THE EFFECT OF PUBLIC AND PRIVATE HEALTH CARE EXPENDITURES ON INFANT MORTALITY RATE IN KENYA

BY

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DECLARATION

I declare that this thesis is my original work and has not been presented to any other University for a degree or any other award.

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DEDICATION

This work is dedicated to my dear mother Serfine Odira Ouko and my beloved husband George Ouma.

ABSTRACT

Public and the private sectors finance Kenyan healthcare system. The public and private sectors contribute34% and 40% of the total health expenditure respectively and the donor contribution is 26%. The total health spending is 6.8% instead of the 15% of the total government expenditure, as per the Abuja agreement to which Kenya is a signatory. The infant mortality rates (IMR) in Kenya is still high, 39 per 1000 live births. While policy and strategy formulation forums pushes for increase in healthcare inputs from the public and private sectors, focus on both the expenditures and outcomes has been ignored. Ascertaining the level of benefits resulting from the various healthcare expenditures is vital. However, researches that summarize the debate on the effects of Public healthcare expenditure (PHE) and Private healthcare expenditure (PRHE) on IMR advocate conflicting views. Little research has since been done for Kenya regarding the effect of PHE and PRHE on IMR. Whether PHE and PRHE reduce IMR in Kenya is still unclear. Other than filling the knowledge gap, an examination of the effect of PHE and PRHE on IMR in Kenya will also be useful in reconciling the different positions. The purpose of the study was to examine the effect of PHE and PRHE on IMR in Kenya. The specific objectives were: To establish the effect of PHE on IMR in Kenya; to ascertain the effect of PRHE on IMR in Kenya; to analyze the joint effect of PHE, PRHE, per capita income (Y), female literacy (FL), immunization coverage (IMU), Urbanization level (URB) on IMR in Kenya. Correlational research design was used. The Health Production model formed the theoretical framework. Time series annual data for a period of 34 years from 1981 to 2014 was used. After confirmation of unit root presence by use of the, Augmented Dickey Fuller test the Johansen cointergration test was done, the variables were found to be cointergrated. Bivariate and Multivariate Newy-West regressions were carried out to estimate

the models. ECM (Error Correction Model) was employed to take care of the adjustments towards equilibrium. The results showed that both the PHE and PRHE had a significant negative relationship with IMR at the 5% level. Increasing PHE by 1% reduced the IMR by 0.12%. 1% increase in PRHE reduced IMR by 0.09%. The joint effects PHE, PRHE, Y, IMU, FL and URB on IMR reveal an R^2 of 91.32%. These variables therefore, accounted for more than 91% of the variations in IMR. Y, IMU, FL and URB also have a negative relationship with IMR. The study concludes that PHE and PRHE are significant for the reduction of IMR in Kenya. That jointly PHE, PRHE Y, IMU, FL, URB reduce IMR in Kenya. The study findings provide impetus for the government to design and implement policies that increase PHE. Measures that increase the PRHE such as Private insurance should be enhanced. The education policies that increase female literacy and the increase in accessibility of healthcare facilities are important.

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ABBREVIATIONS AND ACRONYMS

ADF	Augmented Dickey –Fuller
ECM	Error Correction Model
GDP	Gross Domestic Product
IMR	Infant mortality rate
PHE	Public Healthcare Expenditure
PRHE	Private Healthcare Expenditure
IMU	Immunization Coverage
FL	Female Literacy
URB	Urbanization level
THE	Total Health Expenditure
NHSSP I, NHSSP II	National Health Sector Strategic Policy1 &2
UMR	Under five mortality rate
OOP	Out Of Pocket
NHIF	National Hospital Insurance Fund
WHO	World Health Organization
HIV	Human Immuno deficiency Virus

AIDS	Acquired Immuno Deficiency Syndrome
TB	Tuberculosis
KNBS	Kenya National Bureau of Statistics
MDG	Millennium Development Goals
Y	Per capita Income
KDHS	Kenya Demographic Health Survey
NHA	National Health Accounts

NOTATION AND SYMBOLS

NOTATIONS

The following notations were used in the equations in the research thesis:

$IMR, H, X, Y, PHE, PRHE, IMU, FL, URB$ Variables

$\alpha_i, \beta_i, \gamma, \delta_i, \Omega_i, y_i$parameters$[\, i = 1,2,3,\ldots, n\,]$

$\mathcal{E}_t, e_t, \mu_t, and\ \ v_{\,t}$Error terms

Equation Numbers

Equations from each section are referred to by the section number and equation number within that section.

OPERATIONAL DEFINITION OF TERMS

Infant mortality rate (IMR): A measure of the rate of deaths of live born infants before their first birthday; the numerator is the number of infants under 1 year of age born alive in a defined region during a calendar year who die before they are 1 year old; the denominator is the total number of live births**;** Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year; often quoted as a useful indicator of the level of health in a community.

Public healthcare expenditure: Includes recurrent and capital spending from local and central government budgets, internal borrowings and grants as well as donations from international agencies and non-governmental organizations.

Private healthcare expenditure: Includes direct household (out- of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations.

Per capita income This is the mean income of the people in an economic unit such as a country or city. It includes taking a measure of all sources of income together (such as Gross Domestic Product or Gross National Income) and dividing it by the total population.

Under–five Mortality rate (U-5MR): Is the probability of dying between birth and age five years expressed per 1,000 live births.

Immunization Coverage: According to the WHO, a child is considered fully vaccinated if he has received one dose of Bacterium of Calmette Guerin (BCG), three doses each of Diptheria Pettussis and Tetanus (DPT) and polio, and one dose of measles vaccine. BCG should be given at birth or at first clinic contact; it protects against tuberculosis. DPT protects against diphtheria, pertussis, and tetanus. DPT and polio require three vaccinations at approximately 6, 10 and 14 weeks of age. Measles should be given at or soon after reaching nine months of age. The WHO recommends that children receive the complete schedule of vaccinations before 12 months of age.

Female literacy level: This is the percentage of females aged 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. Generally 'literacy' also encompasses 'numeracy' the ability to make simple arithmetic calculations.

Urbanization level: In this study, it refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization prospects.

Cointergration This is a method of defining the long run equilibrium relationship amongst a group of time series variables.

Error Correction Model This is a combination of long and short run interaction amongst a group of variables (it is an error term lagged once)

Integrated process This is a process of making non stationary data stationary by differencing it ,for example a discrete process integrated of order d must be differenced d times to reach stationarity .

Stationarity: A time series is said to be stationary if it's mean variance and covariance and all invariant with respect to time.

White noise error term : This is an error term that follows the classical assumption, Namely it has zero mean, constant variance $\sigma^2$and is un auto correlated This is a necessary second order stationary condition.

Unit root: This is an alternative test of stationarity condition among time series variables

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The public as well as the private sectors finance Kenyan healthcare system. The Private sector is the main source of health financing in the country contributing about 40% of the Total Health Expenditure (THE), whereas Public sector and the donors contributes 34% and 26% respectively (National Health Accounts(NHA), 2012/2013).

The Governments in developed countries with better health indicators have large growing public health expenditures; nevertheless the role of public expenditure in health care provision has been constantly debated(Kulkarni, 2016). While the need for increasing public expenditure on health care seems necessary from a policy perspective, existing studies on the issue present at best a mixed picture (Barenberg *et al*. 2015). While some researchers such as Gani (2008) and Barenberg *et al*. (2015) found that PHE was significant in reducing infant mortality rates (IMR) in Pacific Island countries, and Indian states respectively, Contrary to their findings, Filmer and Pritchet (1999) and Kulkarni (2016) found an insignificant effect of PHE on IMR in 98 developing countries and 5 BRICS (Brazil, India, China, Russian Federation and South Africa) nations respectively. For example in Africa, researchers such as, Akinkugbe and Mahanoe (2009); Anyanwu and Erhijakpor (2009) found PHE to significantly reduce IMR. Whereas other researchers like, Yakub *et al*. (2012) found PHE to be insignificant in reducing IMR except after in cooperating governance and corruption. In Kenya, Gakunju (2003) found PHE to significantly reduce IMR, whereas, Ochieng' (2010) found an insignificant effect of PHE on IMR. It is important to ascertain the level of benefits that arise due to the public healthcare expenditure (PHE).However, the conflicting views and inconclusive debate make it difficult to determine the

level of benefits resulting from the healthcare expenditure, which is vital in Health policy formulations. In this study, we revisit the issue of the effect of public expenditure on health care on health outcomes in the Kenyan context.

In most developing countries, where child mortality, communicable diseases, income poverty and inequality remain high, private expenditures on healthcare dominate. Further, out-of-pocket expenditure remains a major component of private health expenditures in most of these countries, especially in countries with no social health insurance. This restricts access to medical care, particularly for the poor (Boachie and Ramu, 2016).In Kenya, the Households' Out Of Pocket (OOP) healthcare expenditure as a component of PRHE contributed 27% of the Total Health Expenditure (NHA, 2012/2013).Relatively few studies have been done on the effect of PRHE on IMR. However few, they are not without conflicting views. Muldoon *et al*. (2011) found out that out-of-pocket (component of private healthcare expenditure) expenditure on health significantly reduced infant mortality rates in the United Nation member countries after in cooperating the corruption variable. Oleche (2011) in his studies found out that out-of-pocket health expenditure brought about a decrease in infant mortality rates in Kenya. However, Homaie *et al.* 2013) found no significant relationship between private health expenditures and the IMR in Eastern Mediterranean Countries. The different views as well as the few number of studies on PRHE in Kenya makes it an area for further research in order to fill in the knowledge gap that exists.

The IMR in Kenya is still at a high of 39 per 1000 live births KDHS (2014). This is far from the achievement of MDG of below 22 deaths per 1000 live births by 2015. Total Healthcare Expenditure is only 6.8% way below the Abuja declaration (2001) of 15% of the total government expenditure, to which Kenya is a signatory. The need to increase financial resources to the Kenyan Healthcare system from both the public and private sectors has been a discussion in many policy

and strategy formulation forums, (NHSSP II, 2005-2010; Ong'uti, 2012; Kenya Draft Health Financing Strategy, 2012). Therefore, focus on both the expenditures and outcomes are necessary. According to Preker (2007), to improve the efficiency of healthcare expenditures, resource allocation should be adjusted towards the inputs with higher marginal contribution. However, despite decades of intensive study, there is no consensus regarding the effectiveness of healthcare expenditures for IMR. Studies that summarize the debate on the effects of PHE and PRHE on IMR are inconclusive and often advocate conflicting views. Researchers such as, Akinci *et al*. (2014) found that PHE and PRHE were both significant in reducing IMR in the countries in the MENA region, Kim and Moody (1992) and Musgrove (1996) found both to be insignificant in influencing IMR. The studies that covered the different income levels also showed conflicting views. For example, Issa and Quattara (2005) found PHE to be significant in reducing IMR in the low-income states and PRHE to be more significant in reducing IMR in the high-income states in India. Whereas, Homaie Rad *et al*. (2013) revealed that PHE is significant in reducing IMR in the East Mediterranean Countries but PRHE had insignificant effects on IMR because of the opposing effects of income between the rich and the poor families. Researches that cover Kenya also reveal conflicting views. For example, Novignon *et al*. (2012) found out that both PHE and PRHE significantly reduced IMR in Sub Saharan African countries whereas, Njenga (2013) revealed that the individual effects of both PHE and PRHE had insignificant effects on IMR and that only their complementary effect was significant in Kenya. Therefore, the effect of PHE and PRHE on IMR in Kenya is still unclear. This is in the face of an increased demand for quality, equitable and affordable healthcare for a growing population in line with the Kenya vision 2030.

There is already substantial literature on the link between Public and Private Health expenditures on Infant Mortality Rate in various parts of the world, however, it has been largely ignored in

Kenya. To the best of our knowledge Njenga (2013) is the only country specific study in the literature that examine this link in Kenya. Consequently, there is no evidence in Kenya on what effects the private or public health expenditures have in reducing IMR when invested alone or when jointly invested. In this study, we extend the current state of knowledge on this topic by examining this relationship further by establishing the effect of PHE and PRHE on IMR in Kenya.

Compared with previous studies, this study contributes to the literature in the following aspects: First, it took into account the type of data as well as the period of study. Novignon *et al.* (2012) used panel data for 44countries for 16 years. This brings about two problems. First, data on both mortality and expenditures are unlikely to be compared across countries. Second, the estimates in these studies are subject to bias on account of heterogeneity that might be correlated with the variable of interest (Durlauf *et al.,* 2005).This study tackles the two problems by being country specific, using National annual time series data for 34years (long enough period to produce reliable estimates) instead of 16 years as in the case of Novignon *et al*. and instead of the Kenyan household data supplemented with county level data as in the case of Njenga (2013). Secondly, the adjustments towards the equilibrium; this study employed an Error Correction Model to take care of the short-term dynamics.

Finally, this study considered the joint effects of PHE and PRHE as well as the four other variables such as Income per capita (Y), Immunization coverage (IMU), Female literacy level (FL) and Urbanization level (URB) in line with the existing literature. This is also contrary to Novignon *et al.* (2012)who explored the differential effects of the PHE and PRHE.

The bivariate Newey-West regressions' results reveal that both the PHE and PRHE are significant in reducing IMR in Kenya. The Multivariate regression results of the joint effects of the PHE, PRHE, Y, IMU, FL and URB reveal that they jointly reduce IMR in Keya.

1.2 Statement of the Problem

Total Healthcare Expenditure is 6.8% way below the Abuja declaration of 15% of the total government expenditure to which Kenya is a signatory. The IMR in Kenya is still high of 39 per 1000live births farbelow 22 deaths per 1000 live births by 2015.This provides the impetus for the campaign for increased resources to the health sector. While the need to increase PHE and PRHE seems necessary from a policy and strategy formulation perspective, existing studies on the issue present conflicting views.Focus on both the expenditures and outcomeshas been ignored.Some researchers found out that both PHE and PRHE reduced IMR in the Sub-Saharan African countries, whereas others found out that individually PHE and PRHE had no significant effect on IMR but only complement each other in reducing IMR in Kenya. Only one research has been done for Kenya regarding the effect of PHE and PRHE on IMR. Therefore, the issue as to whether PHE and PRHE improve IMR in Kenya is still unclear. The lack of consensus makes it difficult to determining the level of benefits resulting from the various healthcare expenditures.Consequently, there is no evidence in Kenya on what effects the PHE or PRHE have in reducing IMR when invested alone or when jointly invested.Therefore, the examination of the effect of PHE and PRHE on IMR in Kenya will not only fill the knowledge gap,reconcile the different positions but also help in policy formulation. In line with these observations and concerns, this study sought to; further examine and shed more light on the effects of PHE and PRHE on IMR in Kenya.

1.3 Objectives of the study

The overall objective of this study was to examine the effect of public and private healthcare expenditure on infant mortality rate in Kenya.

The specific objectives:

1. To establish the effect of PHE on IMR in Kenya.
2. To ascertain the effect of PRHE on IMR in Kenya.
3. To analyze the joint effect of Public Healthcare expenditure (PHE),private health expenditure (PRHE),per capita income (Y), female literacy (FL), immunization coverage (IMU), Urbanization level (URB) on infant mortality rate in Kenya.

1.4 Hypotheses of the study

The hypotheses of the study include.

H_{01}: There is no significant effect of PHE on IMR in Kenya

H_{A1}: There is a significant effect of PHE on IMR in Kenya.

$H_{02:}$ There is no significant effect of PRHE on IMR in Kenya.

H_{A2}: There is a significant effect of PRHE on IMR in Kenya.

H_{03}: There is no significant joint effect of PHE, PRHE, Y, FL, IMU, and URB on IMR in Kenya

H_{A3} There is a significant joint effect of PHE, PRHE, Y, FL, IMU, and URB on IMR in Kenya.

1.5 Significance of the study

The examination of the effect of public and private healthcare expenditure on IMR as an indicator of health outcomes in Kenya is important in order to determining the level of benefits resulting from the various healthcare expenditures. It is important not only for the reduction of the IMR but also for helping the policy makers to focus on both expenditure and outcome in order to improve the efficiency of health investment. This study therefore, expected to examine furtherand shed more light on the effects of PHE and PRHE on IMR in Kenya and to fill the knowledge gap on the effect of Public and Private healthcare expenditures on IMR in Kenya. It is also expected that the study will add substantially to the existing body of knowledge on the relationship between healthcare expenditures and various health outcome indicators. The findings and general conclusion of this study will not only be applicable to Kenya but also to the other developing countries.

1.6 Scope and Limitations of the Study

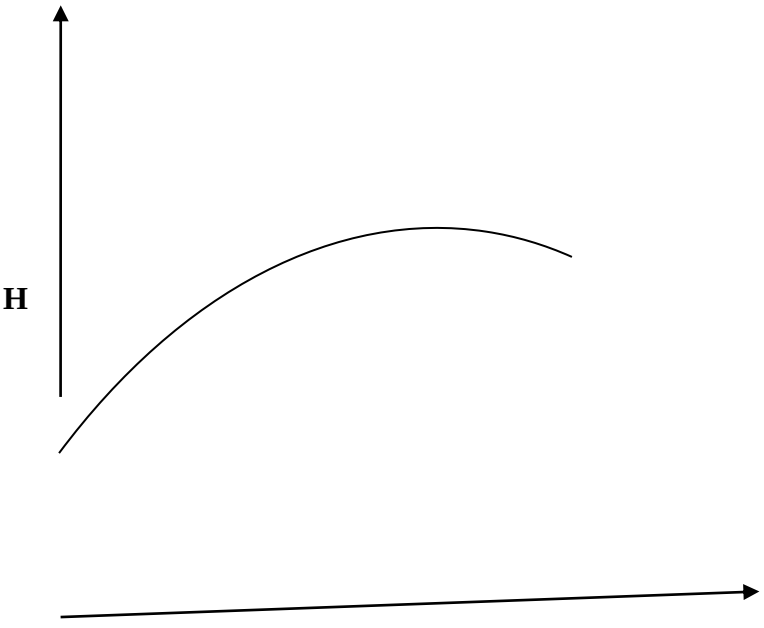
This study was centered on the government and private expenditure on healthcare and their effect on health outcomes such as IMR in Kenya. The study covered the PHE, PRHE,IMR as well as the other covariates for 34 years from the period 1981-2014. The period was chosen because it is long enough to have a reliable analysis of data besides being unique in the sense that it covered implementation of different health policies and reforms. These reforms include: the first National Health Sector Strategic Plan (NHSSP- I) for period 1999-2004, the second National Health Sector Strategic Plan (NHSSP II) for period 2005-2010 National Health Sector Strategic Plan (NHSSP II) Kenya Health Sector Policy Framework, Kenya Essential Package for Health ,Public Health Act Cap 242. This study used time series data from 1981-2014 due to availability since it is a

collection of observations of well-defined data items obtained through repeated measurements over time (Australian Bureau of statistics). However, this study considered only infant mortality as a measure of health status, and only four other variables that influence IMR were considered, that is per capita income (Y),immunization coverage (IMU), female literacy (FL) andurbanization (URB) levels.

1.7 Theoretical framework

This study was based on the health production function. According Preker (2007) the Health Production Function specifies the relationship between outcome (as an output) and health related inputs. According to Nixon and Ulmann (2006) in the health production function ,health is viewed as an 'output ',say of a healthcare system which is influenced by the 'inputs' to that system. Therefore considering Health (H) as an 'output' of a healthcare system and Health care (HC) as 'inputs' into this system.

The basic model of Health Production function:



HC

Figure 1.1 Health production function

$$H_t = Health\ at\ time\ t$$

$HC_t = Health\ Care\ \ at\ time\ t$

$\mathcal{E}_t = Error\ term$

Assuming that all the variables can be measured perfectly. The health production function is written as:

$$H_t = f(HC_t, Other\ inputs_t\ , \mathcal{E}_t) \qquad 1.1$$

Preker affirms that the Health production function can be used at, both the micro level and macro level.The macro level approach is important in determining the allocation of social resources and the government budget; the micro level approach is meaningful in studying individual's health production behavior and demand for health and healthcare.

Based on the Health production function depicted in the equation1.1 above, the model for this study takes the following general form:

$$y = f(x_1, x_2, x_3, x_4, x_5, x_6, \varepsilon) \qquad (1.2)$$

Where:

$y = health\ outcome\ indicator\ IMR$

$x_1 = per\ capita\ income$

$x_2 = \ public\ health\ care\ expenditure$

$x_3 = \ private\ healthcare\ expenditure$

$x_4 = immunization\ coverage$

$x_5 = female\ literacy\ level$

$x_6 = urbanization\ level$

$\varepsilon = error\ ter\mathrm{m}$

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This part presents a review of theoretical and empirical evidence from previous studies carried out on health care expenditure and health outcomes. So far section one provides a brief account of the theoretical literature. Section two discuses a number of empirical studies in and outside Kenya. The synthesis of the chapter and major gaps in the empirical literature are presented in section three.

2.2 Theoretical literature

Two approaches have been adopted by other researchers in this field of study (Zweifel and Breyer, 1997) .The first approach is grounded in the work of Grossman's human capital theory (Grossman, 1972a,b) at the individual level. The second approach and the one adopted in this particular study was the health production function at the macro level.

2.2.1 Grossman's human capital theory

At the level of an individual, this theory regards health as a commodity, which the individual consumer will wish to consume and maximize, subject to his budget constraints, in conjunction

with a number of endogenous and exogenous variables, or characteristics, which have an impact on the individual's health (Grossman, 1972a, b).

Basic model

The utility function of a typical consumer be for a one time period equation (2.1) expressed in Grossman's (1972a, b) notation .The Utility is maximized subject to household and production technology.

$Max U_i = U_i(\varphi, H_i, Z_i), \quad i$=1, 2,3…(2.1)

Subject to:

$$P_i M_i + V_i X_i + W_i(TL_i + TH + T_i) = W_i\Omega + A_i = R_i \qquad (2.2)$$

$$I_i = I_i(M_i, TH_i; E_i) \qquad (2.3)$$

$$I_i = (H_i - H_0) + \delta H_i \qquad (2.4)$$

$$Z_i = Z(X_i, T_i; E_i) \qquad (2.5)$$

Where*;* U is utility

$\delta H_i$is the stock of health in period i and its depreciation rate (time period $i = 1$,for all variables);

$\varphi_i$is the flow of services per unit of health stock so that $h_i = \varphi_i H_i$ is the total quantity of health services available for consumption in period i measured in this case by healthy days;

$H_0$is inherited stock of health capital

P_i andV_i are prices of medical care (M_i) and other goods (X_i) respectively;

W_i is the wage rate in the labor market;

I_i is gross investment in health;

Z_i is an aggregate of all commodities besides health;

TH_i and T_i are time inputs associated with the production of I_i and Z_i;

TL_i is the time lost from market and non-market activities due to illness?

E_i is the level of education;

A_i is non labor income

Ω_i is the total amount of time available in any period;

R is full income ,the monetary value of assets plus the earnings an individual would obtain if he spent all his time working.

Equation (2.2) is the full household income constraint, where;

$\Omega_i = TW_i + TH_i + T_i$,

Where TW_i is hours of work.

The inclusion of TL_i in (2.2) modifies Becker's (1965) time budget constraint, so that it can fully exhaust the total time available in any period (Grossman, 1972a, b) part of the 'full income, R, a concept coined by Becker(1965),is spent on market goods, part of it is spent on non-market production and the remaining part is lost due to illness.

Equations (2.3 and 2.4) are production functions for health and a composite non-healthy commodity respectively.

2.2.2 The health production function

This study adopted this second approach that considers health as production function. According toPreker (2007), the health Production Function specifies the relationship between health outcome (as an output) and health-related inputs .If the maximum health improvement can be achieved at the least total input (cost), efficiency will be achieved. According to Nixon and Ulmann (2006) in the health production function,health is viewed as an 'output ',say of a healthcare system which is influenced by the 'inputs' to that system. They further observed that researchers adopting this approach wished to investigate the relationship between health care expenditure, or medical care resources as inputs, and health outcomes as output of that system. Preker asserts that output in the production function is defined as Health, though how to define health and measure its level are subject to debate. He states that input definition and measurements vary widely with the study objectives. The input alternatives include: healthcare resources used for curative health services, other non-healthcare consumption (nutrition, tobacco, physical exercise); education; income;

environmental factors (such as risk factors related to pollution) and other demographic factors (age, gender).

Therefore considering Health (H) as an 'output' of a healthcare system and Health care (HC) as 'inputs' into this system

The basic model of Health Production function

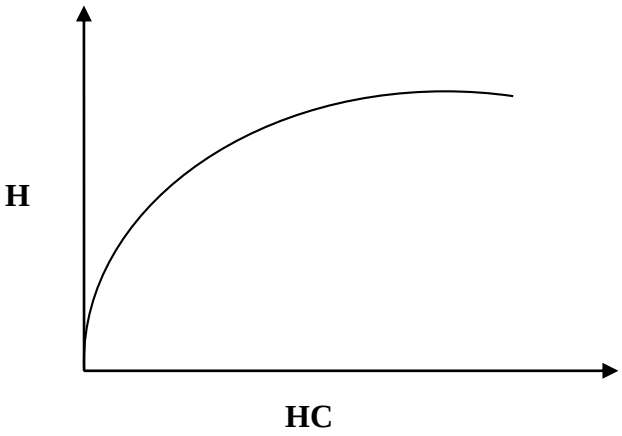


Figure 2.1 Health Production function

Where:

$$H = Health$$

$HC = Health\ Care$

Assuming that all the variables can be measured perfectly. The health production function is written as:

$H_t = f(HC_t, Other\ inputs_t, \varepsilon_t)$ (2.9)

Preker affirms that the Health production function can both be used at the micro level and macro level .The macro level approach is important in determining the allocation of social resources and the government budget; the micro level approach is meaningful in studying individual's health production behavior and demand for health and healthcare.

2.2.3 Summary and Gap in Theoretical Literature

This study adopted the health production function since it is applicable in both the Macro level and micro level (Preker, 2007) unlike the Grossman household model usually applicable in micro level studies. According Nixon and Ulmann (1996), considering micro level results for health policy decision making at macro-level may be misleading.

However the distinction between these approaches has become somehow blurred and a degree of overlap exists as many of the variables employed in the two approaches are the same, and they are both categorized as 'production functions' (Nixon and Ulmann, 2006).

2.3 Empirical literature

Considerable literatures in recent past try to establish the link between health expenditures, per capita income, immunization coverage, female literacy level, fertility rates and some measures of health outcomes such as infant mortality. The available studies so far document a range of effects from no impacts, to limited impacts, and to impacts on only specific interventions.

Infant mortality is regarded as a sensitive indicator of the availability, utilization, effectiveness of healthcare and it is commonly used for monitoring and designing population, and health programs

(The Tribune, 2002). It is one of the components of United Nations human development index (UN, 2007). Hence, its description is very vital forevaluation and planning of the public health strategies (Park, 2005).The Mortality rate; infant (per 1,000 live births) in Kenya was last at 39, according to Kenya Demographic Health Survey(2014). One of the most important items in the Millennium Development Goals (MDG) was to reduce infant and child mortality by two-thirds between 1990-2015 (UNICEF, 2006;CBS, 2004).Achieving the MDG, meant, simply, a reduction in the Kenyan IMR to about 22.0 per 1000 live births by 2015.

2.3.1 The effect of Public healthcare expenditure on infant mortality rate.

Filmer and Pritchett (1997) when they studied Child mortality and public spending used time series cross sector data for 22 countries with data going back to 1870 to do fixed effects estimation and finds an infant mortality elasticity with respect to income of -0.59. Their study attempted to address the issue of allocations within the health sector by including a measure of government spending on primary healthcare in their cross-section analysis of the causal factors of infant mortality. They did not find a statistically significant impact of primary healthcare spending on infant mortality. However their aggregate health sector data are not consistent with the fiscal or the intersectoral data. Measurement errors could have been further exacerbated by the use of statistical techniques to create imputed values for missing observations. This study includes the public component of healthcare expenditure which comprise of the primary healthcare spending and goes an extra mile to add the private component to which they did not include.

In their further study, Filmer and Pritchet (1999) investigated the effect of government health expenditure on infant and under five mortality using cross-sectional data on 98 developing countries in 1992/3. They showed that 95% of the variation in mortality between countries is

explained by income per capita, income inequality, female education, ethnic fractionalization, and whether the country is more than 90% Muslim. Their further study on the impact of government health expenditure on infant and under-five mortality in 98 developing countries revealed a statistically insignificant effect

Kim and Lane (2013) studied Government Health Expenditure and Public Health Outcomes: A comparative study among 17 countries and Implications for U.S Healthcare reforms. They used data from 17 developed countries collected between 1973 and 2000, including Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Sweden, Switzerland, the United Kingdom, and the United States. The dataset used in this study was created through the integration of three data sources: OECD statistics, the World Health Organization (WHO) database and a Quality of Government Study dataset. The dependent variables used were, infant Mortality rates and Life expectancy at birth. The independent variables used were the public expenditure on health as a percentage of total health expenditure in a given country and other socioeconomic covariates such as, real GDP per capita, the Gini coefficient, unemployment rates, and the rate of the aging population (over 65). Data was analysed using Linear Mixed Model. The results show a negative relationship between public health expenditure and infant mortality rate. Specifically, a one percent increase in public health expenditure decreases infant mortality rate by .077, controlling for the effects of other covariates.

Kulkarni (2016) in their study on Health Inputs,Health Outcomes and Public Health Expenditure: Evidence from the BRICS Countries, used the panel data fetched from the World Health Organization and World Bank Databases. They analyzed the data for five BRICS nations, Brazil,

India, China, Russian Federation and South Africa. It estimates the health production function based on Grossman's theoretical framework. Their analysis was based on the panel data regression with fixed effects model. The results showed a positive relation between health outcome and the GDP Per capita, Adult literacy rate, and Out of Pocket expenditure. The environmental pollution represented by CO2 emissions per capita metric ton and Female workforce participation rate shows a negative relation with health outcomes. The age dependency ratio also shows a positive elasticity with IMR confirming the negative relation between age dependency relation and health production. The public health expenditure is showing a positive elasticity with IMR. This implies that higher public expenditure indicates higher IMR or lower health outcomes.However, they did not account for endogeneity.

Gani (2008) in his study on Healthcare financing and health outcomes in pacific Island countries provides an empirical evidence on the relationship between per capita public health expenditure and three measures of health outcomes (infant and under-five mortality rates and crude death rates) using cross-country data from seven Pacific Island countries for selected years between 1990 and 2002. The study provided strong evidence that per capita health expenditure is important in determining health outcomes. The results suggested that a 10% increase in per capita health expenditure would lead to an approximate 6.6% reduction in infant mortality rate, equating to an average reduction of 2.0 infant deaths per 1000 live births for the Pacific Island countries. However, a potential limitation lies in the fact that the study failed to control for private health expenditure and of adult female literacy or education due to the lack of data. Given the nature of cross-country estimations, a consistent set of data was needed for the specified time periods, thus with data missing for some countries it was impossible for them to control for this variable. Hence,

the models tested in their study did not include private health care expenditure of which this study is geared towards capturing.

Bhalotra (2007) in her study entitled "Spending to save? State Health Expenditure and infant mortality in India,'' found out that state health spending saves no lives. Their study was unique in that it took care of the dynamism by allowing lagged effects. After controlling in a flexible way for trended unobservable and restricting the sample to rural households ,a significant effect of health expenditure on infant mortality emerges ,the long run elasticity being about -0.24.In her study the effectiveness of public intervention (state health expenditure) is measured in terms of its impact on infant mortality when she controlled for state education expenditure the expected decrease in IMR was statistically insignificant.

Barenberg, *et al.* (2015) studied the effect of Public health expenditure on Infant Mortality in Indian States. Their study used a panel data set of Indian states between 1983–84 and 2011–12.They used IMR as the dependent variable. The explanatory variables included; public health expenditure, per capita income, female literacy,and urbanization. They found out that public expenditure on health care reduced IMR. Theirbaseline specification showed that an increase in public health expenditure by 1 percentof state-level GDP was associated with a reduction in the IMR by about 8 infant deathsper 1000 live births. They also found that female literacy and urbanization reduces the infant deaths per 1000live births.

Anyanwu and Erhijakpor (2009) did a panel data analysis and using a fixed effect model of 47 African countries between 1999 and 2004. The variables they used included per capita total as well as government health expenditures and per capita income. They used two health outcomes: infant mortality and under five mortality. They found that total health expenditures (as well as the public

component) are a significant contributor to health outcomes with a 10% increase in total health care expenditure per capita resulting in 21% and 22% decrease in under-five and infant mortality rates respectively. This study included the governance and anti-corruption variables, however they did not capture the private healthcare expenditures.

David (1999) examined health expenditure ,services and outcomes in Africa: Basic data and cross-National comparison ,1990-1996 .He reported a reversal in adult mortality trends from 1990 to 1995 with small increases for both males and females .During his study, the relationship between public expenditures on health and key health services and health outcomes. Higher public sector health expenditure was associated with higher measles immunizations coverage, even after adjusting for levels of GDP and female literacy. Three associations were also found between health services and improved health outcomes: measles immunization with childhood malnutrition; contraceptive prevalence with lower infant mortality; and supervised deliveries with lower infant mortality.

Akinkugbe and Mohanoe (2009)studiedPublic health expenditure as a determinant of health status in Lesotho. They used three indicators of health status: life expectancy at birth (years), infant mortality rate (per 1,000 live births), and under-5 mortality rate (per 1,000). They examined the relationship between public expenditure on health care and health status in Lesotho using an econometric technique-the error correction model. They found public health expenditure to reduce IMR in Lesotho. The results of their analyses indicated that the availability of physicians, female literacy, and child immunization also significantly reduced IMR in Lesotho. However, contrary to most of the studies, they found income per capita to be insignificant in determining the level of IMR in Lesotho.

Yaqub, *et al*. (2012) examined public healthcare expenditure and outcomes in Nigeria. They investigated the impact of public health spending on infant and under-5 mortalities as well as life expectancy. They used two-stage-least squares in addition to the ordinary least squares techniques in their estimation because of the possibility of reverse causality. They found out that public health expenditure has negative effect on infant mortality and under-5 mortalities when the governance indicators are included whereas it has wrong signs without the governance indicators. As the level of corruption goes down and value of the corruption perception index rises, there is an improvement in health status since infant and under-5 mortalities decline and life expectancy rises. This implies that simply increasing public expenditure on health is less likely to lead to improvement in health status unless corruption is issue is addressed. However this study did not capture the private component of healthcare.

Boachie and Ramu (2016) conducted a more recent study; on the effect of Public health expenditure on health status in Ghana. Their study used annual time-series data for the period 1990-2012. Infant mortality rate was the dependent variable. Whereas, the real per capita income, literacy levels and female labour force participation were the explanatory variables. Ordinary Least Squares and Newey-West regression techniques were used. The regression estimates suggested that real per capita income, public health expenditure, education and female presence in the labour market were negatively related to infant mortality rate. However, the elasticity coefficients of female participation in the labour market and real per capita income were statistically insignificant at 5% level. They concluded that public health expenditure and literacy/education improve health status by reducing infant mortality. The favorable effect of education or literacy on health is greater

than that of public health spending whereas the effect of real per capita income on health was found to be insignificant. However,this study did not consider the private component of healthcare. Gakunju (2003) in his study of the determinants of health status in Kenya indicated infant mortality as the dependent variable while explanatory variables were GDP per capita, public health expenditure ,doctors' access by households ,female literacy, immunization coverage, and access to clean water and sanitation .His study utilized time series data from period 1960-2000. The fact that government expenditure was significant to households' health came out strongly in his study adding that government expenditure influenced health status with a lag. Meaning that past and current government spending in health sector have significant effect on the health of the population. He found out that income per capita and female literacy was highly significant in the determination of health status with a 0.37% increase in per capita income leading to a 1% reduction in infant mortality. He also found out that a 1.6% increase in female literacy lead to a 1% reduction in infant mortality. However, his study utilized only the central government health expenditure data to explain health status of the population and did not capture the private component of the healthcare expenditure.

Ochieng' (2010) conducted a similar study in Kenya.In his study of the impact of public health expenditure on health outcomes in Kenya used a time series data for the period 1975to 2008. He used two measures of health outcomes namely: infant mortality rate (per 1000 live births) and under- five mortality rate (per 1000 live births) as the dependent variables.He used the number of health professionals, public health expenditure as a share of gross domestic product, femaleliteracy rate and immunization coverage jar measles as independent variables. He asserts that immunization coverage is one of the most important factors relevant to health outcomes in Kenya .The results revealed that though many advocate for greater health expenditure, it does not affect

health outcomes in Kenya. However, Ochieng' in his study was not able to capture the contribution of the private sector, HIV/AIDS and Malaria prevalence, access to safe drinking water. This study has not also captured the dynamics of the health care expenditures, which our study does.

2.3.2 The effect of Private health expenditure on Infant mortality rate.

Muldoon*et al.* (2011) examine the link between mortality rates and 13 explanatory variables, including government and out-of-pocket expenditures on health, using a sample of 136 UN member countries for 2008. Performing mixed effects linear regression analysis, authors find that out-of-pocket expenditures on health is significantly related to mortality rates. Other variables that are found to be important in explaining variability in mortality rates are health care system, access to water and sanitation and corruption index.

Private healthcare expenditure contributes close to 37% of the total healthcare expenditure in Kenya as noted earlier,with Out of Pocket at the point of service being predominant at close to 30% (NHA, 2008/2009).ThereforeOleche (2011) studied a causal link between out-of-pocket health expenditure and mortality. The main source of data for his thesis was the household health expenditure and utilization survey conducted jointly in 2007 by the Kenyan health ministries and the Kenya National Bureau of Statistics. The results from the analysis revealed that a percentage increase in the out-of-pocket health expenditure is associated with a decrease in mortality level of 0.16%. It is also found that a full subsidy on user charges per visit or on the inputs used to produce health services decreases mortality level by 0.51 % through its favorable effect on the total value of healthinputs used by households. His study only captures out of pocket health care expenditure which is but a component of PRHE besides using a short period of time ;1 year.

2.2.3 The joint effect of public, Private Healthcare expenditures, per capita income, immunization coverage, female literacy, urbanization rate on Infant Mortality Rate.

In an influential study, Issa and Quattara (2005) studied the Effect of Private and Public expenditure on Infant Mortality Rates. They disaggregated health expenditure into private and public and divided the countries in their study into two groups according to their level of development (income). The results obtained from employing OLS and panel data techniques on the 160 countries showed strong negative relation between health expenditure and IMRs. However, they found that this effect is channeled through public expenditure at low development levels and through private expenditure at high development stages. Private health expenditure in the group of high-income countries was found to be significant at the 1% level in three out of four regressions; in the group of low-income countries it is insignificant in three regressions and significant in the fourth one at the 10% level. Public health expenditure is not significant in any of the regressions for the high-income group while it is highly significant in all the four regressions of the low-income group. The results of the whole group of countries reveal that private expenditure is significant in two regressions, once at the 5% level and once at the 10% level, and is insignificant in one regression. Public expenditure is significant at the 1% level in two regressions and at the 5% in one regression, and insignificant in the fourth regression. Issa and Quattara (2005) also found strong negative relationship between IMRs and female education. The results of the female literacy showed that female secondary enrolment ratios are highly significant at the 1% level in all the regressions for all and low-income countries, for the high-income group this variable is significant in two regressions at the 1% and 5% levels and insignificant in the other two regressions. Issa and Quattara (2005) in their study also noted income per capita to be an important factor that leads to a decline in infant mortality .Issa and Quattara's study is among the

few studies that have disaggregated healthcare expenditure into the private and public components thereby carrying out the study in a number of countries in different development levels. However this study is country specific and has chosen Kenya as a developing country to be studied. Using data from one country will decrease the problems of data inconsistency that are inherent in studies that use international data,

Nixon and Ulmann (2006) on their study entitled 'the relationship between health expenditure and health outcomes: Evidence and caveats for a causal link', studied the countries of the European Union. They undertook econometric analysis of three dependent variables associated with health outcomes: life expectancy at birth (male and female) and infant Mortality. Their explanatory variables included: total (per capita) health expenditure,health expenditure as a proportion of GDP, number of physicians (per 10,000 head of population),number of hospital beds,in patient admission rate, average in-patient length-of – stay in hospital,population coverage of healthcare system ,unemployment rate,alcohol consumption expenditure on tobacco,nutritional characteristics and environmental pollution.The analysis was applied to data of the 15 EU countries of the period 1980-1995.The results reveal that health expenditure and number of physicians are the only significant determinants in the reduction in infant mortality.

Musgrove (1996) carried out a study in several countries using both economic theory and empirical analysis. He noted that there are different and all but moderately successful combinations of public and private activities which different countries had reached. His study developed arguments for interventions and their limitations; relates them to the instruments available to governments for affecting market outcomes; and examines how health care is actually paid for and provided in a large number of countries and how the level, composition and mechanisms of finance appear to

affect health outcomes. Multivariate estimates of the determinants of child mortality show that: the health share in GDP, the public share in health spending and the share of public expenditure on health in GDP are statistically insignificant.

Kim and Moody (1992), in their study attempt to examine the relative importance of health care resources in predicting infant mortality within industrialized, developing, and underdeveloped countries. Their analyses were based on the data of 117 countries. Findings from their study suggest that health resources as a whole do not make a significant contribution to accounting for the variance of infant mortality rates over and above the variance accounted for by socioeconomic resources only. They noted that the contribution of health resources to the health of the population as a whole is really rather small in comparison to the role of socioeconomic resources. However, the above studies (Musgrove, 1996; Kim and Moody, 1992; Nixon and Ulmann, 2006)suffer two important limitations.First, data on both mortality and expenditures are unlikely to be compared across countries. Second, the estimates in these studies are subject to bias on account of heterogeneity that might be correlated with the variable of interest (Durlauf*et al.*, 2005).This study addresses the first problem by using country specific time series data and the second problem by carrying out diagnostic tests on the data.

Akinci*et al.*(2014)in their study on Examining the Impact of Health Care Expenditures on Health Outcomes in the Middle East and North Africa(MENA) region.They conducted their study on 19 countries in the Middle East and North Africa (MENA) region.They used panel data for 1990-2010 to estimate the impact of government and private health care expenditures on infant, under-five, and maternal mortality rates. Pooled ordinary least regression, random effects, and Hausman-Taylor instrumental variable models were used to examine the relationship between health care

expenditures and selected health outcomes. The results show that after controlling for confounding factors; both government and private spending on health care significantly improved infant Mortality in the MENA region.A percentage increase in per capita government expenditures reduced the infant mortality rate by 8.6 to 9.5 deaths per 1000 live births. Similarly, a percentage increase in the log per capita private expenditures reduced the infant mortality rate by 7.2 to 8.1 deaths per 1000 live births.Improvements in access to safe drinking water, increasing share of births attended by the health personnel, and adult literacy rate also reduced infant, under-five, and maternal mortality rates.

Homaie*et al*.(2013) in their comparison of the effects of public and private Health expenditures on Health status in the East Mediterranean countries considered infant mortality rate as an indicator of health status. They estimated the model using the panel data of EMR countries between 1995 and 2010. They did the unit root test and cointegration test then estimated the model using the random effects. Theyfound outthat the public health expenditures had a strong negative relationship with infant mortality rate. However, a positive relationship was found between the private health expenditures and infant mortality rate (IMR). Private health expenditures contain some health expenditures, such as out of pocket health expenditures and private health insurance. In addition, they observed that, for poorer families increasing the out of pocket expenditures may lead to catastrophic health expenditures and increasing poverty which eventually results in an increase in infant mortality rate. However, for the rich families an increase in the private insurance led to improvement of health status as characterized by decreased IMR. The relationship for public

health expenditures was significant, but for private health expenditures was not because of the opposing effects. They went an extra mile to study the opposing effects between the income per capita and Private Healthcare Expenditure.

Novignon*et al.*(2012) in their study of the effects of public and private health care expenditure on health status in sub-Saharan Africa, used a panel data from 1995 to 2010 covering 44 countries.They used the Fixed and random effects panel data regression models. A 1% increase in total health expenditure reduced infant mortality rate by approximately 3 infants per 1000 live births in both the fixed and random effects models, respectively. While public health care expenditure reduced infant mortality rate by approximately 4 infants in both models at 1% significance level, an increase in private health care expenditure by 1% reduced infant mortality rate by 2 infants per 1000 live births in both models at 1% significance level. However, their study is different from this study in the sense that in as much as it covered Kenya as one of the sub-Saharan African countries it is not a country specific study and only covers a period of 16 years and this may not give the reliable results. They also studied the differential effects of PHE and PRHE on IMR whereas our study tackled the joint effects of these expenditures on IMR.

A recent study was conducted in Kenya by Njenga (2013).In his study entitled "Health Expenditure and child Mortality: Evidence from Kenya ', noted that the previous studies on health impacts of government and household expenditures have been estimated independently of each other. Njenga explores the complementarities of the public and private healthcare expenditures in improving health by estimating own and joint effects of public and private health expenditures on child mortality using Kenyan household data supplemented with county level data as opposed to our study, which uses National time series data. Their study is different since it accounted for the

endogeneity of expenditures and to heterogeneity of child health by using structural linear probability models of neonatal, infant, and under-five mortality. His findings revealed that the effects of public and private health expenditures on child deaths depend critically on age of the child. He stated that public and private health expenditures have no effect on deaths of neonates but significantly influence the mortality of infants and children below the age of five. Similar to this study the found that the expenditures complement each other in reducing child mortality. However, after accounting for the interaction effect, he noted that the separate impacts of the expenditures on mortality are statistically insignificant.

2.3 Summary and gap in literature

It has been observed that issues of healthcare expenditures and health outcomes have been an interesting field of study for decades. On examination of the countries studied, it can be noted that a majority studied various combinations of developed or developing countries such as,Akinci (2014) Kim and Moody (1992). Some studies also capture different income levels either by countries or by families such as Issa and Quattara (2005),Homaie*et al.* (2013). In terms of modeling, techniques all the studies utilized some form of multivariate regression analysis, with some in cooperating lagged variables for data affected by temporal factors for example Bhalotra (2007) and Gakunju (2003)

Several researchers have investigated the effect of government health expenditure (PHE) on IMR. While some studies do not find any support for public health expenditure (PHE) reducing infant mortality rates, others show that public health care spending has beneficial outcomes in terms of reducing infant mortality. For example when Gani (2008) and Barenberg*et al.* (2015)found that PHE was significant inreducing IMR.Filmer and Pritchet (1999), Kulkarni(2016) found an insignificant effect of PHE in IMR. In Africa, when Akinkugbe and Mahanoe (2009), Anyanwu

and Erhijakpor(2009) found PHE to significantly reduce IMR, Yaqub*et al.*(2012) found PHE to be insignificant in reducing IMR except after in cooperating governance and corruption. In Kenya, when Gakunju(2003) found PHE to significantly reduce IMR, Ochieng' (2010) found an insignificant effect of PHE on IMR.Thereby, making the debate inconclusive.

Relatively fewer studies have been done on the effect of PRHE on IMR. When Oleche (2011) found the OOP expenditure (a major component of PRHE) to be significant in reducing IMR in Kenya, Muldoon et al (2011) found OOP expenditure to be significant in reducing IMR after in cooperating corruption Perception index. Much research is still needed in this particular area.

There are several studies on the joint effect of PHE, PRHE, Y, IMU, FL, and URBon IMR.These too have conflicting views on the results. When Akinci*et al.* (2014) found that PHE and PRHE were both significant in reducing IMR in the countries in the MENA region, Kim and Moody (1992) and Musgrove (1996) found both to be insignificant in influencing IMR. There are studies that realize a different effect for each of the two healthcare expenditures. These are: One,Issa and Quattara(2005) who found PHE to be significant in reducing IMR in the low income countries and PRHE being more significant in reducing IMR in the high income countries.The second is Homaie*et al.*(2013) which revealed that PHE is significant in reducing IMR in the East Mediterranean Countries but PRHE had insignificant effects on IMR because of the opposing effects of income between the rich and the poor families. Studies that cover Kenya also show conflicting views. Novignon*et al* (2012) found out that both PHE and PRHE significantly reduced IMR in Sub Saharan Countries whereas, Njenga(2013) revealed that the individual effects of both PHE and PRHE had insignificant effects on IMR and that only their complementary effect was significant. Therefore, the effect of PHE and PRHE on IMR in Kenya is still unclear.

Against this background, this study sought to reassess the effect of PHE and PRHE on IMR in Kenya. This was done by using time series annual data for a period of 34years from 1981 to 2014 and employedNewy -West regression analysis, checking for co-integration then applying an Error-Correction methodology on the model to adjust for equilibrium. The secondary data was obtained from and World Bank databases and Statistical Abstracts (1981-2014) from the Kenya National Bureau of Statistics.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter therefore introduces the methodology and analysis techniques employed in this study. In this chapter, Section 3.1 presents the area of study3.2 presents the Model specification, 3.3 Estimation Technique, followed by the time series properties of the data in section 3.4. The data types and sources, description of the variables are outlined in section 3.5, which gives the data presentation technique 3.6. Section 3.7shows the economic apriori expectations.

3.2 Study area

This study covered only the republic of Kenya,a sovereign state in East Africa. Kenya is located on the equator with the Indian Ocean lying to the south-east and is bordered by Tanzania to the south, Uganda to the west, South Sudan to the north-west, Ethiopia to the north and Somalia to the north-east. Kenya covers 581,309 km^2 (224,445 sq m), and had a population of approximately a population of 38,610,097 by July 2009 (KNBS, 2009) .The Kenyan map is in appendix C.

3.2.1 Research Design

This study used correlational research design to ascertain the effect of public and private healthcare expenditures on IMR in Kenya. The correlational research design is a quantitative method that determines whether or not two variables are correlated. Meaning, to study whether an increase or decrease in one variable corresponds to an increase or decrease in the other variable.

3.2.2 Target population/ Data Set

The study covered 34years of both public and private healthcare expenditures in Kenya, from the period 1981-2014. The period was chosen because it is long enough to have a reliable analysis of data besides being unique in the sense that it covered implementation of different health policies and reforms.

3.3 Model specification

This study utilized the health production function and Gani (2008), structural equation to examine the impact of public spending on health care in the Pacific Island Countries

This study considered IMR as a measure of health status therefore the link between PHEand PRHE and IMR in Kenya could be examined through an empirical framework where the key issues relating to infant mortality and public and private health expenditure is unfolded.

The health production function according to Preker (2007) is stated as;

$$H_t = f(HC_t, Other inputs_t, \varepsilon_t) \qquad (3.1)$$

Where:

H_t= health outcome at time t

HC_t= healthcare inputs at time t

$\mathcal{E}_t = error\ term$

t = time

In equation (3.1) the right hand side depicts the inputs to a health production system where as the left hand side depicts the output to the system which in this case is health status.

In order to investigate the effect of public and private healthcare expenditure on Infant Mortality rate, three models are specified. The first model is to study the effect of Public healthcare expenditure and Infant mortality rate. This model contains the public healthcare expenditure as the only healthcare input. It is written as:

$$\ln IMR_t = \alpha_0 + \alpha_1 \ln PHE_t + \varepsilon_t \qquad (3.2)$$

The second model captures the effect of Private healthcare expenditure on Infant mortality rate. It is written as:

$$\ln IMR_t = \beta_0 + \beta_1 \ln PRHE_t + \varepsilon_t \qquad (3.3)$$

In order to analyze the joint effect of public Healthcare expenditure (PHE),private health expenditure (PRHE),per capita income (Y), female literacy (FL), immunization coverage

(IMU), Urbanization rate (URB) on infant mortality rate the Gani (2008) model was adopted and modified.The Gani (2008) model takes the following general form:

$$Y_{it} = f(H_{it}, X_{it}, \varepsilon_{it}) \qquad (3.4)$$

Where:

Y_{it} =health outcome indicator reflecting health status of country i, at time t

H_{it} =per capita public spending on healthcare of country i, at time t

X_{it} =a vector of socio-economic control variables of country i, at time t

ε_{it} =error term of country i, at time t

Thus, the structural equation to examine the effect of public andprivate spending on health care in Kenya after modification from Gani, equation (3.4) takes the following general form:

$$y_t = f(x_{1t}, x_{2t}, x_{3t}, x_{4t}, x_{5t}, x_{6t}, \varepsilon_t) \qquad (3.5)$$

Where:

$y_t = health\ outcome\ indicator\ IMR\ at\ time\ t$

$x_{1t} = per\ capita\ income\ at\ time\ t$

$x_{2t} = \ public\ health\ care\ expenditure\ at\ time\ t$

$x_{3t} = \ private\ healthcare\ expenditure\ at\ time\ t$

$x_{4t} = immunization\ coverage\ at\ time\ t$

$x_{5t} = female\ literacy\ level\ at\ time\ t$

$x_{6t} = urbanization\ level$at time t

$\varepsilon_t = error\ term\ at\ time\ t$

Health outcomes are presumed to be primarily a function of Health care expenditure (public and private) as well as several other variables (Gani, 2008; Preker, 2000; Nixon and Ulmann, 2006). Having considered Infant mortality rate as one of the three measures of health outcomes in his study,Gani expressed his regression analysis as follows:

$$\ln IMR_{it} = \alpha_0 + \alpha_1 \ln Y_{it} + \alpha_2 \ln PCH_{it} + \alpha_3 \ln IMU_{it} + \alpha_4 \ln URB_{it} + \alpha_5 \ln CI_{it} + v_{it} \qquad (3.6)$$

Where:

IMR =Infant mortality rate;

Y = Per capita income;

PCH = Per capita health expenditure;

IMU = Immunization (against measles);

URB = Urbanization;

CI = calorie intake;

ln = logs

i = Country

t = time

v_{it} = error term.

The error term has assumptions $v_{it} \approx N(0, \sigma^2)$.

Therefore, this study adopted the equation (3.6) which is one of the Gani's models. The PCH in the Gani's model was disaggregated into PHE and PRHE to suite this study. Filmer and Pritchet (1999) asserts that the inclusion of income percapita Y is a necessary control for the universally acknowledged impact of income on health which works through a variety of channels (such as better nutrition, better housing, better sanitation). Going by the above argument, we assumed that the CI has already been captured in Y. According to Barenberg,*et al.* (2015), most studies find female literacy rates to be important because standard public health interventions that can reduce the IMR is enhanced by the ability of the mother to read and follow basic instructions. Thus, a variable FL was included in the model.

After modifications, the equation (3.6) therefore took the form:

$$\ln IMR_t = \chi_0 + \chi_1 \ln Y_t + \chi_2 \ln PHE_t + \chi_3 \ln PRHE_t + \chi_4 \ln IMU_t + \chi_5 \ln FL_t + \chi_6 \ln URB_t + v_t \quad (3.7)$$

$IMR = Infant\ Mortality\ Rate$;

$Y = per\ capita\ income$;

$PHE = Public\ Healthcare\ Expenditure$;

$PRHE = \ Private\ Healthcare\ Expenditure$;

$IMU = \ Immunization\ coverage$;

$FL = Female\ Literacy\ level$;

$URB = \ Urbanization\ Rate$;

$ln =$ logs

$t =$ time

$v_t = \ Error\ term$;The error term has assumptions $v_{it} \approx N(0, \sigma^2)$

The model in equation (3.7) took the form of an input – output relationship. On the left side of the model is infant mortality rate, which is the output, while public and private health care expenditures among others are as inputs. IMR was taken as dependent variable whereas public (PHE) and private healthcare expenditures (PRHE), per capita income (Y), immunization coverage (IMU), Female literacy (FL) and Urbanization level (URB) are the corresponding Explanatory variables.

The transformation of data into logs according to Filmer and Pritchet (1999) achieves two things,first every study that has examined the issue of health expenditures and outcomes has shown a non-linear relationship. The nonlinearity is adequately captured by a log transformation. Second, the regression results provideselasticities which also allows for comparisons in empirical results given it is a scale neutral.

An Error Correction model was formulated to determine the adjustments towards equilibrium in the model in equation (3.5). This is according to Keele and De Boef (2004)

$$EC = \left[\ln(IMR_{t-1}) - \ln(Y_{t-1}) - \ln(PHE_{t-1}) - \ln(PRHE_{t-1}) - \ln(IMU_{t-1}) - \ln(FL_{t-1}) - \ln(URB_{t-1})\right] \quad (3.8)$$

Having made the Error Correction term (equation 3.8), it is then substituted into equation (3.7) to give the Error Correction Model in equation (3.9)

$$\Delta \ln IMR_t = \chi_0 + \chi_1 EC_{t-1} + \chi_2 \Delta \ln Y_t + \chi_3 \Delta \ln PHE_t + \chi_4 \Delta \ln PRHE_t + \chi_5 \Delta \ln IMU_t + \chi_6 \Delta \ln FL_t + \chi_7 \Delta \ln URB_t + \varepsilon_t \quad (3.9)$$

Where:

$EC_{t-1} = one\ period\ lag\ of\ the\ Error\ Correction\ term$

$\Delta lnIMR_t = \log difference\ of\ IMR$ at time t

$\Delta lnY_t = \log difference\ of\ Y$ at time t

$\Delta lnPHE_t = \log difference\ of\ PHE$ at time t

$\Delta lnPRHE_t = \log difference\ of\ PRHE$ at time t

$\Delta lnIMU_t = \log difference\ of\ IMU$ at time t

$\Delta lnFL_t = \log difference\ of\ FL$ at time t

$\Delta lnURB_t = \log difference\ of\ URB$ at time t

$\varepsilon_t = error\ term$

The error term has assumptions $v_{it} \approx N(0, \sigma^2)$

Therefore Error Correction Model in equation (3.9) wasthen used to determine the short term dynamics of the model in the equation (3.7)

3.4 Estimation Technique

The estimation technique used on the log- linearmodels in (3.2) (3.3) and (3.7) is the Newey-West regression procedure found in the Two Stage Least Square (2SLS) method. The variables were first tested forunit root presence using the Augmented Dickey Fullertests. Tests for cointergration were then carried out using the Engel Granger tests. An Error Correction Mechanism was applied to the model in equation (3.7) to determine its adjustment towards long run static equilibrium.

3.4.1 Unit root tests

Problems regarding unit root are well known in the time series literature. A general class of unit root process is therefore generated in the equation : $y_t = y_{t-1} + e_t, t = 1,2,$ ....here $\{e_t\}$is a generally weakly dependent series. It means that the value of y today is highly correlated with y in another time period, even in the distant future or from many years ago. Unit root processes ,such as random walk are said to be integrated of order one or I(1),while weakly dependent process are said to be integrated of order zero, or I(0)(woolridge,2003).

Using time series with strong persistence by a unit root process in a regression equation can lead to very unreliable results. Even if two time series variables don't have any relationship and don't have a time trend, if they are an I (1) series, a simple regression will often result in a significant t statistics, which is spurious .The same considerations arise with multiple regression.If $\{y_t\}$is I (1) and at least some of the explanatory variables are I (1), the results of this regression may be spurious (Woolridge, 2003).

The study adopted the tests developed by Dickey and Fuller (1981); and Said and Dickey (1984).Dickey and Fuller recast the test in the form of a t −test.

3.4.2 Test for Cointegration

Cointergration test was necessary against the loss of information relating to possible long term equilibrium relationship in a model specified in first differences. Cointegration among a set of variables implies that there exists fundamental economic forces that make the variables move stochastically together overtime.

This involved using the Johansen – cointergration test due to its simplicity. The model was subjected to co- integration analysis to ensure that there is a stable long-term relationship between

the explained variables and the regressors. Both the trace test and Maximum Eigen values were obtained.

3.4.3 Error Correction Model

The error correction model was used to investigate the short-term relationships between the series. When variables are co-integrated, it means that there is a long run relationship among them. Despite this long run relationship, there can be disequilibrium in the short run. Error Correction Mechanism had to be carried out on the results. This aimed at examining the reconciliation among the variables. The ECM measures the speed of adjustment from short run. Abivariate form of the error correction model with one lag is

given by Keele and De Boef(2004)

$$\Delta Y_t = \alpha_0 - \alpha_1\left(Y_{t-1} - \beta_1 X_{t-1}\right) + \beta_0 \Delta X_t + \varepsilon_t$$

The first difference of Y is regressed on the first difference of X, the lag of X, and the lag of Y. In this model a variable can have a short-term effect (x goes up this year, y goes up this year) which is given by the differenced term of the independent variable. It can also have a long-run effect (x goes up this year, but affects y in future time periods). X and Y are said to have an equilibrium relationship where changes in x lead to changes in y but over a longer time period. The lag of the dependent variable measures the error correction rate that determines the period after which time X and Y are back into equilibrium after a shock occurred.

The equation (3.8) above was used to investigate the adjustment of the model towards the log run static equilibrium between the series:

3.5 Data

3.5.1 Data Types and Sources

This study uses macro-data for the whole of Kenya for the specific seven variables.

This study used time series data covering a period 1981-2014 from the sources in table 3.1below:

Table 3.1: The variables and their data sources

Variables	**Data Sources**
Infant Mortality Rate	World Bank 2015 databases
GrossDomestic Product percapita	World Bank 2015 databases
Public Healthcare Expenditure	Statistical abstracts (1981-2014) from Kenya National Bureau of Statistics
Private Healthcare Expenditure	World Bank 2015 databases, World Bank publications for 1983, 1990, 1993, and WHO publications for 1990.
Immunization Coverage Rate	World Bank 2015 databases
Female literacy Level	World Bank 2015 databases ,Statistical abstracts (1989-1998)
Urbanization level	World Bank 2015 databases

3.5.2 Description of the Variables

Infant mortality rate (IMR), is the number of infants dying before reaching one yearof age, per 1,000 live births in a given year.

Per capita income, also known as income per person, is the meanincome of the people in an economic unit such as a country or city. It is calculated by taking a measure of all sources of income taken together (such as Gross Domestic Product or Gross national income) and dividing it by the total population. According to Filmer and Pritchett (1999), the inclusion of income per capita is a necessary control for the universally acknowledged impact of income on health which works through a variety of indirect channels (such as better nutrition, better housing,better sanitation)

Public healthcare expenditure in this study it was defined as including recurrent and capital spending from local and central government budgets, internal borrowings and grants as well as donations from international agencies and non-governmental organizations.

Private Health expenditureincludes direct household (out-of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations. **Immunization coverage,** in this study immunization, measles was used as proxy.This measures the percentage of children ages 12 to 23 months who received vaccinations before 12 months or at any time before the survey.

Female literacy level is the percentage of females age 15 and above who can, with understanding, read and writes a short, simple statement on their everyday life. Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations. In this study,Female enrolment as a percentage of gross at the secondary level was used as a proxy to Female literacy level. According to Barenberg*et al.* (2015),most studies find female literacy rates to be important because standard public health interventions that can reduce the IMR is enhanced by the ability of the mother to read and follow basic instructions.

Urbanizationlevel. Urban population (% of total) was used as a proxy. Thisrefers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization prospects.Barenberg*et al.* (2015), also says thatUrbanization is meant to capture the relative difference in the availability of health infrastructure – like hospitals, primary health centers, doctors, nurses – between rural and urban areas.

3.6Data analysis and presentation.

The analysis of the data was done using the econometric software EVIEWS 7.2 .The study also used the descriptive and inferential statistics in data analysis.Tables and graphs were used in data presentation.

3.7 The apriori Economic expectations

The expected effects were: PHE (-); PRHE (-); Y (-); IMU (-); FL (-); and URB (-)

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and discussions according to the objectives of the study. The results are presented in two main sections; the results for the descriptive analyses and the results for the econometric analyses. The data was transformed into their natural logarithms after the descriptive statistics had been done. Data used in the analysis are annual time series data observed from 1981-2014.

4.2 Descriptive Analysis

4.2.1 Trend analysis

Establishing the trend pattern of the data over a period of years was important given it is a time series annual data. Trend analysis helps in the determination of whether the variables under investigation are growing or declining. In addition, it helps to compare through trend characteristics the growth factor of the variables.

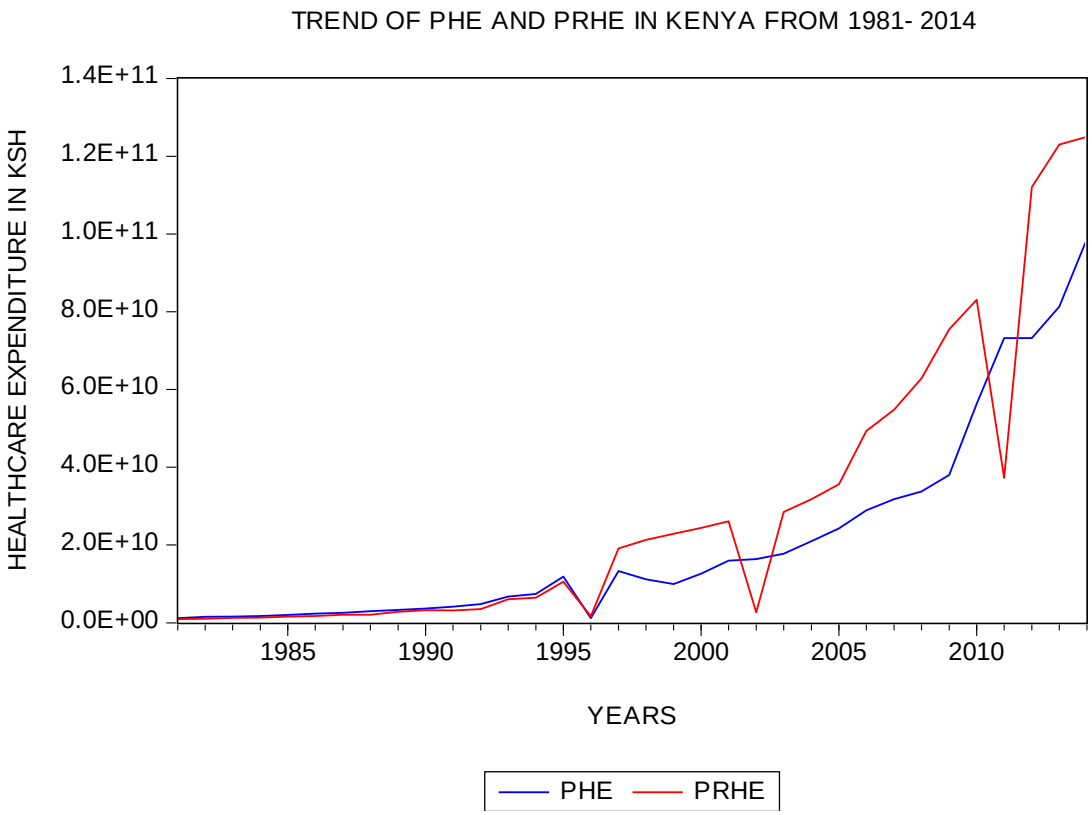
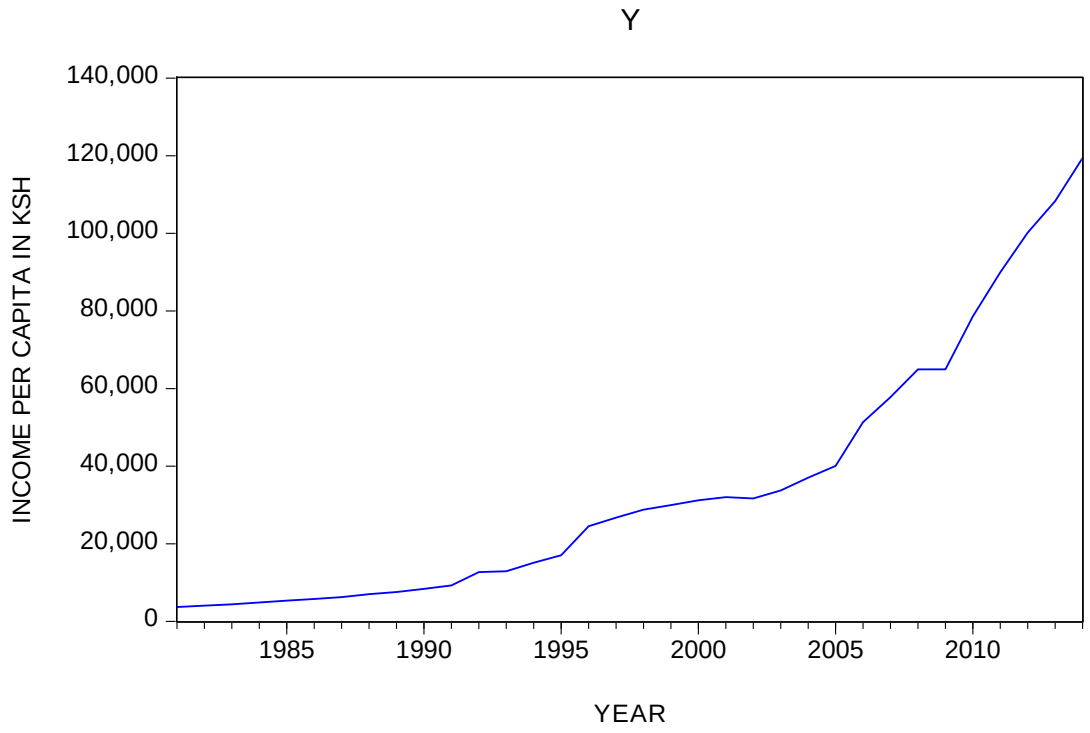


Figure 4.1: Trend of PHE and PRHE from 1981 - 2014

Source: Research data, 2017.

As shown in figure 4.1 the Public Healthcare expenditure (PHE) indicates a steady increase over the years. It is clear that from independence to 1989 the government financed healthcare through general taxation in line with the policy for free medical care. From 1989 to 1992, budgetary constraints and declining donor support led to introduction in user fees in public health facilities. This led to the rise in PRHE from 1994 to 2014 since out of pocket expenditure forms 30% of the PRHE.

THE TREND OF INCOME PER CAPITA (Y) FROM 1981 – 2014



Source: Research data, 2017

Figure 4.2: The trend of income per capita (Y) from 1981 – 2014

From figure 4.2 above the income per capita has been increasing steadily over the years from 1981 to 2014. The inclusion of income per capita is a necessary control for the universally acknowledged impact of income on health which works through a variety of indirect channels such as better nutrition, better housing, better sanitation (Filmer and Pritchett, 1999)

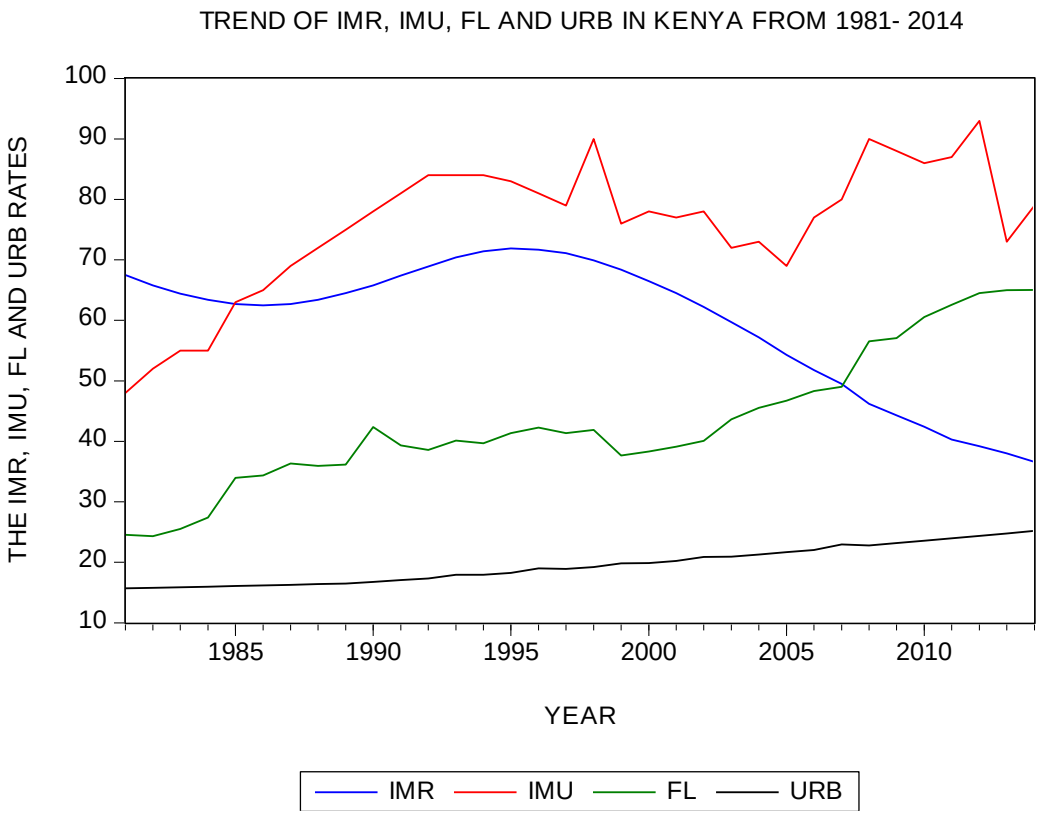


Figure 4.3Trend of Infant Mortality rate, Immunization coverage, female literacy and Urbanization level

*Source***:** Research data 2017

IMR declined in 1981 to 1989 but rose between 1990 and 1997.However, it showed a steady decline from 1998 to 2014. The decline is associated with the establishment and implementations of important health policies such as: The National Health Sector Strategic Plan (NHSSP) II and the Millennium Development Goals of year 2000.Immunization coverage (IMU)has been on the increase over the years possibly due to created awareness as well as establishment and implementations of the above policies. Female literacy levels (FL) showed an initial steady rise probably due to awareness campaigns and the introduction of free and compulsory basic education. However, urbanization level (URB) has shown steady increase towards the end of the period

4.2.2 Tests for normality in the distribution of the data

Non-normality of economic variables among other effects may be associated with the presence of outliers. It is therefore important, before we embark on empirical investigations, to examine whether or not the data exhibits normality and if not, we undertake appropriate measures to normalize the data. To test for normality of the distribution of the time series data, the study adopted three normality tests: test for skewness in the distribution, test for kurtosis distribution and finally test for Jarque-Bera distribution which is merited as a combination of the first two tests; test for skewness and test for kurtosis.

Table 4.1: Descriptive Statistics

	IMR	Y	PHE	PRHE	IMU	FL	URB
Mean	59.60294	34552.90	2.11E+10	2.90E+10	75.70588	43.09302	19.55453
Median	63.40000	27742.86	1.16E+10	1.49E+10	78.00000	40.74095	19.12050
Maximum	71.90000	119421.4	9.88E+10	1.25E+11	93.00000	65.01345	25.19700
Minimum	36.60000	3669.329	1.19E+09	9.39E+08	48.00000	24.34324	15.68100
Std. Dev.	11.04856	32805.34	2.60E+10	3.66E+10	11.09608	11.35840	3.051755
Skewness	-0.860661	1.158529	1.621672	1.453493	-0.864013	0.500051	0.323478
Kurtosis	2.376294	3.324973	4.609012	4.086370	3.210743	2.629493	1.773571
Jarque-Bera	4.748605	7.755347	18.56994	13.64359	4.293193	1.611426	2.723797
Probability	0.093079	0.020699	0.000093	0.001090	0.116881	0.446769	0.256174
Sum	2026.500	1174799.	7.17E+11	9.85E+11	2574.000	1465.163	664.8540
Sum Sq. Dev.	4028.330	3.55E+10	2.23E+22	4.41E+22	4063.059	4257.435	307.3358
Observations	34	34	34	34	34	34	34

Source: Authors' calculations, 2017

From Table 4.1, Skewness, Kurtosis, the Jarque- Bera and its probability, were greatly looked into. The skewness of a symmetric distribution, such as the normal distribution is zero. The results in the table indicate that only variables IMR and IMU are negatively skewed the rest are positively skewed. Kurtosis measures the thickness or the thinness of the tail of variables' distribution. Often, the Kurtosis of a normal distribution is three. If the kurtosis exceeds 3, the distribution is peaked (leptokurtic) relative to the normal hence has a thick/fat tail; if the kurtosis is less than 3, the distribution is flat (platykurtic) relative to the normal hence has a thin tail. Therefore, the conclusion was that Y, PHE, PRHE and IMU have thick tails whereas IMR, FL, URB have thin tails.

The JarqueBera (JB) measures the normality of the variables against the null hypothesis that the variables are normally distributed. From the results, the probabilities of all the variables except Y, PHE, and PRHEare greater than 5%. This indicates that the variables except Y, PHE and PRHEare normally distributed hence the acceptance of the null hypothesis. Meanwhile, the probability of Y, PHE, and PRHE are less than 5% hence leading to the rejection of the null hypothesis .i.e. they are not normally distributed.

4.2.3 Correlation analysis

To facilitate analysis of long run relationship and causality between the variables, the study sought to establish correlations between the variables. Correlation analysis is an ordinary analysis concerned with finding out whether there is some association between two or more of the variables under study, and if so, then there is need to establish the strength and direction of association to relate to the final cause-effect relationship. For that reason, in Table4.2theresults of the ordinary covariance analysis are presented

Table 4.2: **CORRELATION**

Sample: 1981 2014

Included observations: 34

Correlation Probability	IMR	Y	PHE	PRHE	IMU	FL	URB
IMR	1.000000						

Y	-0.900442	1.000000					
	0.0000	-----					
PHE	-0.906146	0.978741	1.000000				
	0.0000	0.0000	-----				
PRHE	-0.884303	0.950739	0.929055	1.000000			
	0.0000	0.0000	0.0000	-----			
IMU	-0.276734	0.496804	0.416751	0.413334	1.000000		
	0.1131	0.0028	0.0142	0.0151	-----		
FL	-0.838358	0.936078	0.904065	0.879355	0.698213	1.000000	
	0.0000	0.0000	0.0000	0.0000	0.0000	-----	
URB	-0.828281	0.949855	0.884238	0.882895	0.579638	0.921518	1.000000
	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	-----

Source: Authors' calculation, 2017

Correlation often oscillates between -1 and + 1. If the correlation between the variables approaches +1, it then means that there is a strong positive association and the variables move strongly in a straight line. If the correlation is approaching -1, the degree of negative association between the variables is also strong but negative. If the correlation is approaching zero, it means that there is no strong (i.e. weak) association between the variables.

From Table 4.2 there is a strong negative association between IMR and all the other variables with only IMU having a weak association. This is as shown by the coefficients of more than 0.82 and probabilities of less than 0.05.

There exists a strong positive association between Y and variables PHE, PRHE, FL and URB with coefficients of more than 0.93 and probabilities of less than 0.05. A strong positive association was observed between FL and variables PHE, PRHE, URB, as shown by a coefficient of more than 0.69 and probabilities of less than 0.05.

4.3 Unit root tests

Generally, the unit root was tested using Augmented Dickey Fuller test the Schwartz information criterion was used and the variables were tested at trend and intercept. This was further confirmed using the Philips Peron test .The results were as given below:-

Table 4.3: Results for Augmented Dickey Fuller unit root test

	at levels			at first difference		
variables	at 5% level	ADF	probability	at 5% level	ADF	probability
LNIMR	-3.568379	-7.037960	0.0000	-3.580623	-3.720828	0.0374
LNY	-3.552973	-1.901069	0.6313	-3.557759	-5.538971	0.0004
LNPHE	-3.552973	-7.572576	0.0000	-3.568379	-6.134070	0.0001
LNPRHE	-3.552973	-6.454118	0.0000	-3.580623	-5.395145	0.0008
LNIMU	-3.552973	-1.983926	0.5883	-3.557759	-8.128863	0.0000
LNFL	-3.552973	-2.423000	0.3612	-3.557759	-5.819109	0.0002
LNURB	-3.552973	-3.071115	0.1296	-3.562882	-6.263411	0.0001

Source: Authors' calculations, 2017

From Table 4.3, the variables were tested for their Stationarity using Augmented Dickey Fuller (ADF) test. The results indicated that only LNIMR, LNPHE and LNPRHE are integrated of order zero, I (0). This is because the probabilities of the critical value at 5% is 0.0000, which is less than 0.05. The variables; LNY, LNIMU, LNFL and LNURB are not stationary at levels since the probabilities of their critical values at 5% are greater than 0.05. However, at first difference, all the variables became stationary of I (1). This is also because the probabilities of their critical values at 5% are less than 0.05.In summary, 3 variables are stationary at level and four are stationary at 1st difference.

4.4 Cointegration tests

Cointegration test shows the long run equilibrium relationship between the variables. If there are variables that have a unit root i.e. are non- stationary, and the normal regression analysis is run, the results may be spurious (meaningless). Since three of the variables under study became stationary of order I(0) and four of them I(1), Cointegration test was done and the results were tabled below:-

Table 4.4: Results for cointegration rank test (Trace)

Sample (adjusted): 1984 2014
Included observations: 31 after adjustments
Trend assumption: Quadratic deterministic trend
Series: LNIMR D(LNY) LNPHE LNPRHE D(LNIMU) D(LNFL) D(LNURB)
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.861996	192.6834	139.2753	0.0000
At most 1 *	0.759099	131.2887	107.3466	0.0005
At most 2 *	0.614630	87.16424	79.34145	0.0113
At most 3 *	0.497497	57.60418	55.24578	0.0306
At most 4 *	0.384469	36.27141	35.01090	0.0364
At most 5 *	0.357363	21.22803	18.39771	0.0196
At most 6 *	0.215414	7.520580	3.841466	0.0061

Trace test indicates 7 cointegrating eqn (s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Authors' calculations, 2017

Table 4.4 shows the Trace value. It also indicates that there are7Cointegrating equations since their probabilities are less than 5%.Thus the rejection of the null hypothesis and acceptance of the alternative.

Table 4.5: Results for the Maximum Eigen Values for the cointergration test

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.861996	61.39475	49.58633	0.0020
At most 1 *	0.759099	44.12444	43.41977	0.0418
At most 2	0.614630	29.56006	37.16359	0.2865
At most 3	0.497497	21.33278	30.81507	0.4467
At most 4	0.384469	15.04337	24.25202	0.4939
At most 5	0.357363	13.70745	17.14769	0.1480
At most 6 *	0.215414	7.520580	3.841466	0.0061

Max-eigenvalue test indicates 2 cointegrating eqn (s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Authors' calculations, 2017

Table4.5 shows the Maximum Eigen value. It also indicates that there are 2 Cointegrating equations since their probabilities are less than 5% .That is 0.0418nd 0.0016 respectively. Therefore, the rejection of the null hypothesis.The rest of the variables have their probability greater than 5%.

Table 4.6: Normalized cointergration coefficients

Normalized cointegrating coefficients (standard error in parentheses)

LNIMR	D(LNY)	LNPHE	LNPRHE	D(LNIMU)	D(LNFL)	D(LNURB)
1.000000	0.957584	0.493757	-0.111786	1.797130	-1.207773	-36.93011
	(0.41618)	(0.10590)	(0.05749)	(0.57553)	(0.55526)	(3.89116)

From Table 4.6, it is observed that a one-unit increase in PRHE decreases the IMR in the rate of 0.11. One unit increase in FL and URB decreases the IMR in the rate of 1.2 and 36.9 respectively.

Having established the long-term relationship between the series, the short-term dynamics between the series can therefore be investigated.

4.5 Empirical Results

The models in equation (3.2), (3.3) and (3.7) were estimated with the Newey-West procedure in the Two Stage Least Square (2SLS) method. When the models were tested using OLS serial correlation was observed. Therefore the Newey-West procedure which corrects for the serial correlation was adopted. The corrected standard errors are known as the HAC (Heterroscedasticity- and Autocorrelation -consistent) standard errors or simply the Newey-West standard errors (Gujarati, 2004).

Table 4.7: Results for the regression of IMR on PHE

Dependent Variable: LNIMR

Method: Two-Stage Least Squares

Sample: 1981 2014

Included observations: 34

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed

bandwidth = 4.0000)

Instrument specification: LNIMR C LNPHE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.858806	0.654878	10.47342	0.0000
LNPHE	-0.121321	0.028855	-4.204465	0.0002

R-squared	0.616420	Mean dependent var	4.068406
Adjusted R-squared	0.604433	S.D. dependent var	0.206965
S.E. of regression	0.130169	Sum squared resid	0.542208
F-statistic	51.42448	Durbin-Watson stat	0.348925
Prob(F-statistic)	0.000000	Second-Stage SSR	0.542208
J-statistic	32.00000	Instrument rank	3
Prob(J-statistic)	0.000000		

Source: Eviews 7.2 output, 2017

Estimation Equation:

==========

LNIMR = C(1) + C(2)*LNPH

Substituted Coefficients:

==========

LNIMR = 6.85880638688 - 0.121320931394*LNPHE

From Table 4.7 as shown by the low Durbin Watson statistics (below 1.5), it is evidenced that OLS regression could have had serial correlation. The Table 4.7 shows the results for the Newey-West procedure in the Two Stage Least Square Method which also corrects for the serial correlation. Therefore the standard errors shown above are the corrected Newey - West standard errors free from serial correlation. The coefficients of the variables measure elasticity as the raw data was converted into natural logs in order to preserve the unit of measurement. The probability of PHE is less than 0.05, meaning that it is significant at the 5% level of significance. The R^2 stands at 0.616420 meaning that the independent variable PHE explains 61.64% of the changes in the dependent variable IMR. The F-statistics stands at 51.42448 and the probability of the F-statistics is significant at 0.000000 at 1% level, meaning that the samples of the independent variable explain the true population.

4.5.1 Discussion of findings for the regression of IMR on PHE

As shown by the results observed in Table 4.7. We notice that the coefficient of the PHE for IMR is negative as per prior expectations. The probability of less than 0.05 shows that PHE is significant at the 5% level of significance. The elasticity is at -0.121321. This means that for every 1% increase in PHE by the state, the IMR decreases by 0.12%.The results on public spending on IMR strongly lends support to similar arguments alluded to by other previous studies such as Boachie and Ramu (2016), Barenberg *et al.* (2015), Gani (2008), Gakunju (2003), among others suggesting that government has an important role in improving health status. Thus, as government increases its health spending, the level of infant mortality falls. This is because essential health service like out-patient treatment of illnesses, immunization and post- natal services for infants and under-five are usually provided by government at no cost to parents. However, these findings are contrary to what Ochieng' (2010) found out, showing that government expenditure on health is insignificant

in reducing infant mortality in Kenya. The findings of this study also contradict earlier results by Musgrove (1996), Filmer and Pritchett (1997, 1999), that public health spending is ineffective in reducing IMR. The infectiveness of public sector intervention in improving health status reported by most of the earlier studies could be due to their aggregation of the countries under study.

Table 4.8: Results for the regression of IMR on PRHE

Method: Two-Stage Least Squares
Sample: 1981 2014
Included observations: 34
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed
bandwidth = 4.0000)
Instrument specification: LNIMR C LNPRHE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.224554	0.576465	10.79781	0.0000
LNPRHE	-0.093442	0.025847	-3.615167	0.0010

R-squared	0.529995	Mean dependent var	4.068406
Adjusted R-squared	0.515307	S.D. dependent var	0.206965
S.E. of regression	0.144089	Sum squared resid	0.664373
F-statistic	36.08433	Durbin-Watson stat	0.329739
Prob(F-statistic)	0.000001	Second-Stage SSR	0.664373
J-statistic	32.00000	Instrument rank	3
Prob(J-statistic)	0.000000		

Source: Eviews 7.2 output, 2017

Estimation Equation:
==========
LNIMR = C(1) + C(2)*LNPRHE

Substituted Coefficients:
==========
LNIMR = 6.22455391346 - 0.0934422868219*LNPRHE

From Table 4.8 the Newey-West procedure used in the regression above also corrects for the serial correlation. Therefore the standard errors in the Table 4.8 are the corrected Newey - West standard errors. The coefficients of the variables measure elasticity as the raw data was converted into natural logs in order to preserve the unit of measurement. The constant and the probability of PRHE is less than 0.05, meaning that it is significant at the 5% level of significance. The R^2 stands at 0.529995 meaning that the independent variable PRHE explains 53% of the variations in dependent variable IMR. The F-statistics stands at 36.08433 and the probability of the F-statistics is highly significant at 0.000001 at 1% level, meaning that the sample of the independent variable explain the true population.

4.5.2 Discussion of findings for the regression of IMR on PRHE

The second objective was concerned with the effect of private healthcare expenditure on IMR in Kenya. The coefficient of the PRHE for IMR is negative as per prior expectations. PRHE is statistically significant at 5% level for IMR. This is as shown by the probability of 0.001which is less than 0.05.The elasticity of PRHE is 0.093442. This indicates that for every 1% increase in PRHE there is a decrease in IMR by 0.093%. This is in agreement with the findings of Muldoon *et al.* (2011) and Oleche (2011), who found that an increase in the Out Of Pocket component of PRHE significantly reduced IMR. However, it is contrary to the findings of Issa and Quattara (2005) and Homaie *et al.* (2013) who found PRHE to be insignificant in reducing IMR in low-income countries and Families respectively.

Table 4.9: Results for regression of IMR on Y, PHE, PRHE, IMU, FL, and URB.

Dependent Variable: LNIMR

Method: Two-Stage Least Squares

Sample (adjusted): 1982 2014

Included observations: 33 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed

bandwidth = 4.0000)

Instrument specification: LNIMR C DLNY LNPHE LNPRHE DLNIMU DLNFL

DLNURB

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.07748	1.493365	6.748171	0.0000
DLNY	-0.414242	0.099965	-4.143876	0.0003
LNPHE	-0.030159	0.015128	-1.993563	0.0568
LNPRHE	0.012458	0.016795	0.741770	0.4649
DLNIMU	-0.487371	0.170775	-2.853886	0.0084
DLNFL	-0.694039	0.120132	-5.777313	0.0000
DLNURB	-3.125675	0.693645	-4.506162	0.0001

R-squared	0.913160	Mean dependent var	4.064051
Adjusted R-squared	0.893120	S.D. dependent var	0.208586
S.E. of regression	0.068192	Sum squared resid	0.120904
F-statistic	45.56679	Durbin-Watson stat	1.013994
Prob(F-statistic)	0.000000	Second-Stage SSR	0.120904
J-statistic	26.00000	Instrument rank	8
Prob(J-statistic)	0.000000		

Source: Eviews 7.2 output, 2017

Estimation Equation:

==========

LNIMR = C(1) + C(2)*DLNY + C(3)*LNPHE + C(4)*LNPRHE + C(5)*DLNIMU + C(6)*DLNFL + C(7)*DLNURB

Substituted Coefficients:

==========

LNIMR = 10.0774803333 - 0.414241678598*DLNY - 0.0301591245243*LNPHE + 0.0124577749578*LNPRHE - 0.487371224428*DLNIMU - 0.694038973003*DLNFL - 3.1256746275*DLNURB

The Newey- west regression technique was also adopted in this model to take care of the problem of serial correlation. Therefore the standard errors shown above are the corrected Newey- West standard errors free from serial correlation. From the results in Table 4.9, the F–statistics is at 45.56679 and its probability is 0.00000.From the probability, it is significant at the 1% level, meaning that the samples of the independent variables explain the true population.R^2 is at 0.91316 meaning that the independent variables explain 91.32% of the variations in the dependent variable IMR.

4.5.3: Discussion for the findings for the regression of IMR on Y, PHE, PRHE, IMU, FL and URB.

The joint effect of the above variables was obtained from the R^2 that is 0.91316.This implies that the independent variables significantly determine the changes in dependent variable. This means that the independent variables jointly explain 91.32% of the variations in the dependent variable IMR. Therefore, the independent variables Y, PHE, PRHE, IMU, FL, and URB are good predictors of IMR. This implies that, for every 1% joint increase in the explanatory variables there is a 91.32% decrease in IMR in Kenya. The remaining 9% are being accounted for by the error term $v_{t..}$

On examination of the individual explanatory variables we realize that their individual effects are also different as observed on the coefficients in Table 4.9.

The coefficient of Y is negative as expected for IMR. It is significant at the 5% level. The elasticity coefficient of Y is -0.414242. This means that a 1% increase in Y would reduce IMR by 0.41%. This is in line with the findings of Gani (2008) for the Pacific Island countries, Gakunju (2003) and Ochieng' (2010) in Kenya. However it is contrary to the findings of Boachie and Ramu (2016) in Ghana, Akinkugbe and Mohanoe (2009) in Lesotho who found per capita income to be insignificant in reducing IMR when they used it as one of the control variables in their studies.

The Immunization coverage (IMU) is significant at the 5% level. The elasticity of IMU for IMR is -0.48737 meaning that for every 1% increase in immunization coverage, IMR decreases by 0.49%. These are in line with the findings of Gani (2008), Akinkugbe and Mohanoe (2009), Gakunju (2003) and Ochieng' (2010) who found IMU to be significant in reducing IMR.

The FL level is highly significant at the 5% level of significance. The elasticity of FL for IMR is -0.694039.The implication is that raising literacy levels by 1% has the potential to reduce infant mortality rate by 0.69% in Kenya. This is in line with the findings of Barenberg *et al.* (2015), Akinkugbe and Mohanoe (2009), Gakunju (2003) who found FL to be significant in reducing IMR in the Indian states Lesotho and Kenya respectively. Female education is an important input in the health production function since it determines the efficiency in health input combination. This elasticity coefficient is higher than Y, PHE and IMU as shown in Table 4.9.

The elasticity coefficient of URB is negative as per the prior expectations. URB is highly significant at the 5% level of significance. The elasticity coefficient is-3.125657. This means that for every 1% increase in URB level, there is a 3.13% decrease in IMR in Kenya. This is in line

with the findings of Barenberg *et al.* (2015) who found urbanization level to reduce IMR in the Indian states.

4.5.4 Error Correction Model (ECM)

The Error Correction Model in Equation (3.9) was therefore estimated and the results shown in Table 4.10

Table 4.10: Results for the ECM

Dependent Variable: DLNIMR
Method: Least Squares
Sample (adjusted): 1983 2014
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.112186	1.515568	-6.012390	0.0000
EC(-1)	-0.586807	0.179944	-3.261055	0.0033
DLNY	0.358953	0.111268	3.226028	0.0036
DLNPHE	-0.026791	0.034772	-0.770470	0.4485
DLNPRHE	0.001336	0.024788	0.053911	0.9575
DLNIMU	0.454967	0.179194	2.538958	0.0180
DLNFL	0.713163	0.136239	5.234634	0.0000
DLNURB	2.476275	0.763593	3.242924	0.0035

R-squared	0.926436	Mean dependent var	-4.078551
Adjusted R-squared	0.904980	S.D. dependent var	0.194292
S.E. of regression	0.059891	Akaike info criterion	-2.580259
Sum squared resid	0.086087	Schwarz criterion	-2.213825
Log likelihood	49.28414	Hannan-Quinn criter.	-2.458797
F-statistic	43.17831	Durbin-Watson stat	1.941495
Prob(F-statistic)	0.000000		

Source: Eviews 7.2 output, 2017

In order for the coefficient of the error correction model to be interpreted, it should be negative and statistically significant. From Table 4.10 the error correction coefficient is negative (-0.586897), and statistically significant at 5% level of significance. Thus, there is a relationship between the series in the short run.

The coefficient of the error correction term measures the speed at which the level of the dependent variable adjusts to changes in the explanatory variables in an effort to achieve long run static equilibrium. The assumptions of the ECM are that the value lies between 0 and 1 and it has a negative sign. From the results in Table 4.10, it is observed that the EC is 58.68%. This shows that 58.7% errors made in a particular year are corrected in the subsequent year.

The Durbin Watson Statistics is 1.941495which is almost 2 meaning that there is no serial correlation in the ECM and that it is not spurious. This can be confirmed further by Breusch Godfrey serial correlation LM test in Table 4.11below.

Table 4.11: Results for the serial correlation test of the ECM

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.608527	Prob. F(2,22)	0.5531
Obs*R-squared	1.677461	Prob. Chi-Square(2)	0.4323

From Table 4.11, the observed*R^2 and the corresponding probability of the Chi-square are considered. From the table, the probability is 0.4323, which is more than the 0.05 at the 5% level of significance. This implies that there is no serial correlation in the ECM since a probability of below 0.05 indicates serial correlation of the error term. Since the null hypothesis was that there is no serial/auto correlation, the null hypothesis thus is accepted.

4.6Tests for the Residual

These are the tests for the residuals for the three regressions

4.6.1 Unit root tests for the residual

Table 4.12: Results for the unit root test for the residual

Null Hypothesis: E has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.135101	0.0002
Test critical values:	1% level	-4.394309	
	5% level	-3.612199	
	10% level	-3.243079	

*MacKinnon (1996) one-sided p-values.

Source: Eviews 7.2 output, 2017

According to Table 4.12, the residuals is stationary, hence, the model can be accepted. The null hypothesis was that E has a unit root. The ADF statistic is -6.135101 and the critical value of Engel Granger test at 10% is -3.243079. The absolute value is -6.135101, which is greater than the critical

values. Hence the alternative hypothesis of E is stationary, was accepted. The probability is 0.0002 which is also less than 0.05, hence E is stationary. Thus the model just estimated is not spurious

4.6.2 Multicollinearity

This refers to a statistical phenomenon where two or more independent variables are collinear, meaning that there is a linear relationship between them leading to unreliable regression estimates. However, unreliability does not mean that the estimates are poor. When the correlations among the independent regression variables are minor, the effects may not be serious. Through the ***VIF technique***, multicollinearity was tested to see if indeed it existed within the variables. The VIF of the regression variables were calculated in Eviews and 5.5415 was obtained. The rule of the thumb is that the VIF of 5 and below reveals the absence of multicollinearity. The value 5.5415 is slightly more than 5. The conclusion therefore is that, there is no serious Multicollinearity. Thus, the null hypothesis of no multicollinearity was accepted.

4.6.3 Heteroskedasticity test

The data used were time series data. As a result, the variables were likely measured with many errors but the errors are not as much as they would appear in a cross sectional data. Heteroscedasticity measures how constant the error terms are, Breusch-Pagan-Godfrey and the White tests were used against the null hypothesis of Homoscedasticity of the error terms. The results are in Table 4.13 and 4.14**.**

Table 4.13: Results for the Breusch-Pagan-Godfrey Heteroscedasticity test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.903369	Prob. F(6,26)	0.5076
Obs*R-squared	5.692740	Prob. Chi-Square(6)	0.4585
Scaled explained SS	2.031900	Prob. Chi-Square(6)	0.9167

Source: Eviews 7.2 output, 2017

From Table 4.13, emphasis is laid upon the observed*R-squared and the corresponding probability of the chi –square. The probability is at 0.9167.This value is greater than 5% hence the acceptance of the null hypothesis of homoscedasticity

Table 4.14: Results for the White's Heteroscedasticity test

Heteroskedasticity Test: White

F-statistic	1.272025	Prob. F(23,9)	0.3685
Obs*R-squared	25.23663	Prob. Chi-Square(23)	0.3382
Scaled explained SS	9.007669	Prob. Chi-Square(23)	0.9959

Source: Eviews 7.2 output, 2017.

From Table 4.14, emphasis is laid upon the observed* R-squared and the corresponding probability of the chi-square. It is computed as the observations (n) times the R^2 from the test regression. The Whites test statistic is asymptotically distributed as a χ^2 with degrees of freedom equal to the number of slope coefficients, excluding the constant, in the test regression. The nR^2 value of 25.23663 is less than the 5% critical χ^2 value of 40.1133 meaning that we accept the null hypothesis of no heteroskedasticity .The probability is at 0.9959. This value is greater than 5% hence, the acceptance of the null hypothesis of homoscedasticity.

4.6.4Normality tests

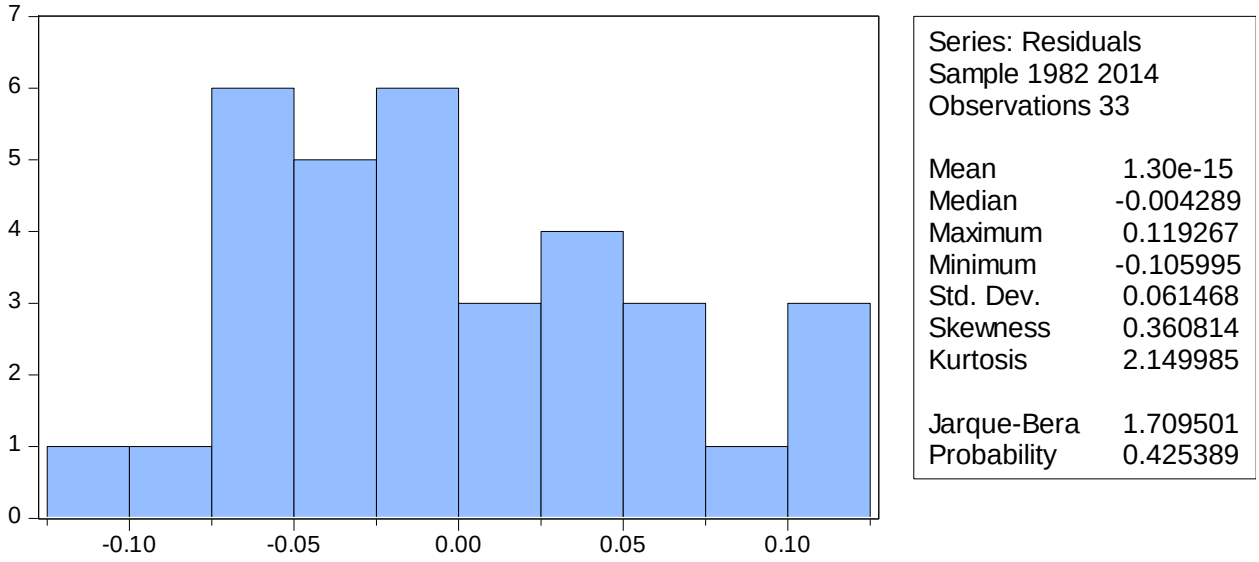


Figure4.4: Histogram for Normality test of the residuals

Source: Eviews 7.2 output

The null hypothesis was that the error term was normally distributed. According to the table and the Figure 4.4, the probability of the Jarque-Bera indicates a value of 0.425389, which is higher than 5%. Hence, the null hypothesis was accepted.

CHAPTER FIVE: SUMMARY OF FINDINGS CONCLUSION AND POLICY RECOMMENDATIONS

5.1 INTRODUCTION

This final chapter of the thesis is presented in five sections. Section 5.2, has the summary of the findings, section 5.3; there is conclusions.5.4 has the policy recommendations of the study, section

5.5 has the contribution of the study .Section 5.6 present the limitations of the study and the areas for further research.

5.2 SUMMARY OF THE FINDINGS

The cointergration results for both the Maximum Eigen value and Trace value indicates that there are 7and 2Cointegrating equations respectively. Thereby, leading to the rejection of the null hypothesis of no cointergrating variables and acceptance of the alternative. The presence of serial correlation as revealed by the Durbin Watson of below 1.5, necessitated the use of Newey-West estimator to remedy serial correlation problem. The standard errors and probabilities after using the Newey-West estimator were different. Thus, Newey-West estimates were robust in that there was no serial correlation and heteroskedasticity in the residuals. In this regard, the Newey-West estimator was adopted in the analysis. The ECM was applied on the multivariate model and it revealed that 58.68% of the errors made in a particular year are corrected in the subsequent year. Further diagnostics revealed some degree of multi-collinearity among the variables as shown the VIF of 5.541. However, the degree was not considered severe. The normality test done suggests that the variables were distributed normally since the null hypothesis of normal distribution could not be rejected (Jacque-Bera = 1.709501; p = 0.425389).

The results for both the bivariate Newey- West regression on the effects of IMR on PHE reveals that PHE is significant in reducing the IMR in Kenya. The results show that for every 1% increase in PHE, IMR reduces by 0.12% in Kenya. Therefore, the alternative hypothesis that there is significant effect of PHE on IMR in Kenya was accepted. This is in line with the findings of other researchers such as Gakunju (2003), Ochieng' (2010), Barenberg *et al*. (2015), Boachie and Ramu (2016). However, these findings are contrary to the findings of Ochieng' (2010).

The results for the bivariate Newey- West regression of IMR and PRHE reveals that PRHE is significant in reducing the IMR in Kenya. It is also shown that for every 1% increase in PRHE, IMR reduces by 0.09% in Kenya Therefore, the alternative hypothesis that there is a significant effect of PRHE on IMR in Kenya was accepted. This is in agreement with the findings of Muldoon *et al*. (2011), and Oleche (2011). However, these are contrary to the findings of Issa and Quattara (2005) and Homaie *et al*. (2013) who noted that PRHE is not significant in reducing the IMR in low income countries and families respectively.

On examining the multivariate Newey-West regression results, joint effects of the PHE, PRHE, Y, IMU, FL and URB indicate that they jointly reduce IMR in Kenya. This is as shown by the $R^2$of 91.32%.The R^2 implies that over 91% of the variations in IMR are accounted for by the above independent variables and only 9% are accounted for by the error term. We therefore rejected the null hypothesis and accepted the alternative hypothesis that there is a significant joint effect of PHE, PRHE, Y, FL, IMU, and URB on IMR in Kenya. The variables Y, IMU, FL and URB levels are significant on IMR. The elasticity coefficients of Y, IMU, FL and URBare-0.41, -0.49, -0.69, and -3.13 respectively. This implies that for every 1% increase in Y, IMU, FL, and URB the IMR reduces by 0.41%, 0.49%, 0.69%, and 3.13% respectively. These are in line with the findings of the other researchers

5.3 CONCLUSION

The focus of this study was to assess the effect of public and private healthcare expenditure on IMRs in Kenya. The study used time series data on the PHE and PRHE for the period of 34 years between 1981 and 2014, together with the selected control variables that determine health outcomes.

The empirical results obtained from Newey-West estimator, suggest that raising public expenditure on healthcare are very crucial in reducing IMR Kenya. Therefore increasing PHE by 1%is likely to reduce IMR in Kenya by 0.12%.

That PRHE is also important for the reduction of IMR in Kenya. An increase in PRHE by 1% leads to a 0.09% decrease in IMR in Kenya.

That, jointly PHE, PRHE, Y, IMU, FL and URB significantly reduces IMR in Kenya. A 1% joint increase in the independent variables reduces IMR by 91.32%. Our study also reveals that the covariates income per capita(Y), immunization coverage (IMU), female education (FL) and Urbanization (URB) levels are highly significant in reducing the IMR in Kenya. The 1% increase in Y, IMU, FL, and URB reduces IMR by 0.41%, 0.49%, 0.69%, and 3.13% respectively. Female literacy and Urbanization play a greater role in reducing IMR in Kenya.

5.4 POLICY RECOMMENDATIONS

While the limitations of this study are acknowledged, the empirical findings nevertheless strongly indicate policy measures that need to be put in place. These are discussed below:

The government should increase its allocation to the health sector .Thus, honoring the Abuja declaration will be a step in the right direction. For instance, increased government allocation will help expand the child health programs and the use of primary healthcare services, especially for children below twelve months.

The study also suggests that while increased private expenditures reduce infant mortality, an increase in the Out Of Pocket component of has only a slight negative effect. Households should take up their role in the provision of private health inputs, such as treatment for non-immunizable

childhood diseases. Kenya should enhance measures that increase private health insurance as a component of private healthcare expenditure.

The government should put in place policies aimed at reducing poverty and income inequality in order to improve the welfare of the people. Reducing poverty and income inequality will enhance people's ability to consume more goods and services, including healthcare and education. Scaling-up immunization programmes, particularly in rural areas, will help reduce infant mortality further, and this will require enough funding from government. The government should pay attention to female education since female literacy has been found to reduce infant mortality significantly at higher rates than health sector spending and income. Thus, policies should gear towards improving female enrolment in schools, at least to the secondary school level. The compulsory and free provision of basic education, enshrined in the Kenyan constitution was a step in the right direction. This could be expanded to include secondary education. Urbanization greatly improves the IMR, possibly through better access to basic health care facilities that are lacking in remote and rural areas. Therefore, policy measures to improve access to basic health care facilities, should be enhanced in the remote setups.

5.5 CONTRIBUTIONS OF THE STUDY

This study being country specific, is important not only for the reduction of the IMR but also for helping the policy makers to make wise judgments, plan health reforms and allocate resources efficiently in Kenya. This study therefore sheds more light on the effects of PHE and PRHE on

IMR in Kenya and to fills the knowledge gap on the effect of Public and Private healthcare expenditures on IMR in Kenya.

5.6 STUDY LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This study has limitations as highlighted here.

This study only used one indicator of health outcomes, which is the IMR for the empirical analysis. It is therefore prudent that future studies use other indicators of health outcomes such as under-five mortality rate and crude death rate alongside the IMR for their empirical analysis to check whether the argument holds or not.

This study only used four control variables, which are income per capita, immunization coverage, female literacy levels and urbanization levels**.** Another possible area for further research is to repeat the test and examine the hypothesis using more comprehensive and rich model that contains more explanatory variables.

The empirical analysis here does not compare health care outcomes between the different income levels. Some previous studies reveal that the healthcare expenditures have different effects at different income levels. The data utilized here are national aggregates that do not differentiate between rich and poor. Hence, such data limitations constrain further analysis on this issue.

This study has not been able to capture the influence of governance and corruption when trying to find the effect of the health care expenditures on IMR. Future studies should include these important aspects.

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APPENDICES

APPENDIXA: DATA BEFORE CONVERSION INTO NATURAL LOGS

YEAR	IMR	Y	PHE	PRHE	IMU	FL	URB
1981	67.5	3669.329	1.19E+09	9.39E+08	48	24.52534	15.681
1982	65.8	4000.495	1.53E+09	1.07E+09	52	24.34324	15.78
1983	64.4	4363.289	1.61E+09	1.29E+09	55	25.50663	15.879
1984	63.4	4847.212	1.76E+09	1.32E+09	55	27.40393	15.979
1985	62.7	5328.566	2.02E+09	1.59E+09	63	33.96266	16.079
1986	62.5	5759.625	2.39E+09	1.75E+09	65	34.35121	16.18
1987	62.7	6204.052	2.58E+09	2.06E+09	69	36.3321	16.281
1988	63.4	6987.257	3.01E+09	2.11E+09	72	35.94222	16.383
1989	64.5	7517.307	3.30E+09	2.84E+09	75	36.18345	16.485
1990	65.8	8378.047	3.63E+09	3.22E+09	78	42.36712	16.748
1991	67.4	9252.672	4.11E+09	3.16E+09	81	39.32775	17.043
1992	68.9	12681.3	4.83E+09	3.50E+09	84	38.57596	17.342
1993	70.4	12918.28	6.72E+09	6.05E+09	84	40.1271	17.955
1994	71.4	15057.75	7.46E+09	6.49E+09	84	39.69741	17.952
1995	71.9	16996.68	1.19E+10	1.06E+10	83	41.35481	18.263
1996	71.7	24469.96	1.20E+09	1.71E+09	81	42.28671	19.019
1997	71.1	26707.8	1.33E+10	1.91E+10	79	41.35481	18.898
1998	69.9	28777.92	1.12E+10	2.13E+10	90	41.8746	19.222
1999	68.4	29930.38	9.96E+09	2.29E+10	76	37.6671	19.855
2000	66.5	31154.4	1.26E+10	2.44E+10	78	38.34074	19.892
2001	64.5	32018.71	1.60E+10	2.61E+10	77	39.09169	20.239
2002	62.2	31670.55	1.64E+10	2.69E+09	78	40.07099	20.891
2003	59.7	33733.1	1.78E+10	2.85E+10	72	43.654	20.948
2004	57.2	37004.15	2.10E+10	3.18E+10	73	45.54195	21.31
2005	54.3	40049.89	2.43E+10	3.56E+10	69	46.73504	21.675
2006	51.8	51315.67	2.89E+10	4.93E+10	77	48.29597	22.045
2007	49.5	57753.5	3.18E+10	5.48E+10	80	48.9961	22.962
2008	46.2	64925.98	3.38E+10	6.29E+10	90	56.56219	22.8
2009	44.3	64925.98	3.80E+10	7.55E+10	88	57.05751	23.183
2010	42.4	78587.49	5.63E+10	8.31E+10	86	60.55717	23.571
2011	40.3	89954.66	7.32E+10	3.73E+10	87	62.57841	23.967
2012	39.2	100161.1	7.32E+10	1.12E+11	93	64.50212	24.37
2013	38	108274	8.13E+10	1.23E+11	73	64.98122	24.78
2014	36.6	119421.4	9.88E+10	1.25E+11	79	65.01345	25.197

APPENDIX B: DATA TRANSFORMED INTO NATURAL LOGS

obs	LNIMR	LNY	LNPHE	LNPRHE	LNIMU	LNFL	LNURB
1981	4.212128	8.207764	20.89358	20.66084	3.871201	3.199707	2.752450
1982	4.186620	8.294173	21.14721	20.79070	3.951244	3.192254	2.758743
1983	4.165114	8.380981	21.19950	20.97791	4.007333	3.238938	2.764997
1984	4.149464	8.486159	21.28858	21.00090	4.007333	3.310686	2.771275
1985	4.138361	8.580837	21.42636	21.18700	4.143135	3.525262	2.777514
1986	4.135167	8.658628	21.59456	21.28288	4.174387	3.536637	2.783776
1987	4.138361	8.732958	21.67106	21.44597	4.234107	3.592702	2.789999
1988	4.149464	8.851843	21.82521	21.46995	4.276666	3.581913	2.796244
1989	4.166665	8.924963	21.91719	21.76707	4.317488	3.588602	2.802451
1990	4.186620	9.033370	22.01250	21.89265	4.356709	3.746373	2.818279
1991	4.210645	9.132668	22.13669	21.87384	4.394449	3.671930	2.835740
1992	4.232656	9.447884	22.29811	21.97603	4.430817	3.652629	2.853131
1993	4.254193	9.466399	22.62835	22.52332	4.430817	3.692052	2.887869
1994	4.268298	9.619648	22.73282	22.59353	4.430817	3.681286	2.887702
1995	4.275276	9.740773	23.19980	23.08412	4.418841	3.722189	2.904877
1996	4.272491	10.10520	20.90559	21.25976	4.394449	3.744473	2.945438
1997	4.264087	10.19271	23.31103	23.67295	4.369448	3.722189	2.939056
1998	4.247066	10.26736	23.13918	23.78197	4.499810	3.734679	2.956055
1999	4.225373	10.30663	23.02184	23.85440	4.330733	3.628787	2.988456
2000	4.197202	10.34671	23.25696	23.91785	4.356709	3.646513	2.990318
2001	4.166665	10.37408	23.49585	23.98520	4.343805	3.665910	3.007611
2002	4.130355	10.36314	23.52055	21.71281	4.356709	3.690653	3.039318
2003	4.089332	10.42623	23.60246	24.07317	4.276666	3.776295	3.042043
2004	4.046554	10.51879	23.76779	24.18273	4.290459	3.818634	3.059176
2005	3.994524	10.59788	23.91374	24.29561	4.234107	3.844494	3.076160
2006	3.947390	10.84575	24.08711	24.62119	4.343805	3.877348	3.093086
2007	3.901973	10.96394	24.18273	24.72696	4.382027	3.891741	3.133841
2008	3.832980	11.08100	24.24373	24.86481	4.499810	4.035341	3.126761
2009	3.790985	11.08100	24.36085	25.04740	4.477337	4.044060	3.143419
2010	3.747148	11.27197	24.75396	25.14331	4.454347	4.103588	3.160017
2011	3.696351	11.40706	25.01646	24.34226	4.465908	4.136420	3.176678
2012	3.668677	11.51454	25.01646	25.44176	4.532599	4.166698	3.193353
2013	3.637586	11.59242	25.12141	25.53545	4.290459	4.174098	3.210037
2014	3.600048	11.69041	25.31596	25.55158	4.369448	4.174594	3.226725

APPENDIX C: RESIDUAL GRAPH