy levels of females, ethno-linguistic fractionalization, GDP per capita, income distribution and dominant religion in a nation. The World Bank (2004) analysis of infant's mortality and health financing using panel data for Indian states 1980-1999 showed that there is no effect of health financing on mortality when state fixed effects as well as linear time trend are incorporated in the model.

Studies by Wagstaff and Cleason (2004) used econometrics analysis techniques and found that good institutions and policies are very crucial factors that reflect the impacts of health spending by the government on health outcomes. They found that the impact of spending by the government on under five mortality stays not significantly different from zero. Kaushalendra et al. (2013) investigated effect of public spending on health and child mortality in India using cross-sectional data from 1985-2009.

The study adopted the OLS, GLS and FER models for analysis and found an insignificant relationship between spending by the public and childhood mortality both for India and for the Empowered Action Group states in India. However, they noted that Women's education and per capita income were significantly related with

reduced childhood mortality. The reviewed literature non examined impact of private and donor spending on health outcomes which our study will analyze. The study will also adopt variables from the studies such as Women's literacy and per capita GDP as control variables.

Other studies revealed a positive impact of health financing on health outcomes. That is to say, as health financing increases childhood mortality increases. The studies include Berger and Messer (2002) who investigated the effects of health expenditures borne by the public, insurance and health outcomes using health production models estimated by use of data of 20 OECD countries running from 1960 to 1992. The authors found out that mortality rates depended on the combination of health expenditures and insurance coverage type. Specifically a rise in public financing lead to a rise in mortality rates. The authors deduced that as country's health expenditures rises, it's important to reduce the financing share that's from the public.

3.4 Conclusion

Most of the previous literature has not been able to clearly show the trends between health care financing and child mortality. The studies revealed mixed effects of health financing on child mortality and thus there is no particular direction in which health financing has on childhood mortality. Hence for a particular economy the impact must only be investigated through empirical evidence.

Nonetheless, most of the reviewed literature analyzed public spending without looking at the different components of the health financing separately. The results from such studies, as claimed by Kittur (2014) and Kyalo (2013), may not necessarily

be trusted. This is because these components of health financing are highly interlinked such that singling out only one (leaving out others) may result in omission biases. In addition people consume health care which is provided through public, donor and public financing and hence the need to analyze joint impacts of these expenditures.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter discusses the methodology adopted to achieve objectives of the study and how it was operationalized. The chapter includes; the Research Design, Theoretical framework, Empirical model, Definition and Measurement of variables, Data Type, Source and Data analysis

4.2 Research Design, Data Type and Sources.

The primary independent variables for the study were private, public and donor health financing. The study adopted the following control variables: Per capita GDP and Women's literacy as socio-economic variables while Doctor's population per 100,000 people and Measles immunization as health system variables.

The study empirically analyzed the impact of health financing on child mortality in Kenya. The study adopted a research design in which secondary time series data dating from 1980 -2014 was used for the analysis.

The period was chosen based on data availability of the various primary and control variables used. The data was collected from various statistical abstracts and world development indicators as specified in Table 4 below

Table 4: Definition, Measurement and Source of Variables

Variable	Definition	Measurement	Data Source
Infant Mortality Rate (IMR)	Probability of dying between birth and one year expressed per 1,000 live births	Per 1,000 live births	WDI
Under 5 Mortality rate (UD5MR)	Probability of dying between birth and five years of age per 1,000 live births	Per 1,000 live births	WDI
Measles Immunization (MI)	Percentage of children immunized against measles by 23 months of age. Coefficient expectation should be negative	%	DHS & WDI
Private Health Financing (PRHF)	It's the totality of health financing by the private sector in Kenya divided by GDP. It's one of the main primary independent variable	As a % of GDP	KHHEUS & WDI
Public Health Financing	It's the total government health financing divided by GDP. A primary independent variable	As a % of GDP	KHHEUS & WDI
Donor Health Financing	Total external health financing divided by GDP. A primary independent variable	As a % of GDP	KHHEUS & WDI
Doctors population (PD)	Its total population divided by total number of doctors multiplied by 100,000. Its relation with mortalities is expected to be negative	Per 100,000 people	MoH, KHP & WDI

Note: KHHEUS - Kenya Households Health Expenditure and Utilization Surveys

WDI – World Development Indicators

MoH – Ministry of Health

KHP – Kenya Health Policy (Annual Reports)

4.3 Theoretical Framework

Based on the theoretical and empirical literature reviewed, the methodology adopted by this study was anchored on Grossman Model (Grossman, 1972) where he explicitly assumes a constant returns to scale health production function. The study adopted Grossman model since it incorporates both the consumption and investment benefits of health.

The Grossman model was modified to facilitate the analysis of household behaviour using macroeconomic data. Zweifel (2012) argued that the Grossman model is at least in parts rejected by micro data as most studies found signs on the coefficients of certain explanatory variables that were not in line with the model's theoretical predictions hence need to use macroeconomic data. Hartwig and Jan (2017) also justified the use of Grossman model to test macroeconomic data. The study argued that individual (households) preferences can be aggregated in such a manner that society (macro economy) can be treated as if it consists of a single 'representative agent' (p2) .Under this argument microeconomic theories can be tested with both micro and macro data.

Grossman developed a theoretical health production function which is specified as follows;

$$H = F(X) \qquad (4.1)$$

Where H is a measure of individual health status and X is a vector of individual inputs to the health production function. The health production function makes it possible to estimate the relationship between health financing and childhood mortality (health outcome) on a macro level, where in empirical work health financing is used as a proxy for healthcare in the estimation.

Therefore, to analyze the impact of health financing on childhood mortality in Kenya, the Grossman model was modified and specified as shown in equation 4.2:

$$Health_t = f\ (Public_t, Donor_t, Private_t, PGDP_t, PD_t, Im_t, LR_t)$$

(4.2)

Where:

$Health_t$, as health status representing infant and under five mortality measured per 1,000 live births

$Public_t$, as Public health financing measured as percentage of GDP

$Donor_t$, as Donor health financing measured as percentage of GDP

$Private_t$, as Private health financing measured as percentage of GDP

$PGDP_t$, as per capita Gross Domestic Product

PD_t, as Doctors population per 1000 population

Im_t ,as percentage of children immunized against measles 23 months old

LR_t, as Literacy level among women aged 15 years and above

4.4 Model Specification and Estimation

In order to estimate the impact of health financing on child mortality in Kenya the study adopted two analytical models in natural logarithmic form.

Unit root tests undertaken shown that the variables are I (0) and I (1). Conventionally Cointegration procedures like Johansen (1991, 1988), requires all data in an equation be integrated of the same order I (m). In such a case a mixture of both I (1) and I (0) would not be possible under the Johansen procedure

To estimate both short-run and long-run impacts of health financing on child mortality in Kenya, the Autoregressive Distributed Lag (ARDL) approach was used.

Abdulabaset et al. (2013) argued that the ARDL model is better than other cointegration techniques because it has the capability to present both short run and long run effects of the model coefficients. It is also applicable when the variables have different orders of integration, me (1) and me (0). In addition bounds testing procedure can be applied even with small samples as it allows for different optimal lag lengths of the variables.

To achieve this, equation 4.2 was adopted and modelled as an Autoregressive Distributive lag model, ARDL as shown in equation 4.3 below:

$$\Delta \ln Health_t = \beta_0 + \sum_{i=1}^{P} \beta_{1i} \Delta \ln Health_{t-i} + \sum_{j=0}^{m} \lambda_{1j} \Delta \ln PD_{t-j} + \sum_{l=0}^{n} \eta_{1l} \Delta \ln PGDP_{t-l} + \sum_{h=0}^{s} \vartheta_{1h} \Delta \mathrm{Im}un_{t-h} + \sum_{r=0}^{g} \nu_{1r} \Delta \ln LR_{t-r}$$

$$+ \sum_{f=0}^{w} \theta_{1f} \Delta \ln Donor_{t-f} + \sum_{z=0}^{q} \phi_{1z} \Delta \ln Public_{t-z} + \sum_{x=0}^{u} \psi_{1x} \Delta \ln \mathrm{Pr}ivate_{t-x} + \alpha_1 \ln Health_{t-1} + \alpha_2 \ln PD_{t-1} + \alpha_3 \ln PGDP_{t-1}$$

$$+ \alpha_4 \mathrm{Im}un_{t-1} + \alpha_5 \ln LR_{t-1} + \alpha_6 \ln Donor_{t-1} + \alpha_7 \ln Public_{t-1} + \alpha_8 \ln \mathrm{Pr}ivate_{t-1} + \alpha_9 ECM_{t-1} + \varepsilon_t \quad (4.3)$$

Where:

Δ: as the difference operator

$\Psi, \phi, \lambda, \theta, \eta, \vartheta, \nu, \beta$: as short run coefficients

$\alpha 1 - \alpha 9$: as long run coefficients.

Health: as vector of under-five mortality rate and infant mortality model

t : as time in years,

ln: as natural logarithmic form,

Im: as percentage measles immunization

PD: as Doctors population per 100,000 people,

LR: as literacy level among women 15 years and above

$PGDP$: as per capita GDP

ECM: as error Correction model

ε_t: as Disturbance term to capture variables omitted by the model

It should be noted that, since *Health* in the above equation is a vector of two variables capturing health outcomes, then essentially 2 ARDL equations are estimated in the study, each for a specific health outcome, that is; for infant and under five mortality. In the specification of the model, the summation signs represents short-run error correction dynamics while the second part of the equation shown by first lags of the variables represents the long-run relationship.

4.5 Times Series Properties

As is a norm in time series analysis, we start by looking at time series properties of the variables namely stationarity and cointegration. We start with stationarity tests analysis and then we look at Cointegration test analysis. These analyses help us determine the orders of integration of the variables which eventually help us determine the correct econometric model.

4.5.1. Stationarity

The estimation and hypothesis testing using time series data is based on the assumption that the variables are stationary or independent of time. A series is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the gap between the two time periods and not the actual time at which the covariance is computed (Gujarati, 2004). If they are not, it means that the variances and covariance of the time series will not be well defined. Therefore the regression results will be spurious and the estimated coefficients will be biased.

Augmented Dickey Fuller (ADF) was used to determine the Stationarity of the data used in the analysis. Stationarity of the data is important since if the economic time series are characterized by non-stationarity then the standard t-tests and F-tests are inappropriate since the limiting distribution of the asymptotic variance of the parameter estimates becomes infinite (Gujarati, 2004). This often leads to spurious results in conventional regression analysis.

4.5.2 Diagnostic Tests

In order to make sure that the data used for the study is reliable and does not lead to spurious results diagnostic tests were carried out.

Descriptive Statistics were carried out to check the mean, median, maximum, minimum and standard deviation of each variable to ascertain whether the data was normally distributed and the results are presented in Appendix A.

Heteroscedasticity arises when variance of error term differs across values of independent variables. The test was done using Breusch-Pagan test as it can detect any form of heteroscedasticity and it is less vulnerable to violations of the normality assumption.

Multicollinearity refers to linear relationship among some explanatory variables. It was checked using mean VIF (variance inflation factor) in the analysis.

To test for specification error the study adopted Ramsey Reset test to detect for the presence of omitted variables, correlation among regressors and the disturbance term as well as detect incorrect functional form of the model. This is because in the presence of the specification errors makes inference procedures invalid since the least squares estimators will be inconsistent and biased.

The sources of endogeneity of health financing were addressed in the study in order to get the real impact of health financing on child mortality. According to Pesaran and Shin (1999) p.386 argued that simultaneous estimation of short run and long run effects in an ARDL model with the appropriate lags removes the problems that are associated with endogeneity and serial correlation in time series data. In addition Jalil and Syed (2009) the study argued that endogeneity is less of a problem when dealing with ARDL analysis that is free from serial correlation. The study ensured no serial correlation through the adoption of Newey-West standard errors in the ARDL estimation.

4.6 Conclusion

The chapter set out to analyze the methodology that the study adopted for the analysis of the impact of health financing on child mortality in Kenya. The chapter covered model selection for the study, the research design, model specification and estimation, definition and measurement of variables, data type and source, Stationarity tests and diagnostic tests.

The chapter concluded that ARDL is the methodology to be adopted as stationarity tests revealed that some variables were stationary in levels at I(0) and I(1) and also it has the capability to show both short run and long run effects of the model coefficients. The period 1980-2014 was selected based on data availability of the variables of interest.

CHAPTER FIVE

EMPIRICAL FINDINGS AND DISCUSSION

5.1 Introduction

This chapter presents empirical estimates of the study. It is divided into four sub-sections: preliminary tests, results from ARDL models, discussion and interpretation of joint short-run and normalized long run effects for both models and lastly concluding remarks of the chapter.

5.2 Preliminary tests:

5.2.1 Unit root tests

A significant concern in time series analysis is to ascertain whether a series is stationary (does not contain a unit root) or non-stationary (has a unit root). It was imperative to carry out stationarity tests in this study to ascertain whether the data is stationary to allow analyzing using econometric techniques. ADF tests were performed to check formally if the series are statistically significant as it handles autoregressive process in the variables

The study adopted Augmented Dickey-Fuller (ADF) test for unit root and the results are in Table 5 as shown below:

Table 5: Results of ADF unit root tests

Augmented Dickey-Fuller					
Variable	**Test Statistic**	**1% Critical**	**5% Critical**	**10% Critical**	**Order of Integration**
ΔlnWomen's Literacy	5.230	3.730	2.992	2.626	I(1)
lnUnder5Mortality	4.008	3.723	2.989	2.625	I(0)
ΔlnPublic Financing	6.211	3.730	2.992	2.626	I(1)
ΔlnPrivate Financing	6.249	3.730	2.992	2.626	I(1)
ΔlnDonor Financing	8.685	3.730	2.992	2.626	I(1)
ΔlnPer capita GDP	3.867	3.730	2.992	2.626	I(1)
lnInfant Mortality	3.533	3.723	2.989	2.625	I(0)
lnMeaslesImmunization	3.125	3.723	2.989	2.625	I(0)
lndoctor's Population	2.756	3.723	2.989	2.625	I(0)

As shown in Table 5 above, it was found that some of the variables were stationary in levels, I(0), while others were stationary after differencing once, I(1), and this made it possible to estimate the results using an Autoregressive Distributed Lag model (ARDL).

5.2.2 Diagnostic Tests Results

The infant mortality and Under Five mortality models were tested for heteroscedasticity and overall fitness of the models. Newey-West standard errors were used to control serial correlation. The diagnostic results are shown in Table 6 below

Table 6: Summary of Diagnostic Tests

Model	**Infant Mortality**		**Under Five Mortality**	
Test	**Statistic**	**Probability**	**Statistic**	**Probability**
Heteroscedasticity (Breusch-Pagan)	3.78	0.0519	1.17	0.2785
Specification (Ramsey Reset)	0.35	0.7952	9.16	0.1000
Multicollinearity (Mean VIF)	13.65		12.65	

For Infant Mortality model, the Ramsey Reset test, null hypothesis states that the model has no omitted variables. The statistic had a probability value greater than 5 percent (0.7952) and hence the null hypothesis could not be rejected thus the model has no omitted variables. Results of Breusch-Pagan test for heteroscedasticity show that the statistic has a P-value of 0.0519 which is greater than 0.05. In this case, the null hypothesis of constant variance could not be rejected hence the residuals have a constant variance.

The results for Under Five Mortality model above shown that the Breusch-pagan test statistic for heteroscedasticity had a probability value of 0.2785 which is greater than 0.05, showing that the null hypothesis of constant variance could not be rejected at 5 percent level implying that the residuals have a constant variance. Results for Ramsey Reset test for specification could not be rejected as the statistic has a probability value greater than 5 percent ($p>0.05$) and hence the null hypothesis could not be rejected and hence the model is correctly specified, no omitted variables.

Both models revealed the presence of multicollinearity, since their VIF was greater than 10. This can be attributed to fact that, the study adopted ARDL methodology that automatically differences variables which leads to collinearity among the same variable in different time periods. Most of the explanatory variables specifically

health financing variables had a common trend, that is, increasing over time and this leads to multicollinearity. According to (Gujarati, 2004) Multicollinearity violates no regression assumptions since it is a data deficiency problem and sometimes we have no choice over the data used for empirical analysis hence the solution was do nothing since it is not a statistical problem.

5.3 Pesaran ARDL Bounds Testing (cointegration)

Cointegration analysis tests for the presence of long-run relationship between health outcomes and health financing. The Pesaran cointegration method provides two critical values, one assuming that all underlying variables are I(0) and the other assumes that underlying variables are either I(1) or I(0).According to Pesaran, if the calculated t-statistic indicates the presence of long-run relationship then adopt ARDL methodology.

5.3.1 Bounds test results of infant mortality model

Table 7 below shows the bounds Cointegration results of Infant Mortality rate ARDL model. The null hypothesis states that there are no level relationship. We reject if T statistic is less than critical values at 1, 5 and 10 percent levels of significance and accept if T value is greater than the t-critical.

Table 7: ARDL Bounds Test Results of Infant Mortality

		5% Critical		10% Critical	
Null Hypothesis	**T statistic**	**CVL**	**CVU**	**CVL**	**CVU**
$\alpha i = \alpha j = 0,$ $\gamma ij = 1,.,8$ $i \neq j$	-1.636	-3.13	-4.86	-2.86	-4.57

Note: *CVL and CVU are the lower bound and upper bound critical values provided by Pesaran et al. (2001).*

According to Table 7 the t-statistic (/1.636/) is less than the 5% and 10% critical values(/3.13/,/4.86/,/2.86/,/4.57/) we therefore reject the null hypothesis of no levels relationship and conclude that there exists long run relationship between infant mortality rates with health financing, GDP per capita, doctor population, literacy level and measles immunization.

5.3.2 Bounds test results of under-five mortality model

Subsequently cointegration test for long run relationship between under-five mortality and health financing was done. Table 8 below presents the bounds tests cointegration results for Under-Five Mortality rate ARDL model.

Table 8: Bounds Cointegration Test Results of Under Five Mortality

		5% Critical		10% Critical	
Null Hypothesis	**T statistic**	**CVL**	**CVU**	**CVL**	**CVU**
$\alpha i = \alpha j = 0,$ $\gamma ij = 1,.,8$ $i \neq j$	-1.625	-3.13	-4.86	-2.86	-4.57

Note: *CVL and CVU are the lower bound and upper bound critical values provided by Pesaran et al. (2001).*

According to Table 8, the t-statistic /1.625/ is less than the 5 and 10 percent critical values(/3.13/,/4.86/,/2.86/,/4.56/) and we therefore reject the null hypothesis that states no levels relationship and conclude that there exists long run relationship between under five mortality rates with health financing, GDP per capita, doctor population, literacy level and measles immunization.

5.4 ARDL Estimation

We estimated our models using the Autoregressive Distributed Lag (ARDL) cointegration technique as proposed by Pesaran and Shin (1999) .The results of each health outcome model are presented by the ARDL analysis below.

5.4.1 ARDL results and interpretations for Infant Mortality

According to Akaike Information Criteria (AIC), the infant mortality ARDL model (2 2 4 1 1 3 2 1) was selected based on the optimal number of lags of each variable.

The original coefficients, Newey-west standard errors-value and T-statistics of the model are as shown below in Table 9.

Table 9: Short Run ARDL Results for Infant Mortality Model

Variable	Coefficient	Newey-standard Error	T-Statistic	P-Value
lnIMR				
LD.	0.549236	0.2302287	2.39	0.048
lnPD				
D1.	0.0018801	0.0069549	0.27	0.795
LD.	0.000487	0.0088999	0.05	0.958
lnPGDP				
D1.	0.0149924	0.0454742	0.33	0.751
LD.	-0.0118852	0.0240251	-0.49	0.636
L2D.	-0.0077598	0.0365154	-0.21	0.838
L3D	-0.0004886	0.0196357	-0.02	0.981
lnPublic				
D1.	-0.0112849	0.0094039	1.20	0.269
lnPrivate				
D1.	-0.005972	0.0230033	-0.26	0.803
lnDonor				
D1.	-0.0000225	0.0008183	-0.03	0.979
LD.	0.0029434	0.0020003	1.47	0.185
L2D.	0.0019556	0.0008908	2.20	0.064
lnMeasles				
D1.	-0.0005395	0.0007545	-0.72	0.498
LD.	-0.0002921	0.0004262	-0.69	0.515
lnLR				
D1.	0.0004791	0.0104284	-0..05	0.965

Since the coefficients cannot be interpreted as given, summarized joint short run coefficients for infant mortality were estimated, presented and interpreted as shown below in Table 10.

Table 10: Joint Short-Run Effects on Infant Mortality

Variable	Null Hypothesis	F Statistic	P-Value
Own	$\alpha_0=\alpha_1=0$	5.69	0.0485
Public Financing	$\Phi_0=0$	1.44	0.2692
Private Financing	$\Psi_0=0$	0.07	0.8026
Donor Financing	$\theta_0= \theta_1= \theta_2=0$	1.99	0.2040
Per capita GDP	$\eta_0= \eta_1= \eta_2= \eta_3=0$	0.07	0.9899
Doctor's population	$\lambda_0= \lambda_1=0$	0.04	0.9595
Measles Immunization	$\vartheta_0= \vartheta_1=0$	0.33	0.7265
Women's Literacy	$\nu_0=0$	0.00	0.9646
Adjusted R-Squared	0.8965		
Speed of Adjustment	-0.15104		

From Table 10 the estimated overall regression fit shows a good fit. The adjusted R-squared is shown to be 0.8965 suggesting that 89.65% of the dependent variable has been explained by the independent variables.

P-value for the coefficients of primary variables (that is private, public and donor funding) were found to be 0.8026, 0.2692 and 0.2040 respectively which are above 0.05 hence they are statistically insignificant hence they do not individually influence infant mortality in the short-run.

This result contradicts with Mohanoe (2003) who found that an increase in public financing leads to a decrease in infant mortality in Botswana, and Marwa et al. (2012)

who found that health spending by the government had a significant contribution towards reducing infant and child mortality. Nevertheless, the result concurs with an empirical study by Ichere (2013) on health expenditures and childhood mortality in Kenya using Kenya integrated household and budget survey data of 2005/2006. The author found that both public and private health expenditures are statistically insignificant separately in influencing child mortality in Kenya.

In the short run the coefficients, all control variables, have a P-value greater than 0.05 implying than none influenced infant mortality in the short-run either individually or jointly. Table 11 below presents the normalized long run effects for infant mortality (health outcome) by both primary and control variables:

Table 11: Normalized Long Run Effects for Infant Mortality

Effect	Variable	Coefficient Value	Null Hypothesis	Probability
$-\left(\alpha_2/\alpha_1\right)$	Doctor's population	-0.0538	$-\left(\alpha_2/\alpha_1\right)$ =0	0.01
$-\left(\alpha_3/\alpha_1\right)$	Per capita GDP	-0.7383	$-\left(\alpha_3/\alpha_1\right)$=0	0.05
$-\left(\alpha_4/\alpha_1\right)$	Measles Immunization	-0.0325	$-\left(\alpha_4/\alpha_1\right)$ =0	0.33
$-\left(\alpha_5/\alpha_1\right)$	Women's Literacy	-0.2601	$-\left(\alpha_5/\alpha_1\right)$=0	0.18
$-\left(\alpha_6/\alpha_1\right)$	Donor Financing	0.2117	$-\left(\alpha_6/\alpha_1\right)$ =0	0.63
$-\left(\alpha_7/\alpha_1\right)$	Public Financing	-0.0464	$-\left(\alpha_7/\alpha_1\right)$ =0	0.01
$-\left(\alpha_8/\alpha_1\right)$	Private Financing	-0.7760	$-\left(\alpha_8/\alpha_1\right)$=0	0.38

***Note**: The normalized effects are calculated by dividing the long-run coefficients over the dependent variables coefficient.*

The coefficients for the primary variables (donor, public and private financing) are α_6 (0.2117), α_7 (-0.0464) and α_8 (-0.7760) with a p-value of 0.63, 0.01 and 0.38 respectively. The coefficient signs for both public and private are negative as expected but donor has a positive coefficient against earlier expectation. The long run impacts of private and donor financing on infant mortality are insignificant as they have a p-value greater than 0.05 although the coefficient of private financing was negative.

From the results it can be noted that both in the short-run and long run, private and donor financing methods are insignificant in influencing infant mortality.

Public financing has a negative and significant coefficient. In this case, a 1 percent increase in public financing decreases infant mortality by 0.0464 percent in the long run, holding other things constant. Government policies take time before their impacts are felt by the populace. Kenya is a middle-income country with about 46 percent of the population living below poverty line and government plays an important role in health care provision. Additionally health facilities infrastructure and equipment's are very expensive and it is only the government that can afford such in poor countries. The finding concurred with a study by Vavken et al. (2012) who analysed the impact of increased health financing on health outcomes in Australia. The authors found that public health care financing was important in reducing infant mortality in Australia. This is a reflection that public health financing improves health outcomes (infant mortality) both in developed and developing nations.

Women's literacy level (LR) and child immunization against measles have negative signs though insignificant in influencing long run effects on infant mortality. The coefficient for doctor's population (PD), $\alpha_{2,}$ is negative and significant. It shows that a 1 percent increase in doctor's population per 100,000 population reduces infant mortality rate by 00.05384 percent other things held constant. The finding concurs with empirical findings such as by Nixon and Ulman (2006) that found child health programs such as immunization and increase in the number of physicians to reduce infant mortality. The coefficient of per Capita GDP (PGDP), α_3, has a negative sign and is statistically significant. The result shows that a 1 percent increase in PGDP reduces infant mortality by 0.7383 percent, holding factors constant.

5.2.2 ARDL Estimated results and Interpretations for Under Five Mortality

The ARDL model (4 2 4 1 1 3 2 1) was selected based on the optimal number of lags of each variable using Akaike Information criteria (AIC). The original coefficients, Newey-west standard errors-value and T-statistics of the model are as shown below in Table 12.

Table 12: Short Run ARDL results for Under Five Mortality model

Variable	Coefficient	Newey-standard Error	T-Statistic	P-Value
lnUMR				
LD.	0.7260114	0.2933064	2.48	0.056
L2D.	-0.2083072	0.6589557	-0.32	0.765
L3D.	0.6952066	0.7250785	0.96	0.382
lnPD				
D1.	-0.0005596	0.0070886	-0.08	0.940
LD.	-0.0050341	0.0088953	-0.57	0.596
lnPGDP				
D1.	-0.0090181	0.0531172	-0.17	0.872
LD.	-0.0088204	0.0264201	-0.33	0.752
L2D.	0.0037391	0.0371414	0.10	0.924
L3D	-0.0011401	0.019858	-0.06	0.956
lnPublic				
D1.	0.0050669	0.0136062	0.37	0.725
lnPrivate				
D1.	-0.0023414	0.0230982	-0.10	0.923
lnDonor				
D1.	0.0000351	0.0007607	0.05	0.965
LD.	0.0010122	0.0022543	0.45	0.672
L2D.	0.0009912	0.001007	0.98	0.370
lnMeasles				
D1.	-0.00051	0.0006479	-0.79	0.467
LD.	0.0000924	0.0005577	0.17	0.875
lnLR				
D1.	-0.0025495	0.0096251	-0.26	0.802

The raw coefficients could not be interpreted and hence the joint short-run coefficients were estimated and presented as shown below in Table 13

Table 13: Joint short run effects on under five mortality

Variable	Null Hypothesis	F Statistic	P-Value
Own	$\alpha_0=\alpha_1=0$	4.60	0.0669
Public Financing	$\Phi_0=0$	0.14	0.7249
Private Financing	$\Psi_0=0$	0.01	0.9232
Donor Financing	$\theta_0=\theta_1=\theta_2=0$	0.49	0.7052
Per capita GDP	$\eta_0=\eta_1=\eta_2=\eta_3=0$	0.10	0.9790
Doctor's population	$\lambda_0=\lambda_1=0$	0.19	0.8361
Measles Immunization	$\vartheta_0=\vartheta_1=0$	0.39	0.6990
Women's Literacy	$\nu_0=0$	0.07	0.8017
Adjusted R-squared	0.9503		
Speed of Adjustment	-0.1507		

The overall regression fit of the model is 95.03% as reported by the adjusted R-squared which implies that the dependent variable has been explained 95.03% by the independent variables.

The primary variables (public, private and donor financing) have positive signs against our earlier expectation and insignificant at levels. The result showed that joint short run effects of public, private and donor financing have no influence on under five mortality rates. It implies that in the short-run, health financing has no influence on under five mortality rates since even the speed of adjustment is low at 15.07 percent.

The joint short-run effects of the control variables, per capita GDP, doctor's population, immunization against measles and women's literacy level had no influence on under five mortality rates. This imply that the high levels of under-five

mortality in Kenya is due to other factors. According to a health expenditure and utilization survey report by the Ministry of Health (2009a), some households do not visit health facilities when ill due to cultural and religious beliefs as such a child ends up dying of a condition that is not only preventable but also curable.

Table 14 below presents the normalised long run effects for under five mortality (health outcome) by health inputs (public financing, donor financing, private financing, Women's literacy, per capita GDP, measles immunization):

Table 14: Normalized Long run effects on Under Five Mortality

Effect	Variable	Coefficient Value	Null Hypothesis	Probability
$-\left(\alpha_2/\alpha_1\right)$	Doctor's Population	-0.2316	$-\left(\alpha_2/\alpha_1\right)=0$	0.24
$-\left(\alpha_3/\alpha_1\right)$	Per Capita GDP	-0.7268	$-\left(\alpha_3/\alpha_1\right)=0$	0.09
$-\left(\alpha_4/\alpha_1\right)$	Measles immunization	-0.00428	$-\left(\alpha_4/\alpha_1\right)=0$	0.01
$-\left(\alpha_5/\alpha_1\right)$	Women's literacy	-0.1541	$-\left(\alpha_5/\alpha_1\right)=0$	0.06
$-\left(\alpha_6/\alpha_1\right)$	Donor Financing	-0.0778	$-\left(\alpha_6/\alpha_1\right)=0$	0.15
$-\left(\alpha_7/\alpha_1\right)$	Public Financing	-0.5619	$-\left(\alpha_7/\alpha_1\right)=0$	0.48
$-\left(\alpha_8/\alpha_1\right)$	Private Financing	0.5438	$-\left(\alpha_8/\alpha_1\right)=0$	0.20

***Note**: The normalized effects are calculated by dividing the long-run coefficients over the dependent variables coefficient.*

The results in Table 14 show that all independent variables have negative signs except for private financing whose sign is positive. The primary variables are insignificant in influencing the long run impacts on under five mortality rate.

The coefficient for per capita GDP is significant and negative. From the results, other things held constant, a 1 percent increase in Per capita GDP reduces under five mortality rate by 0.7268 percent. As a country's Per capita GDP improves it leads to improved living conditions for the populace such as nutrition, hygiene which improves under five mortality. The coefficient for child immunization against measles is found to be significant and negative where a 1 percent increase in child immunization against measles reduces under five mortality by 0.00428 percent holding factors constant. The finding is in line with studies such as Rajkumar (2008) and Kyalo (2013) who found that measles immunization reduces under five mortality rates.

The coefficient for Women's literacy level is also found to be negative and significant where a 1 percent increase in Women's literacy level reduces under five mortality rate by 0.1541 percent, holding factors constant. Literate Women use basic services like antenatal care as literacy increases the demand for health services utilization since Women are more aware of child health and as theory suggests that there is a positive relationship between literacy and health outcomes.

5.5 Conclusion

Empirical results generated by the study were analyzed and interpreted concisely in this chapter. The study used Kenyan data dating from 1980-2014 to analyze the impact of health financing on child mortality. The study found that in the short run private, public and donor health financing does not influence child mortality (infant and under five mortality).

Also the study found that public, private and donor health financing does not influence under five mortality in the long run. Per Capita GDP, child immunization against measles and Women's literacy level were found to reduce under-five mortality rates in the long run. Additionally the results revealed that Public financing, doctor's population per 100,000 people and Per capita GDP reduced infant mortality in long run.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The chapter comprises summary of the findings, contribution to knowledge, conclusions of the study and recommendations. The main purpose of this study was to find the impact of health financing on child mortality in Kenya.

6.2 Summary of findings

In Kenya over the years health financing as a percentage of GDP has been increasing but child mortality have not been improving as expected. The study used time series data dating from 1980 to 2014 and used an ARDL analysis approach .The objectives of the study were to evaluate whether health financing influences infant mortality in Kenya and to analyse whether health financing influences under five mortality in Kenya.

The salient findings of the study are as follows:

Infant Mortality

In the short-run health financing had no influence on infant mortality.

Additionally in the long-run only public health financing improved infant mortality holding factors constant. Health financing specifically public health financing was interpreted as significant, therefore the hypothesis is rejected.

Under Five Mortality

The study found that both in the short run and long run health financing did not influence under five mortality rate. In this case health financing was interpreted as not significant, therefore the hypothesis is accepted.

6.3 Contribution to knowledge

The study revealed that besides health financing there are other factors that influence child mortality in Kenya. These factors include: doctor's population per 100,000 people, Women's literacy level, Per Capita GDP and child immunisation against measles all these were found to reduce child mortality in Kenya. These suggest the importance of women empowerment through education specifically in matters concerning child health and that government should actively campaign for immunization programs, maintain economic growth and increase the number of medical doctors. A study to investigate the feasibility of these dimensions is thus recommended

6.4 Conclusion

The study findings revealed that in the long run public health financing reduced infant mortality. The findings concurred with other previous literature that found a negative impact of public health financing on child mortality (Cremieux, Ouellette, & Pilon, 1999; Mohanoe, 2003; Gani.A, 2009). Besides health financing, the study found other independent variables such as doctor's population to improve infant mortality while Women's literacy level, child measles immunisation reduced under five mortality rates in the long run and Per Capita GDP reduced both infant and under five mortality.

6.5 Recommendations

The recommendations are based on results of this study and are divided into two sections. The first section presents a set of recommendations to the policy makers. The second section proposes recommendations providing suggestions for future research.

6.5.1 Recommendations for Policy Makers

The study found public health financing to have a significant impact in reducing infant mortality. The study recommends health professionals to agitate for an increased allocation of funds by the government to the health sector. Similar studies found that government financing improve infant mortality such as Kyalo (2013) and Kaushalendra et al. (2013)

6.5.2 Recommendation for Further Research

The study recommends further research on other health outcomes as well as analyze the impact of factors such as religion and cultural beliefs on health outcomes. In the future, with availability of data, studies should be carried out to measure the impact of health financing on maternal mortality.

6.6 Limitations of the Study

Challenges were encountered in acquiring time series data for various variables of interest which were dropped, namely: data on mid-wives and nurses so as to analyze their impact on child mortality as well as data on maternal mortality which made it impossible for the study to investigate it although, according to the Kenya Health Policy (2012b), maternal deaths remain the main cause of death among women of childbearing age

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APPENDICES

Appendix A: Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std Dev	Obs
Public	1.8259	1.6630	3.5039	1.2956	0.5686	35
Private	2.3770	2.3825	2.6193	2.1236	0.1569	35
Donor	12.2428	8.7688	35.3273	1.5626	10.2704	35
Measles Immunization	74.8857	78	93	49	11.9232	35
Women's Literacy	48.9981	49.0257	49.8487	47.9455	0.4827	35
Per Capita GDP	541.7574	405.0256	1335.065	223.3348	298.607	35
U5 Mortality	89.7486	96.3	108.2	53.5	17.1500	35
Infant Mortality	4.0438	61.9	69.1	38.2	9.6933	35
Doctors Population	2.0854	0.1375	0.1998	0.0128	0.0421	35

Appendix B: UnNormalized Long Run ARDL Results for Infant Mortality (IMR) and U5MR Models

Variable	Model	Coefficient	Newey-West Std Error	P-value	T-statistic
lnPublic	IMR	-0.0070	0.07252	0.926	-0.10
	U5MR	-0.08467	0.09879	0.431	-0.86
lnPrivate	IMR	0.1172	0.2010	0.578	0.58
	U5MR	0.08194	0.20053	0.700	0.41
lnDonor	IMR	-0.0320	0.02460	0.235	-1.30
	U5MR	-0.01172	0.02446	0.652	-0.48
lnMeasles Imun.	IMR	-0.00491	0.0065	0.478	0.75
	U5MR	-0.0006456	0.00664	0.926	-0.10
lnLR	IMR	0.0393	0.1024	0.38	0.713
	U5MR	0.02322	0.1051	0.834	0.22
lnPGDP	IMR	0.1115	0.4630	0.817	0.24
	U5MR	-0.1095	0.4141	0.802	-0.26
lnPD	IMR	-0.0081	0.06701	0.907	-0.12
	U5MR	0.0349	0.0708	0.643	0.49