

**HEALTH EXPENDITURE AND SELECTED HEALTH-RELATED  
MILLENNIUM DEVELOPMENT GOALS IN SUB-SAHARAN AFRICA**

**BY**

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## DECLARATION

This is to certify that this thesis is the result of research undertaken by NICHOLAS ASHIABI towards the award of the Master of Philosophy (M. Phil.) Degree in Economics in the Department of Economics, University of Ghana. I hereby declare that with the exception of references made to other peoples' works, which have been duly acknowledged, this thesis is entirely my own work under the guidance of my supervisors and neither part nor whole of it has been presented for another degree anywhere.

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## ABSTRACT

Sub-Saharan Africa (SSA) has been identified as the region least likely to achieve the MDGs. Of all the MDGs, those related to health seem far out of reach of the region even though SSA countries have been making efforts to achieve them. The unmatched nature of the efforts and outcomes has attracted several concerns in the literature. One variable that is very crucial to the advancement of the region towards the health-related MDGs is health expenditure. Though there are several studies that focus on the relationship between health expenditure and health outcomes only a few have focused on the disaggregated effects of the public and private components of health expenditure on health outcomes in SSA. This gap in the existing literature necessitated the current study.

The study sought to investigate the effects of public and private health expenditures on selected health-related MDGs, namely, child health and maternal health, in SSA. Data was gathered from 40 countries in SSA over the period 2000-2010 and was analysed using the fixed effects estimation technique. The results indicate that public health expenditure has a negative and significant effect on child health measured by under-five and infant mortalities whereas it has a negative insignificant effect on maternal health proxied by maternal mortality ratio in SSA. The results also revealed that private health expenditure is not a significant determinant of under-five, infant and maternal mortalities in SSA. Real GDP per capita and female literacy rate were found to negatively affect under-five, infant and maternal mortalities in SSA. Maternal mortality was further found to be negatively affected by the effectiveness of government in the region whereas the proportion of the population with access to improved water source was found to be negatively related to under-five and infant mortalities in the region. The study recommends that the Abuja Declaration on health should be enforced in the region and female literacy should be enhanced in SSA. Furthermore,

policy makers should endeavour to provide improved water source to a greater proportion of the population.



## DEDICATION

I dedicate this thesis to my family who offered me unconditional love and support throughout the course of this project and my studies.



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## LIST OF ACRONYMS/ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIDS	Acquired Immune Deficiency Syndrome
AU	African Union
BMI	Body Mass Index
CEE	Central and Eastern Europe
CIS	Commonwealth of Independent States
EAP	East Asia and Pacific
EU	European Union
FE	Fixed Effects
GAVI	The Global Alliance for Vaccines and Immunization
GDP	Gross Domestic Product
GLS	Generalised Least Squares
GMM	Generalised Moment Method
GNP	Gross National Product
HIV	Human Immunodeficiency Virus
IMR	Infant Mortality Rate
LIC	Least Income Country
MDG	Millennium Development Goal
MENA	Middle East And North Africa
NA	North America
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
ORT	Oral Rehydration Therapy
PPP	Purchasing Power Parity

PRS	Political Risk Services
QALY	Quality Adjusted Life Years
RE	Random Effects
SSA	Sub-Saharan Africa
TBA	Traditional Birth Attendant
TSLS	Two Stage Least Squares
U5MR	Under-five Mortality Rate
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Emergency Fund
VIF	Variance Inflation Factor
WDI	World Development Indicators
WHO	World Health Organisation

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to the study

Human capital has been identified as an indispensable catalyst for economic growth and development (Romer, 2001). Human capital, however, basically depends on both education and health. Grossman has therefore argued in his human capital model that, quality health significantly influences human capital development through the additional working time and the utility derived from good health (Grossman, 1972). This implies that although an individual derives some utility from good health, it also serves as a critical determinant of his/her productivity level. The output level of a country is hence significantly influenced by the health status of the population. Health is therefore a very important component of economic growth and development.

After the Second World War, the world was confronted with several developmental challenges; prominent among them was poor health. Due to the outbreak of several (infectious) diseases immediately after the War and the low level of medical technology during that period, the global disease burden was on the increase with increases in mortality rates and reduction in life expectancy across the globe. In addition to these problems, some regions of the world (especially SSA) were confronted with extreme poverty and political instability which further worsened the poor health status in these regions. However, in the recent decades, innovations in medical technology (via potent drugs), improvements in basic health care and enabling health policies brought sharp decreases in infant and child mortalities and as a result a general improvement in life expectancy.

Despite this progress, there was still much to be done to improve equity in health status across the world during the twentieth century. This was because in some of the Low Income Countries (LICs), there was a consistent rise in mortalities resulting from especially reduced public spending on health and the deterioration of basic health services. Several measures were put in place in the twentieth century to halt and if possible reverse these trends. For instance, there was the formation of The Global Alliance for Vaccines and Immunization (GAVI) in the 1990's with the missions of ensuring that 1) all the world's children are protected against vaccine-preventable diseases, 2) there was wider access to essential drugs, and 3) there was access to vaccines and such simple and cost-effective interventions as insecticide-treated bed nets which could sharply reduce high mortality and disability rates among poor people around the world. Despite these efforts, little progress was made by the end of 1999.

It was for this reason that 147 Heads of States adopted the Millennium Development Goals (MDGs) in 2001. This was mainly aimed at addressing the world's most astounding poverty and health issues and then to enhance development across all the regions of the world. The MDGs were planned and adopted with the basic intention of synchronizing all the development efforts of the developing economies into achieving the same or similar targets. They were also meant to direct the targets of aid/grants flowing from the developed to developing economies since most aid are now linked directly or indirectly to either one or more MDGs. All the international institutions (such as the UNO, World Bank, International Monetary Fund) have therefore used the MDGs as a guide in their dealings with less developed economies. The MDGs are made up of eight main goals, with 2015 as the year of meeting the goals. Each goal has targets set in areas of poverty reduction, health

improvements, education attainment, gender equality, environmental sustainability and fostering global partnerships (UNDP, 2003). The eight MDGs are;

- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

The MDGs were designed to produce a healthy and a richer world. Freire and Kajiura (2011) therefore assert that meeting these goals or a significant progress towards meeting them would produce a healthier and a more economically sound world.

Although meeting these goals demand huge effort and commitment from the leaders of all nations in the world, much more effort is needed from the leaders of Sub-Saharan Africa (SSA). This is because the region has the poorest of all the targets and indicators of the MDGs. It is important to note that most countries in the world (including the developing ones) have the necessary policies needed to achieve these goals. For instance, the free maternal health care and the Health Insurance Scheme of Ghana and the Social Insurance System of Canada have the capacity of improving maternal health and reducing under-five mortality in these countries. This implies that the MDGs can be achieved in most countries by simply pursuing existing policies and implementing on-going programmes more efficiently (Freire and Kajiura, 2011). However, due to several factors such as inadequate resources and

political instability in some countries in SSA, existing policies targeted at achieving the MDGs within the specified time period are not strongly pursued.

With about two years to the date set for achieving the eight MDGs, SSA is still lagging behind the rest of the world in achieving all the goals. Although some countries in the region are making significant progress in achieving some of the MDGs, the region as a whole is not on track to reach all the MDG targets by 2015. This was explicitly echoed by Sachs and McArthur (2005);

“Sub-Saharan Africa, most dramatically, has been in a downward spiral of AIDS, resurgent Malaria, falling food output per person, deteriorating shelter conditions, and environmental degradation, so that most countries in the region are on a trajectory to miss most or all of the Goals . . . . The region is off-track to meet every MDG.” (pp. 2, 19)

SSA is off-track in meeting the MDGs due to several reasons such as the perennial droughts in the region and the absence of adequate data on SSA making it difficult to adequately assess the progress of the region in achieving the MDGs. Besides, the overly ambitious nature of the targets in the MDGs implies that any progress made by the region will be insignificant relative to the set targets. In the case of MDG 1 for instance, halving the number of people living in poverty implies that SSA will have to reduce poverty for a larger number of people (in absolute terms) than the rest of the world since it has the largest number of people living in poverty. Hence, any little progress in the reduction of poverty will be regarded as inadequate. Therefore, achieving all the MDGs by 2015 in SSA will demand greater efforts and commitment from the region than other regions of the world.

Among the MDGs, the health-related targets are the ones that seem far out of reach of most countries in the region and for that matter the region as a whole. For instance, whereas its North Africa counterpart was reducing infant mortality at an average annual rate of 5.7 per cent from 2000 to 2010, SSA which had the highest regional infant mortality rate in 1999 rather had an annual decline rate of 2.4 per cent during the same period. The 2.4 per cent annual rate of decline falls far below the expected rate of decline of 5.3 per cent needed for the region to meet the target on infant mortality by 2015. Similarly, SSA accounted for 56 per cent of the global Maternal Mortality Ratio (MMR) with 500 deaths per 100,000 live births in 2010 (UNO, 2012). Some of the factors that could possibly account for the slow progress of SSA towards achieving the health-related MDGs are economic difficulties, wars/political instability, drought, poor leadership and natural disasters which have engulfed the region for many decades.

Both governments and households/firms play crucial roles in the provision of health services needed to build the human capital in most countries but the contribution of the former far outweighs that of the latter in SSA. In SSA where the private sector is not adequately developed and incomes are low, the government is responsible for the provision of essential health services such as the provision of health facilities, training of health personnel and the acquisition of essential drugs in order to make them affordable to the citizens. Governments in SSA therefore play crucial roles in every effort aimed at achieving the health-related MDGs and thereby improving health. The private sector, even though not adequately developed, also plays an equally important role in improving health in the region.

One element that is crucial to making significant progress towards the health-related MDGs is the expenditure on health. This is because adequate and efficient health-related spending is widely considered as inevitable in the improvement of health (Anyanwu and Erhijakpor,

2007). According to the World Bank, total health expenditure is the sum of public and private health expenditures. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation (World Bank, 2012).

The growing concerns on achieving the MDGs have led to consistent increases in total health expenditure in most countries in the world including SSA. For instance, health expenditure per capita, PPP (constant 2005 international \$) in SSA increased from \$79.22 in the year 2000 to \$147.14 in 2010 and that of the OECD and North America also increased from \$2,393.29 to \$4,177.39 and \$4,488.69 to \$7,856.29 respectively in the same period (World Bank, 2012). Despite the global increase in health expenditure, the WHO asserts that it (health expenditure) has generally received less attention in government budget in the developing regions of the world, especially SSA, where incomes are low and resources are relatively scarce (WHO, 2010). Health expenditure mostly constitutes only a small proportion of their GDP as compared to that of the advanced economies. In 2010 for example, whereas health expenditure constituted only about 6 per cent of GDP in SSA, it constituted as much as 13 per cent and 17 per cent of GDP in the OECD and North America respectively. Health expenditure share of GDP is therefore lower in SSA than in the OECD and North America.

SSA<sup>1</sup> is, geographically, the area of the continent of Africa that lies south of the Sahara. Politically, it consists of all African countries that are fully or partially located south of the Sahara. It comprises 48 countries from the Eastern, Western, Central and Southern parts of the continent with a total land area of 23,638,000 square kilometres. By the year 2009, SSA had a total population of 841 million with an annual growth rate of 2.5 per cent. The GDP (in constant 2000 US\$) of the region in that year was US\$ 509,018 million whereas the GDP per

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<sup>1</sup> The demographics of SSA are from the 2011 African Development Indicators.

capita was US\$618 (constant 2000 prices) with an annual growth rate of 2.6 per cent. Life expectancy at birth in the region was 52.5 years in 2009 with under-five mortality rate (U5MR) reaching as high 130 per 1,000 live births. In terms of literacy, although female literacy rate is still lagging behind that of the male, more adults are generally acquiring formal education over the years with adult literacy rate in SSA reaching 74.3 per cent and 56.8 per cent for males and females respectively in 2009 (World Bank, 2011a).

## **1.2 Problem Statement**

SSA has been increasing the amount of resources devoted to healthcare over the years and yet the improvements in health have not been encouraging. During the periods between 2000 and 2010 for instance, health expenditure per capita, PPP (constant 2005 international \$) increased from \$79.22 to \$147.14 which is about 86 per cent increase but under-five mortality only declined from 4 million to 3.7 million deaths during this period indicating a decline rate of 7.5 per cent and maternal mortality fell from 201,192 deaths to 161,250 deaths representing a 19.9 per cent decline. Thus, while per capita health expenditure has been rising, the impact on health outcome has not been fully realised in the region over the years.

Health expenditure is usually viewed as a vital element of health status across the world. It is normally seen as a direct determinant of health outcome. This is because the amount of resources devoted to health directly determines the level of health outcome, all other things being equal. It is therefore expected that as a nation/region spends more on health, its health outcomes should also improve. This is however, not the situation in SSA where the improvements in health do not correspond to the increases in health expenditure across the region. This could be as a result of the inability of policy makers to identify the exact

component of health expenditure that needs to be influenced to achieve specific health targets. Health expenditure comprises private and public health expenditures and each plays significant role in improving health.

The relationship between health expenditure and health outcomes has therefore attracted a lot of attention in the literature. Despite several decades of intensive study on health expenditure and health outcomes, Anyanwu and Erhijakpor (2007) assert that there has not been a general agreement on the effectiveness of health expenditure on health outcomes. This is because while some studies did not find any significant relationship between (public) health expenditure and health outcomes others revealed that health expenditure is important in improving health. Such inconclusiveness in the findings of previous studies could be mainly due to differences in methodologies (i.e. methodological problems) and the countries or group of countries (choice of sample countries) used in the studies.

Owing to the manner in which previous studies on the subject have been conducted, there still exists a gap in the literature on the effects of private and public health expenditures on health outcomes in SSA. Several studies have usually considered the effect of total health expenditure or only public health expenditure on health outcomes (Filmer and Pritchett 1999; Gupta et al. 1999; Crémieux et al. 1999; Thornton, 2002; Baldacci et al., 2002; Gupta et al. 2002; Nixon and Ulmann, 2006; Anyanwu and Erhijakpor, 2007). Since total health expenditure is made up of both private and public health expenditures, such studies are not able to clearly bring out the contributions of each of these two components of total health expenditure on health outcomes.

Besides, some cross-country studies also grouped all developing countries in the world into one group or considered African countries as one group (see Filmer and Pritchett 1999; Anyanwu and Erhijakpor, 2007; Issa and Ouattara, 2005; Hanmer et al., 2003). This makes it

difficult to use the findings of such studies for policy formulation in SSA only. This is because all the developing nations in the world are not homogeneous. Each has certain features that are very peculiar to its development process. Such peculiar features are very vital in every effort targeted at improving health. For instance, some of the environmental conditions (such as sanitation) faced by SSA are not the same as those in Asia and the Pacific. Therefore considering all developing countries as one in any study will ultimately affect the outcome of such studies.

It is hence clear that not much has been done on the effects of each of the two components of total health expenditure – private and public health expenditures - on health outcomes in only SSA. Though Novignon et al. (2012) aimed at bridging this gap, their study did not consider the non-linear and non-monotonic relationship between health inputs (such as private and public health expenditures) and health outcomes and it also did not control for literacy, an important determinant of health outcomes. Besides, their study mainly considered population health indicators such as crude death rate and life expectancy.

These gaps in the work of Novignon et al. (2012) and other studies motivated this current study which basically aims at considering the effects of private and public health expenditures on some selected health-related MDGs; namely, child health and maternal health, in SSA.

### **1.3 Research Questions**

Two questions motivate this study:

- First, do increases in private and public health expenditures in SSA help improve child health in the region?
- Finally, do increases in private and public health expenditures in SSA help improve maternal health in the region?

### **1.4 Research Objectives**

The answers to the above research questions will help achieve the objectives underlying this study which are; to

- Assess the effects of private and public health expenditures on child health in SSA.
- Assess the effects of private and public health expenditures on maternal health in SSA.

### **1.5 Significance of the Study**

The answers to the research questions are very important because they may justify either higher public or private investments or both in health programmes in SSA in order to achieve the MDGs. Furthermore, this study will also help bridge the gap in existing literature on the effects of private and public health expenditures on health outcome in SSA.

## **1.6 Scope of the Study**

This study is only limited to countries in SSA. This makes it difficult to generalize the facts and findings of the study to cover the other developing regions of the world.

## **1.7 Organization of the Study**

The study comprises six chapters. This introductory chapter gives a background to the study taking into consideration the problem statement and the significance of the study. This is followed by chapter two which presents an overview and trends in health expenditures and health outcomes in SSA. Chapter three reviews the existing empirical literature on the topic. It also discusses the theoretical framework underpinning the study. Chapter four presents the methodology. It comprises the model, estimation technique and data used in the study. The presentation and discussion of results are contained in chapter five while chapter six presents the conclusion and policy recommendations.

## **CHAPTER TWO**

# **OVERVIEW OF HEALTH EXPENDITURES AND HEALTH OUTCOMES IN SSA**

### **2.1 Introduction**

This chapter looks at the overview and trends in the main variables of the study. This is done with the use of tables and graphs. It therefore elaborates on the trend in healthcare expenditure across the regions of the world before and after the adoption of the MDGs. Also, the movements and the directions of the selected MDGs across the globe are assessed in this chapter. In all the discussions in this chapter, focus is placed on SSA.

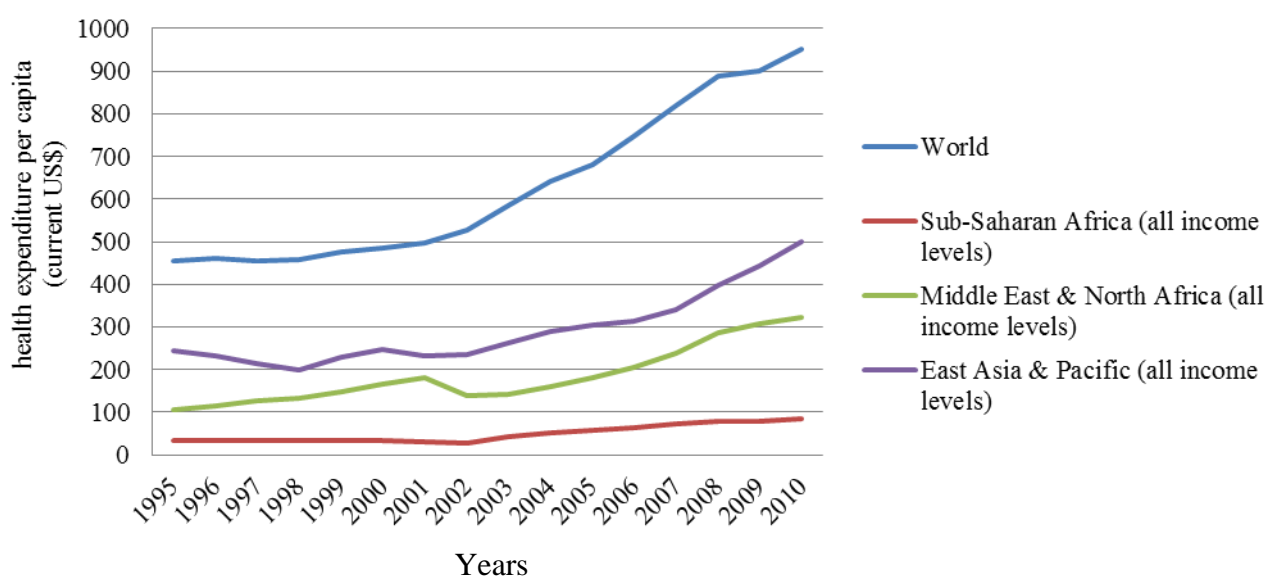
### **2.2 Health Expenditure Trends**

Due to the growing concerns on meeting the health-related MDGs, the role of healthcare expenditure has increasingly become crucial across the world. This comes as a result of the identified relationship between health expenditure and health outcomes in the literature. In order to improve health, most nations embark on the provision of health facilities, training of health personnel and the acquisition of essential drugs. All other things being equal, the availability as well as the quality of these facilities and services ultimately determines the quality of health in a nation. Health expenditure is therefore very critical in every effort aimed at improving the health status of every nation due to its numerous functions. In short, health expenditure does not only cover the provision of healthcare services (i.e. preventive and curative) but also includes family planning activities, nutrition activities and emergency aid designated for health (World Bank, 2012).

Over the years, there have been consistent increases in health expenditure in all the regions of the world. For instance, by the year 2010, total health expenditure per capita, PPP (constant 2005 international \$) in the world had increased from \$453.98 in 1995 to \$783.17 in 2005 and then to \$1022.13 in 2010. Similarly, total health expenditure as a percentage of GDP rose from 8.81 per cent in 1995 to 10.39 per cent in 2010 (World Bank, 2012).

From Figure 2.1, it is clear that the global total health expenditure per capita has been increasing over the years since 1995. Although the rate of increase was marginal between 1995 and 1999, health expenditure per capita has witnessed higher rates of increase from the year 2000. This could be attributed to the growing interests of most countries in meeting the health-related MDGs which directly includes the provision of healthcare services and facilities. Similarly, most developing countries have received a lot of foreign aid which are aimed at solving specific health problems such as reducing MMR and Infant Mortality Ratio (IMR) via the provision of insecticide treated mosquito nets to pregnant women and nursing mothers.

**Figure 2.1:** Health expenditure per capita in selected regions of the world (1995-2010)



**Source:** World Bank, 2012

Sub-Saharan Africa also witnessed such consistent increases in health expenditure per capita although these increases began after 2002. Prior to this period, the region observed marginal increases and declines in health expenditure per capita as revealed in Figure 2.1. From Figure 2.1, total health expenditure per capita in SSA experienced an annual average decline of 0.001 per cent from 1995 until 2002 where it began to increase. This decline in health expenditure per capita prior to 2002 could be attributed to the high population growth rate in the region and the political instability across the region which results in breakdown of health infrastructure and the exodus of health personnel from the region. However, due to the commitment to achieve the health-related MDGs and the Abuja Declaration<sup>2</sup>, the region observed a consistent increase in health expenditure per capita from 2002 until 2009 where it was nearly equal to that of 2008 and thereafter continued to increase.

Although the world has witnessed increases in health expenditure over the past decade, the rates of increase are not the same in all the regions of the world as depicted in Figure 2.1. From Figure 2.1, it is evident that SSA is the region with the lowest health expenditure per capita and also the region with the least tendency of reaching the world's yearly average level of US\$626.69 (current US\$). Yet, a similar developing region such as East Asia and the Pacific has the potential of making good progress thereby at least converging to the world's average in some few years if existing policy measures are followed more efficiently (Freire and Kajiura, 2011).

Over the past decade, health expenditure has witnessed different trends across the various regions of the world. Whereas some regions are devoting much resource into the

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<sup>2</sup> Abuja Declaration is the commitment of African leaders to increase government funding for health to at least 15 per cent of their national budget every year.

development of health, the expenditure on health is only a small fraction of the overall national expenditure in other regions particularly SSA.

**Table 2.1:** Health expenditure trend across selected regions in the world

Regions	HE per capita (current US\$)			HE total (% of GDP)			HE public (% of GDP)			HE private (% of GDP)		
	2000	2005	2010	2000	2005	2010	2000	2005	2010	2000	2005	2010
<b>World</b>	484	682	950	9.22	9.72	10.39	5.34	5.70	6.52	3.88	4.02	3.87
<b>SSA</b>	32	58	85	5.96	6.63	6.47	2.40	2.61	2.93	3.57	4.02	3.55
<b>MENA</b>	166	180	322	4.65	4.40	4.64	2.68	2.57	2.86	1.96	1.82	1.78
<b>EAP</b>	249	304	500	6.64	6.67	6.89	4.81	4.53	4.79	1.83	2.14	2.10
<b>NA</b>	4446	5967	8050	13.10	14.28	17.24	5.82	6.69	9.34	7.28	7.59	7.70
<b>OECD</b>	2284	3266	4365	10.06	10.89	12.57	5.95	6.54	8.16	4.10	4.34	4.41

**HE** is health expenditure      **MENA** is Middle East and North Africa

**EAP** is East Asia and Pacific      **NA** is North America

**Source:** World Bank, 2012

Table 2.1 illustrates the trend of health expenditure across various regions in the world. It is clear from Table 2.1 that from the year 2000 to 2010 both health expenditure per capita and health expenditure as a percentage of GDP have increased across all the regions of the world. Although SSA has also experienced such increases in health expenditure, it is still the region that spends the least on health expenditure per capita compared to the other regions of the world. In comparison with East Asia and Pacific (EAP) and Middle East and North Africa

(MENA) where health expenditure per capita were US\$500 and US\$322 respectively in 2010, health expenditure per capita in SSA was US\$85 which is over ten times below the world's average of US\$950 in 2010 (Table 2.1). This is usually because the increase in total health expenditure in SSA does not correspond to the population growth rate in the region.

Similarly, health expenditure constituted only 6.47 per cent of GDP in SSA in 2010 which is below the world's average of 10.39 per cent in that year. Health expenditure both in per capita and as a percentage of GDP has consistently been highest in the North American region over the years. This shows that health related expenditure is highly inadequate in SSA where the disease burden is very high relative to the other regions. Health expenditure per capita in North America was US\$8,050 in 2010 representing an increase from US\$5,967 in 2005 and US\$4,446 in 2000. Also, health expenditure as a percentage of GDP in that region increased from 13.10 per cent in 2000 to 14.28 per cent in 2005 and later jumped to 17.24 per cent in 2010 (Table 2.1). Some of the factors that might account for such high health expenditure in North America are the large number of medical specialists and the use of expensive and sophisticated medical technology.

In order to help boost the contribution of government to total health expenditure, African Union countries pledged in 2001 to increase government funding for health to at least 15 per cent of their total national budget in every year. This became generally known as the Abuja Declaration. Even though most of the countries have made progress in scaling up government spending on health after the Abuja Declaration, no country in the SSA region has been able to achieve the Abuja Declaration target as at 2010. Thus government health financing in the region is far below the world average.

Since government spending on health is relatively smaller in the region, it implies that individuals in SSA have the responsibility of bearing a greater cost of their health care

expenditure despite the numerous positive externalities that accrue to the government from good health. Hence, except in SSA, the contribution of public health expenditure to total health expenditure is more than that of the private health expenditure in all the regions (Table 2.1). For instance, in 2010, public health expenditure as a percentage of GDP in SSA was about 3 per cent whereas that of private health expenditure was about 4 per cent of GDP. However, in the other regions such as EAP, public health expenditure as a percentage of GDP in 2010 was about 5 per cent whereas private health expenditure as a percentage of GDP in that year was 2 per cent (Table 2.1). A situation where the contribution of private health expenditure outweighs that of public health expenditure suggests that governments in SSA are not devoting enough resources to health. This is a major source of worry especially in regions where poverty levels are high such as SSA (Novignon et al., 2012).

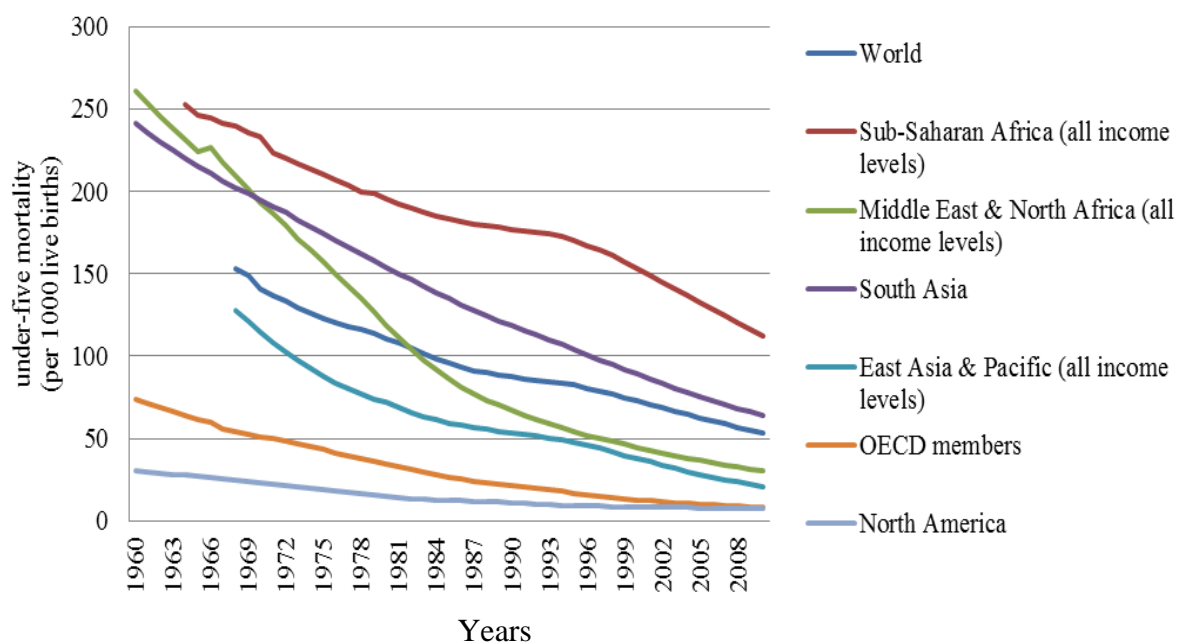
### **2.3 Under-Five Mortality and Infant Mortality**

Under-five mortality is a concept used to express the probability of dying between birth and age five expressed per 1,000 live births whereas infant mortality refers to the probability of dying before age one expressed per 1,000 live births. These concepts are widely used as measures of children's, and more broadly a population's, well-being. Infant mortality is further considered as a simple indicator of the 'availability, utilization and effectiveness of health care systems and thereby used for monitoring and designing population and health programmes' (Anyanwu and Erhijakpor, 2007). Reduction of the under-five mortality rate by two-thirds between 1990 and 2015, equivalent to an annual average rate of reduction of 4.3 per cent, is one of the health-related MDGs.

Both under-5 mortality and infant mortality have been very high during the 60's and the 70's (Figure 2.2). However, since 1990, considerable progress has been made in reducing under-five mortality. Despite population growth, the number of under-five deaths worldwide fell from more than 12 million in 1990 to 7.6 million in 2010 (UNO, 2012). Infant mortality rates (IMR) have also been declining in all the regions of the world. In developing region for instance, IMR declined from an average of 98 per 1,000 live births in 1990 to 63 in 2010.

These declines could be attributed to improvements in many factors among which are health expenditures. The global health expenditure (as a percentage of GDP) has consistently been increasing from 8.81 per cent in 1995 to 10.39 per cent in 2010. Increases in health expenditures may possibly lead to the provision and improvements in health facilities, medical breakthroughs via research, training of health personnel and the provision of essential drugs among others. These facilities and services help in the treatment and curbing certain diseases which could otherwise have resulted in deaths among children and infants.

**Figure 2.2:** Trend in under-five mortality across the world



**Source:** UNICEF, 2012

Despite the reduction in U5MR in all the regions in the world since 1960, the rates still remain much higher in many developing countries, especially in SSA. Nevertheless, progress on reducing under-five mortality in the world as a whole has accelerated. For instance, SSA - the region with the highest level of under-five mortality in 1990 - has doubled its average rate of reduction, from 1.2 per cent a year during 1990-2000 to 2.4 per cent during 2000-2010. Though under-five mortality has been declining since 1995 in all the regions of the world, the global progress is still insufficient to reach the MDG target on child mortality. Nonetheless, by the year 2012, Northern Africa had already achieved the MDG 4 target, bringing down the child mortality rate by 67 per cent, and Eastern Asia is close, with a 63 per cent decline (UNO, 2012).

Progress has been very slow in SSA where under-five mortality and infant mortality have been increasing in some countries. SSA still remains the region most affected and accounts for more than one-third of deaths of children under the age of five. The gap between the MDG 4 and reality is greatest in SSA where under-five mortality was 170 in 1995 and 112 in 2010 – far short of the target of 62 in 2015 (Figure 2.2). However, six countries in SSA are on track in achieving MDG 4, namely, Cape Verde, Eritrea, Mauritius, Seychelles and most recently, Botswana and Malawi (UNICEF, 2009).

**Table 2.2:** Under-five deaths (in millions) across the world

<b>UNICEF Region</b>	<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
SSA	3.1	3.1	3.3	3.5	3.7	4	4	4	3.7
Eastern & Southern Africa	1.3	1.3	1.4	1.5	1.6	1.6	1.6	1.5	1.3
West & Central Africa	1.6	1.7	1.8	1.9	2	2.2	2.2	2.3	2.2
Middle East & North Africa	1.2	1.1	1	0.9	0.7	0.6	0.5	0.4	0.4
South Asia	5.3	5.1	5	4.7	4.4	3.9	3.3	2.8	2.5
East Asia & Pacific	5	3.5	2.4	2.5	2.2	1.6	1.2	0.9	0.7
Latin America & Caribbean	1.2	1.1	0.9	0.8	0.6	0.5	0.4	0.3	0.2
CEE/CIS	0.6	0.6	0.5	0.4	0.4	0.3	0.2	0.2	0.1
Industrialized countries	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Developing countries	16.1	14.3	12.9	11.8	11.8	10.6	9.4	8.4	7.5
Least developed countries	3.3	3.3	3.4	3.5	3.5	3.5	3.3	3.2	2.9
<b>World</b>	<b>16.6</b>	<b>14.7</b>	<b>13.2</b>	<b>12.8</b>	<b>12</b>	<b>10.7</b>	<b>9.6</b>	<b>8.5</b>	<b>7.5</b>

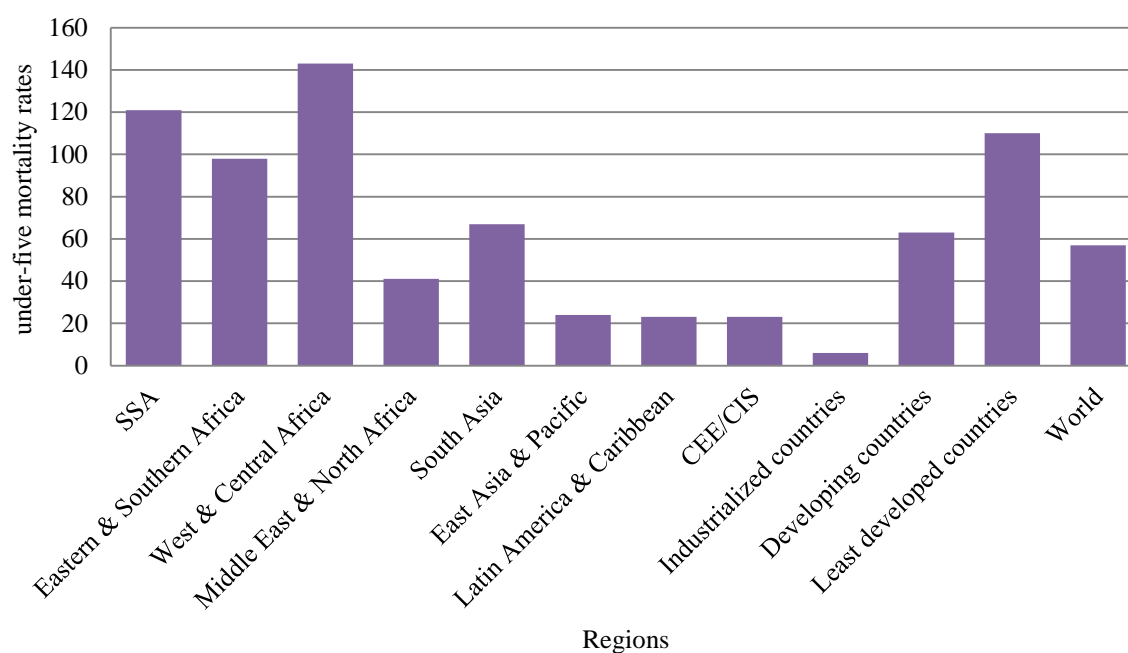
**Source:** UNICEF, 2012

From Table 2.2, it is evident that SSA alone accounted for about 49 per cent of the 7.5 million under-fives who died globally in 2010. As some of the developing regions make significant progress in reducing it, under-five deaths in both SSA and South Asia constitute a greater proportion of the world total. The 6.2 million child deaths in these two regions in 2010 corresponded to 82 per cent of such deaths on a global scale (UNO, 2012). In the year 2010, the highest rates of under-five mortality were found in West and Central Africa where about 143 of every 1,000 children born die before age five compared to an average of six in the industrialised countries. According to Anyanwu and Erhijakpor (2007) two sets of countries that have worsened outcomes are those that have been hit hardest by HIV such as

those in Southern Africa and those that have been at war recently like Congo. Other factors that could be attributed to the high U5MR in the region were the inadequate sanitation and the inadequate access to improved water sources which results in the outbreak and spread of diseases such as diarrhoea and cholera, which largely affects children. The poor coverage of immunisation programmes in the region could also be a reason why the rate is high.

Jones et al. (2003) also argued that most of the child deaths in the developing regions of the world are caused by diseases (predominantly acute respiratory infections, diarrhoea, and malaria) for which practical, low-cost interventions, including immunization, oral rehydration therapy (ORT), and antibiotics, exist. In the year 2010, West and Central Africa together recorded the highest U5MR in the world and was closely followed by East and Southern Africa. This therefore makes SSA the region with the highest U5MR in the world in 2010 as shown in Figure 2.3. Some factors that accounted for this could be the several civil conflicts and the severe drought and famine in the SSA region during that period.

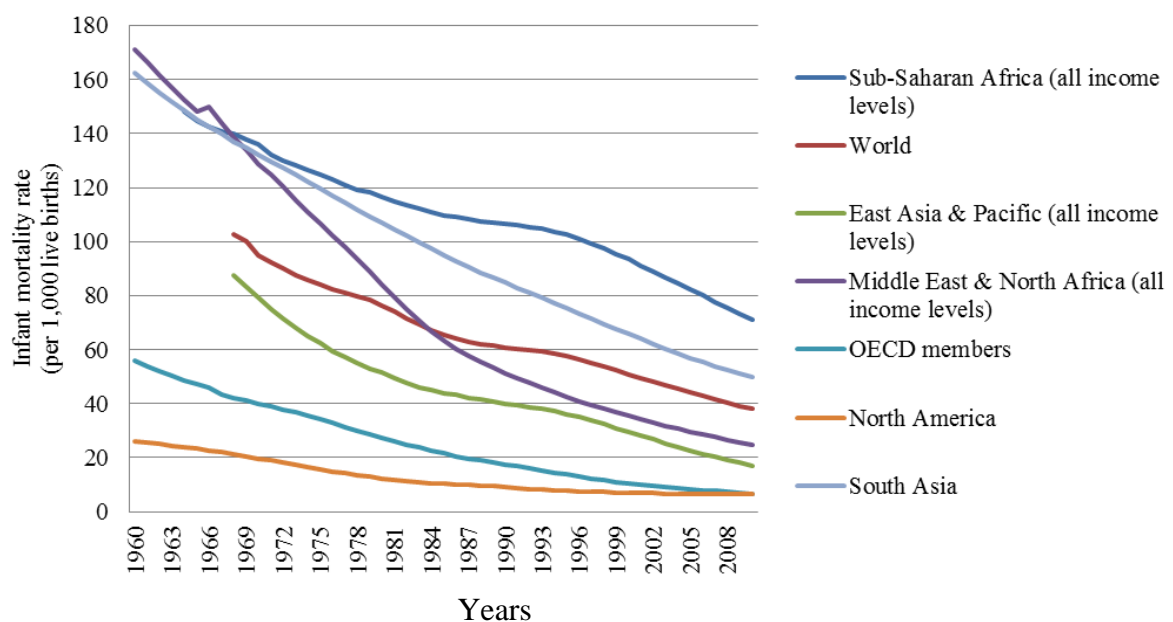
**Figure 2.3:** Under-five mortality rates across the world in 2010



**Source:** UNICEF, 2012

Available data indicates that almost 70 per cent of under-five mortality occurs in the first year of life (UNICEF, 2012). Hence, any effort aimed at reducing child mortality must as a matter of necessity address the causes of neonatal and infant deaths. Significant progresses in infant and child health are the largest contributors to increased life expectancy in most countries. Some of the major causes of infant mortality include inadequate care at birth and afterward, malnutrition, poor sanitation, and exposure to acute and chronic disease (UNO, 2012).

**Figure 2.4:** Trend in infant mortality rates across the world (1960-2010)



**Source:** World Bank, 2012

Similarly, infant mortality rate has also been declining across all the regions of the world since 1995. For instance, IMR in the world reduced from about 103 per 1,000 live births in 1968 to 51 in 2000 and then to 38 in 2010. Also, MENA which had the highest rates across the world in the 60's now has one of the lowest rates by reducing IMR from 171 per 1,000 live births in 1960 to 25 in 2010. Similarly, SSA also witnessed a decline in the rate from about 148 per 1,000 live births in 1964 to 71 in 2010. But as expected, the rate is still highest

in SSA, followed by South Asia (see Figure 2.4). This could be attributed to the dominance of the main causes of infant mortality in these two regions.

As the global rate of infant mortality declines, the proportion that occurs during the neonatal period, the first month after birth, is increasing. Over the last two decades, almost all regions have seen slower declines in neonatal mortality than in under-five mortality. Globally, deaths within the first month of life fell from 32 per 1,000 live births in 1990 to 23 in 2010. This implies an average decline of 1.7 per cent per year-much slower than the 2.2 per cent per year reduction of under-five mortality, over the same 20-year period (UNO, 2012).

One of the main factors influencing under-five mortality rate is female literacy (mothers' education). Mothers' education remains a powerful determinant of child deaths. Children of educated mothers - even mothers with only primary schooling - are more likely to survive than children of mothers with no education (UNO, 2012). In 2010, children of mothers with no education in SSA were 1.4 per cent more at risk of dying before their fifth birthday than children of mothers with only primary education. It is therefore possible to speed up the decline in under-five mortality by expanding interventions that target women empowerment especially via education.

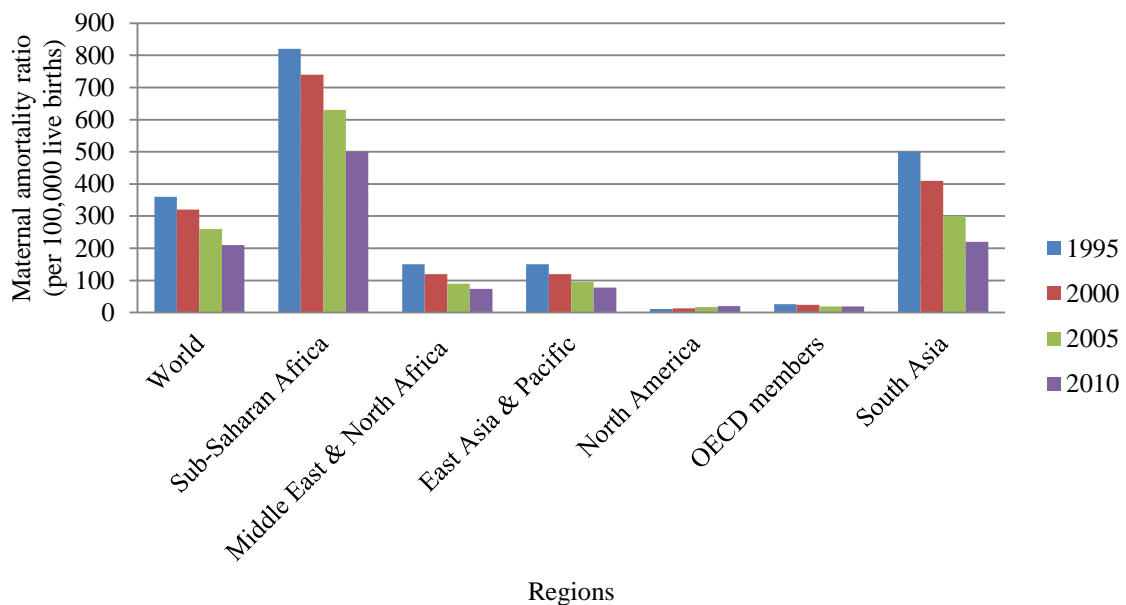
## **2.4 Maternal Mortality**

Maternal mortality ratio (MMR), the number of women who die during pregnancy, childbirth and six weeks after delivery, per 100,000 live births, is also a crucial indicator of the quality of health systems across countries. This is because according to UNICEF (2012) about 80 per cent of maternal deaths could easily be avoided. Available data indicates that more than 350,000 women die annually from complications during pregnancy or childbirth, almost all

of them - 99 per cent - in developing countries (UNICEF, 2012). Although there are signs of progress in improving maternal health since 1990, the progress is still well short of the 5.5 per cent annual decline needed to meet the MDG target of reducing by three quarters the maternal mortality ratio in 1990 by 2015.

According to the UNO (2012), “an estimated 287,000 maternal deaths occurred in 2010 worldwide, a decline of 47 per cent from 1990. Sub-Saharan Africa (with 56 per cent of these deaths) and Southern Asia (29 per cent) together accounted for 85 per cent of the global burden in 2010, with 245,000 maternal deaths between them”. The number of maternal deaths per 100,000 live births - the MMR - was also down, from 440 in 1990 to 240 in 2010, for the developing regions as a whole.

**Figure 2.5: Maternal mortality ratio across the world (1995-2010)**



**Source:** World Bank, 2012

Although there has been significant progress in SSA, a woman’s maternal mortality risk is 1 in 30 compared to 1 in 5,600 in the developed regions. This makes SSA the region with the

highest MMR in the world. From Figure 2.5 it is clear that though the MMR across the world has been declining in all regions of the world since 1995, the rate is still highest in SSA.

One reason for such high MMR in the developing regions- especially SSA- is the low rates of births attended by skilled health personnel. Skilled health personnel (doctor, nurse or midwife) can administer interventions to prevent and manage life-threatening complications during childbirth such as heavy bleeding, or refer the patient to a higher level of care when needed. In SSA, the proportion of deliveries attended by skilled health personnel rose marginally from 42 per cent in 1990 to 45 per cent in 2010 compared to an increase from 51 per cent to 84 per cent in North Africa (UNO, 2012).

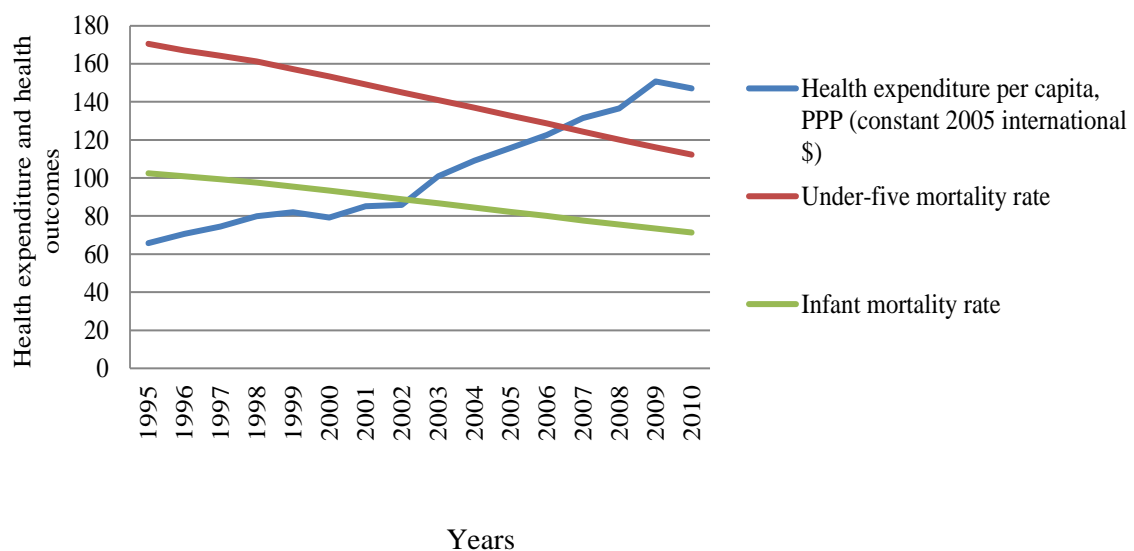
## **2.5 Health Expenditure and Health Outcomes**

Over the years SSA has witnessed much improvement in health. There has been consistent decline in mortality rates (maternal, infant and under-five mortalities) resulting in increases in life expectancies in the region. Although the region still accounts for the largest disease burden in the world, health status in the region is currently better than a decade ago (see Figure 2.6). This could be attributed to several factors among which are increases in health expenditures which results in higher remuneration of health workers and better health facilities in the region. Despite the high population growth rate, the region has on the average witnessed consistent increases in health expenditure per capita especially since 2002. An expansion in health expenditure implies the provision of more health facilities, training of more health personnel and essential drugs. Therefore as health expenditure increases, all other things being equal, there would be the availability of facilities to improve health thereby leading to the improvements in health as shown in Figure 2.6 below.

Some policies that have led to the improvements in health in the region include the National Health insurance in some countries such as South Africa, Mauritius and Ghana; the free maternal delivery and immunization programmes in Ghana among others.

From Figure 2.6 below, it is evident that as health expenditure increases, all else being equal, mortalities tend to decline. Though the decline in mortalities cannot be entirely attributed to the rise in health expenditures, the impact of improvements in health facilities, training and remuneration of health personnel and the provision of essential drugs among others which directly results from increases in health expenditure cannot be over emphasised.

**Figure 2.6:** Health expenditure and health outcomes in SSA (1995-2010)



**Source:** World Bank

Despite the improvement in health outcomes in the region, child and maternal mortalities are still very high in the region. Recent statistics indicate that every year 4.4 million children - including 1.2 million newborns - and 265,000 mothers die in SSA (Kinney et al., 2010).

## **2.6 Conclusion**

From afore discussions, it is evident that SSA accounts for a greater portion of the global maternal, child and infant mortalities. Although it has made some progress in reducing these mortalities over the past decades in order to reach the MDG targets by 2015, progress is very slow in the region compared to the other regions of the world. The rates of the progress in the region are far below the required rates of decline needed to achieve the targets on MDGs 4 and 5 in 2015 unless there is vigorous implementation and fine tuning of existing policies. On health expenditure, countries in SSA are still spending less on health than the rest of the world.

## CHAPTER THREE

### REVIEW OF LITERATURE

#### 3.1 Introduction

This chapter analyses the theoretical underpinning of the study. Literature is further reviewed on empirical works that provide explanations on the relationship between health expenditure and health outcome with emphasis on developing regions especially SSA. This chapter also expounds the gaps in the existing literature on the subject and as a result clarify the essence and contribution of this study in filling these gaps.

#### 3.2 Theoretical Review<sup>3</sup>

Theoretically, this study is based on Grossman's model of 'demand for health' (Grossman, 1972). This theory was further extended and simplified by Wagstaff (1986). "The theory develops a conceptual apparatus for analysing the interaction of socioeconomic determinants of health and indicates how this can be used to shed light on a variety of topical policy issues such as socioeconomic inequalities in health and the design of prevention policies" (Wagstaff, 1986, p.1). The article by Wagstaff was basically aimed at simplifying the mathematically complex literature of Grossman whilst maintaining its economic essence.

According to Wagstaff, the theory of demand for health views the individual as 'demanding' a commodity 'health'. The theory is built on three basic economic concepts namely; the indifference map, the health production function and the budget constraint. The indifference

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<sup>3</sup> The theoretical review is adapted from the work of Wagstaff (1986).

map of an individual is made up several indifference curves of that individual. The indifference curve is a 'welfare contour' depicting a combination of commodities that gives the individual a certain level of utility (welfare). Under this theory, the individual views 'good health' (i.e. health) as a desirable commodity as well as 'other things in life' (for simplicity let's call the 'other things in life' consumption) from which pleasure is derived. However, the individual does not place overriding value on 'health' relative to the 'other things in life'. The individual's indifference curve is therefore a curve showing a combination of health and consumption that gives the individual a given level of satisfaction. Similarly, a nation's indifference curve is also made up of health and consumption.

The 'health production function' - the next concept of the theory - postulates that an individual combines health inputs in 'producing' his health. The relationship linking these health inputs such as medical care, health care, food, education, etc. and the output, health, is known as the 'health production function'. The health production function also links a nation's health inputs to its health which can be measured in terms of life expectancy, infant mortality, child mortality, maternal mortality among others. This concept of the theory is extensively discussed in the next section because it forms the basis of this study.

Finally, the theory also assumes the existence of a budget constraint. Both health inputs and consumption are not costless. They are all acquired at a cost (i.e. they have prices attached to them). Hence, the quantity of health inputs and consumption an individual can acquire depends on his income and the prices of the health inputs and the consumption. Since health depends on the quantity of health inputs, then it also depends on the income of the individual as well as the prices of the health inputs and the consumption. At the national level, the amount of health produced in a country therefore depends on among other things the income (per capita income) of the country and the prices of health inputs.

Combining these three principles (i.e. the indifference map, the health production function and the budget constraint), it can be deduced that the amount of health produced in a country depends on factors such as technical knowledge (education), per capita income among others.

### **3.2.1 The Health Production Function**

The study is specifically underlined by the health production function of the ‘demand for health’ theory. This concept postulates that an individual combines health inputs (including socioeconomic variables) in ‘producing’ his health. This therefore suggests that individuals have a great level of control over their wellbeing owing to the fact that they can influence their health-affecting consumption patterns, their healthcare utilisation and their environment. In production theory, firms produce their outputs by combining factor inputs which are basically labour and capital. The relationship linking the factor inputs of a firm and the firms’ output is known as the “production function”. The demand for health theory adopts this idea and considers the individual “producing” his health by combining “health inputs”. Food, medical care, education and sanitation are all examples of health inputs and the individuals health output can be measured in terms of quality adjusted life years (QALY) and body mass index (BMI) among others.

Since there are several examples of health inputs, it is appropriate to talk in terms of a “bundle” of health inputs comprising health care, food and other health inputs. The relationship linking the bundle of health inputs to the output, health, is known as the ‘health production function’. The health production function also links a nation’s health inputs to its health outcome which can be measured in terms of life expectancy, infant mortality, child mortality, maternal mortality among others. The study therefore assumes that a nation

produces health by combining socioeconomic inputs such as per capita GDP, health expenditures and female literacy rates.

One main feature of the health production function is the law of diminishing marginal productivity. This implies that as more health inputs are used, more health is produced but successive additions to the quantity of health inputs employed results in smaller increments in health. Hence, the relationship between health inputs and health is expected to be non-linear and non-monotonic. This principle of diminishing marginal productivity in the production of health is portrayed in the difference in the experiences of developing and developed countries. In developing countries where both health and health inputs are very low, small increases in health inputs results in relatively larger impacts on health than the advanced countries where health and health inputs are very high.

The health production function shows the amount of health that can be obtained from a given quantity or bundle of health inputs for a given state of technical knowledge. However, technical knowledge is not constant over time - it improves in response to advancements in medical science. An individuals' understanding of the health production process improves with progress in medical science. With better understanding, it would be possible to produce health more efficiently. This means that more health would be produced per unit of health input than previously, all other things being equal. As a result, a nation's health production function can be seen to depend on the state of technical knowledge prevailing in the country. This means that when the state of technical knowledge changes, the efficiency of producing health changes as well.

It is very vital to consider the effects of knowledge on the health production function. Increase in knowledge over time implies that some individuals will be more knowledgeable about the technology of health production than others. This means that with higher education

one is in a better position to understand and adjust to information about health matters from physicians and other sources than the poorly educated. The more educated are therefore better equipped to produce a healthy diet from a given outlay on food and to digest information about possible health hazards in their workplace. Hence, the ability to produce health efficiently also depends on one's level of education.

### **3.3 Empirical Literature Review**

Determinants of health outcomes have received several attentions in both the advanced and developing countries over the years. At the micro level, the main factors that determine the health status of individuals of a household usually include: personal and socio-cultural factors (including household income and other personal characteristics of household members such as lifestyle, educational level, sexual practices, diet among others), geographical and environmental factors (i.e. access to clean water and sanitation, prevalence of communicable diseases and environmental health hazards) and health services (i.e. quality, availability, affordability and accessibility of preventive and curative health services) (Anyanwu and Erhijakpor, 2007). At the macro level, several studies have been conducted on the determinants of health outcomes and these studies have found socioeconomic factors such as health expenditure, female literacy rate, per capita GDP, health aid, immunisation among other factors to be key determinants of health in countries across the world.

### 3.3.1 Health Expenditure and Health Outcome

Health expenditure plays a very significant role in determining health outcomes in almost every country. This is because the expenditure on health in a country helps in eradicating avoidable diseases through the provision of health facilities, provision of medical equipment and essential drugs, training of health personnel and research and dissemination of information on health. Health expenditure is decomposed into private and public health expenditures.

According to the World Bank (2010), private health expenditure includes direct household (out-of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations whereas public health expenditure comprises recurrent and capital spending from government (both central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds. Each of these components of health expenditure is equally important in improving health status in every country. For instance, the recurrent and capital spending from government ensures the provision of health facilities and payment of health workers' salaries among others and private insurance (a component of private health expenditure) enhances an individual's access to health care.

Due to the pivotal role of health expenditure in the determination of health outcome, several studies have been conducted to assess the extent of the relationship between health outcome—especially under-five mortality, infant mortality and maternal mortality - and health expenditure while controlling for other socioeconomic determinants of health. The results of these studies are however inconclusive because of the contrasting views in the literature on the direct effects of health expenditure on health outcome (Anyanwu and Erhijakpor, 2007).

Earlier studies have shown that health expenditure has no impact on health outcome. For instance, the study by Musgrove (1996) using 1990/1 cross-sectional data on 69 countries show that there is no evidence that expenditure on health as a share of GDP reduces child mortality (for either rich or poor countries). The study moreover, divulge that public health expenditure as a share of GDP has no influence on child mortality, whether for all countries together or separately for those who spend either a high or a low public share of GDP as health expenditure. The study however found that child mortality is rather strongly related to per capita income.

Similarly, two different studies by Filmer and Pritchett (1997; 1999), using 1992/3 cross-national data for 173 countries and 98 developing countries respectively, to empirically examine the impact of both non-health factors (economic, educational, cultural) and public spending on health in determining under-five mortality and infant mortality, reveal that public health expenditure is not a crucial determinant of health. In both studies, they estimated the relationship between health outcome and health expenditure using three different estimation techniques – Ordinary Least Squares (OLS), median regression and Two-Stage Least Squares (TSLS) estimation techniques - to ensure the robustness of their results. Their finding suggests that public health expenditure is not a dominant driver of health outcome - as measured by under-five mortality and infant mortality - because the coefficient of public health expenditure was small and statistically insignificant. However, non-health policy factors such as a country's income per capita, the distribution of income, female education and other cultural factors (such as degree of ethnic fragmentation and the predominant religion) explain almost all (95 per cent) of the variations in mortality across countries in these studies. They argue that such a result is not unexpected because the small

difference in public sector health spending between the best and worst “outliers” in the sample strongly hinted that it was unlikely to have empirically large effects.

The insignificant relationship between health expenditure and health outcomes as identified by some studies resulted from the classification of health expenditure. Though health expenditure is made up of public and private health expenditures, emphasis in the earlier studies is on the impact of total health expenditure on health outcome. The inability to decompose total health expenditure in such studies failed to depict the true effect of health expenditures on health outcomes in such studies.

Some of the studies that considered only public health expenditure also identified a weak and statistically insignificant link between the public health expenditure and health outcome because of the weaknesses of three factors in the path between the public health expenditure and health outcome as suggested by Filmer and Pritchett (1999). These factors are; health production function in terms of improvement of health status in association with the consumption of health services; net public sector impact in the light of possible crowding out of services which will be consumed anyway; and public sector efficacy for creating effective health services.

Besides, some of these studies also lump all the countries in their studies into one group irrespective of their development levels whilst others considered all developing countries across the world as one group in their analysis of the connection between health expenditure and health outcome in developing regions. This form of categorisation of the samples adversely affects the results of such studies since regional differences are not considered.

Despite the findings of these earlier studies, some studies have found a positive relationship between health expenditure and health outcome. In other words, these studies have found that

improvement in health expenditure leads to declines in mortalities such as maternal, infant and under-five mortalities and consequently resulting in enhancement of life expectancy. For instance, a cross-country study by Anand and Ravallion (1993) using 22 developing countries in 1985 and OLS estimation technique indicates that public health spending has a significant impact on life expectancy at birth (after controlling for GNP per capita and poverty). This confirms the general perception that increases in health expenditure aids in the improvement of health.

Furthermore, Cremieux et al. (1999) conducted a panel-data study to analyse the effect of health expenditure on gender-specific infant mortality and life expectancy in Canadian provinces over the period 1978-1992. Their result indicates that increases in health expenditures are critical in improving health outcome by lowering infant mortality and improving life expectancy. Other control variables such as physician per capita and per capita income are equally very important in affecting health outcome over the years. The results are robust across Generalised Least Squares (GLS) and fixed effect estimation techniques. Their findings indicate that apart from health expenditures, other socioeconomic variables are equally important in influencing health.

Similarly, Gupta et al. (2001) in a study to assess the impact of public health expenditures on under-five mortality provide evidence from 70 countries with data for the period 1990-99 that public spending on health is more important for reducing under-five mortality in low-income countries than in the high-income ones. This suggests that there is higher return on public health expenditure in the developing countries compared to the developed ones. Their study used country average of the variables for the period 1990-99 and controlled for literacy rate and consumption.

The results of Gupta et al. (2001) are supported by the findings of Issa and Ouattara (2005) who also undertook a panel data study to evaluate the impact of private and public health expenditures on IMR for the period 1980-2000 by using 160 countries. In order to arrive at robust estimates, they estimated the relationship by using OLS, fixed and random effects and system-GMM estimation techniques. The results of their study (after controlling for real per capita GDP, female literacy and carbon dioxide emission) show strong negative relation between health expenditures and IMRs. However, their findings indicate that this effect is channelled through public health expenditure at low development levels, just as the findings of Gupta et al. (2001), and through private health expenditure at high development stages. This means that in developing countries public health expenditure plays a significant role than private health expenditure in reducing IMR whereas private health expenditure is more important in reducing IMR in advanced countries than public health expenditure. This might possibly be due to the limited participation of governments in the health sector of the advanced economies compared to the developing economies.

Another study by Gupta et al. (2002) using cross-sectional data for 50 developing and transition countries observed in 1993-1994 revealed a positive relationship between health spending and health outcome. After controlling for other socioeconomic determinants of health (including adult literacy rate, per capita GDP, access to sanitation and urbanization), the authors analysed the impact of public health expenditure on infant mortality and under-five mortality by using OLS and TSLS estimation techniques. Their results indicate that increases in public health expenditure reduce the mortality rates for both infants and under-fives though the relationship is mathematically weak but statistically significant. This weak relationship could be due to the complex bureaucracies and the high inefficiencies that exist

in the public sector of developing and transition economies especially during the sample period.

Besides, the result of the study of Baldacci et al. (2002) is also in favour of the argument that public health expenditure has a significant impact on mortality. After conducting a study using 1996-98 cross-sectional data for 94 countries to assess the effect of government health expenditure on health, and using TSLS and OLS estimation techniques, they argue that public expenditures on healthcare negatively affects infant mortality and child mortality across the world. They arrived at this conclusion after controlling for other determinants of health such as GDP per capita, total fertility rate, spending per pupil and urbanization.

In addition, in a study by Berger and Messer (2002), the effects of public financing of health expenditures, insurance coverage and other factors on health outcomes (as measured by mortality rate per 1,000 population) are examined within health production models estimated using 1960-1992 data across 20 OECD countries. Their results revealed that mortality rates depend on a mix of healthcare expenditure and the type of health insurance coverage. They found that increases in the publicly financed share of health expenditures are associated with increases in mortality rates even though increases in total health expenditures result in decreases in mortality rates. The differences in the effects of public and total health expenditures in this study therefore suggests that considering only total health expenditure in any study may not bring out its true effects on health outcome. Some of the control variables included in the study are female labour force participation, GDP per capita, proportion of the population with at least post-secondary education and tobacco consumption per capita.

A recent study of 113 countries covering mainly low and middle income countries conducted by Gottret and Scieber (2006) revealed that government health expenditure plays a critical role on health outcome in low and middle income countries than any other variable such as

education, roads, sanitation, GDP per capita and donor funding. Their finding however indicates that an increase in government health expenditure has a larger impact in reducing under-five mortality than maternal mortality. Their results are robust over three different estimation techniques namely; OLS, TSLS and GMM.

Moreover, a panel-data study conducted by Nixon and Ulmann (2006) into the relationship between health care expenditure and health outcomes for 15 EU countries with data from 1980 to 1985 also yielded similar results as those from previous literature. After using fixed effects estimation technique and controlling for other health determinants such as physicians per 10,000 population, pollution and nutrition, they find that health expenditure is among the most important factors in lowering infant mortality though it makes only a marginal contribution to the improvement of male and female life expectancy in the EU.

Furthermore, a study conducted by Buor and Bream (2004) using cross-sectional data from 28 countries in SSA for 1998 found out that maternal mortality in SSA is not only determined by medical factors. After analysing the data using bivariate correlation and categorical cross-tabulations, they find that in the SSA region, health expenditure per capita have strong negative association with maternal mortality. Other variables in the study which equally influence MMR are GNP per capita, female literacy and births attended by skilled health personnel. They therefore advocate that there should be adequate allocation resources to the health sector to help improve maternal health.

Likewise, Imam and Koch (2004) undertook a comprehensive study into the determinants of infant, child and maternal mortalities in SSA using 1999 cross-sectional data for 38 countries in the SSA region. Their findings were similar to those reported above. They found that per capita GDP, female literacy rate, births attended by trained health personnel, the adult HIV/AIDS prevalence and immunization rate are the main determinants of infant mortality in

SSA. Child mortality is also determined by the same variables which determine infant mortality except the births attended by trained health personnel which was not included in the model used in the estimation of child mortality. They further found that maternal mortality in SSA is mainly determined by GDP per capita, births attended by trained health personnel and the prevalence of war. The findings of this study brings to the fore the significant impact of war/civil unrest on health across the region. It further throws more light on some of the neglected variables that influence health outcome.

Additionally, a study by Anyanwu and Erhijakpor (2007) provides econometric evidence linking African countries' per capita total as well as government health expenditures to two health outcomes: infant mortality and under-five mortality. This relationship is examined using data from 47 African countries between 1999 and 2004 and using robust OLS, robust TSLS and fixed effects estimation techniques. The results indicate that, while controlling for GDP per capita, female literacy, physicians per 1,000 population, urban population and ethnic fractionalization, health expenditures – both per capita total and public - have a statistically significant effect on infant mortality and under-five mortality in Africa. This implies that for African countries, total health expenditures (as well as the public component) are very important contributors to health outcomes.

Equally, Alvarez et al. (2009) using an ecological multi-group study compared variables associated with MMR between 45 countries in SSA using data collected between 1997 and 2006. At the end of the study, a relationship between the MMR and some educational, sanitary and economic factors was observed. Their results indicate that there is an inverse and significant correlation between the MMR and the per-capita government expenditure on health. Before arriving at this result, other explanatory variables were included as a control in the analysis. These variables include prenatal care coverage, births assisted by skilled health

personnel, access to an improved water source, adult literacy rate, primary female enrolment rate, education index and the Gross National Income per capita.

In a very recent study, Novignon et al. (2012) investigates the effects of public and private health care expenditure on health status (as measured by life expectancy at birth, death rate and IMR) in SSA using a panel data from 44 countries in the region from 1995 to 2005 and using GLS-fixed and GLS-random effects estimation techniques. Their findings suggest that although both private and public health expenditures are still crucial components of health status, the effect of public health care expenditure is greater than that of private health care expenditure in the SSA hence governments in the region must focus more on improving public health expenditure.

Although these studies identify a direct relationship between health expenditure and health outcomes, there are still some gaps that need to be bridged in order to empirically recognise the extent of this relationship in SSA. Due to the manner in which these studies are undertaken, it will be generally impossible to generalise their findings for SSA.

One main gap in previous studies is the sample selection used for the study. For instance, some of the studies are conducted for only developed nations (Cremieux et al., 1999 and Nixon and Ulmann, 2006). Other studies also lump both developing and developed nations in one sample (such as Gupta et al., 2001 and Gottret and Scieber, 2006) and those that attempt to decompose them end up grouping all developing nations into one sample irrespective of the region these countries are located (this includes Issa and Ouattara, 2005 and Gupta et al., 2002). Using these samples in a study makes it difficult to extend the results of such studies to SSA. Since SSA is the region that is lagging behind in the achievement of especially the health-related MDGs, there is the necessity to undertake a study for only SSA.

To solve the problem with the sample selection and to bring out the degree of the effects of health expenditures on health outcomes in SSA necessitated the studies of Novignon et al. (2012); Alvarez et al. (2009); Anyanwu and Erhijakpor (2007) and Buor and Bream (2004). However, some limitations with the study by Anyanwu and Erhijakpor (2007) include the omission of private spending on health (or private health expenditure) in the study just as in other studies (Baldacci et al., 2002; Gupta et al., 2002; Buor and Bream, 2004; Gottret and Scieber, 2006; Alvarez et al., 2009). This lapse adversely affects the policy implications of these studies. This is because total health expenditure comprises private and public health expenditures which are equally important in every effort aimed at influencing health outcome. Failure to include private health expenditure in any study therefore neglects its vital contribution towards the enhancement of health outcomes. The study by Anyanwu and Erhijakpor (2007) also grouped all African countries in one sample thereby resulting in the inability of the study to be used for policy consideration for only SSA.

Besides, the study by Novignon et al. (2012) does not adequately address certain methodological issues in the literature. The study failed to control for other socioeconomic determinants of health apart from the age distribution of the various countries and their income levels. Additionally, the study by Novignon et al. (2012) assumed a linear relationship between socioeconomic variables and health outcomes. One feature of the principle underlying the relationship between socioeconomic factors (including health expenditures) and health outcome (i.e. the health production function) is diminishing marginal productivity. This is adequately captured by a double-log or semi-log transformation of the model. This is not incorporated in the Novignon et al. (2012) study. The study of Novignon et al. (2012) is therefore unable to account for this feature of the health production function in the estimation of the relationship between health expenditures and

health outcome. A summary of recent and relevant literature with the gaps is presented in Appendix IV.

These existing gaps therefore necessitate further studies into the effects of private and public health expenditures on health outcomes especially in SSA. This study is aimed at bridging the gap by using SSA as one sample and further accounting for the law of diminishing marginal productivity in the model. Also, health expenditure in this study is decomposed into its private and public components. In all, the study contributes to the empirical literature on the relationship between health expenditures and health outcomes.

### **3.3.2 GDP per capita, Female Literacy and Health Outcome**

Income and education have been widely perceived to exert influence on health outcomes. According to the theory of ‘demand for health’ as discussed in section 3.1, income determines the amount of health inputs that could be acquired to produce some amount of health. Practically, all other things being equal, the income levels in a country determine the amount of resources that will be made available for health needs. This suggests that countries with higher incomes have the tendency of making more financial resources available to cater for the health needs of the people. GDP per capita or real GDP per capita is usually used as a proxy for income levels in most studies. Education also makes it possible for people to adequately assimilate information about health thereby enhancing health. As a result of the numerous positive externalities associated with female literacy than male literacy, female literacy is normally used to represent education in studies that look at the relationship between health expenditure and health outcome.

Due to the perceived impact of income and education on health outcomes, most studies include GDP per capita or real GDP per capita and female literacy rate as control variables when investigating the effect of health expenditure on health outcomes (or when analysing the determinants of health outcomes) across the world. In almost all of these studies GDP per capita and female literacy rate have been found to have a negative and significant impact on health outcome irrespective of the health indicator used even though in some of these studies health expenditure was found to have no significant influence on health. Some of such studies include the studies by Musgrove (1996), Filmer and Pritchett (1997, 1999), Gupta et al. (2001, 2002), Buor and Bream (2004) and Issa and Ouattara (2005) among others.

Besides, studies which have investigated the determinants of health using various socioeconomic variables also provide evidence to establish the fact that per capita GDP and female literacy rate are very vital in determining the health of every nation. Studies such as Imam and Koch (2004) among others validate this argument.

### **3.3.3 Governance and Health**

There is scant literature on the impact of governance on health outcome across the globe even though it plays a very important role in determining health outcome. One of such literature that considered the influence of governance on health outcome is the study by Rajkumar and Swaroop (2007). In this study, Rajkumar and Swaroop study the relationship between public spending, governance, and outcomes. After gathering data for 57 countries over three years: 1990, 1997 and 2003, and using OLS regressions, they empirically find that the differences in the efficacy of public spending can be largely explained by the quality of governance. Their results indicate that public health spending lowers child mortality rates more in countries with

good governance - measured by the level of corruption and the quality of bureaucracy. Other control variables included in the study are GDP per capita, female education, access to safe water and predominant religion.

### **3.4 Conclusion**

The relationship between health expenditure and health outcome is underpinned by the theory of 'demand for health' by Grossman (1972). This theory has necessitated several empirical research aimed at supporting the theory or otherwise. Most of the studies frequently include other variables such as GDP per capita and female literacy which are well-thought-out to impact on health. However, the components of total health expenditure - private and public - are not usually considered separately in a single study. This directly affects the results of such studies since the various components of health expenditure may have different effects on health. Other studies also used samples which might adversely influence the conclusions from such studies. This study is initiated to bridge these gaps in the literature.

## **CHAPTER FOUR**

### **METHODOLOGY AND DATA SOURCES**

#### **4.1 Introduction**

Different methodologies have been used in the literature to investigate the relationship between health expenditure and health outcomes across countries. Some of these methodologies include cross-sections, panel data and distribution approaches such as GLS, OLS, fixed and random effects. Other studies adopted the time series approaches including Error Correction Model to analyse this relationship in individual specific countries. This chapter presents a discussion of the methodology and the data that is used in this study. This discussion initially highlights the theoretical framework from which the estimated model in this study is derived. It also focuses on the estimation technique and diagnostic checks that are conducted on the variables to ensure that the results are efficient, consistent, reliable and unbiased among others. This chapter further discusses the reasons underlining the choice of the variables that are used in the study and the sources of data.

#### **4.2 Model Specification and Empirical Framework**

This study is essentially founded on the theory of ‘demand for health’ propounded by Grossman (1972) which was later extended and simplified by Wagstaff (1986). The theory of ‘demand for health’ is based on three fundamental economic principles, namely; the

indifference map, the production function and the budget constraint. These concepts have been discussed in the previous chapter<sup>4</sup>.

The model used in this study is based on the health production function concept of the theory of ‘demand for health’ which postulates that people/nations produce health by utilising socioeconomic variables. Hence health is a function of socioeconomic variables.

Mathematically, this is written as follows:

$$Health = f(\text{socio-economic variables}) \quad (1)$$

Since the current study is much interested in the role of private and public health expenditures on health outcome, private and public health expenditures are separated from the other socioeconomic determinants of health as shown below:

$$HEA = f(PUH, PRH, Z) \quad (2)$$

Where *HEA* is the selected health-related MDG

*PUH* is public health expenditure as a percentage of GDP

*PRH* is private health expenditure as a percentage of GDP

*Z* is a vector of socioeconomic control variables;

The empirical model to be used in this study is adapted from the works of Anyanwu and Erhijakpor (2007) and Novignon et al. (2012).

In order to investigate the effect of private and public health expenditure on health outcome, the study starts with a health status model specified in a panel form as follows:

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<sup>4</sup> These concepts have been extensively discussed in section 3.1

$$y_{it} = \alpha_i + X_{it}\beta_i + u_{it}, \quad i = 1, 2, \dots, n, t = 1, 2, \dots, T \quad (3)$$

Where  $y_{it}$  is a vector of the dependent variables,

$X_{it}$  is the matrix of independent variables,

$\beta_i$  is the vector coefficients of the independent variables,

$\alpha_i$  is the intercept which represents the country/regional specific effect and

$u_{it}$  is the error term which is assumed to be normally distributed.

To achieve the objectives of the study, the treatment variables from equation (2) are substituted into equation (3) to give equation (4) below;

$$HEA_{it} = \alpha_i + \beta_1 PUH_{it} + \beta_2 PRH_{it} + \beta_j Z_{it} + u_{it} \quad (4)$$

Where HEA represents the selected health-related MDGs

$PRH$  is private health expenditure as a percentage of GDP

$PUH$  is public health expenditure as a percentage of GDP,

$Z$  is a matrix which represents the set of control variables,

$\beta_j$  is the associated slope coefficients of the control variables ( $j = 3, \dots, n$ )

$i$  represents the countries ( $i = 1, \dots, 40$ )

$t$  represents the years ( $t = 2000, \dots, 2010$ )

The set of control variables, drawing on the existing literature on the determinants of infant mortality, child mortality and maternal mortality include real GDP per capita, female literacy rate, effectiveness of governance, improved water source and improved sanitation, which captures the cleanliness of the environment.

Substituting the set of the control variables into equation (4) gives:

$$HEA_{it} = \alpha_i + \beta_1 PUH_{it} + \beta_2 PRH_{it} + \beta_3 RGDPPC_{it} + \beta_4 FLR_{it} + \beta_5 GOV_{it} + \beta_6 H2O + \beta_7 SAN_{it} + u_{it} \quad (5)$$

Where *PRH* and *PUH* are as previously defined

*RGDPPC* is real GDP per capita

*FLR* is female literacy rate

*GOV* is the effectiveness of governance

*H2O* is the percentage of the population with access to improved water source

*SAN* is the percentage of the population with access to improved sanitation

*i* represents the countries ( $i = 1, \dots, 40$ )

*t* represents the years ( $t = 2000, \dots, 2010$ )

Given that the main aim of the study is to assess the effect of health expenditure, private and public, on the selected-health related MDGs in SSA, equation (5) does not contain all the explanatory variables that might affect these rates. To keep the analysis simple the study includes just a set of variables that have been identified in the literature as key determinants of IMR, MMR and U5MR in SSA.

Taking the natural log of equation (5) gives;

$$\ln HEA_{it} = \alpha_i + \beta_1 \ln PUH_{it} + \beta_2 \ln PRH_{it} + \beta_3 \ln RGDPPC_{it} + \beta_4 \ln FLR_{it} + \beta_5 \ln GOV_{it} + \beta_6 \ln H2O_{it} + \beta_7 \ln SAN_{it} + u_{it} \quad (6)$$

The transformation of the model to logs achieves two important objectives. First, one main feature of the health production function, the theoretical basis of this study, is that it exhibits the property of diminishing marginal returns. Hence, for reasons associated with diminishing marginal returns and the adverse effects of most socioeconomic variables after an initial positive outcome, the relationship between the health inputs and health is expected to be non-linear and non-monotonic. The non-linearity in this relationship is adequately captured by a log transformation. Secondly, the transformation of the variables to log means that the coefficients of the variables measure elasticities which provide a basis for comparison with other studies (Filmer and Pritchett, 1999, p.1310).

### 4.3 Description of Variables and Expected Signs

The dependent and independent variables in the study are chosen in accordance with the objectives of the study and the literature reviewed earlier. Although there are several health indicators in the MDGs and several socioeconomic variables that influence health in SSA, only few has been selected in order to keep the analysis simple and due to time constraint. The a priori expectations of the signs of the independent variables are based on the theoretical literature and the findings from previous studies.

#### **4.3.1 Dependent Variables**

The dependent variables are chosen from the MDGs. Health issues form a crucial aspect of the MDGs. As a result, three out of the eight MDGs are directly related to health while there are several other health indicating targets. Out of the three MDGs that aim at directly improving health, only MDGs 4 and 5 which aim at reducing child mortality (or improving child health) and improving maternal health respectively is considered by this study. MDG 6 (i.e. combating HIV/AIDS, malaria and other diseases) is not included in this study. Infant mortality is however included in the study owing to its crucial role in determining the progress towards achieving MDG 4. Besides, infant mortality is also regarded as a very sensitive indicator of the availability, utilization and effectiveness of health care and hence is usually used for comparing health systems across countries. The health of a child below age one usually depends on the quality of the health system prevailing in the country.

Therefore, the dependent variables to be analysed are infant mortality and under-five mortality, both measuring child health and maternal mortality as an indicator of maternal health. This is due to the importance of these variables in determining the overall health status of a country. These variables are also widely used in comparing health systems and health status across nations and besides a lot of resources are directed towards the improvement of child and maternal health.

#### **4.3.2 Independent Variables**

The choice of the independent variables is guided by the findings from existing literature and the purpose of the study. In order to avoid the problem of omitted variables, other important socioeconomic determinants of health are included in addition to the main treatment variables

which are public and private health expenditure as percentages of GDP. The control variables used in the study are real GDP per capita, female literacy rate, effectiveness of governance, improved water sources and improved sanitation, which captures the cleanliness of the environment.

➤ *Public Health Expenditure*

Public health expenditure consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance fund (World Bank, 2012). It is measured as a percentage of GDP. It is an indicator of the volume of public resources that are channelled into health in the form of infrastructural development, payment of health workers' salaries, training more health professionals, provision of essential drugs, medical research among others. All other things being equal, an increase in public health expenditure implies improved access to health care and health services which helps to decrease IMR, MMR and U5MR. Public health expenditure is therefore expected to be negatively related to the IMR, U5MR and MMR.

➤ *Private Health Expenditure*

Private health expenditure (as a percentage of GDP) includes direct household (out-of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations (World Bank, 2012). It measures the amount of resources from the households and firms that go into health. Private health expenditure equally plays a very important role in the improvement of health especially in developing economies where government resources are limited. With insufficient resources, government's role in the provision of adequate health services is unsatisfactory. Households and firms must therefore

also participate in the provision of health services to help improve health outcomes. Private health expenditure therefore complements public health expenditure in the improvement of health. A direct relationship between private health expenditure and health status is expected. This means that an increase in private health expenditure is expected to impact negatively on IMR, U5MR and MMR. However, in developing economies such as SSA where incomes are generally low, increases in private health expenditure reduce the savings ability of households thereby reducing population welfare and hence deepening poverty in such regions. This may affect the expected relationship between private health expenditure and health in SSA. This is because, increases in private health expenditure reduces the amount of resources that is available for other consumption goods which are equally important in influencing health. The improvements in health from private health expenditure could therefore be crowded out by the negative effects of the unavailability of other consumption goods. Nevertheless, private health expenditure is anticipated to be inversely related to IMR, U5MR and MMR is expected

➤ *Real GDP Per Capita*

There exists empirical evidence which suggests that the population's health status improves as a nation's per capita incomes rise (Musgrove, 1996; Gupta et al., 2001, 2002; Buor and Bream, 2004 and Issa and Ouattara, 2005 among others). This implies that real GDP per capita has been shown to be a very crucial determinant of health status. Real GDP per capita is gross domestic product (measured at a constant price) divided by population. GDP is the total monetary value of all the goods and services produced in a country over a period of time, usually one year. It is however calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data on real GDP per capita are expressed in 2000 U.S. dollars. Gupta et al. (1999) argue that a rise per capita

income results in improvement in the health status of the population. This is because a rise in income per capita increases the ability of governments and firms to supply more and better health care facilities and hence improves access to health care. Higher income also enhances the ability of households to demand more health care. Again, higher incomes has the tendency of improving public health infrastructure such as improved water and sanitation, better nutrition, better housing and the ability to pay for health care (Pritchett and Summers, 1996; Cutler et al., 2006; Anyanwu and Erhijakpor, 2007). This means that an increase in real GDP per capita will lead to increases in the demand for health care and hence an improvement in health status, all things being equal. Real GDP per capita is therefore expected to have an inverse relationship with IMR, U5MR and MMR.

➤ *Female Literacy Rate*

Female literacy is also argued as a very important determinant of health status in every country. Female literacy refers to the percentage of females who can, with understanding, read and write a short, simple statement on their everyday life. According to the World Bank (2012), 'literacy' also encompasses numeracy skills (i.e. the ability to make simple arithmetic calculations). The impact of female literacy on the health status of a nation is channelled via the improvement in the health of infants, children (i.e. under-fives) and mothers (Baldacci et al., 2004; Schultz, 1993). In developing economies especially SSA, women play very significant role in family health. Literacy therefore aids their ability to make sound and informed decisions with regards to family health. This is because educated mothers are in a better position to assimilate information about their health and that of their children and hence are more likely to be aware of nutrition and health needs of their children (Currie and Moretti, 2003). As a result, almost every study that looks at the effect of health expenditure on health outcome has female literacy as a control variable. Female literacy is expected to be

directly related to improvement in health by reducing IMR, U5MR and MMR. For the want of adequate data on female literacy in SSA, this study used female secondary school enrolment (% gross) as a proxy for female literacy (adapted from Issa and Ouattara, 2005). Female secondary school enrolment (% gross) is the total female enrolment in secondary education, regardless of age, expressed as a percentage of the female population of official secondary education age.

➤ *Improved Sanitation*

Environmental factors such as air quality and sanitation among others have equally important effects on health. Environmental cleanliness reduces the outbreak and spread of communicable diseases thereby reducing mortality. During the outbreak of communicable diseases, children (both infants and under-fives) and pregnant/lactating mothers are the most vulnerable. Hence improving environmental conditions helps prevent the outbreak and spread of diseases which further goes a long way to reduce IMR, U5MR and MMR. This study will use the percentage of population with access to improved sanitation as a proxy for environmental cleanliness. Access to improved sanitation facilities refers to the percentage of the population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection (World Bank 2012). An inverse relationship is therefore expected to exist between improved sanitation and mortality.

➤ *Government Effectiveness*

Governance equally plays an important role in determining the effectiveness of health expenditures on health outcome. The Political Risk Components of the International Country

Risk Guide (ICRG) has identified six different indicators as measures of the quality of governance in various countries across the world<sup>5</sup>. These indicators are Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Corruption Control. This study uses the effectiveness of governance because according to Kaufmann et al. (2003), it basically measures the ability of government to produce and implement good policies and deliver public goods. The implementation of good policies and the provision of public goods are very important in influencing the health of a nation. Good policies such as free maternal delivery and health insurance and public goods such as roads and defence are very important in determining the health status of a nation. Public goods such as roads help increase accessibility to health service and the formulation and implementation of health policies are very fundamental to guide the delivery of quality health care in a country. The availability and implementation of good policies and the provision of public goods will therefore ultimately lead to reductions in mortalities hence governance effectiveness is expected to have an inverse relationship with the selected health-related MDGs in SSA. The scores for each of the six governance variables lie between -2.5 and 2.5, with higher scores corresponding to better institutions (Kaufmann et al., 2003). However, none of the countries used in the study had a negative score for government effectiveness. Government effectiveness is expected to be inversely related to the selected health indicators.

➤ *Improved Water Source*

An equally important socioeconomic variable that can influence health outcomes is the quality of drinking water. Water is very vital for human survival and hence its quality could

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<sup>5</sup> The data contains annual values for indicators of the quality of governance constructed by Stephen Knack and IRIS Center, University of Maryland and provided by The PRS Group.

be very critical in affecting the health of users. Water borne diseases, which are normally caused by poor quality of drinking water, have been a hindrance on the efforts of SSA in improving health in the region. Therefore, improvement in the quality of drinking water across the region is very vital in improving health. This study therefore includes the percentage of the population with access to an improved water source as a proxy for quality of drinking water in SSA. According to the World Bank (2012), access to an improved water source refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, and rainwater collection. The World Bank (2012) further defines reasonable access as the availability of at least 20 litres per person per day from a source within one kilometre of the dwelling. As more people get access to improved water source the incidence of water borne disease is expected to decline thereby leading to improvement in all health indicators such as child health and maternal health. Briefly, improved water source is expected to be inversely related to the selected health-related MDGs in SSA.

#### **4.4 Diagnostic Checks**

For any regression results to be reliable, the estimates must be unbiased, efficient, consistent and reliable among others. For the regression results to meet these criteria the error term of the variables in the regression must be homoscedastic, the regressors must not be highly correlated and the variables must be stationary. This means that the presence of heteroscedasticity, severe multicollinearity and unit roots will affect the (OLS) estimates of the study. To ensure that this is avoided, the variables in the study and the OLS results were subjected to three main diagnostic checks to ensure that they all meet the required criteria

needed to produce efficient results. Where a particular criterion is not met, an appropriate estimation technique which takes the existence of such problems into consideration is used. The checks to be conducted are heteroscedasticity, multicollinearity and unit root tests.

#### **4.4.1 Heteroscedasticity Test**

For OLS estimation results to be efficient and unbiased, the variance of the error terms of all the dependent variables must be constant (i.e. homoscedastic). However, due to the presence of outliers in the variables, incorrect data transformation, incorrect functional forms, improvement in data collecting technique, omission of important variables, skewness in the distribution of one or more regressors included in the model and incorrect model specification, the variance of the error terms of the dependent variables are not always constant (Gujarati, 1995). In such situations, there is the problem of heteroscedasticity. Although it is a problem which is usually associated with cross-sectional data, it is sometimes present in panel dataset. When heteroscedasticity is present, even though OLS parameter estimates are still unbiased and consistent they are inefficient (i.e. they have larger than minimum variances). Besides, the presence of heteroscedasticity makes the estimated variances of the regression parameters biased (they will no longer have minimum variance), thereby resulting in incorrect statistical tests for the parameters and biased confidence intervals (t and F tests based on them will be misleading). To detect the presence of heteroscedasticity in the OLS estimates, the study use the General Heteroscedasticity Test as proposed by White (1980). This test is easy to implement and does not rely on the normality assumption of the variables, which is a limitation in the other tests for heteroscedasticity.

#### 4.4.2 Stationarity or Unit Root Test

In running a regression – applicable to time series and panel data, all the variables are expected to be stationary. This means that each of the variables used in estimation should not have a unit root. “A stochastic process is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance between the two time periods and not on the actual time at which the covariance is computed” (Gujarati, 1995, pp.713). Although unit root is usually a problem associated with time series dataset due to larger time period involved, it is both appropriate and acceptable that the variables in a panel dataset be stationary.

In this study, the Fisher unit root test is employed from among a pool of many equally relevant panel unit root tests such as the Levin and Lin (LL) Tests (1992), the Im, Pesaran and Shin (IPS) Test (1997), the Breitung’s Test (2000) and the Levin-Lin-Chu (LLC) Test (2002) among others.

The choice of the Fisher unit root test over the others is due to the merits associated with it. The Fisher test can be carried out for any unit root test derived and the test does not require simulating adjustment factors that are specific to the sample size and specification. Besides, the Fisher unit root test has a superior power especially when there is a combination of both non-stationary and stationary variables and the Fisher-type test suffers the least when T (time) is large and N (sample) is small. Furthermore, the Fisher can be used with any unit root test and even if the Augmented Dickey Fuller (ADF) test is used, the choice of the lag length for each sample can be separately determined. Also, in the Fisher-type test, there is no restriction of the sample sizes for different samples (they can vary according to availability of the data). This study therefore used the Fisher unit root test to test for stationarity in the variables due to the numerous benefits it has over the other unit root tests.

#### 4.4.3 Multicollinearity Test

One problem that affects the results of any regression model is the presence of multicollinearity in the regressors. Formerly, multicollinearity was used to mean the existence of an exact linear relationship among some or all explanatory variables in a regression model (Frisch, 1934). However, in recent times, the term is used in a much broader sense to embrace the incident of perfect multicollinearity as well as the case where the regressors are intercorrelated but not perfectly (Gujarati, 1995). Multicollinearity in the regressors is caused by many factors such as the data collection method, model specification and overdetermined model among others. In the presence of multicollinearity, although OLS estimators are best, linear, unbiased and efficient, they have large variances and covariances thereby making precise estimation difficult. This tends to make the t-ratio of one or more coefficients statistically insignificant whilst the R-squared tends to be very high.

It is however important to note that the presence of multicollinearity is not as much a problem as its severity (Gujarati, 1995). This is because the regressors in a regression model are very likely to be correlated but when such correlation is very high (i.e. high multicollinearity) then the coefficients will be affected. Therefore, the presence of severe multicollinearity will affect the estimates of a regression model.

Though there are several ways of testing for the presence and severity of multicollinearity such as the use of auxiliary regressions, correlation matrix, eigenvalues and condition index this study will use the Variance Inflation Factor (VIF) to detect the severity of multicollinearity in the model. This test is easy and widely used in detecting the presence of multicollinearity. As a rule of thumb, if the VIF of a variable exceeds 10 then that variable is said to be highly collinear (Kleinbaum et al., 1988).

#### 4.5 Estimation Techniques

In order to ensure the robustness of the results across different estimation techniques, the study considered three different estimation methods. The first estimation method employed was the Ordinary Least Squares (OLS) because it is basic and widely used. However, the presence of heteroscedasticity affects the reliability of the OLS estimates.

The Fixed Effects (FE) and the Random Effects (RE) estimation techniques are also used. Some benefits of these two techniques are that they ‘can handle the systematic tendency of individual specific components to be higher for some units than for others (individual effects) and possible higher in some time periods than others (time effects)’ and ‘they adjust for heteroscedasticity’ (Issa and Ouattara, 2005, p.6).

The fundamental principle underlying the application of the FE is that the unobserved cross-country heterogeneity is correlated with the independent variables included in the models. However, in the RE estimation, that assumption of correlation between the unobserved heterogeneity and included independent variables is relaxed. One of the benefits in the use of RE over FE is that it allows for the inclusion of country specific time-invariant variables which may be relevant in explaining the dependent variable. Some of the country specific time-invariant variables which influence health outcome may include geographical, institutional and cultural factors which are usually unique for each country. Therefore, in situations where a model contains time-invariant variables such as dummy variables, the RE produces consistent and efficient estimates compared to the FE. On the other hand, where the unobserved heterogeneity among the cross-sections is believed to be correlated with the regressors in a model, the FE produces consistent and efficient estimates than the RE does.

In order to determine which result (either FE or RE) is more appropriate in a panel regression, the Hausman (1978) test is carried out. This test provides a rule of thumb for the acceptance or rejection of results produced by either the FE or RE. The Hausman (1978) test tests the null hypothesis of no correlation between the unobserved heterogeneity and the regressors. When the null hypothesis is accepted, then RE will produce estimates that are both consistent and efficient. In such a situation, the FE estimates will be consistent but inefficient.

The FE and RE estimation techniques were however developed under the premise that all the dependent variables are strictly exogenous (strict exogeneity assumption). This is however not always the case and is therefore a weakness in the FE and RE.

In all, three different estimation techniques are employed by this study namely OLS, FE and RE. However, in the presence of heteroscedasticity and severe multicollinearity, the OLS estimates are not reliable and efficient and hence would not be discussed. Rather, a Hausman (1978) test is employed to choose between the FE and the RE for discussion. All estimations are done using version 12 of Stata (StataCorp, 2011).

#### **4.6 Data**

The data on all the variables used in the study is purely secondary and are all obtained from the World Bank's World Development Indicators except MMR and government effectiveness. Data on MMR is obtained from WHO, where data exist for the years 2000, 2005 and 2010. MMR for the year 2008 was obtained from the Human Development Report (UNDP, 2011) and the yearly annual change in MMR for each country as estimated by WHO are used to extrapolate the remaining years in the sample. Data on government effectiveness

is obtained from The Political Risk Components of the International Country Risk Guide (ICRG).

The study covers 40 SSA countries<sup>6</sup> over the period 2000 to 2010. These countries are selected based on the availability of data within the sample period. Countries within the region which do not have data for any of the dependent variables as well as the independent variables of interest are not included in the study. Similarly, countries without data for more than one of the control variables are also dropped from the study, hence the 40 countries out of the 48 SSA countries.

#### **4.7 Conclusion**

This chapter discussed the theoretical framework underpinning the study and subsequently develops the models that will be estimated by the study. The methodology used in arriving at the results together with the diagnostic checks employed was clearly outlined. All the variables in the model were adequately discussed as well as their a priori expectations. The sample size and sample period were also outlined in this chapter and the software package used for the estimation.

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<sup>6</sup> See appendix II for the list of countries used in the study

## CHAPTER FIVE

### PRESENTATION AND DISCUSSION OF RESULTS

#### 5.1 Introduction

This chapter delves into the analysis by estimating the empirical model and discussing the findings using dataset for 40 SSA countries covering the period 2000 to 2010. This chapter presents the descriptive analysis of all the variables used in the study and it further contains the sensitivity analysis or the diagnostic checks discussed in the previous chapter. The results of the estimations are then discussed in cognisance with previous studies. All the analyses are carried out using STATA version 12 (StataCorp, 2011).

#### 5.2 Descriptive Analysis

The summary statistics of the selected health-related MDGs and some of the variables that influence them are discussed in this section. It must be noted that the statistical values represent values for the study period. Also, though some countries are dropped from the study due to data unavailability the dataset used in the study contains few missing observations. The critical statistics that are discussed include the standard deviation, the mean, the minimum values as well as the maximum values of the variables. Table 5.1 shows the descriptive statistics of the variables.

**Table 5.1** Descriptive Statistics of Variables

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Minimum</b>	<b>Maximum</b>
<b>IMR</b>	74.55386	25.31891	13	145.5
<b>U5MR</b>	119.8414	45.44653	15.2	240.6
<b>MMR</b>	570.6947	263.0189	27.33402	1300
<b>PUH</b>	2.561886	1.261933	.1463853	8.451191
<b>PRH</b>	3.289888	2.132652	.5	13.54909
<b>RGDPPC</b>	823.7672	1139.896	82.66194	5180.968
<b>FLR</b>	33.86135	24.15571	4.67961	97.89083
<b>SAN</b>	31.32648	20.16876	7	89
<b>H2O</b>	65.17123	15.89627	29	99
<b>GOV</b>	.2881707	.1841976	0	.63

**Source:** Author's Computation

The mean of the variable is an indicator of the average of the variables used in the study. It shows that on average, MMR was 571 deaths per 100,000 live births in SSA from the year 2000 to 2010 whereas IMR and U5MR stood at 75 and 120 deaths per 1,000 live births respectively within the same period in SSA. This means that there is still a lot to be done in terms of reducing U5MR and especially MMR in the region. The mean column further indicates that public and private health expenditures each constituted 2.6 per cent and 3.3 per cent of GDP respectively in SSA during the study period and real GDP per capita in the region during the period under consideration was on the average of US\$824 (2000 US\$). On the average, only 31 per cent of the population in SSA had access to adequate sanitation from 2000 to 2010 whereas about 65 per cent had access to improved water source. Table 5.1 also

shows that, on average as low as 34 per cent of females were enrolled into secondary education within this period and the level of governance effectiveness in the region was 0.29. This means that governance is not deepened/effective in the region since the average score is less than half of the total score.

The standard deviation is a pointer of how spread-out the variables are from their mean values. It shows how the variables are scattered from their respective means. The difference between the minimum and the maximum values of the variables give the range of the variables used in the study. The range is an indicator of the level of fluctuations in the variables. The larger the range values the higher the level of fluctuations in a variable and vice versa. Governance effectiveness has the least fluctuations whilst real GDP per capita has the highest fluctuations among the variables.

The minimum and maximum values can also be used as a measure of the best and worst performance of the countries used in the study. For instance, from Table 5.1, it is evident that at least one country in SSA has been able to reduce U5MR to 15 deaths per 1,000 live births within the study period where as U5MR was as high as about 241 deaths per 1,000 live births in at least one country within the study period. In some country (countries), public health expenditure formed as low as 0.15 per cent of their GDP whilst it constituted about 13.55 of another country's GDP.

### **5.3 Diagnostic Results**

The study conducts some diagnostic checks to determine the appropriate technique to use in estimating the models developed in the previous chapters. Some of the sensitivity analyses are conducted on the variables whilst others are on the pooled OLS regression results to

determine whether the estimates were consistent, reliable and unbiased among others. A unit root test is undertaken on all the variables to examine their stationarity conditions and a heteroscedasticity and multicollinearity tests are used to determine the reliability of the pooled OLS estimates.

### 5.3.1 Unit Root Results

The results of the unit root tests on all the variables are presented in Table 5.2 below.

**Table 5.2:** Fisher unit root test of variables based on ADF

Variables	Inverse $\chi^2$		Inverse Normal		Inverse Logit		Modified Inv. $\chi^2$	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
<b>IMR</b>	173.6389	0.0000	-5.9523	0.0000	-6.0668	0.0000	7.4028	0.0000
<b>U5MR</b>	148.8837	0.0000	-4.8391	0.0000	-4.7456	0.0000	5.4457	0.0000
<b>MMR</b>	159.6557	0.0000	-4.2819	0.0000	-4.2279	0.0000	6.2973	0.0000
<b>PUH</b>	163.578	0.0000	-5.7871	0.0000	-5.7156	0.0000	6.6074	0.0000
<b>PRH</b>	160.8870	0.0000	-5.8706	0.0000	-5.8853	0.0000	6.3947	0.0000
<b>RGDPPC</b>	123.0179	0.0014	-3.6633	0.0001	-3.6173	0.0002	3.4009	0.0003
<b>FLR</b>	129.9815	0.0000	-0.1779	0.4294	-2.4518	0.0079	5.3149	0.0000
<b>SAN</b>	117.6553	0.0039	-2.9849	0.0014	-2.9399	0.0019	2.9769	0.0015
<b>H2O</b>	117.9375	0.0037	-2.6192	0.0044	-2.6747	0.0040	2.9992	0.0014
<b>GOV</b>	92.8144	0.0042	-4.0479	0.0000	-3.7211	0.0001	2.9955	0.0014

**Ho:** All panels contain unit roots

**Ha:** At least one panel is stationary

**Source:** Author's Computation

Following Choi (2001), the null hypothesis is rejected at 1 per cent in favour of the alternative hypothesis for all the variables on the basis of the inverse  $\chi^2$  test. Choi (2001) argues that when the number of panels is finite, the inverse  $\chi^2$  test is applicable and powerful. This statistic has a  $\chi^2$  distribution with  $2N$  degrees of freedom, and large values are cause to

reject the null hypothesis. As a rule of thumb, when the probability of the inverse  $\chi^2$  of a variable is less than the significant level, we reject the null hypothesis and conclude that the variable is stationary. It can therefore be concluded that for all the variables in the study at least one panel is stationary at 1 per cent hence spurious regressions are unlikely to occur in the study. The inverse normal, the inverse logit and the modified inverse  $\chi^2$  tests also corroborate the inverse  $\chi^2$  test.

### 5.3.2 Multicollinearity Results

A multicollinearity test was conducted on the regressors and the results are shown in Table 5.3 below.

**Table 5.3:** VIF Test for multicollinearity

Variable	lnFLR	lnRGDPPC	lnH2O	lnGOV	lnSAN	lnPRH	lnPUH
VIF	3.50	3.30	3.05	2.02	1.87	1.41	1.22

**Source:** Author's Computation

Using the Kleinbaum et al. (1988) rule of thumb, since the VIF of each of the variables is below 10, it can be concluded that multicollinearity is not severe in the model. Also, the correlation matrix in the appendix confirms that multicollinearity is not severe.

### 5.3.3 Heteroscedasticity Results

Heteroscedasticity tests were conducted on the estimates of the pooled OLS regression and the results are given in Table 5.4.

**Table 5.4** White's test for homoscedasticity

<b>Null Hypothesis: Homoscedasticity</b>	
<b>Output for U5MR</b>	chi2(35) = 106.36 Prob > chi2 = 0.0000
<b>Output for IMR</b>	chi2(35) = 115.13 Prob > chi2 = 0.0000
<b>Output for MMR</b>	chi2(35) = 82.32 Prob > chi2 = 0.0000

**Source:** Author's Computation

In all three OLS regressions, the null hypotheses of homoscedasticity are rejected at 1 per cent in favour of the alternative hypothesis that there are unrestricted heteroscedasticity in the regressions.

The presence of heteroscedasticity affects the estimates from the OLS regressions. This therefore affects the use of OLS in estimating the models of the study. In order to minimise this problem, the study adopts the use of the fixed and random effects in estimating the models. As argued by Issa and Ouattara (2005), the FE and the RE were designed to adjust for the problem of heteroscedasticity.

## 5.4 Empirical Results and Discussion

The results are estimated using fixed effects (FE) and random effects (RE). After the regression output for each of the selected health-related MDGs, a Hausman (1978) test is performed on the random and fixed effects results to evaluate which is more appropriate for discussion. The level of correlation among the independent variables in the study is minimal

as presented in the correlation matrix<sup>7</sup>. This reduces the suspicion of severe multicollinearity in the estimation results which could affect the reliability of the estimates.

The regression results for the effects of private and public health expenditures on U5MR, IMR and MMR in SSA are presented in Tables 5.5 and 5.6 respectively. The results of the Hausman test<sup>8</sup> leads to the rejection of the null hypothesis of RE at 5 per cent level in favour of FE in all the regressions. The larger R-squared values of the FE results compared to those of the RE results in all three regressions also gives an indication of the appropriateness of the FE results over the RE results. The results of the FE are therefore interpreted and subsequently discussed. However, for purpose of comparison all three results - the OLS, FE and RE - are presented. The coefficients of the variables represent their respective elasticities.

From the regression estimates in Table 5.5, it is observed that private health expenditure, the proportion of the population with access to improved sanitation and the effectiveness of governance are not significant in affecting both U5MR and IMR in SSA. The remaining variables in the model however are all significant at the conventional 5 per cent level in the FE regressions of U5MR and IMR. The F-statistics of the FE regressions of U5MR and IMR indicate that the two models are each highly significant at 1 per cent and the R-squared shows that about 59 and 62 per cent of variations in U5MR and IMR respectively in SSA are explained by variations in the explanatory variables used in the study.

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<sup>7</sup> Refer to appendix I for the correlation matrix

<sup>8</sup> Refer to appendix III for the results of the Hausman tests

**Table 5.5:** Estimation Results for Child Health

Explanatory Variables	U5MR			IMR		
	OLS	Fixed Effects	Random Effects	OLS	Fixed Effects	Random Effects
<b>lnPUH</b>	-0.199*** (0.033)	-0.160*** (0.040)	-0.193*** (0.037)	-0.201*** (0.030)	-0.108*** (0.032)	-0.151*** (0.030)
<b>lnPRH</b>	-0.032 (0.033)	-0.069 (0.051)	-0.042 (0.045)	-0.028 (0.031)	-0.059 (0.040)	-0.045 (0.037)
<b>lnRGDPPC</b>	-0.110*** (0.029)	-0.282** (0.111)	-0.102* (0.055)	-0.108*** (0.026)	-0.333*** (0.087)	-0.109** (0.050)
<b>lnFLR</b>	-0.353*** (0.040)	-0.175*** (0.053)	-0.282*** (0.047)	-0.241*** (0.037)	-0.103** (0.042)	-0.188*** (0.039)
<b>lnSAN</b>	0.155*** (0.032)	0.003 (0.166)	0.141* (0.080)	0.149*** (0.030)	0.085 (0.131)	0.132* (0.073)
<b>lnH2O</b>	0.146 (0.099)	-0.735*** (0.268)	-0.452** (0.188)	0.006 (0.091)	-0.778*** (0.210)	-0.572*** (0.161)
<b>lnGOV</b>	-0.042 (0.061)	0.116 (0.109)	0.027 (0.093)	-0.035 (0.057)	0.118 (0.085)	0.032 (0.077)
<b>constant</b>	5.586*** (0.360)	10.374*** (0.947)	7.898*** (0.667)	5.327*** (0.330)	9.824*** (0.744)	7.650*** (0.571)
<b>R-squared</b>	0.7077	0.5885	0.5577	0.6670	0.6175	0.5842
<b>F-statistic</b>	58.10***	29.83***		48.06***	33.67***	
<b>Wald chi2(7)</b>			213.31***			220.50***
<b>Number of obs.</b>	176	176	176	176	176	176

\*\*\*, \*\* and\* represent statistical significance at 1%, 5% and 10% respectively

Figures in parenthesis are standard errors

**Source:** Author's Computation

Public health expenditure, one of the main variables of interest, negatively affects U5MR and IMR in SSA with elasticities of 0.16 and 0.11 respectively. This means that a 1 per cent increase in public health expenditure in SSA across time will lead to a 0.16 per cent decline in U5MR and 0.11 per cent decline in IMR in the region implying that both U5MR and IMR are not highly responsive to public health expenditure in SSA. Therefore, given that 4.4 million children (under-fives) die in SSA every year, then a percentage point increase in public health expenditure (as a percentage of GDP) across the region will result in the saving of the lives of as many as 7,040 children in the region. In relation to the other variable of interest, private health expenditure, the results of the regression indicate that it has no statistically significant effect on U5MR and IMR in SSA though the sign is negative as expected.

Other variables had interesting results. Real GDP per capita is highly significant at 1 per cent in the regression outputs of U5MR and IMR. Real GDP per capita is negatively related to U5MR and IMR implying that a 1 per cent increase in real GDP per capita will result in a 0.282 and a 0.333 per cent decline in U5MR and IMR in SSA respectively. This means that a percentage increase in real GDP per capita in the region could result in saving the lives of 12,408 children (under-fives) in SSA. Female literacy rate has also proven to be very significant at 5 per cent in influencing both U5MR and IMR with negative relationship in both results. When the proportion of females who get enrolled in secondary school (female literacy rate) across SSA increases by 1 percentage point, then there will be a decline of 0.175 per cent and 0.103 per cent in U5MR and IMR respectively in the region.

The results in Table 5.5 further indicate that the proportion of population with access to improved water source has the largest effects on both U5MR and IMR in SSA with coefficients of -0.735 and -0.778 respectively. This means that a percentage point increase in

the proportion of population with access to improved water source would result in saving 32,340 children's lives in the region.

The output for MMR as presented in Table 5.6 is significantly different from those of the U5MR and IMR. From Table 5.6, the FE regression results indicate that both public and private health expenditures are surprisingly not significant in influencing MMR though the entire model is significant at 1 per cent with an R-squared of 47 per cent. Similarly, the proportion of population with access to improved sanitation and improved water source in SSA are also not significant in affecting MMR though the signs are negative as expected. However, effectiveness of governance as well as female literacy rate and real GDP per capita are significant at 10 per cent and 1 per cent respectively with all of them being negatively related to MMR in SSA. The regression result in Table 5.6 also shows that real GDP per capita has the largest effect on MMR in SSA compared to the other variables in the study with a coefficient of -0.347. This implies that with 265,000 mothers dying every year in SSA, a 1 per cent rise in real GDP per capita across the region would result in preserving the lives of about 920 mothers in the region.

**Table 5.6:** Estimation Results for Maternal Health

Explanatory Variables	MMR		
	OLS	Fixed Effects	Random Effects
<b>lnPUH</b>	-0.296*** (0.041)	-0.051 (0.044)	-0.101** (0.041)
<b>lnPRH</b>	0.004 (0.041)	0.044 (0.057)	0.060 (0.050)
<b>lnRGDPPC</b>	-0.140*** (0.035)	-0.347*** (0.122)	-0.143** (0.068)
<b>lnFLR</b>	-0.057 (0.050)	-0.100* (0.058)	-0.157*** (0.052)
<b>lnSAN</b>	0.139*** (0.040)	-0.064 (0.183)	0.090 (0.099)
<b>lnH2O</b>	-0.156 (0.123)	-0.373 (0.295)	-0.414* (0.218)
<b>lnGOV</b>	-0.183** (0.077)	-0.211* (0.119)	-0.264** (0.105)
<b>constant</b>	7.553*** (0.446)	10.252*** (1.042)	8.827*** (0.776)
<b>R-squared</b>	0.5420	0.4660	0.4459
<b>F-statistic</b>	28.40***	18.20***	
<b>Wald chi2(7)</b>			133.43***
<b>Number of obs.</b>	176	176	176

\*\*\*, \*\* and\* represent statistical significance at 1%, 5% and 10% respectively

Figures in parenthesis are standard errors

**Source:** Author's Computation

The results obtained for the entire SSA region show that public health expenditure is very important in reducing U5MR and IMR. The findings indicate that failure to disaggregate total health expenditure into private and public health expenditures and mixing all countries in a study will ultimately affect the results of any study. For instance, the strong negative relationship between public health expenditure and U5MR and IMR identified by this study is in contrast to the results of earlier studies such as Musgrove (1996) which found no evidence that health expenditure as a share GDP reduced child mortality for either rich or poor countries. The results of Musgrove (1996) could be due to the failure of the study to disaggregate health expenditure into its two main components, namely, public and private health expenditures, as was done by this study.

Also, contrary to the findings of this study, studies such as Filmer and Pritchett (1997; 1999) revealed that public spending on health is not a crucial determinant of under-five and infant mortalities in all countries. The failure of these studies to identify any significant relationship between public health expenditure and health outcome could be attributed to the lumping of all countries used in the study irrespective of their levels development and their geographical locations. Another reason could be the estimation approaches used; OLS and TSLS. The omission of private health expenditure might also be a reason for such results.

However, the finding of an inverse relationship between public health expenditure and U5MR and IMR by this study confirms the results of recent studies such as Gupta et al. (2001), Baldacci et al. (2002), Issa and Ouattara (2005), Anyanwu and Erhijakpor (2007) and Novignon et al. (2012). Some of these studies also found a negative relationship between public health expenditure and other health measures such as life expectancy and death rate among others. Such similar results by some of the studies were arrived at perhaps due to the

incorporation of the two components of total health expenditure and the inclusion of countries with similar characteristics.

The studies of Issa and Ouattara (2005) and Novignon et al. (2012) for instance, decomposed health expenditure into public and private components in their studies and further Novignon et al. (2012) used countries from SSA whereas Issa and Ouattara (2005) grouped countries on the basis of their development levels. The results of these studies showed that public health expenditure is a major determinant of health outcomes in SSA as measured by under-five mortality and or infant mortality. Hence, child health in SSA has been proved to be meaningfully affected by the amount of government (public) resources devoted to health in the region.

Such a negative relationship between public health expenditure and IMR and U5MR means that provision of health facilities, essential drugs, training of health personnel or any effort directed at improving access to and quality of health care by local and central governments would significantly influence child health in SSA. This result is very likely especially in SSA where income levels are very low and the improvements in child health are often seen as the responsibility of governments. With low income levels and less importance placed on child health, citizens mostly rely on the government for the provision of essential health care services especially for the enhancement of child health. For instance, in SSA, immunization programmes and the remuneration of health workers are usually the responsibility of governments. This therefore calls for the need to enforce the Abuja Declaration by the regional body AU and the sub-regional bodies such as ECOWAS.

However, public health expenditure was found to be unimportant in influencing maternal health in SSA though the relationship is negative. This finding is in contrast to the results of Buor and Bream (2004) which established a significant negative relationship between public

health expenditure and maternal mortality in SSA. However, the finding of Buor and Bream (2004) was based on bivariate correlations as well as cross-tabulations in assessing the effect of public health expenditure on MMR. Such estimation techniques are too deterministic and hence do not fully bring out the impacts of the explanatory variable on the dependent variable.

The insignificant effect of public health expenditure on MMR in SSA may possibly be attributed to the high proportion of deliveries that occur outside health centres/facilities. Unfortunately adequate data does not exist for the proportion of total births that occur outside recognised health facilities in SSA. However, given that only 45 per cent of the total (registered) births in SSA were attended by trained health personnel (with a large proportion being TBA) in 2010 (UNO, 2012) and the high level of unregistered deliveries in the region, one could infer that public health expenditure impacts on only a few pregnant women.

Unlike previous studies such as Issa and Ouattara (2005) and Novignon et al. (2012) which found private health expenditure to be very important in reducing IMR, the results of this study indicate that private health expenditure is not an important determinant of the selected health-related MDGs in SSA though it is negatively related to U5MR and IMR. The results of this study reveal that child health and maternal health are not affected by private health expenditure. The assumption of a linear relationship between health expenditures and health outcomes, the absence of important control variables such as female literacy rate and the use of different explanatory variables could have influenced the result of Novignon et al. (2012). Besides, Novignon et al. (2012) used GLS-fixed effects and GLS-random effects in their estimation which is different from the estimation techniques applied in this study. The grouping of all developing nations as one in the study of Issa and Ouattara (2005) might have influenced their results.

The insignificant relationship between private health expenditure and the selected health-related MDGs in SSA can be explained by the low income levels in the region. With generally low income levels, expenditures by households to get access to health care services (i.e. private health expenditure) reduces their savings ability thereby decreasing the welfare of the population and hence deepening poverty levels in the region. Deepened poverty levels tend to adversely affect the ability of individuals to acquire other health enhancing goods such as balanced diet, adequate shelter, sanitation and education. The positive gains from the private health expenditure are thereby completely crowded-out by the negative effects of the deepened poverty. This could explain why private health expenditure does not significantly affect child health and maternal health in SSA.

Consistent with most studies, this study finds a strong negative relationship between per capita income (real GDP per capita) and all the selected health-related MDGs. This implies that as per capita income among countries in SSA increases, households are able to afford essential health services leading to improvements in health and hence a decline in mortalities. Higher per capita income implies improvement in welfare thereby increasing the ability of individuals to access and utilise health enhancing facilities. It also enhances the ability of the government to provide health services. This finding is consistent with the studies of Musgrove (1996), Filmer and Pritchett (1997, 1999), Gupta et al. (2001, 2002), Buor and Bream (2004), Issa and Ouattara (2005), Imam and Koch (2004) and Alvarez et al. (2009) although such studies used different estimation techniques. Real GDP per capita has therefore proved to be a robust determinant of health in SSA. However, studies such as Anyanwu and Erhijakpor (2007) and Ricci and Zachariadis (2006) found a weak and insignificant relationship between per capita income and mortalities.

The strong negative relationship between female literacy and the selected health-related MDGs as established by this study is in conformity to the theory of demand for health by Grossman (1972) and Wagstaff (1986) which argues that improvements in education will lead to improvement in health (or decline in mortalities). The result from this study shows that female literacy is a very important determinant of health especially in SSA where family health mostly depends on women. As argued by Baldacci et al. (2004) and Schultz (1993), female literacy impacts on the health of a nation especially through improvements in the health of children and mothers. In SSA, women are mostly responsible for caring for the young ones, the sick and the aged. Literacy therefore helps them make informed decisions regarding their health and that of their wards especially since education helps improve their knowledge about the health needs of their families.

Besides, female literacy reduces the number of teenage pregnancies and mothers with the associated complications during child birth. This is because as females spend more time acquiring education the probability of them being married at a younger age is reduced. Several existing studies such as Imam and Koch (2004), Issa and Ouattara (2005) and Anyanwu and Erhijakpor (2007) among others have all identified female literacy as being vital in improving the health status of nations in Africa.

The proportion of the population with access to improved water source in SSA undoubtedly directly affects child health by reducing U5MR and IMR in the region but surprisingly does not affect MMR. The negative impact of the proportion of the population with access to improved water source on U5MR and IMR in the region could be attributed to the vulnerability of infants and under-fives during the outbreak of diseases usually caused by poor source of drinking water in the region. This result confirms the studies of Gunther and Fink (2010) and Cutler and Miller (2005) both of whom found that improved water source

significantly reduces child mortalities. SSA is one of the regions with poor drinking water facilities which are further worsened by frequent drought and the pollution of water bodies. Such water related problems are largely the major cause of the outbreak of diseases such as cholera and diarrhoea in the region. During the outbreak of diseases, children (including infants) who are noted to have less immunity against diseases are usually the worse affected. Therefore, increasing the number of people with access to improved water source will significantly improve child health in the region.

Governance effectiveness is found to negatively affect only MMR in SSA. This shows that maternal health in SSA is largely influenced by the effectiveness of governance in the region. The implication is that as governance is deepened in the region, MMR consequently reduces. During the time of conflict and war, women are the most affected. Therefore, the absence of war, which is a basic requirement for effective governance, spares women all such tragedies they had to go through. Policies which are targeted at improving and advancing maternal health are usually implemented during these periods. The free maternal delivery system of Ghana is a typical example. Hence, as governance becomes more effective in SSA, more attention is given to women and mothers especially in policy formulation and implementation. All these factors combine to explain why effectiveness of governance significantly affects MMR in SSA.

## **5.5 Conclusion**

This chapter has analysed the effect of private and public health expenditures on child and maternal health. The results indicate that public health expenditure is more important in influencing child and maternal mortalities in SSA than private health expenditure. This

means that for countries in the region to achieve the health related MDGs, focus must be placed on public health expenditure than the private health expenditure. The results further indicate that female literacy rate, real GDP per capita as well as the proportion of the population with access to improved water source are equally important in enhancing the efforts of the region to achieve the MDGs. The effectiveness of government is also vital in achieving the MDGs.

## CHAPTER SIX

### CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

#### 6.1 Introduction

This chapter summarises and concludes the study. The first section looks at a summary of the findings as well as the conclusions. The second section presents policy implications and recommendations that would be relevant for policy makers. The limitations of the study which could necessitate future studies are discussed in the final section of this chapter.

#### 6.2 Summary and Conclusion

The slow pace of SSA in reaching the MDGs has attracted a lot of concern in recent literature. Of all the MDGs, the health-related ones are those that seem out of reach of SSA though the region has been making efforts at reaching them. The unparalleled nature of the efforts and outcomes in meeting the health-related MDGs in SSA has attracted several concerns.

One variable that has been identified to be very crucial in achieving the health-related MDGs is health expenditure. Though several studies have been undertaken to identify the relationship between total health expenditure and health outcome in the region, only a few have considered the separate effects of the public and private components of health expenditure on health outcome in SSA. The objectives of the study were therefore to assess the effects of public and private health expenditures on child health as measured by U5MR

and IMR and maternal health as measured by MMR. These three indicators were selected from the MDGs.

The study also analysed the trend of public and private health expenditures in the region relative to the other regions of the world and further assessed the evolution of the selected MDGs in the region over the years. The study used the OLS, FE and RE estimation techniques to estimate the relationship between health expenditure and the selected health-related MDGs. However, after using the Hausman Test, the FE estimates were discussed over those of the RE. The OLS estimates were not discussed due to the presence of heteroscedasticity.

Using data for 40 countries in SSA from 2000 to 2010, the study identified that public health expenditure has a significant negative relationship with child and infant mortalities but an insignificant relationship with maternal health. Private health expenditure was also proven to be ineffective in influencing health in the region since it was statistically not significant in the FE regressions. The study further found that other socioeconomic variables such as real GDP per capita, female literacy, the proportion of the population with access to quality water source and the effectiveness of governance were equally important factors that affect health in the region. These factors were all found to be inversely related to mortalities. Of all the regressors, the proportion of the population with access to improved water source had the largest impacts on U5MR and IMR whereas real GDP per capita had the biggest impact on MMR. The results indicate that a 1 per cent increase in the proportion of the population with access to improved water source and real GDP per capita in SSA would lead to a decline in child deaths by 32,340 and maternal deaths by 920 respectively in the region. Also, a 1 per cent increase in public health expenditure would result in saving the lives of 7,040 children in the region.

### **6.3 Policy Implications and Recommendations**

The empirical results lead to the following policy implications and suggested recommendations in no particular order. In general, these recommendations are aimed at accelerating progress in meeting the MDGs especially those related to health in SSA.

From the findings of the study, it is important for governments to increase public health expenditure. This is because such increases in public health expenditure have the capacity of improving child health and saving the lives of children in SSA as shown by the results of the study. Policy makers should therefore target means of increasing the publicly financed share of health expenditure. This could be done through social health insurance, expansion of existing medical facilities and training of more health personnel among others. Besides, the Abuja Declaration on health should be enforced in the region to help accelerate progress towards the MDGs. Though this study provides evidence to support increases in public health expenditure in SSA, it is important to add that this may not be a sufficient condition in achieving progress in health status. In the face of corruption (poor management and misallocation), increases in public health expenditure could have no effect or adverse effect on health in the region.

Female literacy was identified as a robust determinant of child and maternal health in SSA. This therefore calls for the need to increase the proportion of females who get education up to at least secondary schools. Governments in the region should make it a priority, in policy formulation and implementation, to get more females educated. Most countries in the region have cultures that inhibit the education of females. Such cultures should be totally eradicated if the region aims at reaching the MDGs. Besides, policy makers should put in place policies such as scholarships for females and affirmative actions in favour of females to serve as incentives to get more females educated.

Furthermore, SSA governments should continue to prioritise the provision of adequate and quality drinking water to the citizens. Efforts at the delivery of mechanised boreholes and pipe borne water among others in the region should be accelerated to reduce the reliance of Africans on polluted water bodies for drinking. This could go a long way to reduce the outbreak and spread of water borne diseases thereby helping improve health outcome in the region.

Similarly, countries in SSA should take the initiative to increase their income levels (real GDP per capita). Since per capita GDP comprises both GDP and population, policy makers should take steps to reduce population growth in the region while making greater efforts to increase economic growth. Factors such as family planning and reduction in early marriages among others could help reduce population growth rate in the region whilst economic growth can be propelled through foreign direct investments, expansion of the private sector and increases in governments' expenditure amongst others.

Finally, there is the need for governments in SSA to be effective especially in the provision of social services. This could be done through the formulation and implementation of relevant policies and the provision of public goods. Governments in the region should make efforts at reducing the level of corruption in the region because high level of corruption could render most if not all afore mentioned recommendations less effective. Some of the main causes of corruption in SSA are low income levels and weak institutions. Hence to curtail corruption, the salaries of public sector workers should be improved and institutions in the region should be strengthened through adequate staffing among others.

#### **6.4 Study Limitations**

The FE and the RE estimation techniques were developed on the basis of strict exogeneity among the regressors. The absence of this condition could affect the results of the study. Besides, certain equally important determinants of health were omitted from the list of regressors due to data unavailability. Finally, most of the variables used in the study do not have enough time series observation which would have improved a panel study as this one. Notwithstanding these limitations which could be the basis for further research, the results of the current study are still valid and could be used as the basis for policy formulation.

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## APPENDICES

### I. Correlation Matrix

	<b>lnIMR</b>	<b>lnU5MR</b>	<b>lnMMR</b>	<b>lnPUH</b>	<b>lnPRH</b>	<b>lnRGDPPC</b>	<b>lnFLR</b>	<b>lnSAN</b>	<b>lnGOV</b>	<b>lnH2O</b>
<b>lnIMR</b>	1.000									
<b>lnU5MR</b>	0.975	1.000								
<b>lnMMR</b>	0.740	0.715	1.000							
<b>lnPUH</b>	-0.462	-0.429	-0.528	1.000						
<b>lnPRH</b>	-0.061	-0.059	-0.004	-0.263	1.000					
<b>lnRGDPPC</b>	-0.639	-0.648	-0.533	0.210	0.097	1.000				
<b>lnFLR</b>	-0.707	-0.764	-0.513	0.244	0.169	0.751	1.000			
<b>lnSAN</b>	-0.322	-0.355	-0.259	0.195	0.119	0.605	0.636	1.000		
<b>lnGOV</b>	-0.418	-0.433	-0.411	0.163	0.298	0.330	0.577	0.359	1.000	
<b>lnH2O</b>	-0.502	-0.475	-0.482	0.185	0.366	0.682	0.647	0.566	0.590	1.000

Source: Author's Computation

## II. List of Countries

Angola	Congo, Dem. Rep.	Guinea	Mauritania	Sierra Leone
Benin	Congo, Rep.	Guinea-Bissau	Mauritius	South Africa
Botswana	Cote d'Ivoire	Kenya	Mozambique	Sudan
Burkina Faso	Eritrea	Lesotho	Namibia	Swaziland
Burundi	Ethiopia	Liberia	Niger	Tanzania
Cameroon	Gabon	Madagascar	Nigeria	Togo
Cape Verde	Gambia, The	Malawi	Rwanda	Uganda
Chad	Ghana	Mali	Senegal	Zambia

## III. Results of Hausman Tests

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### Null Hypothesis: Difference in coefficients not systematic (Random Effects)

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**Output for U5MR**

$$\begin{aligned} \text{chi2}(7) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 24.72 \end{aligned}$$

$$\text{Prob}>\text{chi2} = 0.0009$$

**Output for IMR**

$$\begin{aligned} \text{chi2}(7) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 24.87 \end{aligned}$$

$$\text{Prob}>\text{chi2} = 0.0008$$

(V<sub>b</sub>-V<sub>B</sub> is not positive definite)

**Output for MMR**

$$\begin{aligned} \text{chi2}(7) &= (b-B)'[(V_b-V_B)^{-1}](b-B) \\ &= 15.54 \end{aligned}$$

$$\text{Prob}>\text{chi2} = 0.0296$$


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**Source:** Author's Computation.

**IV: Summary of recent and relevant literature**

<b>Author(s) and Year</b>	<b>Sample Size, period and Estimation Techniques</b>	<b>Dependent Variables</b>	<b>Independent Variables</b>	<b>Main Findings</b>	<b>Gap</b>
Gupta et al. (2002)	50 developing countries, 1993-1994 OLS and TSLS	IMR and U5MR	Health spending, Adult literacy rate, urbanization, access to improved sanitation	Health spending is negatively related to IMR and U5MR	All developing countries are grouped as one, total health spending is not divided
Baldacci et al. (2002)	94 countries 1996-98 cross-sectional TSLS and OLS	IMR and U5MR	Public health expenditure, GDP per capita, total fertility rate, spending per pupil and urbanization	Public health expenditure negatively affects IMR and U5MR in the world	All countries are grouped as one
Issa and Ouattara (2005)	160 countries, 1980-2000 OLS, Fixed and Random Effects, GMM	Infant mortality rate (IMR)	Private and public health expenditures, carbon dioxide emissions, female literacy, Real GDP	Strong negative relation between health expenditures and IMR	SSA is grouped with other developing nations
Anyanwu and Erhijakpor (2007)	47 countries in Africa, 1994-2004 Robust OLS, Robust TSLS, Fixed effects	Under-5 and infant mortality rates	Per capita total and public health expenditures, female literacy, GDP per capita, physicians	Per capita Total and public health expenditures are inversely related IMR and U5MR	Did not account for impact of private health expenditure and it was for all African countries
Novignon et al. (2012)	SSA 1995-2010 GLS-fixed effects and GLS-random effects	IMR, life expectancy, crude death rate	Total, private and public health care expenditures, per capita GDP, HIV prevalence, hospital beds	Private and public health expenditures are inversely related to IMR and death rate but directly related to life expectancy	Assumption of linear relationship between regressors and health.

**Source:** Author' Compilation