PUBLIC HEALTH EXPENDITURE AND HEALTH OUTCOMES IN KENYA

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A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF ECONOMICS IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS IN ECONOMICS OF KENYATTA UNIVERSITY

NOVEMBER, 2013
DECLARATION

This project report is my original work and has not been presented for an academic award in any University.

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To

My parents and my family
ACKNOWLEDGEMENTS

I am indebted to my supervisors Dr. Julius Korir and Dr. Martin C. Wainaina for the immense support, guidance and contribution in making this research project what it is. I would want to acknowledge Ms Qabalie Baraqo and my classmates who have encouraged and gave a lot of support throughout my study. I also thank the lecturers in School of Economics, Kenyatta University for their invaluable contribution they gave in realization of this project.
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<th>Description</th>
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<tr>
<td>AR</td>
<td>Autoregressive</td>
</tr>
<tr>
<td>BIA</td>
<td>Benefit Incidence Approach</td>
</tr>
<tr>
<td>ECM</td>
<td>Error Correction Methods</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GOK</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>IMR</td>
<td>Infant Mortality Rate</td>
</tr>
<tr>
<td>KHP</td>
<td>Kenya Health Policy</td>
</tr>
<tr>
<td>LCD</td>
<td>Less Developing Countries</td>
</tr>
<tr>
<td>LEB</td>
<td>Life Expectancy at Birth</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>PHE</td>
<td>Public Health Expenditure</td>
</tr>
<tr>
<td>PIC</td>
<td>Pacific Island countries</td>
</tr>
<tr>
<td>THE</td>
<td>Total Health Expenditure</td>
</tr>
<tr>
<td>U5MR</td>
<td>Under-Five Mortality Rate</td>
</tr>
</tbody>
</table>
OPERATIONAL DEFINITION OF KEY TERMS

Health outcomes: include whether a given disease process gets better or worse, what the costs of care are, and how satisfied patients are with the care they receive. The focus is not on what is done for patients but the results from what is done.

Public Health Expenditure: is the current and capital spending from government budgets and external borrowing.

Total Health Expenditure: is the sum of government expenditure on health, private expenditure on health, and Non Governmental organizations and donors’ expenditure on health in a given year.
ABSTRACT

Government health spending remains a critical element of the social and economic development of any country. Internationally health outcomes have received a great attention; Millennium Development Goals has 3 of its 8 goals related to health issues, the Abuja Declaration in 2001 committed countries to increase health budget allocation to 15 percent of total government budget for provision of health services and improving health outcomes. Kenya total public health expenditure as a percentage of Gross Domestic Product has increased from 1.2 percent in 1980/81 to about 2.0 percent in 2010/11 with health indicators in the same period not following the same trend. The objective of this study was to determine the relationship of public health expenditure and health outcomes in Kenya. The study was based on Grossman (1972) theoretical model that applies a vector of inputs in production of health status. Longitudinal research design was adopted and Ordinary Least Squares multiple regression technique applied using data for over the period of 1980-2011. The research finding revealed that public health expenditure has a negative and significant relationship with both Under-Five Mortality Rate and Infant Mortality Rate. Life Expectancy at Birth was found to have a positive relationship with public health expenditure. However primary gross enrolment ratio, child immunization for measles and the ratio of doctors to the population were found to improve health outcomes more than public health expenditure. The study recommends that based on the findings specific health programmes targeting specific health outcomes and infrastructure development should be encouraged for better health outcomes to be realized.
CHAPTER ONE

INTRODUCTION

1.1 Background

Health plays the key role in determining the human capital. Better health improves the efficiency and the productivity of the labor force, ultimately contributing to the economic growth and improvement in human welfare. To attain better, more skilful, efficient and productive human capital resources, governments subsidize the health care provision for their people. In this regard, the public sector pays whole or some part of the cost of utilizing health care services. The size and distribution of these in-kind transfers to health sector differs from country to country but the fundamental question is how much these expenditures are productive and effective (Akram and Khan, 2007). Besides the nature of the existing circumstances of the human resource, any marginal change in public sector spending on health services may have positive impact on the human capital and economic growth.

Internationally health outcomes have received a great attention; Kenya is signatory of Millennium Development Goals (MDGs) which has 3 of its 8 goals related to health issues; reduce infant mortality, improve maternal health and combat HIV/AIDS, malaria and other diseases. Therefore the government has set out policies to ensure that these health targets are achieved. The Abuja Declaration in 2001 committed countries to increase health budget allocation to 15 percent of total government budget for provision of health services and improving health outcomes.
The Government of Kenya being a signatory to Abuja Declaration and a partner to Millennium Development Goals has developed its development frameworks focusing on social pillar as seen in vision 2030 to improve health outcomes of its population among other social concerns (Republic of Kenya, 2012a). Thus it is expected that government health budget allocations may be increased.

There are several health service financing methods in Kenya, including out of pocket, taxation, donor funding and health insurance. However Socio-economic analysis of the poverty dimensions reveals that the main health challenge facing the poor is affordability of health services (Republic of Kenya, 2009). This challenge calls for government involvement in health care financing as the constitution of Kenya mandates the government to provide its citizens with adequate and improved health care. Global development effort towards MDGs attainment is coming close and the government has also set their long term target for various health indicators. Table 1.1 shows some of Kenya’s health indicators and the targets that have been set by the ministry of health to be achieved by the year 2030.
Table 1.1: Kenya health progress indicators

<table>
<thead>
<tr>
<th>Health Indicator</th>
<th>2010 Estimates</th>
<th>2030 Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life expectancy at birth (years)</td>
<td>60</td>
<td>72</td>
</tr>
<tr>
<td>Annual death (per 1,000 persons)</td>
<td>10.6</td>
<td>5.4</td>
</tr>
<tr>
<td>Infant mortality rate (per 1,000 births)</td>
<td>52</td>
<td>20</td>
</tr>
<tr>
<td>Under 5 mortality rate (per 1,000 births)</td>
<td>74</td>
<td>24</td>
</tr>
<tr>
<td>Maternal mortality rate (per 100,000 births)</td>
<td>488</td>
<td>113</td>
</tr>
</tbody>
</table>

Source: Kenya health policy 2012-2030

The government faces the challenge of reversing the trend of health outcomes in the country. Maternal mortality in Kenya is high at 488 and the government will have to develop policies to meet the target of 113 by the year 2030. In 1994, the Government of Kenya (GOK) approved the Kenya Health Policy Framework (KHPF) as a Blueprint for developing and managing health services. It spells out the long-term strategic imperatives and the agenda for Kenya’s health sector. This policy responds to utilization of health resources and health sector expenditures.

1.2 Kenya’s Health financing policies and Expenditure Analysis

The ministry of health (MOH) utilizes government health funds. However the MOH has faced challenges in lack of adequate drugs and pharmaceuticals, staff shortages, and poor maintenance of equipment, transport, and facilities. Macroeconomic issues such as inflation and national debt have the potential to affect health allocations (Muga, Kizito, Mbaya, Gakuruh, 2004). Public
expenditures and budgets in Kenya show that total health spending constitutes about 8 percent of the total government expenditure and that recurrent expenditures have been consistently higher than the development expenditures, both in absolute terms, and as a percentage of the GDP (Republic of Kenya, 2010). The government has failed to allocate 15 percent of total government budget for provision of health services and improving health outcomes as agreed in the Abuja Declaration.

The health budget allocation has continued to be skewed in favour of tertiary and secondary care facilities, which absorb 70 percent of health expenditures. Primary care units, being the first line of contact with the population, provide the bulk of health services. Health personnel expenditures are high, compared to expenditures on drugs, pharmaceuticals, and other medical inputs such as medical equipment and supplies (Muga, Kizito, Mbaya, Gakuruh, 2004). The personnel spending in Kenya accounts for about 50 percent of the budget, leaving 30 percent for drugs and medical supplies, 11 percent for operations and maintenance at the facility level and 10 percent for other recurrent expenses. Expenditures for curative care constitute more than 48 percent of the total MOH budget (Flenngard A.H and Maina T.H, 2007).

Public health facilities continue to be the major providers of health care services. In 2009/2010 Public health facilities accounted for nearly half (47 percent) of total health expenditure (THE), followed by private health facilities, which were responsible for 22 percent. Expenditures on public health programmes increased

Table 1.2 Health expenditure and financing in Kenya.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2001/2002</th>
<th>2009/2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population, 2009</td>
<td>31,190,843</td>
<td>38,610,097</td>
</tr>
<tr>
<td>Total GDP at current prices (Ksh)</td>
<td>1,611,269,647,022</td>
<td>2,273,000,000,000</td>
</tr>
<tr>
<td>Total GDP at current prices ($)</td>
<td>20,499,613,830</td>
<td>29,978,897,389</td>
</tr>
<tr>
<td>Total government expenditure (Ksh)</td>
<td>304,627,619,387</td>
<td>761,800,000,000</td>
</tr>
<tr>
<td>Total government expenditure ($)</td>
<td>3,875,669,458</td>
<td>10,047,480,876</td>
</tr>
<tr>
<td>Total Health Expenditure (THE) (Ksh)</td>
<td>82,232,016,764</td>
<td>122,853,559,803</td>
</tr>
<tr>
<td>Total Health Expenditure (THE) ($)</td>
<td>1,046,208,865</td>
<td>1,620,331,836</td>
</tr>
<tr>
<td>Government health expenditure as a % of THE</td>
<td>8.00%</td>
<td>4.60%</td>
</tr>
<tr>
<td>Financing sources as a % of THE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>29.60%</td>
<td>28.80%</td>
</tr>
<tr>
<td>Private</td>
<td>54.00%</td>
<td>36.70%</td>
</tr>
<tr>
<td>Donor</td>
<td>16.40%</td>
<td>34.50%</td>
</tr>
<tr>
<td>Financing agent distribution as a % of THE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>42.80%</td>
<td>36.60%</td>
</tr>
<tr>
<td>Private</td>
<td>49.80%</td>
<td>33.90%</td>
</tr>
<tr>
<td>NGOs and Donors</td>
<td>7.40%</td>
<td>29.50%</td>
</tr>
<tr>
<td>Provider as a % of THE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public facilities</td>
<td>49.40%</td>
<td>46.70%</td>
</tr>
<tr>
<td>Private facilities</td>
<td>35.70%</td>
<td>22.20%</td>
</tr>
</tbody>
</table>

Source: Kenya National Health Accounts (2010).
As shown in the Table 1.1 THE in absolute value has increased, and the health sector is predominantly financed by the private sector sources which have reduced significantly. Public sector financing is seen to be almost remaining constant with contribution from donors more than doubling. However the public sector utilizes the larger share of total health expenditure as the provider and financing agent distributor. In Kenya 44.3 percent of the population is poor, and this rises the concern of financing accessibility to health care by the poor, hence the government should ensure an efficient and high quality health care system that is accessible, equitable and affordable (Institute of Economic Affairs 2008). The trend of the government health budgetary allocation has been on the rise. Figure 1.1 presents the trend of public health expenditure as a percentage of GDP.

![Graph showing trends in public health expenditure as a percentage of GDP.](image)

Source: Statistical abstract various issues and world development indicators.

Figure 1.1 Trends in public health expenditure as a percentage of GDP.
The public health expenditure as a percentage of GDP rose from about 1 percent in 1980/81 to about 2.0 percent in 2010/11. The allocation to the health sector in the financial year 2010/2011 translated to about 9 percent of the total Government expenditure; however this is below the Economic Recovery Strategy target of 12 percent, and the Abuja Declaration, to which the government is committed to allocate, 15 percent of total public spending to providing quality health care.

Economists have continued discussions whether the distributional effects of public spending have significant outcomes on health, education and other social services. For instance Mohanoe (2003), on examining the relationship between public expenditure and health status in Lesotho, found a significant statistical relationship between government expenditure and health status in Lesotho. The study of Nixon and Ulmann (2006), investigating between health expenditure and health outcomes in European and developing countries revealed there have been bias that poor countries will have better health outcomes. Filmer and Pritchett (1999), in their study of developed and developing countries arguing that there are no significant statistical relationship between health expenditure and outcomes. However differing degrees of efficiency in health system organization, finance and responsiveness explain much of the difference in health outcomes between the rich and poor, either within countries or between countries, and reasserted the primacy of social, economic and political causes for variation in mortality across time and place (Renton, Wall and Lintott, 2012).
1.3 Trend in the health outcomes indicators.

The Kenyan health sector has developed its health policy (Kenya health policy of 2012) to guide the attainment of long term health outcomes targeted by the government of health as outlined in the vision 2030 and the 2010 constitution (Republic of Kenya, 2012c). The impact target for the health outcomes as indicated in the Kenya Health Policy (KHP) will be measured by Life expectancy at birth, Maternal deaths per 100,000 live births, Neonatal deaths per 1,000 live births, Under-five deaths per 1,000, Youth and Adolescent death per 1,000, Adult deaths per 1,000, Elderly deaths per 1,000 and years lived with disabilities. However effects of public spending on health are usually measured by health outcomes variables such as infant or child mortality rates and life expectancy (Gani, 2009).

Key health indicators in Kenya suggest relative improvement or decline in the health status. Figure 1.2 shows the trend of selected health outcomes in Kenya for the period over 1980/81 to 2010/11. The trend over the period of 1980/81 to 2010/11 for infant and under five mortalities and life expectancy at birth was available with the other health outcomes lacking adequate data for this period.
Maternal mortality ratio is considerably worrying, it has worsened from 380 in 1990 to 488 per 100,000 in 2011, and maternal death in Kenya is the leading cause of death in women of child bearing age (Republic of Kenya, 2012b). Life expectancy at birth (LEB) as seen has declined from 57.74 in 1980 to 56.50 in 2010. The rate of under-5 mortality has relatively improved from 108 in 1980 to 84 per 1,000 live births in 2010 against a target of 45, with infant mortality rate also improving relatively during the same period. This makes the progress towards Kenya’s attainment of the MDGs slow and uncertain (Republic of Kenya, 2012; WHO, 2009).
In efforts to meet the health outcome goals government plays an extremely important role as a financier and provider of health care services. However with the public spending on health increasing, the health outcomes seem not to be improving.

1.4 Statement of the Problem

A country expects that public spending will reduce poverty and improve human capital; hence it is important to assess the effectiveness of public expenditure on health outcomes (Akram and Khan, 2007). However, the effect of the level of public expenditure on health outcomes varies in different countries with some studies revealing improved effect and others insignificant effect where most of these studies are based on international comparisons (Filmer and Pritchett, 1999; Mohanoe, 2003; and Nixon and Ulmann, 2006). In Kenya public health expenditure as a percentage of GDP has increased over the years though health outcomes seem to have not followed the same trend. The emerging question is whether or not public health spending affects health outcomes in Kenya, as the country is not likely to meet the Millennium development goals in health (Republic of Kenya, 2012).

1.5 Objectives of the study

The overall objective of this study was to determine the relationship of public health expenditure and health outcomes in Kenya. The Specific Objectives were to;

i. Determine the effect of public health expenditure on under-five mortality.
ii. Determine the effect of public health expenditure on infant mortality.

iii. Determine the effect of public health expenditure on life expectancy.

1.6 Hypothesis

The study tested the following hypothesis:

i. Public health expenditure has no effect on under-five mortality.

ii. Public health expenditure has no effect on infant mortality.

iii. Public health expenditure has no effect on life expectancy at birth.

1.7 Significance of the study

The Government commitment to improving the health status to allow its citizens participate fully in socio-economic development in the country has implications on expenditure. With scarcity of resources it is important to understand the effects of any investments made. This information will be useful to policy makers and practitioners. However in developing countries, studies on health expenditure and health status are scarce, and specifically in Kenya there is no much effort towards this relationship therefore this study intends to add knowledge to policy makers and stimulate interest for further research in this area.

1.8 Scope of the study

This study used time series data for Kenya health public health expenditure and health outcomes for the period 1980-2011; hence the study looked at this relationship specifically to Kenya's situation.
1.9 Limitations of the study

There were difficulties in obtaining time series data for maternal mortality which denied the study the privilege to investigate this health outcome. In Kenya maternal death is the leading cause of death in women of child bearing age (Republic of Kenya, 2012).
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction.

This chapter contains three sections. The first section deals with theoretical literature of the relationship between health outcomes, public health expenditure and other socio economic variables. The second section deals with the empirical literature review. The chapter concludes by overview of literature indicating the gap of the study.

2.2 Theoretical literature Review

2.2.1 The Grossman Theoretical Model

The Grossman theoretical model treats social, economic, and environmental factors as inputs of the health production system. Health economists maintain that in creation and maintenance of health will involve a production process. A health production function indicates the maximum amount of health that an individual can generate from a specific set of inputs in a given period of time.

The Grossman model view health as a durable capital stock that produces an outcome of healthy time, where the level of health of an individual is endogenous. The model assumes that individuals inherit an initial stock of health that depreciates with age and can be increased by investment, individual’s ability to restore the state of health is deemed optimal at a speed that does not depend on their state of health. The model further assumes that in the usual inter-temporal
utility function, the length of life as of the planning date is fixed and endogenous variable, death takes place when the stock of health falls below a certain level. Therefore, length of life depends on the quantities of stock of health that maximize utility subject to certain production and resource constraints. The model inter-temporal utility function of a typical consumer is then given as;

\[ U = U(\Phi_0, H_0, \ldots, \Phi_i, H_i, Z_0, \ldots, Z_n), \] \hspace{1cm} (2.1)

Where \( H_0 \) is the inherited stock of health, \( H_i \) is the stock of health in the \( i \)th time period, \( \Phi_i \) is the service flow per unit stock, \( h_i = \Phi_i H_i \) is total consumption of "health services," and \( Z_i \) is total consumption of another commodity in the \( i \)th period.

By definition, net investment in the stock of health equals gross investment minus depreciation:

\[ H_{i+1} - H_i = I_i - \delta_i H_i \] \hspace{1cm} (2.2)

Where \( I_i \) is gross investment and \( \delta_i \) is the rate of depreciation during the \( i \)th period. The rates of depreciation are assumed to be exogenous, but they may vary with the age of the individual. Consumers will then produce gross investments in health and the other commodities in the utility function according to a set of household production functions:

\[ I_i = I_i(M_i, TH_i; E_i) \]
\[ Z_i = Z_i(X_i, T_i; E_i) \] \hspace{1cm} (2.3)
In these equations, $M_i$ is healthcare, $X_i$ is the goods input in the production of the commodity $Z_i$, $TH_i$ and $T_i$ are time inputs, and $E_i$ is the stock of human capital. It is assumed that a shift in human capital changes the efficiency of the production process in the nonmarket sector of the economy, just as a shift in technology changes the efficiency of the production process in the market sector. It is also assumed that all production functions are homogeneous of degree 1 in the goods and time inputs. The health production function is then specified as:

$$H = F(X)$$

(2.4)

Where $H$ is a measure of individual health status and $X$ is a vector of individual inputs to the health production function. The elements of the vector include: initial individual endowment like genes, time devoted to health related procedures, income, nutrient intake, environment, consumption of public goods, healthcare, and education. In empirical work, health expenditure is used as a proxy for healthcare in the estimation.

Zweifel (2012) pointed out is that the Grossman health model is very inspiring to health economist, as production function is attractive as it focuses on allocative efficiency in the use of factor inputs in production and the resulting distribution of income to those factors. This will make it possible to estimate the effect of inputs on health outcomes.
2.2.2 Social Learning Theory and Health Belief Model

In this model self-efficacy is proposed as an independent variable along with other traditional health belief variables of perceived susceptibility, severity, benefits and barriers. Incentive to behave (health motivation) is also a component to this model. The social learning theory assumes that behavior is determined by expectancies and incentives.

1. Expectancies

✓ Expectancies of environmental cues (how one event is connected to another)

✓ Expectancies of health outcomes

✓ Expectancies to perform the behavior to lead to desired health outcomes.

2. Incentives of the value of the health outcome where behavior is regulated by its consequences which are interpreted and understood by the individual.

The health belief model hypothesizes that are health related relay upon the simultaneous occurrences of; existence of health concern, perceived threat of a health problem and the belief that a particular health recommendation would be beneficial in reducing the threat at subjectively acceptable cost. This model considers using a $2 \times 2$ classification on how different combination of internality-externality and self efficacy will influence compliance with a medical regime. Table 2.1 shows the relationship of variables influencing behavior.
Table 2.1: Relationship of variables influencing health behavior

<table>
<thead>
<tr>
<th>SELF-EFFICACY</th>
<th>LOCUS OF CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Internal</td>
</tr>
<tr>
<td>High</td>
<td>A</td>
</tr>
<tr>
<td>Low</td>
<td>C</td>
</tr>
</tbody>
</table>

Persons in cell A will most likely follow professional advice with an individual in cell D least likely to comply. Those in cell B will believe in undertaking the recommended behavior but will not do so as they are not convinced of they will derive the desired effect. Persons in section C believe health outcomes are personally determined. This analysis reveals that both locus of control (outcome expectation) and efficacy expectations are important for a specific behavior to occur.

Efficacy expectation assumes that an individual can successfully execute the behavior required to produce health outcomes. Both outcome (perceived benefits) and self efficacy are required for behavior. This relationship can be presented as:

PERSON → BEHAVIOR → HEALTH OUTCOME

Efficacy Expectations

Outcome Expectations
For an individual to behavior for health outcomes must believe the behavior will deliver the expected outcome (health) and they can behavior (efficacy expectation).

This model is complex and may be confusing about the interrelationship among the variables and may be difficult for application by researchers.

2.3 Empirical literature review

Society expects governments to intervene in the health sector to increase access to health care, protect consumers against the adverse effects of market failures, and provide safety nets for the poor (Nandakumar, Farag and Kris, 2008). In this analysis of the determinants of health expenditures the authors emphasized that magnitude and share of these determinants in health expenditures varies across countries. Most of the research has focused on high-income countries. There is a need to study this issue in the context of low and middle-income countries. Therefore, this study was designed to fill these gaps for developing countries and more so specifically to Kenya. However many studies estimating the relationship between public spending and health outcomes have utilized cross-national data and very few estimates have been conducted for developing countries. However it should be noted that the impact of public spending on health is not constant, but is likely to vary from country to country and hence the results will be sensitive to the sample used (Filmer and Pritchett, 1999).

Filmer and Pritchett (1999) utilized cross national data of 98 developed and developing countries for the year 1990 to find the relationship between health
expenditure and health outcomes, applying Ordinary Least Squares technique (OLS) and econometrics procedures. They used under-five and infant mortality rates as measures of health status as it is arguably superior to alternative measures as a general measure of health status. Their results reported that the impact of public spending on health is insignificant, acknowledging that variables as GDP per capita, income distribution, female illiteracy rates, ethno-linguistic fractionalization, and the predominant religion of a country explain variations in mortality. The study revealed Costa Rica does well and has public spending of 7.49% of GDP on health sector while Jamaica and Sri Lanka do well spending only 2.89 and 1.67% of GDP on health respectively. However it should be noted that International comparisons as the case in the study of Filmer and Pritchett (1999), should be interpreted cautiously because of definitional and methodological differences in the data across countries (Anderson, Hurst, Hussey, and Jee-Hughes, 2000).

Filmer, Hammer, and Pritchett (2000), when investigating government spending for services to improve health in developing countries, revealed primary health care may have little impact on health outcomes. Similarly in an empirical analysis of the determinants of health outcomes related to the Millennium Development Goals in 39 developing countries Fay, Leipziger, Wodon, and Yepes (2005), findings was that GDP per capita becomes less important once a more complete set of explanatory variables is used for analyzing the determinants of health outcomes. Instead, variables such as female literacy, access to basic health care, and
infrastructure, which are certainly easier to affect than the GDP per capita, are found to be the key.

Fayissa and Gutema, (2005) estimated a health production function in Sub Saharan Africa. They used panel data analytical approach where time series data of each country was averaged over two years and a total of five periods were formed for each country. Their model was estimated by a method of one-way and two-way panel data analyses. This study based their health production function for Sub Saharan Africa on Grossman (1972) theoretical model. Life expectancy at birth was the dependent variable with income per capita, illiteracy rate, food availability, ratio of health expenditure to GDP, urbanization rate, and carbon dioxide emission per worker being the explanatory variables. The empirical results suggested that an increase in income per capita, a decrease in illiteracy rate, an increase in food availability were associated with improvement in life expectancy at birth. Health expenditure had a negative relationship with life expectancy at birth however this result might have been due to the methodology the study adopted.

Using the primary data of the Pakistan Social Standard Living Measures Survey, Akram and Khan (2007), employed the three-step Benefit Incidence Approach (BIA) methodology to carry out a study to measure the incidence of government spending on health in Pakistan at provincial, both rural and urban level. This study revealed that total public sector expenditure on health had increased with the government committed to invest in the health sector, especially for the poor who do
not afford private consultation. Health expenditures on Mother and Child sub-sector was progressive in overall Pakistan; which implied that poor were getting more benefit from these expenditures as compared to the rich who did not find quality of government healthcare services satisfactory. The share of health subsectors showed that Mother and Child Programme got the least share in the total health sector budgetary expenditure and that this increased expenditures provided most healthcare services in urban areas than rural areas with infant and maternal mortality rates still worsening in Pakistan. This study in Pakistan by using primary data managed to achieve a more comprehensive explanation of why health outcomes are not impressive. The different results suggest that it will depend on how the provision of healthcare by the public health sector succeeds in targeting the majority population.

Surveying the literature on the link between public spending, governance, and outcomes, Rajkumar and Swaroop (2008), found that rich countries have a lower child mortality, and the link between public health spending and child mortality is negative, but the efficacy of public spending in lowering child mortality is positively related with the level of governance. In particular Rajkumar and Swaroop (2008), used health status regression borrowing from Filmer and Pritchett (1999), but in this study they modeled the interaction between public spending and governance indicators in assessing the impact on health outcomes. They used a sample of 228 observation over three years 1990, 1997 and 2003 from 91 developed and developing countries to reveal surprising result that public spending
often does not yield the expected improvement in outcomes but good governance was important to achieve better results. These findings are particularly relevant for developing countries, where there is an ongoing debate on how to achieve the Millennium Development Goals (MDGs). However, a study by Picazo and Zhao (2008), on Zambia health public sector review, showed that the declining government health spending underlined the major problems facing health sector. Even though the total health expenditure as a share of GDP had increased, government health spending as percentage of the total health expenditure was decreasing. This was seen as the reason for the increasing IMR, U5MR and MMR with these ratios in Zambia among the highest in the world.

By contrast however, other studies show that health care spending has beneficial outcomes in terms of reducing mortality rates. For example, In a study analyzing the relationship between health care spending and health outcomes in Canada for the period 1978-1992, Crémieux, Ouellette, and Pilon (2000), managed to find a strong relationship between health care spending and health outcomes. Their model was an aggregate function that successively examined the determinants of four health indicators based on a generalized least squares estimation with provincial fixed effects. They stated that past researchers’ failure to find a significant relationship between the two variables results from data heterogeneity inherent to international comparisons, rather than specification bias or the absence of a clear relationship between these variables. Based on a homogenous province-specific Canadian data show that lower health care spending is associated with a
statistically significant increase in infant mortality and a decrease in life expectancy in Canada, this relationship was independent of various economic, socio-demographic, nutritional and lifestyle factors, as well as provincial specificity or time trend. Unlike other studies, Cremieux et al. (2000), controlling heterogeneity between the variables was the reason of a positive relation between the variables. The claim that homogeneous data will show strong relationship between spending and health outcomes did not hold in a study conducted by Akram and Khan (2007), in Pakistan citing quality of public healthcare services was poor and these services were largely provided in urban areas than rural areas where the majority needed government services.

Mahanoe (2003) investigated the impact of overall government expenditure and health status in Lesotho for the period 1980-2001. The results revealed that per capita income was not a significant determinant of health status in Lesotho, with variables as public expenditure on health, availability of physicians, female literacy and immunization being the most important factors. However, Filmer and Pritchett (1999) identified that high per capita income contributed to lower mortality and increased life expectancy. It was also important to relate specifically public health expenditure and health outcomes which this study did not do.

As well, Nixon and Ulmann, (2006) econometric analyses using a fixed effects model was conducted on a panel data set for the former 15 members of the European Union over the period 1980-1995. Their results showed a marginal but
positive effect for health expenditure on the examined health outcomes for
developed nations (Represented by EU), more so for infant mortality than life
expectancy, which is consistent with evidence confirming diminishing returns in
the area of health care in developed countries. In contrast however they established,
small amounts of health expenditure in developing countries, and even intermediate
countries, would almost certainly have a bigger impact. This again is inconsistent
with a study done in two cross-sections of developing countries, under-5 mortality
is found to be associated strongly with maternal and infant health program effort
and with the share of births attended by trained personnel, but never with any
indicator of health care spending (McGuire, 2006).

McGuire (2006), in a study of public health care spending and outcome in two
cross-sections of developing countries, 94 in 1990 and 46 in 1995 used ordinary
least squares multiple regression to explore the association between maternal and
infant health care provision and under-5 mortality. The study specifying the model
with variables taken from Filmer and Pritchett (1999) confirmed that developing
countries with more health care spending do not have systematically lower levels of
under-5 mortality, whereas countries with better maternal and infant health care
services do. The study found the reason why public health care spending shows no
association with under-5 mortality in most cross-national studies of developing
countries may be that the maternal and child health care interventions that are most
effective in reducing under-5 mortality are so inexpensive that they do not even
show up in data on the share of public health spending devoted to basic, local, or primary health care services which is a stunning revelation.

Investigations by Gani (2009), provided empirical evidence on the relationship between per capita public health expenditure and health outcomes; infant mortality rate (IMR), under-five mortality rate (U5MR), and crude death rates (CDR), using cross-country data from seven Pacific Island countries (PICs) for selected years between 1990 and 2002. The results of the fixed-effects estimation procedure, correcting for AR(1) errors, revealed strong evidence that per capita health expenditure was an important factor in determining health outcomes, with per capita income and immunization also featuring strongly. The study also revealed that government health care funding impacts the infant mortality rate more strongly than the under-five mortality rate, where these shows that different variables of health outcomes may be affected with different magnitudes which was of great interest. However this study failed to include Education (illiteracy levels) which is a key variable that may affect health outcomes as it has been used in various studies.

However, according to Vavken, Pagenstert, Grim, and Dorotka (2012), who conducted a study in Austria for a 12 year period (1997-2008) with an objective to search for associations between health care spending and health care outcome. Two parameters of health care outcome, mortality and years of life lost were regressed on measures of health care spending applying ordinary least squares, Prais-
should be interpreted cautiously because of definitional and methodological differences in the data across countries (Anderson et al., 2000).

Findings from previous studies are not clear concerning the relationship between public spending and health outcomes. The suggestion that poor countries may achieve more due to health care spending on health shows that different health outcomes may be realized from similar health spending depending on the level of development and this would automatically lead to different outcomes even among Less-developing countries where this paper intends to find the specific relationship on public health spending and outcomes in Kenya adopting Grossman Model based on its strength to predict this relationship. This investigation in Kenya will help policy makers and practitioners in their search for cost effective mechanisms for providing health services and the reallocation of health resources in such a way that the gains from health spending could be optimized.
CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter presents the methodology adopted in achieving the objectives of this study. The chapter include; the Research Design, Theoretical framework, Empirical model, Definition and Measurement of variable, Data Type and Source, and Data analysis.

3.2 Research Design

The study empirically analyzed the effect of public health expenditure and health outcomes in Kenya. The study adopted longitudinal research design in which time series data collected for the period 1980 to 2011 was regressed to obtain the relation between health outcomes, public health expenditure and other socio economic variables examined by the study.

3.3 Theoretical Framework

Based on the theoretical and empirical literature reviewed, the methodology adopted by this study was anchored on Grossman Model. The Grossman theoretical model developed a theoretical health production function which is specified as follows;

\[ H = F(X) \]

(3.1)

Where \( H \) is a measure of individual health status and \( X \) is a vector of individual inputs to the health production function. The health production function makes it
possible to estimate the relationship of health spending and health outcomes where in empirical work, health expenditure is used as a proxy for healthcare in the estimation. The advantage of estimating an aggregate health production function is that, estimates of the over-all effect of healthcare utilization on the health status of the population can be obtained.

3.4 Empirical Model

The Empirical model to achieve the objective of this study was adopted with relation to the theoretical framework. The study adopted three models in natural logarithmic form each on under-five mortality rate, infant mortality rate and life expectancy at birth by adopting and modifying equation 3.1,

$$\text{LogHSt} = \beta_0 + \beta_1 \text{LogPHGDP}_{1-t} + \beta_2 \text{LogPGER}_{1-t} + \beta_3 \text{LogPD}_{1-t} + \beta_4 \text{LogCFI}_t + \mu_t \quad (3.2)$$

Where,

HS, is under five mortality rate in first model, infant mortality model on the second model and life expectancy at birth in the third model,

t, is time trend,

Log, is natural logarithmic form,

PHGDP, is public health expenditure as a share of GDP in local currency,

PGER, is primary school gross enrolment rate,

PD, is population of doctors per 100,000 people,

CFI, is child immunization for measles,
U, is error term to capture any omitted variables.

β's are parameters estimated.

3.5 Definition and Measurement of Variables

This study will adopt Under-five mortality rate, infant mortality rate and Life expectancy at birth as the dependent variables as they are good measures of health outcomes (Gani, 2009). Table 3.1 presents the definition, measurement and data source of the variables that were used for the study.
<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition</th>
<th>Measurement</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Under five Mortality Rate (U5MR)</strong></td>
<td>The total number of deaths of children-under five divided by total number of live births multiplied by 1000.</td>
<td>Ratio (per 1,000 live births).</td>
<td>World development Indicators</td>
</tr>
<tr>
<td><strong>Life Expectancy at Birth (LEB)</strong></td>
<td>The number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.</td>
<td>Average of mortality of all ages.</td>
<td>World development Indicators</td>
</tr>
<tr>
<td><strong>Public Health Expenditure as a percentage of GDP (PHGDP)</strong></td>
<td>This is the government total spending for health divided by GDP. This is the primary independent variable but other variables will be adopted to control the regression. The coefficient sign is expected to be negative.</td>
<td>Percentage</td>
<td>World development Indicators and various issues of Statistical abstracts.</td>
</tr>
<tr>
<td><strong>Population of Doctors per 100,000 people (PD)</strong></td>
<td>The total number of the population divided by total number of doctors multiplied by 100,000. The expected relation with mortalities is negative.</td>
<td>Ratio (per 100,000 people)</td>
<td>Various issues of Statistical abstracts.</td>
</tr>
<tr>
<td><strong>Infant mortality rate (IMR)</strong></td>
<td>The probability of dying between birth and exactly one year of age expressed per 1,000 live births.</td>
<td>Ratio (per 1,000 live births).</td>
<td>World development Indicators</td>
</tr>
<tr>
<td><strong>Primary Gross Enrolment Rate (PGER)</strong></td>
<td>The ratio of total enrollment in primary school regardless of age, to the population of the age group that officially corresponds to the level of education shown.</td>
<td>Ratio to population</td>
<td>World Development Indicators</td>
</tr>
<tr>
<td><strong>Child immunized for Measles (CIM)</strong></td>
<td>This represents the percentage of children immunized for the measles by the age of 23 months. The coefficient sign is expected to be negative.</td>
<td>percentage</td>
<td>World Development Indicators and various statistical abstracts.</td>
</tr>
</tbody>
</table>
3.6 Data Type and Source

This study used secondary data. The data was collected from various statistical abstracts and World Development Indicators.

3.7 Data Analysis

The study sought to respond to three objectives. These objectives were to determine the effect of public health expenditure on three health outcomes (under-five mortality, infant mortality and life expectancy at birth). Subject to time series characteristics, stationarity tests were carried out. KPSS test for stationarity was employed as it is more superior to ADF as it addresses the structural breaks in time series data (Brooks, 2008). The variables were found not cointegrated and the regression outputs satisfied all diagnostic tests. These objectives were achieved by establishing the statistical significance of the individual coefficient using two-tailed tests since they assumed negative or positive values. This was done by Ordinary Least Squares multiple regression technique.
CHAPTER FOUR
EMPIRICAL FINDING AND DISCUSSION

4.1 Introduction

This chapter presents the empirical estimation including descriptive statistics, correlation, unit root tests, and findings from the investigation.

4.2 Preliminary tests and Correlation of the variables

Preliminary test was carried out and the statistical characteristics of all variables used for this study for the period 1980-2011. Table 4.1 present descriptive statistics of the variables used in this study. The variables used for this study are; life expectancy at birth (LEB), under five mortality rate (U5MR), infant mortality rate (IMR), public health expenditure as a share of GDP (PHGDP), primary gross enrolment ratio (PGER), population of doctors per 100,000 people (PD), and Child immunized for Measles (CIM).

Table 4.1: Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>LEB</th>
<th>U5MR</th>
<th>IMR</th>
<th>PHGDP</th>
<th>PGER</th>
<th>PD</th>
<th>CIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>56.281</td>
<td>99.781</td>
<td>63.719</td>
<td>1.441</td>
<td>103.721</td>
<td>14.952</td>
<td>74.219</td>
</tr>
<tr>
<td>Median</td>
<td>56.500</td>
<td>101.000</td>
<td>64.500</td>
<td>1.650</td>
<td>105.500</td>
<td>15.000</td>
<td>77.500</td>
</tr>
<tr>
<td>Maximum</td>
<td>60.000</td>
<td>117.000</td>
<td>71.000</td>
<td>2.200</td>
<td>120.000</td>
<td>19.000</td>
<td>90.000</td>
</tr>
<tr>
<td>Minimum</td>
<td>52.000</td>
<td>73.000</td>
<td>50.000</td>
<td>0.800</td>
<td>90.000</td>
<td>12.100</td>
<td>46.000</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>2.876</td>
<td>11.769</td>
<td>5.467</td>
<td>0.483</td>
<td>9.461</td>
<td>1.624</td>
<td>12.104</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.187</td>
<td>-0.541</td>
<td>-0.853</td>
<td>-0.013</td>
<td>-0.037</td>
<td>0.731</td>
<td>-0.892</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.601</td>
<td>2.578</td>
<td>3.118</td>
<td>1.279</td>
<td>1.745</td>
<td>3.562</td>
<td>2.859</td>
</tr>
</tbody>
</table>
Mean and median are used to locate the center of the relative frequency distribution. Measures of dispersion namely; maximum, minimum, skewness and kurtosis show whether the values fall close to the central tendency measure. Positive skewness means the distribution has a long right tail while negative skewness means a long left tail respectively. Kurtosis measures the peakedness or flatness of a distribution of a series.

All the variables have positive mean and median implying that they have a normal frequency distribution. Population of doctors per 100,000 people have a positive skewness implying that the distribution has a long right tail while life expectancy at birth, under five mortality rate, infant mortality rate, public health expenditure as a share of GDP, primary gross enrolment ratio, and Child immunized for Measles has negative skewness thus indicate a long left tail. From the values, it is evident that all variables are normally distributed.

The correlations analysis was done for the independent variables and recorded in Table 4.2.

Table 4.2: Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>LPHGDP</th>
<th>LPGER</th>
<th>LPD</th>
<th>LCIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPHGDP</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPGER</td>
<td>-0.17561</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPD</td>
<td>0.52889</td>
<td>-0.05534</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>LCIM</td>
<td>0.41284</td>
<td>-0.56649</td>
<td>0.764758</td>
<td>1</td>
</tr>
</tbody>
</table>
Logic behind assumption of no multicollinearity is simple that if two or more independent variables are linearly dependent on each other, one of them should be dropped. A suggested rule of thumb is that if the pair correlation between two regressors is very high, in excess of 0.8, multicollinearity may pose serious problem. From correlation results presented in Table 4.2 suggest there is no multicollinearity.

4.3 Results of the Unit Root Test.

An important concern in data analysis is to know whether a series is stationary (do not contain a unit root) or not stationary (contains a unit root). It was important to test for stationarity so that data can be analyzed with econometric techniques as incase of non-stationarity some basic model assumptions are not met and this can result to spurious results (Brooks, 2008).

The study adopted Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test as it is more superior to ADF (Brooks, 2008). The result of the unit root test using KPSS is shown in Table 4.3. If the KPSS statistic is greater than the critical value the null hypothesis is rejected.
Table 4.3: Results for KPSS unit root test

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level Intercept Kpss t-statistic</th>
<th>Critical value 1%</th>
<th>Level Trend and intercept Kpss t-statistic</th>
<th>Critical value 1%</th>
<th>Order of integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>LogU5MR</td>
<td>0.247827 (4)</td>
<td>0.739000*</td>
<td>0.160603 (4)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
<tr>
<td>LogLEB</td>
<td>0.204872 (5)</td>
<td>0.739000*</td>
<td>0.117055 (4)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
<tr>
<td>LogIMR</td>
<td>0.311185 (4)</td>
<td>0.739000*</td>
<td>0.165616 (4)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
<tr>
<td>LogPHGDP</td>
<td>0.493738 (4)</td>
<td>0.739000*</td>
<td>0.098186 (4)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
<tr>
<td>LogPGER</td>
<td>0.487509 (5)</td>
<td>0.739000*</td>
<td>0.192382 (4)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
<tr>
<td>LogCIM</td>
<td>0.204872 (4)</td>
<td>0.739000*</td>
<td>0.158645 (4)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
<tr>
<td>LogPD</td>
<td>0.698846 (4)</td>
<td>0.739000*</td>
<td>0.109787 (3)</td>
<td>0.216000*</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Note: The values in the table and those in bracket are the Kwiatkowski-Phillips-Schmidt-Shin tests statistics and the band width. The band width is based on Bartlett Kernel. * indicates stationary at 1% level.

The results of KPSS found out that all the variables were stationary both at level with intercept and also at trend and intercept. The variables are integrated of order zero I(0), suggesting cointegration does not exist.

4.4 Estimating the Regression Models

The study estimated three regression models for under-five mortality rate, infant mortality rate, and life expectancy at birth. Regression for under-five mortality rate and infant mortality rate was estimated using data over the period of 1980-2011 in two independent models. Further investigations were carried out to determine more
definite and reliable results by lagging the explanatory variables. The model specification appeared as follows:

\[ \log(HSt) = \beta_0 + \beta_1 \log(PHGDPe_{t-2}) + \beta_2 \log(PGER_{t-2}) + \beta_3 \log(PD_{t-2}) + \beta_4 \log(CIMt) + Ut \ldots \ldots (4.1) \]

Where HSt represents under-five mortality rate (U5MR) for the first model and infant mortality rate (IMR) for the second model. The negative number indicates the number of lags. The individual models for under-five mortality rate and infant mortality rate were tested for serial correlation, Heteroscedasticity, normality and for model specification. Table 4.4 presents the diagnostic summary of these results.

Table 4.4: Diagnostic summary for U5MR and IMR

<table>
<thead>
<tr>
<th>TEST</th>
<th>statistic U5MR</th>
<th>Probability U5MR</th>
<th>statistic IMR</th>
<th>Probability IMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specification (Ramsey Reset Test)</td>
<td>0.292247</td>
<td>0.5938</td>
<td>1.434259</td>
<td>0.2428</td>
</tr>
<tr>
<td>Serial Correlation (Breusch-Godfrey)</td>
<td>2.748294</td>
<td>0.2531</td>
<td>0.475244</td>
<td>0.7885</td>
</tr>
<tr>
<td>Heteroscedasticity (ARCH)</td>
<td>0.008807</td>
<td>0.9252</td>
<td>0.132168</td>
<td>0.7162</td>
</tr>
<tr>
<td>Normality (Jarque-Bera)</td>
<td>5.291100</td>
<td>0.107096</td>
<td>2.693905</td>
<td>0.260032</td>
</tr>
</tbody>
</table>

The Ramsey Reset test for no specification error could not be rejected as the statistic for both U5MR and IMR has a probability value exceeding 5% (p>0.05%), and therefore the null hypothesis cannot be rejected hence the model is correctly specified. Serial Correlation LM test statistic for the null hypothesis of no serial correlation could not be rejected as the probability value of Obs*R-squared is
0.2531 for U5MR and 0.7885 for IMR indicating no presence of serial correlation in the residuals (p>0.05%). For Heteroscedasticity, the p-value of Obs*R-squared shows that null hypothesis of no Heteroscedasticity cannot be rejected. This implies that the residuals do have constant variance which is desirable meaning that residuals are homoscedastic. Jarque-Berra statistics is 5.2911 for U5MR and 2.694 for IMR, since p-value is greater than 5 percent the null hypothesis for normal distribution cannot be rejected meaning that population residual (u) is normally distributed which fulfills the assumption of a good regression line.

The models having passed all the diagnostic tests, the regression results for under-five mortality rate model were recorded in Table 4.5.

Table 4.5: U5MR regression results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGPHGDP(-2)</td>
<td>-0.0713</td>
<td>0.0334</td>
<td>-2.1367</td>
<td>0.0426</td>
</tr>
<tr>
<td>LOGPGER(-2)</td>
<td>-1.3471</td>
<td>0.1299</td>
<td>-10.373</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOGPD(-1)</td>
<td>-0.5015</td>
<td>0.2100</td>
<td>-2.3879</td>
<td>0.0248</td>
</tr>
<tr>
<td>LOGCIM</td>
<td>-0.2354</td>
<td>0.1227</td>
<td>-1.9182</td>
<td>0.0666</td>
</tr>
<tr>
<td>C</td>
<td>13.2125</td>
<td>0.7803</td>
<td>16.9329</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared: 0.862433
Adjusted R-squared: 0.840422
Durbin-Watson Statistic: 1.362619
From Table 4.5 sign of the coefficients are as expected and significant. The overall regression fit as estimated by Adjusted R-squared indicates a good fit. The Adjusted R² for U5MR is reported to be approximately 84% implying that 84% of the dependent variable has been explained by the independent variables. The Durbin-Watson statistic is 1.362619, however this statistic is difficult to interpret and therefore Breusch-Godfrey test for serial correlation in the residuals is applied and from Table 4.4 the null hypothesis for no serial correlation could not be rejected.

The second model for infant mortality rate was estimated and the regression results are recorded in Table 4.6. The infant mortality rate model satisfied all the diagnostic tests for serial correlation, Heteroscedasticity, normality and for model specification as presented in the Table 4.4.
Table 4.6: IMR regression results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGPHGDP(-2)</td>
<td>-0.0858</td>
<td>0.0222</td>
<td>-3.8686</td>
<td>0.0007</td>
</tr>
<tr>
<td>LOGPGER(-2)</td>
<td>-0.9765</td>
<td>0.0863</td>
<td>-11.313</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOGPD(-1)</td>
<td>-0.2610</td>
<td>0.1396</td>
<td>-1.8697</td>
<td>0.0733</td>
</tr>
<tr>
<td>LOGCIM</td>
<td>-0.2222</td>
<td>0.0816</td>
<td>-2.7243</td>
<td>0.0116</td>
</tr>
<tr>
<td>C</td>
<td>10.3537</td>
<td>0.5186</td>
<td>19.9615</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared 0.882685
Adjusted R-squared 0.863915
Durbin-Watson Statistic 1.731549

From Table 4.6 sign of the coefficients are as expected and significant. The overall regression fit as estimated by Adjusted R-squared indicates a good fit. The Adjusted $R^2$ for IMR is reported to be approximately 86% implying that 86% of the dependent variable has been explained by the independent variables. The Durbin-Watson statistic is 1.731549, however this statistic is difficult to interpret and therefore Breusch-Godfrey test for serial correlation in the residuals is applied and from Table 4.4 the null hypothesis for no serial correlation could not be rejected.

The third model for life expectancy at birth after lagging the explanatory variables appeared as follows:
LogLEB_t = \beta_0 + \beta_1 \text{LogPHGDP}_{t-10} + \beta_2 \text{LogPGER}_{t-10} + \beta_3 \text{LogPD}_{t-3} + \beta_4 \text{LogCIM}_t + U_t \ldots \ldots \ (4.2)

The negative number indicates the number of lags and the variables are as explained for equation 4.1 with LEB being life expectancy which is the dependent variable. The model for life expectancy at birth was tested for serial correlation, Heteroscedasticity, normality and for model specification. Table 4.7 presents the diagnostic summary of the results.

Table 4.7: Diagnostic summary for LEB

<table>
<thead>
<tr>
<th>Test</th>
<th>Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specification (Ramsey Reset Test)</td>
<td>1.8548</td>
<td>0.1921</td>
</tr>
<tr>
<td>Serial Correlation (Breusch-Godfrey)</td>
<td>0.8685</td>
<td>0.6477</td>
</tr>
<tr>
<td>Heteroscedasticity (ARCH)</td>
<td>0.1043</td>
<td>0.7468</td>
</tr>
<tr>
<td>Normality (Jarrque-Bera)</td>
<td>1.5429 (Jarrque-Bera)</td>
<td>0.4623</td>
</tr>
</tbody>
</table>

These results as indicated in Table 4.6 as well reveal that the model pass all the diagnostic tests. This fulfills the assumption of a good regression line. Therefore the model was regressed applying Ordinary Least Squares (OLS) technique and the regression output for life expectancy at birth is recorded in Table 4.8.
From Table 4.8 sign of the coefficients are as expected and significant. The overall regression fit as estimated by Adjusted R-squared indicates a good fit. The Adjusted $R^2$ for LEB is reported to be approximately 88% implying that 88% of the dependent variable has been explained by the independent variables. The Durbin-Watson statistic is 2.182132, however this statistic is difficult to interpret and therefore Breusch-Godfrey test for serial correlation in the residuals is applied and from Table 4.7 the null hypothesis for no serial correlation could not be rejected.
4.5 Discussion and Interpretation of the Estimated Results

As indicated by the regression results, the coefficients of the explanatory variables were appropriately signed. The results for under-five and infant mortality rates indicate that there is a negative and significant relationship between public health expenditure and the mortalities. For the model of life expectancy at birth the results indicate a positive and significant relationship between public health spending and life expectancy. This is in line with theoretical expectation and previous empirical results (Crémieux et al., 2000; Mahanoe, 2003; and McGuire, 2006).

The first model for under-five mortality reveals a negative and significant relationship between public health expenditure and under-five mortality. For a one percent change in public health expenditure under-five mortality reduce by 0.0713 percent. This result agrees with the studies of (Mahanoe, 2003; and McGuire, 2006). Mahanoe (2003) found that increased public spending in Lesotho was responsible for the decreased under-five mortality rate. McGuire in his study investigating the relationship between public spending and health outcomes in developing countries revealed that countries with more health spending had lower levels of under-five mortality rate.

Under-five mortality was also found to be improved by primary gross enrolment ratio, the population of doctors per 100,000 people and child immunized for measles. These variables had a negative and significant relationship with under-five mortality. Primary gross enrolment ratio which also proxied literacy rate showed
that if literacy rate went up by one percent it would reduce under-five mortality rate by 1.347 percent. Fay, Leipziger, Wodon, and Yepes (2005) also found that high literacy improved health outcomes.

The population of doctors per 100,000 people when increased by one percent reduced under-five mortality rate by 0.5015 percent as shown from the regression output. The coefficient for child immunized for measles was also found to be negative and significant where a one percent increase in child immunization for measles under-five mortality rate reduced by 0.2354 percent. This finding for child immunization for measles to reduce under-five mortality was confirmed by previous empirical studies (Rajkumar and Swaroop, 2008).

These results from under-five regression output reveal that public health expenditure, primary enrolment ratio, population of doctors per 100,000 people and child immunized for measles all played a role in reducing under-five mortality rate. However primary gross enrolment ratio which also shows literacy levels was more significant to reducing under-five mortality than public health expenditure, population of doctors per 100,000 and child immunized for measles.

In the second model for infant mortality found public health expenditure to have a negative and significant relationship with infant mortality. For a one percent increase in public health spending infant mortality will decrease by 0.0858 percent, Vavken et al. (2012) found government health expenditure to be important in
improving infant mortality in Austria. This shows that public health spending reduced infant mortality in developed and developing countries.

Primary gross enrolment ratio was found to also have a negative and significant relationship with infant mortality. This may be contributed by parents for being more aware of ways to take care of their infants as theory explains a positive relationship between literacy and health outcomes. From the results, for a one percent increase in primary gross enrolment ratio, infant mortality improved by 0.9765 percent.

The results from the infant mortality regression output also revealed the population of doctors per 100,000 population and child immunized for measles to play a role in improving the infant mortality rate. These findings concurred with the empirical findings of Nixon and Ulman (2006) that found health program efforts as child immunization and increase in number of doctors to be important in reduction of infant mortality rate. The results show increasing the population of doctors per 100,000 people by one percent lead to a reduction of infant mortality by 0.2610 percent. The coefficient for child immunized for measles was negative and suggested a one percent increase in immunization for measles will reduce infant mortality by 0.2222 percent.

The results for infant mortality rate indicate; public health expenditure, primary enrolment ratio, population of doctors per 100,000 people and child immunized for
measles to reduce infant mortality rate as was expected. Public health expenditure is also found to have a greater effect for infant mortality than under-five mortality rate with primary gross enrolment ratio influencing infant mortality reduction than the other variables.

The third model for life expectancy at birth revealed a positive and significant relationship between public health expenditure, primary enrolment ratio, and child immunized for measles with life expectancy at birth. However population of doctors per 100,000 people was found to be positive but insignificant in influencing life expectancy at birth.

The relationship between public health expenditure and life expectancy at birth was positive and significant. For a one percent increase in public health expenditure life expectancy was found to improve by 0.0850 percent. This finding was consistent with previous empirical finding (Picazo and Zhao) that noted that deteriorating health status in Zambia was because of decreasing public health spending.

The effect of primary gross enrolment ratio on life expectancy as well was positive and significant. This study found a one percent increase in primary gross enrolment ratio, life expectancy increased by 0.4515 percent. Fayissa and Gutema, (2005) also found this positive relationship of literacy and life expectancy at birth to hold. In their study in Sub Saharan Africa revealed that decreased illiteracy rate was responsible for the improvement in life expectancy at birth.
The relationship between population of doctors per 100,000 people and life expectancy was found to be positive but insignificant. These suggested that the ratio number of doctors to the population played no role in improving life expectancy. This may be because as years go by other socio-economic factors become more important than the number of doctors in improving life expectancy.

Child immunization for measles was found to be positive and significant in improving life expectancy at birth in Kenya. A one percent increase in child immunization for measles life expectancy in Kenya increased by 0.114 percent. These results were also consistent with previous empirical studies (Filmer and Pritchett, 1999; and Gani, 2009).

These results from the three models agreed with the study of Nixon and Ulman, (2006) that public health expenditure in developing countries will impact health outcomes. The study of Crémieux et al. (2000) stated that public health spending was statistically significant in reducing infant mortality and increasing life expectancy in Canada was attributed to the homogenous data. This study by using homogenous data for Kenya may also have contributed to these findings where public health expenditure was found to improve health outcomes. Whereas revealed by Gani, (2009) that public health care funding may impact some health outcomes more than others, the study found Public health expenditure in Kenya to impact life expectancy and under-five mortality more than infant mortality rate.
The results also show that even though public health spending helps in improving health outcomes, primary gross enrolment rate and child immunization for measles are more effective in improving health outcomes. Primary gross enrolment ratio, child immunization for measles and the ratio of doctors to the population are found to be more important in reducing under-five and infant mortality than public health expenditure. Primary gross enrolment rate and child immunization for measles are found to be more important to increasing life expectancy than public health expenditure. However the ratio of doctors to the population is found to be insignificant in improving life expectancy.

4.6 Conclusion

The chapter looked at the estimation of model explaining the relationship between public health expenditure and other socio economic factors with health outcomes (Under-five mortality rate, Infant mortality rate and Life expectancy at birth) in Kenya using OLS multiple regression technique. The results from the regressed equation show that public health expenditure has a negative and significant relationship with both U5MR and IMR. LEB is found to have a positive relationship with public health expenditure. PGER and CIM have a negative relationship with the mortalities and positive relationship with life expectancy and this is as expected in theory. However PD was found to have a positive relationship with life expectancy but was insignificant.
CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATION

5.1 Introduction

This chapter summarizes and concludes the research findings as carried out. At the end of the chapter, recommendations are proposed based on the research findings. This chapter comprises the summary of the study findings, conclusions of the study and recommendations. The purpose of this study was to establish the relationship between public health expenditure and health outcomes in Kenya.

5.2 Summary of findings

The objective of the study was determining the relationship between public health expenditure and health outcomes in Kenya. Effects of public spending on health are usually measured by infant and under-five mortalities and life expectancy (Gani, 2009). The study used under-five mortality, infant mortality and life expectancy as the dependent variables regressing three independent models for each health outcome. The independent variables were public health expenditure being the primary independent variable, with primary gross enrolment ratio, population of doctors per 100,000 people and child immunization for measles also included as independent variables to control the model.

The study used time-series data for the period of 1980-2011 applying OLS multiple regression technique. Empirical findings of under-five mortality, infant mortality
and life expectancy regression revealed that these health outcomes are improved by public health expenditure. Public health expenditure was found to reduce under-five and infant mortalities while improving life expectancy. Primary gross enrolment ratio and child immunization for measles were found to improve the health outcomes more than public health expenditure. Moreover all variables were appropriately signed although the ratio of Doctors to population was found to reduce under-five and infant mortalities but insignificant to explaining life expectancy.

5.3 Conclusions

Following the study finding it was revealed that public health expenditure was important in improving health outcomes. The finding of this study as well agreed with previous empirical results, (Crémieux et al., 2000; Mahanoe, 2003; McGuire, 2006; and Gani, 2006) that public spending on health improves health outcomes. However the study found other independent variables (Primary gross enrolment ratio, child immunization for measles and the ratio of doctors to the population) were more important than public health spending in improving health outcomes with the ratio of doctors to the population being insignificant in explaining improved life expectancy.

5.4 Contribution to knowledge

This study reveals that primary gross enrolment ratio, population of doctors per 100,000 people and child immunization for measles are important factors in
improving health outcomes. Therefore as health professionals continue to agitate for increased health spending to improve health outcomes these factors should also be considered. This information is will be important to policy makers in allocating health resources for provision and improvement of health outcomes.

5.5 Policy implications

Kenyan health professionals are agitating for implementation of Abuja declaration of 2001 that Kenya is a signatory, which committed countries to increase their health budget allocation to 15% of total government budget for provision of health services and improving health outcomes. However the study found out that other factors as primary gross enrolment ratio, child immunization for measles and the ratio of doctors to the population to be significant for better health outcomes.

Therefore this study recommends that policy makers and practitioners should search for cost effective mechanisms for providing health services and the reallocation of health resources in such a way that the gains from health spending could be optimized. Specific health programmes targeting specific health outcomes and development of infrastructure should also be encouraged for improved health outcomes in Kenya.

This study also recommends that government should target improved literacy rate for the population as primary gross enrolment ratio is found to influence improvement of the health outcomes than public health expenditure, child
immunization for measles and the population of doctors per 100,000 people. Health policy makers should also focus on increased efficiency and quality public health spending and build capacity at the county level to ensure a wider access of health facilities to the population.

5.6 Areas for further research

The study recommends that further research should be done on other health outcomes other than infant and under-five mortalities and life expectancy. This will help policy makers understand factors that are efficient in improving these health outcomes.
REFERENCES


