EFFECTS OF HEALTH CARE COSTS ON CHILD MORTALITY RATES IN KENYA

By

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DECLARATION

This research paper is my original work and has not been presented at any other institution or university

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This research paper has been submitted for examination with my approval as the university supervisor.

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Sign.. Date...

DEDICATION

This work is dedicated to my son and daughters for their cheerful encouragement and humour we shared while doing our study work together. May this research paper serve as an inspiration for you to study even to greater heights as you start climbing through the academic ladder. Special dedication goes to my dear family members for their understanding and encouragement during the process of writing this work.

My special dedication goes to my humble parents whose wisdom and selflessness in offering me basic education finally led to the realization of this dream. Thanks to the entire family members who offered their encouragement as I undertook this study. To my great father who cherished this whole idea way back while I was young, I say thank you again and my God bless you very much for your inspiration and for being resourceful in this long academic journey.

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ABSTRACT

Infant and child mortality rates in a given country reflect the health status and social wellbeing of society. In addition to being an indicator of the nation's wellbeing, child mortality on its own is a recipe for emotional challenges bedevilling citizens which torment their peaceful lives. The reduction of child mortality rates by two thirds for the period between year 1990 and 2015 is the millennium development goal number four. It is part of the important global agendas that target to make the world a better place to live in for humanity and a key component of universal health as a right for all.

This research is aimed at establishing the relationship between healthcare costs and child mortality rates in Kenya. With specific bias to under- five mortality rates, we explored the variables of health care costs that influence child mortality outcomes in Kenya. Currently, healthcare in Kenya is on greater proportion financed by out of pocket expenditure thereby directly affecting household's incomes. Other sources of healthcare financing include direct government purchasing, private health insurance, the national health insurance and donor funding. According to the National health Accounts of 2010, Private health care financing is estimated at 36.7%, public 28.8% while Donors finance Kenya's health care to the tune of 34.5% of the total health expenditure (THE).

In assessing the relationship between under-five mortality rates in Kenya and health care cost among other correlates, we shall employ the maximum likelihood method in our analysis of secondary data from the KDHS. We shall model our variables on a binary logistic regression in order to establish the how healthcare costs and other secondary variables interact to affect under-five mortality rates. In the model, under-five mortality was our dependant variable while healthcare costs, gender, wealth index, employment status of the mother, child birth order and education level of the mother were dependant variables.

Our findings show that Under-five mortality rates were negatively correlated with healthcare cost contrary to our expectation that the relationship ought to be positive such that the higher the health care cost the higher the likelihood of under-five mortality. These findings were significant at $P < 0.05$. Further to that we found that, Employment status of the mother and education level of the mother was also negatively correlated, confirming our expectations.

However the relationship established between under-five mortality and employment and education status of the mother were in our case not significant. On the other hand, wealth index of the household which in our case was a proxy for household income had a positive relationship with under-five mortality probabilities, though the findings were insignificant at $P<0.05$. Gender of the child and child birth order also showed positive correlation where gender=1 if male and 0 if otherwise.

Since Under-five mortality reduces with additional spending on health care of children, it's our humble view that the national government in liaison with county governments invest more resources in child health programs for the country to achieve its millennium development goal. The need for incomes through employment cannot be overlooked in this case. We therefore recommend that governments initiate more investments to create jobs alongside offering amble environments for investments in the private sector

CHAPTER ONE
INTRODUCTION

This chapter explores the known facts about child mortality rates in Kenya and to some substantial extent, the global perspectives and how healthcare costs influence these mortality rates. The chapter also focuses on the objectives of the study comprising the primary objective and the secondary objectives, including the research questions to be answered by the research, its significance and the limitations of the study in our settings.

The chapter aim to provide the contextual framework and explain the choice of the research topic. It will also clarify the concept of under-five mortality and to explain why the under-five mortality rate is a powerful determinant of future economic growth.

1.0 Background Statement

1.1 Child Mortality Rates

Child mortality rates, also known as under-five mortality rates refers to the number of children between birth and exactly five years that die within one year expressed per one thousand. Reduction of child mortality rates to below 33 deaths per 1000 by the year 2015 is the United Nations millennium development goal number four. Since 1990 when the community of nations under the united nations committed to the millennium development goals, there has been a general trend in reduction of child mortalities in the world overall.

However in Africa, there has been a reversal of trends in the recent past. In Kenya there was tremendous improvement in trends on child mortality rates from 1960 to 1990 from over 100 deaths per 1000 live births to about 60 per 1000 live births. However in the period from 1993 to 2003, the trend reversed and the under -five mortality rates increased to about 115 deaths per 1000 live births. This trend is retrogressive considering that by 2015, under five mortality rates ought to have been reduced to about 33 deaths per 1000 live births implying a two third reduction. This calls for more rapid integrated interventions that are relevant in reducing these mortalities to target.

According to UNDP (2009) Kenya MDG needs Assessment report, the period between 1993 to 2000 maternal mortality also increased and reached approximately 590 per 100000. Although this trend has been related to diseases such as malaria, diarrheal diseases, respiratory, malnutrition and measles or a combination of these, there hasn't been explicit documentation on the implication of economic factors such as costs, demand and supply of health care. UNICEF (2013) projected that under nutrition contributed up to 45 % of the total mortalities of all under five mortalities. Children who are exclusively breast fed for the first six months of live are fourteen times more likely to survive compared to non breast fed children.

According to UNICEF (2010), in 1990, the estimated child mortality was 12.4 million deaths with 7 as the average for developed countries and 109 for counties in sub Saharan region demonstrating a very huge inequality across the regions. There were notable disparities between households between the poor and the wealthy even in developed countries. However in poor countries where the mortality rates are highest, often child mortality rates go unnoticed since poor families fail to record them in national registries. An ethnographic study in Brazil's Pacatuba, found that the under five   mortality reported only captured 44.4% of the actual deaths that occurred in that community. High travel costs, labour costs and a withdrawal of socioeconomic benefits are some of the likely reasons why deaths may not be registered to national vital registries within a country

UNICEF (2012) estimated child mortality to be 8.1 million, 2010 as 7.6 million, 2011 as 6.9 million and finally in 2012 the estimated deaths were 6.6 million which translates to 17,000 children dying each day. From these estimates we can be optimistic to think that the world is getting closer to achieving the millennium development goal number four.   However, the worrying part of this total estimates was that more than 81.5 % of these deaths occurred in sub Saharan Africa and a southern Asia. These counties are characterized with low income levels and poverty. Child mortality is emotionally and physically damaging to mourning parents and communities.

From research by "Save the children" (2013), in India, children from poor households are more likely to die before the age of five compared to those from wealthy households. In 2009, 31

countries recorded child mortalities beyond 10%. Of primary concern is that all the 31 countries except Afghanistan were in Africa with Chad leading the league.

In Africa, despite the positive trend of declining child, mortality since 1960s when most of the countries acquired independence, there have been challenges such as political instability, the advent of insurgents of infectious diseases such as HIV and AIDS, Measles and possibility also in an increase in mortality rates from non communicable diseases. The lack of fully fledged vital registration systems in most sub-Saharan countries had made it a difficult to perform detailed assessment of child mortality rates.

The reduction of child mortality rates in Africa since 1960 can be attributed to success of the Vaccination programs, rewards of efforts in malaria treatment and control i.e. new treatment, impregnated bed nets and rapid diagnostic tests. National research Council (2012) acknowledge that improvement in socioeconomic conditions might also have an influence, but the results of that influence could be visible only over the long term and will not explain the relative decline in mortality rates.

Individual countries in Africa have adopted measures aimed at reducing child mortality by devising programs that work within their context. In Ethiopia, there has been tremendous improvement in reducing child mortality rates by investing in simple bare bone clinics that are of low cost and are by minimally educated and trained personnel. With this program in place are now treated right across the country on a scale that previously was un- heard off around the world. Despite the improvement, Ethiopia still has a long way to go when it comes to child mortality. In Ethiopia's case malnutrition is still the main cause of child mortality. Merely 20% of Ethiopian babies are born underweight weighing less than 51 /2 pounds and about 40% percent of the kids does not get to normal height due to nutrition.

The Kenya Demographic Health survey (2008) reported a decline in child mortality rates in the past decade as a result of various global initiatives to improve child health. After many years of declining health indicators recent data show an improvement in mortality indicators for Kenyan children. KDHS (2008) reported that the infant mortality rates improved to 52 from 77 in 2003 while the under- five mortality rates improved to 74 from 115. Despite this focus and recent progress in child survival achieving the millennium development goal targets of 33 per 1000 per

year for under- five mortality rates and 26 per 1000 deaths for infant mortality by 2015 will be a challenge unless neonatal care; which is closely linked to maternal care, receives more attention. The table below summarises the mortality trends in Kenya for the preceding period.

Table 1.1 Early childhood mortality rates

Years preceding the survey	Aproximate calendar Years	Neonatal Mortality	Post neonatal mortality	Infant mortality	Child mortality	Under- five mortality
0- 4	2004-2008	31	21	52	23	74
5- 9	1999-2003	35	32	67	29	95
10- 14	1994-1998	25	34	59	37	93

Source; Kenya demographic and health survey 2008/2009

From these figure though in general terms the under five mortality rates seem to have decreased, the rate at which the reduction has occurred is slow and inconsistent. This is evidenced for the period between 1994 and 2003 for which the rates went slightly higher than the preceding period, that is fro 93 per 1000 t0 95 per 1000. This calls for through investigation on the determinants of under five mortality for which the government need to invest more if themillennium development goal is to be realised

Ochako et al (2003) analyzed the variants of healthcare cost on the utilization of maternal health services among young women in Kenya. They found that distance from nearest health care facilities negatively affected utilization of maternal health care services and hence contributed positively to maternal and infant mortality rates especially neonatal mortalities. It is imperative to acknowledge that indeed infant mortality and maternal mortality are inseparable.

In a study by Ustrup et al (2014) on "potential barriers to healthcare in Malawi for under-five children with cough and fever; A national Household survey" they observed that inequalities in access to health services occasioned by disparities in the abilities to meet healthcare costs when required contributes to differences in child mortality outcomes between countries and within

countries. They found that children from poor households are more likely to die compared to those from richer households due to higher exposures to health risks such as malnutrition, reduced access to preventive and curative healthcare services and as result die before the age of five.

1.2 Healthcare Expenditure

Health care expenditure refers to the monetary resources spend on health care. In a system of health Accounts (NHA), spending by the government and households are all captured to determine the Total Health Expenditure on health care (THE). THE is defined as the sum of all expenditures that have the goal of promoting health and preventing disease, disease treatment and preventing deaths, caring for persons with chronic ailments, assisting patients to die with dignity, providing and administering public health, and providing and administering health programs including funding programs.

The National Health Accounts (2009/2010) financial year, Kenya spend 122.9 billion shillings of health care translating to 5.4 of the GDP corresponding to a 20% growth compared to 2004/2005 where the THE was 4.8 of GDP. The per capita spending on health care was approximately Kenya shilling 3,203 compared to Kenya shilling 2, 868 in 2004/2005.

However the total government expenditure on health care as a percentage of the national budget declined from 8.6% in 2001/2002 to 4.6% in 2009/2010. This is was retrogressive according to the government commitment to the Abuja declaration.

The NHA guide (WHO 2003) defines financing agents as institutions that obtain and administer health resources from financing sources to pay for health care services. In Kenya financing agents include the ministry of health and ministries responsible for implementing health programs, the National hospital insurance fund, private health insurance, private and parastatal firms, households, NGOs, County governments and donors. According to NHA (2009/2010), these agents spend on health care in the proportions outlined in the figure below.

Table 1.2 Breakdown of financing by source for three seasons

Source	2001/02	2005/06	2009/10
Public	29.6%	29.3%	28.8%
Private	54.0%	39.3%	36.7%
Donors	16.4%	31.0%	34.5%
Other	0.1%	0.4%	0

Source, 2001/02, 2005/06, and 2009/10 (KNHA 2010)

From these figures, it is clear that spending on health care from private sources remain highest compared to public spending.

Ustrup et al (2014) demonstrated that healthcare costs was significantly associated with reduced utilization of health care services among Malawian children who were under five and had suffered a cough, malaria and diarrhoea. They found that household wealth contributed to whether healthcare was sort from trained medical personnel, untrained medical personnel or not seeking care at all. Children from poor households were less likely to seek healthcare from trained medical personnel compared to counterparts from richer households. They also found that time spent travelling when seeking care was significantly associated with place of residence and type of health care provider visited with children from rural areas spending more time and hence costs than those from urban areas. In addition, more time was spent travelling to seek health services from trained health personnel as opposed to non trained health personnel. They concluded that children from richer households, living in urban area and seeking care from trained health provider was associated with higher direct costs though the proportion of costs to income were significantly higher for rural children compared to urban, rich households.

In a study by Novignon et al (2012), Total healthcare expenditure was more likely to reduce infant mortality rate by 1% level of significance. They found that an increase in total health expenditure by 1% reduced infant mortality rates by about three infants per 1000 live births. They concluded that THE, whether public or private significantly improves the life expectancy at

birth in sub Saharan Africa countries. On the same note total health expenditure irrespective of source, significantly reduces infant and child mortality rates per 1000.

1.3 Problem Statement

Vision 2030 is anchored in the growth of the Kenyan economy to a middle income status by the year 2030. The growth of the Kenyan economy depends on the aggregate increase in economic productivity of the country and the well being of its population. The country's goal for the health sector is to provide equitable and affordable quality health services to all Kenyans. This is in recognition of the fact that good health and nutrition boosts the human capacity to be productive. Subsequently, this will enhance economic growth and contribute to poverty reduction and the realization of the vision's social pillar goals on health and education. The health sector is one that appeals to the equity and socioeconomic agenda emphasized in the social pillar of the vision 2030, GOK (2012)

As much as there are substantive positive trends in decline of child mortality rates and concerted efforts by the Kenyan government, the decline rate remains below the goal set in the MDG number 4 of 33 deaths per 1000 by 2015. Holtz et al (2013) noted that child mortality rates are useful indicator of the country's health status. Prevalence of childhood diseases and poor prenatal healthcare influence socioeconomic development by reducing the numbers of individuals surviving and moving into the economically productive labour force of the middle aged demographic strata. The increased survival rates however need to be accompanied by corresponding family planning programs.

According to the Kenya needs Assessment report (2000) asserts that the major challenge in the reduction of child mortality is the continued increase in child mortality rates since 1990s in all regions of the country (formally provinces). Moreover, by the early 2000s, the country continued to lag behind the MDG target. There is inequity to accessing health care since health care costs are high especially in sustaining the poor. Furthermore the adjustment of the VAT act of 2013 on basic commodities especially those consumed in delivery of health care will no doubt have an impact on the cost of health care upwards posing a problem on the utilization of health care.

Otai et al (2013) notes that the introduction of free maternity in public health facilities by the government of Kenya is a good gesture aimed at reducing maternal mortality rates and boosting child survival. She however points out that the free maternity policy must be accompanied by corresponding quality of services in order to attract an increase in demand for such services at these facilities. KDHS (2008) reported that while up to 90% of expectant mothers attend antenatal care, less than half of them deliver away from hospitals. The prevalence of home births plays a large role in the high maternal mortality rates and mother to child transmission of HIV AIDs. According to KDHS (2008), maternal mortality rates stood at 488 per 100000 live births.

USAID- Kenya (2013) noted that other than direct financial charges that may affect hospital deliveries, lack of transport, long distance to facility, and attitudes towards healthcare workers, cultural preferences and charges for other services could explain the low attendance of maternity services. Further to that, the offer on free maternity is only at delivery and therefore do not absolutely enhance the survival of the mother and the child before and after birth. These findings by USAID essentially aims to demonstrate that the millennium development goal number 4 may not be achieved by the year 2015 since the slow reduction of child mortality rates are born by healthcare costs which are in tandem a critical course of under-five mortality rates in Kenya as well as in sub-Saharan Africa.

In this paper, we recognize the socio-economic consequences of high mortality rates in the country and hence we aim to establish the extent by which healthcare costs contributed to high child mortality rates for the period between 2003 and 2008.

1.4 Research Questions

1. How does cost of health care influence child mortality rates in Kenya?

2. Are there any other factors that influence child mortality among Kenyan population?

1.5 Objectives of the Study
1.5.1 General objective

The overall objective of this study is to determine how health care costs influence child mortality rates in Kenya.

1.5.2 Specific Objectives

i. To evaluate the influence of healthcare costs and other correlates on child mortality rates in Kenya.

ii. Draw policy recommendations derived from objectives (i) above.

1.6 Justification of the study

This study will contribute some knowledge for policy makers and scholars to better understand the economic parameters that influence child mortality rates and particularly those that directly or indirectly impact on the cost of health care especially in the Kenyan setting. The study will provide valuable lessons to policy makers, citizens and stake holders in understanding the setbacks and strengths in the current health financing policies and child mortality outcomes alongside the implications of the said mortalities on the well being of the nation and the corresponding future economic productivity equation. Specifically the lessons learned in this study will provide better understanding on the implications of the current health care costs on child mortalities and the economic expectations of the vision 2030 goal of attaining a middle income economy.

This study may also be relevant to the government of Kenya and the ministry of health in assessing the current health care costs and financing available in relation to outcomes in child mortality rates in the country. At the moment, though the central government alongside the county governments intervenes in the provision of health care by financing directly and through the national health insurance, health care costs remain high for most households especially for the poor. The study will therefore provide a snapshot of some key factors where the government and other stake holders in the health sector need to refocus on if health care cost were to be effectively managed and child mortality rates lowered to the expected levels.

Finally, the study will provide relevant literature findings for researchers to utilize in their future related works. The study will highlight some of the identified gaps and recommend future research areas which the researchers can undertake.

CHAPTER TWO
LITERATURE REVIEW

This chapter covers literature concerning child mortality rates and the socioeconomic variables that affect it. First we look at the theoretical literature on child mortality and its effect on economic development and how it is affected by heath care costs. To answer the research questions in this study, we highlight some of the theories that anchor child mortality rates on the economic development of a country. We also discuss some theories that illustrate the interactions between variables that determine child mortality rates and perhaps the recommended intervention there to.

The study of infant and child mortality rates is important for any country since it forms the basis of gauging the socio- economic development of that country. It is an indicator to the wellbeing of society and meaningful to the growth of the economy at large. High infant and child mortality rates in a country could be taken to mean high fertility rates and low socio- economic status and high out migration of a country, Otieno et al (2000). They described the likely effects of changes in child mortality to the socio- economic well being of the nation using the theoretical framework known as the Mosley Chen framework as discussed in our conceptual framework in the methodology

2.1 Theoretical Literature

Health care is considered an economic good. Like any other economic good resources available for health care are finite while our wants for health care are infinite. With economic forces of demand and supply for health care in play, a price tag is inevitably attracted in the market. This invokes the concept of opportunity cost in choosing between health care and other competing needs or when decisions have to be made from among the available range of health care services. Since health care is an Economic good, choices must be made about what quantity and mix of health care to produce, how to produce it and who pays for it and how to distribute it.

Beker (1965) and Grossman (1972) Stated that health in itself is an economic good albeit with special characteristics. It can be regarded as a fundamental commodity, one of the true objects of peoples wants and for which other more tangible goods and services such as health care are

simply means to create it. This can be justified because health can be manufactured by individuals, households, governments and other agents and it has an impact on people's welfare, it's wanted and people are willing to pay for its improvement, and it is scarce relative to peoples wants. Health care costs are incurred in procuring the health care production processes. Resources that are involved in the production of health care include personnel, equipment, land and buildings and raw materials. These costs are in turn borne by the patients, households, government or health care financing agency such as health insurance companies.

2.1.1 The Grossman Model of Health Production

Grossman (1972) described a model for demand of "good health" as a commodity. He first described the demand for good health as being influenced by the amount of productivity and labour force available in the economy and good health measured in rates of mortality and morbidity. Secondly he illustrated how the demand for health care is not principally influenced by the medical services offered but rather the outcomes "good health".

Grossman noted that Economists were emphasizing on demand for healthcare at the expense of demand for health since conventional demand theories assumes that goods and services bought in markets enter consumer's utility functions. He challenged this reasoning by drawing a sharp distinction between the fundamental objects of choice- called commodities and market goods. Thus consumers produce commodities with inputs of market goods and their own time. For instance, consumers use sporting equipment and their own time to produce recreation, travelling time and transportation to produce visits and pharmaceutical goods and health care services to produce good health.

Since the goods and services are inputs to produce commodities, the demand for them is a derived demand. Good health therefore is treated as a durable item within the new framework of examining consumer behaviour and it's described as health capital; a component of human capital and sometimes treated as stock in literature on investment in human beings. In this model, individuals inherit initial stock of health which then depreciate over time at an increasing rate up to some stage in the lifecycle, and can be increased by investments. Examples of direct investments into gross production of health stock include, own time, medical care, exercise, diets housing and others.

In the model, the level of health is not exogenous but dependant on amount of resources allocated for its production at least in part. It is demanded because, as a consumption commodity, it directly enters consumer's preferences. Secondly health is demanded because, as an investment commodity, it determines the total amount of time available for market and non market activities. Like for most conventional commodities, in the market, the fundamental law of downward sloping demand curve for health dependents on the shadow price which is a combination of variables that combine to produce health. Shifts in these variables alter the optimal amount of health demanded and the derived demand for gross investments such as medical expenditures.

The shadow price is expected to increase with age if there is increase in the rate of depreciation on the stock of health over one's lifespan and falls with education since the more the education, the greater the efficiency of individuals in producing health.

2.1.2 Unified Theory of the Economic and Demographic Transition

Proponents of this theory argue that Individuals make optimal decisions about fertility, education of their children and the type and intensity of the investments in their own education. These decisions are affected by different dimensions of mortality and technological progress which change endogenously during the process of development.

The model generates an endogenous transition from a regime characterized by limited human capital formation, little longevity, high child mortality, large fertility and a sluggish income and productivity growth to a modern growth regime in which lower net fertility is associated with the acquisition of human capital and improved living standards. Unlike previous models, the framework emphasizes the education composition of the population in terms of the equilibrium share of educated individuals, and differential fertility related to education. Cervellato & Sunde (2007)

2.2 Empirical Literature

2.2.1 Healthcare expenditure and child mortality outcomes

Increased government expenditure on health and education improves both access to and the attainment in schools and reduces mortality rates for infants and children. There is increased recognition that expenditure allocations in terms of health care and education can boost economic growth while promoting equity and reducing poverty. The rationale for increased spending in health is justified on the grounds that it helps reduce the impact of disease on the productive life years of the population. On the other hand increased spending on Education is based on the principle that education has an impact on individuals' lifetime incomes. However there has not been conclusive empirical evidence on the efficiency that these resources ought to be distributed (World Bank Country study). They concluded that total health care spending has a statistically significant effect on infant and child mortality rates

The impact of public expenditure on health care is transmitted primarily through the flow of public resources to health programs and to actual delivery of services. The presence of large external effects on certain public health programs is usually advanced as the basis by which the impact of public expenditure on health can be explained. Such impact can in this case be infant and child mortality rates. It is assumed that induced increases in public expenditure ought to be felt by the public in terms of improved health care.

Public policy that reduces the level of health care spending, especially the cost effectiveness programs may lead to deleterious consequences on health care delivery. The main beneficiaries of cost effective interventions are usually the poor and therefore increases in public spending on health care improves the health outcomes of this people Birdsall & James (1992)

The role of civil society and government has a direct and indirect impact on child mortality outcomes and life chances through resource availability and equity of distribution according to Wolfe et al (2014). They found that other than deaths attributed to disease and injury, children's lives can be protected through supportive social policy and redistributive fiscal measures and concluded that social protection was the life saving medicine for the population. This argument was based on the economic front that contributes to child mortality outcomes.

In the study on determinants of under-five mortality in rural empowered action group states in India by accounting for family level clustering and adjusting for background variables using Cox frailty , Mani et al (2012) found that mothers age at birth, place of delivery, sex of the baby, composite variable of birth order and birth interval, and breast feeding were significant determinants of under-five mortality. They concluded that while planning for child survival programs in rural EAG states, parental competence which explain the unobserved familial effect need to be considered alongside significant programmable determinants.

In the study on child survival and policy options in Kenya using survival analysis and three rounds of health surveys from 1993 to 2003, Mariara et al (2008), they found that favourable child and maternal characteristics, household assets and health care services were associated positively with the likelihood of survival at time t. In addition they demonstrated that maternal education and modern contraception methods were key policy aspects that affected childhood survival. Just as highlighted in our introduction, in their further simulations, they postulate that it unlikely that the millennium development goal number 4 will be achieved.

Studying the socioeconomic determinants of Infant mortality in Kenya, Mustafa et al (2008) used a series of logistic regression models to select the significant factors affecting infant mortality both in urban and rural Kenya. They then used the Wald tests to rank the magnitude of the selected variables on child mortality using the KDHS 2003 data. They found that breast feeding, ethnicity and sex of the child in that order were increasingly significant in determining infant mortality outcomes whereas child birth order was still significant in rural Kenya.

In the study by Kaldewei et al (2010) on the determinants of infant and Under-five mortality – the case of Jordan, they found that Jordan's current development stage, behavioral factors seem to matter more for infant and under-five mortality than traditional health and infrastructure interventions. This pattern reveals itself when it comes to birth spacing and breastfeeding, but also a mother's age at birth, education level, and smoking status revealed significant influences on under—five mortality in the country.

Kaldewei et al (2010) also found a disconcerting change over time in the effect of a child's sex on the risk of infant mortality. While the biological advantage of girls was reflected in their estimation results for the entire 35-year period before the survey, which showed a significantly higher infant mortality risk for boys. They established that this effect disappeared during the 10-year and 5-year periods before the survey. Against at the backdrop of overall improvements in health care and the reduction in infant mortality, they concluded that boys have benefited relatively more from such developments than girls.

In work of Ellis and Mwabu (2004) on the demand for outpatient medical care in rural Kenya, they established that the choice of transport to the healthcare provider was dependent on cost of travel, time of travel and income of the households. They further observed that if walking was the only means of transport to seek health care services, then the potential choices affected by the three factors would be duly restricted in their model. They also found that the willingness to pay for bust transport to the providers would essentially provide significant demand responses to the services offered at a fee at by the health care providers.

On his part Mutunga et al (unpublished) studying the household environmental effects and socioeconomic characteristics on child mortality, they found that being born male or twin has lower probability of survival compared to the contrary and that household size was negatively related to child mortality. They attributed better housing, nutrition, education and access to healthcare to the larger households and thus these variables contributed positively to increased survival. In addition they found that access to clean drinking water, non polluting cooking fuels were positively related to child survival probabilities.

In a study by Alves et al (2005), looking at the determinants of infant and child mortality rates at municipal level and analysis of the determinants of mortality at individual level in Brazil, they found that education ranked first in determining child mortality rates. Other economic variables such as income per capita was shown to be second strongest in determining child mortality outcomes followed by sanitation services availability of which are influenced by costs and hence economic costs. However in this study they were not specifically concerned with healthcare costs.

Increased government expenditure on health and education improves both access to and the attainment in schools and reduces mortality rates for infants and children (Filmer and Prichett 1997). They found that expenditure allocations in terms of health care and education can boost economic growth while promoting equity and reducing poverty. The rationale for increased spending in health is justified on the grounds that it helps reduce the impact of disease on the productive life years of the population by reducing barriers to access such as direct healthcare costs.

On the other hand according to World Bank country study (1997), increased spending on Education is based on the principle that education has an impact on individuals' lifetime incomes. However there has not been conclusive empirical evidence on the efficiency that these resources ought to be distributed. They concluded that total health care spending has a statistically significant effect on infant and child mortality rates in any particular country as it reduces cost barriers to health care.

Cornia et al (1997) examined the changes in infant, child and maternal mortality rates in sub-Saharan Africa from 1960 to 1965 and the factors that were responsible for the observed changes. They found that the main determinants of child mortality were average per capita household income, female literacy nutrition status, safe water supply, immunization services and access to health services. They found that like income per capita, female literacy and access to health care had comparable effects on child mortality outcomes in the region. On the other hand they established that immunization had greater impact on child and maternal mortality rather than infant mortality.

Gupta et al (1999), in the IMF study found out that public spending alone cannot guarantee improved health and education indicators or outcomes, even though agreeing that costs borne by patients due to health care utilization could explain mortality outcomes. In a subsequent study, they showed that allocation of spending within subsectors of health and education could successfully contribute to positive child mortality outcomes. For instance shifting health spending toward primary healthcare has a favourable effect on infant and child mortality rates.

Thomas et al (1987), in a Brazilian study found that socioeconomic status and mother's education had substantial effect on child mortality outcomes. However, only one third of the

child mortality outcomes could be explained by mothers' education and therefore recommended that other variables that affect healthcare interrelate to affect child mortality rates. Education was also shown to influence many interrelated variables such as migration, labour market behaviour, use of health care and modern technology that affect child mortality outcomes.

In Ethiopia, using the DHS data for 2005, Muluye et al (2012) investigated the socioeconomic, demographic and environmental factors affecting infant mortality rates in Ethiopia. Using the Kaplan Meier method and Cox proportional regression models, they found that most infant deaths occurred in the first months and declined as the ages advanced to 12.They also identified breast feeding, mothers age, mothers level of education, child birth order, source of drinking water and sex of infant as predictors of infant mortality.

According to Schultz (1984) they found that variables including cost of healthcare affect utilization of health services and hence mortality. They suggested that, the puzzle that remains was how mother's education explains more of the variation in child mortality than do other variables such as access to health care, cost of health care or even family income available for health care. Schultz et al (1984) proposed the hypothesis that better educated mother uses a different mix of observable health inputs than the less educated mother; she uses these inputs more effectively; or her education is positively correlated with the use of other minor health inputs that are not observed and is credited with the use of this inputs on child health. Schultz suggested among the different mix of variables as the ability to pay for health care.

Filmer and Pritchett (1997) examined the impact of economic, educational, cultural factors and public spending on health in determining child and infant mortality. Using United Nation data of 1992, the result of cross-country study in 104 countries showed that 95% of the cross national variations in under five mortality rate can be explained by five factors: The level of income and its distribution, the extent of female education, the extend of ethno linguistic differences within a country and whether it is predominately Muslim. GDP per capita alone could explain 84 percent of the mortality difference. High average income implied low under-five mortality. While high income inequality implied high child mortality while high costs for maternal and child health care contributed to high child mortality rates

Using multiple regressions, McGuire et al (2002) explored the impact of socioeconomic factors (GDP per capita, income inequality, geography and culture), provision of basic services, and democratic experiences on variation in under- five mortality rates across 92 developing countries. He found that female schooling, access to mother and child health care and access to adequate sanitation were strongly associated with lower under five mortality levels. GDP per capita, income equality, geography, and culture (ethnic divisions, dominant religion region of the world) were also found to affect child mortality outcomes.

Fotso et al (2007), in his research on progress towards the child mortality millennium development goal in urban sub-Saharan Africa, concluded that more rapid population growth in urban areas affects access to clean drinking water and vaccination coverage thereby increasing child mortality rates in most cities. He noted that failure by governments to target the growing subgroups of the urban poor and improve their living conditions and health status may result to lack of improvement on the national indicators of health thus limiting the achievement of goal number 4 of the Millennium development goals.

Moisi et al (2010) investigated the effect of Geographic access to health care in rural Kenya with high health facility density on child mortality rates. By using Geographic information systems to analyze pedestrian and vehicular travel time to hospitals and vaccine clinics to evaluate the effect of travel time on under-five mortality rates. They found that the widely held notion that geographic distance to health facilities was correlated with mortality outcomes did not hold. There was no effect on travel time on infant and child mortality rates in their primary analysis. However, Moisi et al (2010) admitted that these should be interpreted with caution due to likely confounders that may have been impossible for them to adjust for.

On the contrary, Okwaraji et al (2012) studied the effect of geographic access to health facilities on child mortality in rural Ethiopia using a geographic information system to map 2,058 households selected randomly and used in a cross sectional survey. Of the 2,058 households, 29.4% were in urban areas while 70.6% were in rural areas. Analyzing the results using random effect Poisson regression, they found that distance to health centre had marked influence on under- five mortality rates in poor rural remote area of Ethiopia.

In addition, Ochako et al (2011) in their work on utilization of maternal healthcare services among young women in Kenya, analysing data from the KDHS 2003, they demonstrated how distance contributes to healthcare costs. They found that increased cost due to distance had an effect on the utilization of maternal health care and thus positive effect infant mortality outcomes.

Rheingans et al (2012), using survey data from three countries in sub Sahara Africa (Kenya, Mali and Gambia), they estimated the direct medical costs, direct non medical costs, indirect medical costs (productivity losses) and cost borne by households due to diarrhoea in young children. They found that the direct medical costs incurred due to diarrhoea per household were less than half of the mean costs per country. In all countries there was a trend towards lower costs among poorer households and in two of the countries diarrhoea illness affecting girls. Rheingan et al (2012) conclude that for poor children and girls, this could suggest reduced investment in care which in turn may result in increased risk in child mortalities.

Nattey et al (2013) studied the relationship between household socioeconomic status and under-five mortality rates and to compare health inequality between socioeconomic quartiles in rural Tanzania. Using a cross sectional study that included 11,189 under-five children residing in7298 households in 2005, they observed that household socioeconomic status and maternal education had a direct correlation to health care spending among households and were strongly associated with child mortality outcomes in rural Tanzania.

Kyu et al (2013) worked on the association of urban slum residency and infant mortality rates in low and middle income countries. In their findings, living in slum neighbourhoods was associated with high average proportions of spending on health care leading to increased infant mortality. However, they concluded that there was no difference between the very poor households compared to the better to do of households living in slum settlements on infant mortality outcomes. They also found that increasing child age exacerbated the risk of stunting associated with staying in a slum settlement.

Using the KDHS 2008-2009 data for Kenya, Ettarh et al (2012), investigated the influence of geographic access and maternal factors on the likelihood of under-five year mortality rates in rural and urban Kenya. They found that the likelihood of under-five mortality was significantly

higher for rural areas compared to urban and household poverty contributed the most to these mortality outcomes. They concluded that the predictors of mortality in under- five year old were different between rural and urban areas of Kenya.

Wafula et al (2012) noted that there was an increased infant mortality rates from 59 per 1000 per in 1998 to 78 deaths per 1000 in 2003. They investigated the probable course of the negative trend that will eventually affect the realization of the millennium development goal number 4 since that was a 32% decline in reducing infant mortality rates using a merged data set of the Kenya demographic health survey of 1993, 1998,and 2003. They found that the duration of breast feeding, maternal education, regional HIV prevalence, and malaria endemicity were the factors that contributed most to the observed infant mortalities over the period. In addition they observed that barriers to access to health care significantly contributed to increased child mortality rates.

Yassin et al (2009) points out that recent research show negative correlation between cost recovery and attendance levels. In Mozambique, Khalid documented more than 50% reduction in attendance at primary health care clinics. He noted that in Zimbabwe, stricter enforcement of user fee collection resulted in decline in outpatient attendance at hospitals allied to a decline in number of women registering for antenatal care. An increase in user fees in Kenya in 1989 had similar dramatic results. Khalid argues that the notion that health care is highly price elastic is very serious for child survival as statistics indicate that majority of child hood deaths occur due to low or improper rates of care seeking from health facilities. Dehydration and pneumonia which are the leading causes of death among children can easily be treated by simple low cost interventions. He notes that cost recovery can be counterproductive in reducing child mortality.

Novignon et al (2012) studied the effect of healthcare expenditure on population health status and examined the effect of public and private expenditure sources. Using panel data from 44 countries in Sub-Saharan Africa from 1995 to 2010, they found that health care expenditure influenced health status of populations. They found that health care expenditure had a positive relationship in increased life expectancy at birth, reduced deaths and infant mortality rates. They found that both public and private healthcare spending had significant positive relationship with health status even though public health spending had higher effect on the outcomes

2.3 Overview of Literature

From literature it was found that healthcare expenditure has substantial influence on child mortality rates and socioeconomic development. (Prichett et al 1997, Sanjev Gupta et al 1999, Yassin et al 2009, Rheingans et al 2012). It was found that all the variants of health care costs; direct medical costs, indirect medical costs and indirect non medical costs had an effect on child mortality outcomes (Rheingans et al)

Socioeconomic status and maternal education had corresponding positive effects on child mortality outcomes with maternal education accounting for close to one third of all the mortality outcomes. (Thomas et al 1987, Schultz et al 1984, Kyu et al 2013, Wafula et al 2012, Nattey et al 2013,McQuire et al 2002, Christophe et al 2007) McQuire et al (2002) in his findings questioned how maternal education could explain many of the variations in child mortality than do other variables such as access to healthcare, cost of healthcare, or family income available for health.

It was also found that household income influences child mortality rates outcomes with high average incomes implying lower under five mortality rates while high income inequality implying high under five mortality. (Prichett et al 1997) while Geographic access to health care facilities had an effect on child mortality outcomes as well (Okwaraji et al 2012, Moisi et al 2010). In addition, it was found that disease prevalence such as HIV AIDS, Malaria and diarrhoea diseases, sanitation and vaccination affects child mortality outcomes (Wafula et al 2012, Fotso et al 2007, Rheingans et al 2012).

In this study therefore, we attempt to investigate the relationship between health care costs and under-five mortality rates as reported in the KDHS survey of 2008/2009. Unlike most of the studies that have been explored in the above empirical literature, this study intend to include other indirect cost that goes with healthcare with a view of ascertaining that decreasing the cost of health care at facility level might fail to provide the solution to healthcare utilization if other related costs are not taken into cons

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter discusses the research design and methodology that will be employed in this study. The chapter includes conceptual framework, econometric model and the description of the specified model that will be used in the analysis of data in order to derive the desired results. The chapter also describes the source of data to be used in this study.

3.2 Conceptual framework

Our study shall adopt (Mosley and Chen 1984) framework where we shall model the effects of Health care costs, maternal education, gender of the child, Child birth order and socioeconomic status on under- five mortality. These authors developed the framework in order to study the factors that affect child mortality rates. It is based on the concept that social and economic determinants of child mortality interact through a set of biological or proximate determinants to affect children's probability of survival. Therefore in this context the model illustrates the economic, social and medical causes of child mortality. They further classified the proximate determinants into five categories which included; maternal factors (mother' age and parity), environmental contamination (routes of infections), injury, nutrients deficiency and personal illness control (preventive and curative). All economic and social; the distal determinants of child mortality operate though these proximate determinants and are grouped by Mosley and Chen in community level, household and individual variables.

Figure 1; The Mosley Chen Conceptual framework (Mosley and Chen 1984)
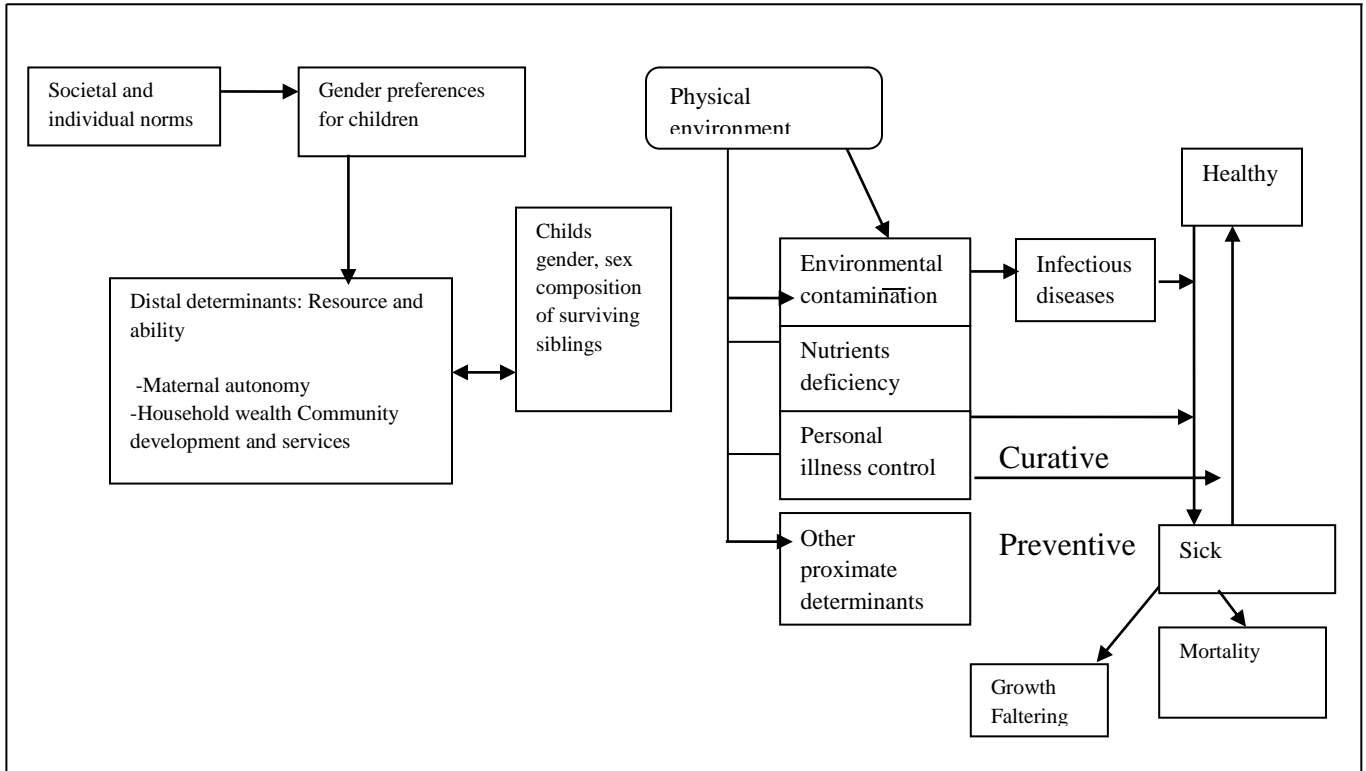
3.3 Econometric model

In undertaking the estimation of the relationship between health care cost and under five mortality rates, we shall employ a binary logit model which is a probabilistic thus ranging between 0 and 1. In our case, we shall assume that the error term takes a logistic distribution with a mean of 0 and a variance $\pi/3$. This model will be beneficial in our study since it will determine whether the independent variables that affect under five mortality rates also determine the probability of observing death.

From our framework, childhood mortality can be considered as a discrete variable that take the value of 0 if death occurs and zero if no death is observed. If not, then let us observe some variable say Y that takes the values between (0 and 1) but define our latent variable Y* such that;

$$Y^* = X_i\beta + \varepsilon \qquad \text{...1}$$

Where Y* is our dependent variable of either observing death or not, X_i are the factors that contribute to childhood mortality, while β_s are the coefficients to be estimated and ε is the error term. The logit model in the equation below is estimated using the maximum likelihood method (MLE) where the likelihood observing a death depends either on increase or decrease in health care costs and/or other factors identified.

$$Y_i = \begin{cases} \{ \{ \begin{array}{l} 1 \; if \; y > 0 \\ 0 \; otherwise \end{array} \end{cases} \qquad\qquad 2$$

Therefore,

Our logit model is given by the cumulative distribution function (cdf) as illustrated in equation below;

$$pr\; y = 1 \; = \; \Lambda\; X\beta \; = \; \int_{-\infty}^{X\beta} \frac{1}{2\pi} \; e^{-\frac{k^2}{2}} \; dk \qquad\qquad 3$$

$\Lambda(X_i\beta')$ is the cumulative distribution function for ε which yields the likelihood function as shown below;

$$L = \;\;_{Y=0}\Lambda\; -X_i\beta' \;\;\;_{Y=1}[\,1 - \Lambda(-X_i\beta')] \qquad\qquad 4$$

Having a CDF of ε in our case is logistic meaning we already have our logistic model. Therefore, we shall base our logit model on the following specified cumulative logistic probability function;

$$\textbf{Prob}_i = \Lambda(Z_i) = \Lambda\big((\alpha + X_i\beta')\big) = \frac{1}{1+e^{-Z_i}} = \frac{1}{1+e^{-(\alpha+X_i\beta')}} \qquad\qquad 5$$

3.4 Model specification

We shall specify our model by looking at the respective effect of the identified variables (independent) on the mortality cases as shown below;

U5M = β_0 + β_1Cost + β_2Gend + β_3Employ + β_4MEdu + β_5Wealthindex +β_5CBO + ε 6

Where; U5M =Under Five Mortality cases

Cost=Average cost of health care predicted by type of medical service offered during delivery

Gend= Gender of the child

Employ=Employment rates in the population under study

MEdu=Maternal education

Wealth index= Households distribution in terms of their wealth quartiles

CBO= Child Birth Order

βsare the coefficients to be estimated

ε= Stochastic error term assumed to be an estimator of the unknown in this case

3.5 Variables

Under-five mortality

Under-five mortality is our dependant variable and it implies the death of children before the attainment of five years or 59 months of age. Under-five mortality includes infant mortality rates which are death of children before the age of twelve months. This is a necessarily a dichotomous variable where U5M=1 if death arises and 0 if otherwise for our logistic regression to appear appropriate. If the mother rather than the child is the unit of analysis then a "mortality rate" for the mother can be calculated, which may be treated as a continuous variable and OLS used for estimation. However, child-specific analysis is to be preferred since it allows for the inclusion of child-specific factors.

It is our expectation that under- five mortality will be influence either positively or negatively by our independent variable after the analysis.

Health care costs

This study focuses on healthcare costs and how they affect child mortality outcomes. In analysing the effects of healthcare costs on under-five mortality outcomes, we chose the mode of

delivery as the proxy for costs and we used dummy variables coding caesarean=1 and zero if normal or otherwise. The selection of the mode of delivery as a proxy for healthcare only serves to explain the relationship between healthcare costs and under-five mortality since we appreciate that healthcare costs can be accrued through several other variants of goods and services during and after delivery in the process of consuming health services. We expect to find a positive relationship between healthcare costs and under- five mortality outcomes for the period under study.

Mother's employment status

The working status of mothers is included in our model as a dummy variable where mothers employment status =1 if employed and 0 if otherwise. We used data as captured by the KDHS for this variable with the aim of establishing whether mothers working status has any correlation with child's survival probabilities. Some previous studies including one by Kishor and Parasuraman (1998) showed that there was a negative correlation between mothers employment status and child mortality. The infant mortality rates were 10 % higher for employed mothers compared to non working mothers.

We expected to establish that infants born of employed mothers have higher probability of survival in the first five years of life compared to those born of mothers who are not employed. This is because more resources will be dedicated to children by their working mothers compared to those whose mothers are not employed and hence better access to health care

Wealth index

KDHS captured and quantified assets for the households surveyed and therefore wealth index clusters was created. We use the given wealth indices as the corresponding proxies for respective households incomes. It is expected that the higher the rung along the index, the more likely the access barriers to quality healthcare diminish and therefore the higher the probability of under-five survival in those households. Previous studies including one by Chalasani et al (2010), have shown that wealth index has a negative correlation to under-five mortality. However this expectation is not cast in stone in this regard since various variables interact to determine

consumption of health care including the households' willingness to pay for particular health care services

Gender of household head

We used gender of household head as dummy variable in our model where gender =1 if household head is male and 0 if otherwise. In our case we intent to test the probability of dying before the age of five if the child is born in a household whose head is male or otherwise. Since there is no economic relationship between gender and mortality, we do not expect any differences in the mortalities of either gender

Education attainment of the mother

From KDHS 2008/2009, education was measured in levels such that one either had no education, primary complete, primary incomplete, secondary incomplete, secondary complete and more than secondary. In this study we use these levels of education as documented by KDHS since measurement of education in years of schooling is not available by using dummy variables corresponding to these levels.

The role of parental education in determining children's health and nutritional status is two-fold. First, better education should translate into higher incomes. Since we did not include income as a separate variable, then this effect should exert a positive effect on the coefficient of parental education variables. Even when income is included in the estimated equation, more parental schooling could be beneficial for child health and mortality outcomes. Better educated parents are more likely to be able to make better use of available information about child health needs. In addition by virtue of being educated themselves may increase their preference for child quality over quantity (a decision which can also reflect the increased opportunity cost of the mother's time).

Charmarbagwala et al (2010) in their analysis established that most likely, successful completion of primary schooling or functional literacy is sufficient to uphold the positive outcomes of low mortality and better health status, and post-primary school education might only add limited benefits, though this depends on the quality of schooling. Furthermore, education might be a

signal for parents' innate intellectual abilities, leading to a positive coefficient even if education itself possesses no value.

It is expected that the higher the rung in education attainment of the mother, the higher the probability of survival of the infants and children born of them before the age of five years and the reverse is also true to our expectation.

Childs birth order

The variable capturing child's birth order was captured in the KDHS. We therefore employ it in our model to establish if there will be any correlation to under- five mortality in Kenya. We expect that at the end of this study, higher birth orders will be associated with increased probability of under-five mortality. Previous studies including that of Houle et al (2013) found that children under the age of 24 months of age whose subsequent siblings were born within eleven months experienced increased odds of dying as compared to those whose subsequent siblings were born more than eleven months

The table below summarizes the variables discussed above and their corresponding measurements.

3.6 Definition of variables, measurement and respective expected signs

Variable	Measurement criteria	Expected Sign
Dependent variable		
Under-five mortality	Children who die before their fifth birth day or below 49 months will be coded 1 and those who die after their fifth birth day will be coded zero.	
Independent variables		
Healthcare costs	Mode of delivery=1 if caesarean section 0 if normal delivery	Positive (Filmer and Pritchett, 1997)
Gender	Gender= 1 if Male 0 if female	Positive (Filmer and Pritchett, 1997)
Maternal Education	Mother's Education levels= 1 if No Education 2 if Primary; 3 if Secondary; 4 if Tertiary.	Negative (Wafula, et al., 2012) and (Schultz, 1984)
Employment	Employment; I if employed, 0 otherwise	Negative (Nattey et al, 2013)
Wealth index	Wealth index=1 if poorest, 2 if poorer, 3 if middle, 4 if richer and 5 if richest	Negative (McGuire, et al., 2002) and (Rheingan, et al., 2012)
Child Birth Order	First Birth Order=1 if first birth order, 0 if not	Positive (Wafula et al, 2012)

3.7 Data source description

This study will rely on the information collected by Kenya demographic and household survey KDHS 2008-2009, where a total of 38,089 persons who were interviewed. The direct respondents were women aged between 15 and 49 years while men were between 15 and 54 years. Information on age at time of survey, religion, marital status, maternal education, residence and access to media was sought. There is also information on adult employment status, occupation and wealth index. In relation to our study, further information was sought on child mortality in years of age and health care consumption history.

Data for mortality estimation shall be obtained with age specifications required for every death incidence of children aged below five years and other relevant information such as number of children, sex, living with them among other information.

This study will be correlation analysis between under-five morality rates and health care costs, household wealth index, gender of the child, education attainment of the mother, employment status of the mother and child's birth order as independent variables. Since healthcare costs were not absolutely available with respect to this survey, we intent to use the mode of delivery of children as the proxy for healthcare costs as discussed above. The research will aim to draw some meaningful relationships if any between under- five mortality rates and health care costs and also review the comparative effects of these other variables to the average under-five mortality rates in Kenya.

Since the survey does not have a price variable to use as estimates of financial costs for the healthcare services, we therefore make an assumption that the costs of health care remained constant throughout the study period. This is the limitation of our data source including the absence of other variables that affect access such as distances from nearest health facility. However the advantage of health survey data is that they provide national level data.

3.8 Diagnostic tests

3.8.1 Heteroscedasticity

This involves testing of the constant variance failure to do that we shall have spurious output. Sometimes it is referred to as heterogeneity of variance will be tested by the Breusch pagan test and residual plots. Therefore correction of heteroscedasticity if present is necessary in order to obtain correct standard errors that would be used in hypotheses testing.

3.8.2 Multicollinearity

We shall test to find out the existence of Multicollinearity. We shall employ variance inflation factors (VIF) as well as calculation of correlation matrices. The inclusion of highly correlated variables may lead to inflated coefficients which have an impact on interpretation if the results thereof are to be used in policy development. Therefore, they have to be removed so as to authenticate the results, Mukras (1993).

3.8.3 Endogeneity

Endogeneity is bias resulting from the correlation of the independent variables and the error terms. It may arise due to measurement errors, simultaneity, omitted variables, feedback effects, and autocorrelation. We also suspect attenuation bias in our survey data since not all the respondents might have provided complete responses. We shall employ instrumental variables in an effort to solve this problem. In the same spirit, Durbin-Wu Hausman test will be employed in selecting specific among numerous instrument variables. This will enable us to select the most robust instrumental variable(s) Gujarati (2004).

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND DISCUSSION

This chapter describes the relationship between health care costs and child mortality rates in Kenya. We use Binary logit model to establish the existing relationship using data from the Kenya Demographic and Health Survey of 2008/2009. We further compute the pattern of health care costs among the households using the same model. In this study, we have employed tables to make our presentations of the results achieved using the described model. In modelling these variables, we used   STATA 12 to obtain the results presented in this chapter

4.1 Descriptive Statistics

We explored the various characteristics of both dependent and independent variables which include the under-five mortality, health care costs, employment status of the mother, wealth Index level, gender of the head of the household, education levels of the mother and child's birth order. We assessed their respective means, standard deviation, minimum and maximum values. The summary statistics are as described in the table below.

Table 4.1: Descriptive statistics

	1	2	3	4	5
Variables	N	Mean	Standard deviation	Maximum	Minimum
U5m	373	0.528	0.500	1	0
Hc	6077	0.063	0.244	1	0
Gender	6079	0.292	0.455	1	0
Employment status	6077	0.548	0.498	1	0
Education attainment	6079	1.062	0.770	1	0
Wealth Index	6079	2.812	1.516	5	1
Child birth order	6079	3.445	2.322	13	1

Note: U5m=Under-five mortality cases, Hc= Healthcare costs

Source: Computed from the KDHS 2008/2009 data

From these statistics, out of the 373 under-five mortalities recorded from interviewing 6079 women respondents, the minimum deaths per household was 0 while the maximum was 1. Among the deaths reported, U5m alone comprised about 53% of the total mortality in the country for the period between 2004 and 2008 while 47% of the mortalities occurred after five years. Furthermore the female gender comprised of about 30% of the recorded under five mortalities which is lower compared to that of the male gender was about 70%. The minimum for gender was 0 while the maximum observed was 1 implying there was no gender bias in the collection of this data

Majority of the women interviewed (54.8%) were employed while 43% were unemployed while the minimum unemployment status per respondent was 0 and the maximum being 1since employment status as used in this case was a dummy variable.

Birth order was also included as a variable likely to affect child mortality outcomes in the Kenyan setting. The average birth order among the respondents was 3 for the study period. In addition the lowest birth order was 1 year while the highest was 13.

Wealth index was used to estimate the economic status of the households where the respondents were representing. The categories were the poorest=1, poor=2, middle=3, rich=4 and richest= 5. From our descriptive statistics, the minimum wealth index was 1 while the maximum was 5. The mean wealth index was 2.8 implying on average the respondents were in the middle level wealth status and therefore projecting the Kenyan society to be of middle income status on average.

Education was described as No education=1, Primary=2, Secondary=3 and tertiary=4. From these statistics therefore, the minimum level of education among respondents was 0 while the maximum was 2. The average level of education among respondents was1, implying that on average the women respondents had primary level education achievement. These findings are significant especially recalling that the average level of education of the respondents was primary education.

4.2 Correlation analysis

This is used to measure the linear relationship between the dependent and independent variables. The association measured is not expected to exceed |0.5| beyond which we term the association as having Multicolinearlity from table below, we found out that all pairs of the relationships were below the threshold value implying that there is no Multicolinearlity.

The established relationship established between under-five mortality was negative with health care costs, employment status and education while positive relationship with wealth index and gender while health care cost is negative correlated to gender and child birth order but positively correlated with employment status, wealth index and education. Employment status was negatively correlated with wealth index and positively related with gender, education and child birth order.

Wealth index on the other hand was only positively related with education but negatively related to gender and child birth order while gender was negatively associated with education and positively related with child birth order. Finally, education is negatively related child birth order.

The computation of our correlation results as shown in the table below.

Table 4.2: Correlation results

Variables	U5M	Healthcare costs	Employment status	Wealth Index	Gender of household head	Mothers education	Child birth order
Under Five mortality	1.000						
Healthcare costs	0.1636	1.0000					
Employment status	-0.0420	0.1071	1.0000				
Wealth Index	0.0320	0.1416	-0.0208	1.0000			
Gender of Household head	0.0760	-0.0630	0.0421	-0.0408	1.0000		
Mothers Education attainment	-0.0350	0.1967	0.1450	0.3768	-0.0448	1.0000	
Child birth order	0.0222	-0.1061	0.1438	-0.2634	0.0616	-0.2628	1.0000

4.3 Regression Results

We carried out binary logit regressions for the designed estimation. The coefficients of the logiit model relate to the underlying liner index. Hence the interpretation in this case is normal with respect to the latent variable $y*$ which is unobservable. The coefficients therefore are interpreted to mean changes in logit index with a unit change of the dependant variable.

Table 4.3: logistic regressions for under-five mortality

u5m	Coefficients	Standard Error	z	P>z
Health care costs	-1.778911	.653666	-2.72	0.006
Employment status	-.1116494	.2234593	-0.50	0.617
Wealth index	-.1593177	.1326928	1.20	0.230
Gender of household head	.3078642	.2344377	1.31	0.189
Education levels	-.0513661	.1722678	-0.30	0.766
Child birth order	.0151078	.0451667	0.33	0.738
Constant	.0269269	.3048854	0.09	0.930

Number of observations   = 371

LR chi2(6)   =   14.06

Prob > chi2   =   0.0290

Pseudo R2   =   0.0274

Considering the test of goodness of fit to determine if there are any additional independent variables that are significant by chance, the following results are revealed. First, the p value for the link test regression is 0.0282 indicating that the model has been correctly specified. Our variable of interest that is health care cost is highly significant with a p value of 0.006 given the 5% significant level.

In order to interpret the relationship between U5M and the dependant variables, we computed the marginal effects as shown by the table below:

Table 4.4: Marginal effects of the under five mortality

Number of observations= 371		
Independent variables	Marginal effects	Standard Error
Health care costs	-.4274235	.1516546**
Employment status	-.0268263	.0536203
Wealth index	-.0382797	.0316375
Gender of household head	.0739713	.0558134
Education levels	-.0123419	.0413718
Child birth order	.00363	.0108459

**Significant standard errors

These logistic results show the probability of U5M as a function of healthcare costs, gender, wealth index, education level of the mother and child birth order. We shall give special attention to variables whose coefficients are significant.

From the above table, it was revealed that health care costs are significant factors which have an effect on under-five mortality. The relationship is negative implying that for a unit increase in

health care cost, leads to a reduction in under-five mortality rates in Kenya by 42.7%. This is contrary to our expectation where our prior expectation was postulating a positive relationship. The findings indicate that for a unit increase in health care cost, there is a 42.7% likelihood of reduced under-five mortality in Kenya (P value= 0.006). This may be attributed to the facts that on average, highly advanced procedures for delivery requiring latest technology are ambiguously highly priced as well compared to standard normal deliveries and traditional methods.

In addition to the mode of delivery used in these research project as a proxy for health care cost, during the process of delivery of health care in clinics, it is expected that the use of advanced technology is superior to prior existing technology in terms of service delivery and positive health outcomes and therefore expected to attract higher healthcare costs. Further to that, healthcare costs can also be determined by the degree of training of personnel offering the health service since we expected that the higher the training of a health care worker, the more likely he or she is to make more informed decisions in making treatment choices. It is imperative then to expect higher costs for consuming services from these highly trained medical personnel especially if the services are offered privately or without government incentives.

In addition, well equipped health care facilities that also stock branded medicines and provide attractive ambience for recovery are costly. This is necessary for them to be in order to recover costs by having them born by the patients or their relatives. This kind of facilities are those known in Nairobi and caters for the working class through mostly their private health insurances and cash for the wealthy including other major cities in the country.

Although we used methods of delivery as proxies for healthcare costs, in practice other variants of health care costs are manifest. Using distance and travel time as an alternative proxy for health care costs we highlight the findings by Okwaraji et al (2012). In assessing the impact of travel time and distance to health facilities on child health in rural Ethiopia, they found that distance to health centre had marked influence on under-five mortality outcomes in rural poor setting of Ethiopia. They suggested that were the government to meet this costs by setting up new health centres in those regions and therefore reducing the burden to households, under-five mortality rates would be expected to drop significantly.

Employment in our analysis was shown to have a negative correlation with U5M Outcomes. Mothers who were employed had a 2.6% reduced probability of experiencing U5M compared to that not in employment. The findings however in this paper were not significant at P=95%. This can be attributed to the confounding factors during data collection. It can be said that employment increases the household's income through wages and salaries and therefore children born in those households enjoy the benefits of accessing health care compared to those households where the mother is not employed.

Wealth index exhibited a negative relationship to under five mortality outcomes as expected. In this paper, a unit change in the wealth index of the household reduces the probability of U5M by 3.8% though p value is not significant. This can be attributed to the household's ability to afford healthcare and its costs including descent leaving conditions that are also protective to the health of the young ones.

Gender of household head had a positive correlation to under- five mortality outcomes. A child being born in a household whose head is male had a 7.3% probability of dying before the age of five compared to if the child was born in a household whose head is a female. Though this findings are in agreement with our expectation, its significance at P=95% is not satisfactory since it was 18%. The increased likelihood of survival of the child whose household head is female compared to if it was male can only be understood by explanations of gender equity with which are beyond the scoop of this work.

Education level of the mother had a negative relationship with the U5M outcomes for the period of study. An increase by one level of education of the mother reduces the probability of dying by 1.2%. However, the results were not significant at P=95% significance. This could be attributed to the confounding factors during data collection or the size of the representative sample used. Education in itself is a proxy to understanding health and health behaviours and income of the mother and thus the socioeconomic status of the household. This variable therefore is indirectly positively correlated with the ability to meet costs of health care and thus U5M outcomes.

Child birth order was positively correlated with U5M outcomes. A unit change in birth order increases the probability of U5M by 0.3%. However the results for the correlation were not significant at 95% confidence. This could be attributed to planning factors for the family with

regards to disposable resources available for health care. Children of lower birth order are likely to experience reduced healthcare resources as well as resources for general care at family level compared to those in the higher birth order and hence their survival may be less compared to their siblings in the higher birth order.

4.4 Discussion of the Results

The negative results of the correlation between under-five mortality rates and health care costs were unexpected and raises more a little more to be desired. Even though we used mode of delivery as a proxy for cost of child healthcare, and in the understanding that there are other variants of health care cost such as indirect transport costs, lost man hours and direct non medical financial costs that affect access and utilization of healthcare services, one would have expected a positive relationship between these costs and health care outcomes such as under- five mortality in this case.

However, these results confirms the findings by Filmer and Prichett (1997) Rheingans et al (2012), Novignon et al (2012), Ochako et al and Gupta et al (1999) who found that increased spending on healthcare reduces the impact of disease and therefore better health outcomes for the citizens. Schultz et al in assessing the influence of cost of healthcare on under-five mortality concluded that healthcare costs affected under five mortality rates positively although they were not explicit on the elements of costs they had analysed.

Since infant and child mortality has been and continues to be an important problem in the country the reverse of these findings would have given hope to many needy households and the national government in spending less resources and gaining better child mortality outcomes. However the results would have taken a different turn should the study environment be only where the government spends on all medical expenses and households on non medical ones. At the moment, the Kenyan government offers free maternity services in its facilities. However, the proportion of citizens accessing these services remains a matter of speculation.

In our results, the employment status of the mother had a negative correlation with Under-five mortality rates. As expected these results further affirms the findings by Alves et al (2005), who found that income of the mother was the second strongest determinant of under-five mortality after education. Other scholars of which the findings concur with include but not limited to;

Cornia et al (1997), Filmer and Prichett (1997), Mcquire et al (2002) and Ettarh et al (2012). Employment status on its own is a proxy for incomes of the mother and therefore that of the household. This state of employment and income of the mother directly influences the mothers' choices to access and quality of child health care. In fact, in the Kenyan scenario, mothers who are formally employed will more often than not be enrolled to employer funded private health insurance which increases their access and choice of healthcare their baby can consume compared to their counterparts who are not employed.

It's the desire of every country to eliminate poverty among her citizenry and improve if not perfect the wellbeing of those citizens. Indeed the elimination of absolute poverty and hunger among nations is a millennium development goal just like the reduction of under-five mortality rates b two third that ought to be achieve by the year 2015 which is first approaching. Our finding conforms to these needs to reduce poverty and therefore achieve reduced infant and child mortality rates. Since these findings showed that poverty had a positive correlation to under-five mortalities, it will be important to have cross sector collaboration within the government, the private sector and global patterning in mitigating for these two goals.

These results further affirms the findings by Nattey et al (2013) who studied the relationship between household socioeconomic status and under-five mortality rates and to compare health inequality between socioeconomic quartiles in rural Tanzania. Using a cross sectional study that included 11,189 under-five children residing in7298 households in 2005, they observed that household socioeconomic status had a direct correlation to health care spending among households and were strongly associated with child mortality outcomes in rural Tanzania.

However, our results contradicted the findings by Kyu et al (2013) who established that there was no difference between the very poor households compared to the better to do of households living in slum settlements on infant mortality outcomes. They also found that increasing child age exacerbated the risk of stunting associated with staying in a slum settlement.

We found that gender of household head had a positive correlation with under-five mortality. This can be understood in the context that a greater proportion of a female's income is more likely to be spent on the child as compared to if the income was at the disposal of the male

household head. A mothers income is more likely to be spent on the child in a complex of needs and privileges compared to if the income was at the disposal of the father.

Our findings on the influence of education was in agreement with our projections such that the higher the education attainment of the mother, the lower the likelihood of experiencing under-five mortality. An increase by one year of schooling by the mother reduces the likelihood of experiencing under-five mortality by 1.2%. This also affirms the findings of other studies by Mariara et al (2012), Mutunga et al (undated) and Alves et al (2005) who demonstrated that education attainment by the mother explained more of the under-five mortality rates than do other variables that they had considered in their work. Further consistency is noted with Thomas et al (1987), Muluye et al (2012), Schultz et al (1984), Filmer and Prichett (1997) and Nattey et al (2013)

Our findings though in agreement with these previous studies, did not show significance except that our results demonstrated negative relationship between education and under-five mortality. We therefore opine that education beyond primary level may only provide limited benefits to children born of those mothers compared to those with complete primary education and therefore under-five mortality outcomes.

Child birth order was also found to have appositive correlation with under-five mortality during the period we analysed. It is our view that these results can in a way be explained by the resource constraints that accompany households getting more and more children though the reasoning may not be absolute. If this is true then the principle element of interest as regards health care and health outcomes such as under-five mortality in our case is the issue of access and lifestyle changes within households. No wonder the campaign for smaller family sizes have been cherished by the government to discourage higher birth orders and increase chances to access to quality health care.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary and Conclusion

This study investigated the effects of health care costs on under five mortality outcomes in Kenya by using secondary data analysis from Kenya demographic and health survey of 2008/2009. Health care costs remain the most important factor that influence utilization and access to child health care in the country among other factors including those considered for analysis in this study. Our approach for the analysis of the existing relationship between Healthcare costs and under-five mortality was based on binary logit model which illustrated the linear relationship between these variables with Under-five mortality as dependant variable.

Results of the binary logit model of probability for under-five mortality show that healthcare costs, mother's employment status, wealth index, gender of the infant, education attainment by the mother and child's birth order all influence under-five mortality outcomes in Kenya to various corresponding degree.

Contrary to our expectation, health care costs are negatively correlated to under-five mortality outcomes in Kenya. These results are consistent with the findings by Novignon et al (2012) which showed that health care expenditure had a positive relationship in increased life expectancy at birth, reduced deaths and infant mortality rates. They demonstrated that both public and private healthcare spending had significant positive relationship with health status even though public health spending had higher effect on the outcomes but inconsistent with the findings by Ellis and Mwabu (2004) who studied distance, cost of travel and household incomes and how they affect the mode of transport as proxies of health care costs and its effects on utilization of health care services. They suggested that if walking was the only means of transport to seek health care services, then the potential choices affected by the three factors would be duly restricted in their model and therefore utilization and health care outcomes would have been better enhanced in rural Kenya.

Employment status of the mother had a negative relationship with under-five mortality outcomes in the study sample and therefore a true reflection of the Kenyan scenario. These results can be

associated with socioeconomic status of the household since employed on its own is a proxy for better income and better access to healthcare courtesy of income and insurance. Employment can also be associated with Education since in most cases work opportunities require certain educational qualifications and the higher the education the more likely that the individual will be in employment.

These findings are consistent with the findings by Thomas et al (1987) Schultz et al (1984), Kyu et al (2013), Wafula et al (2012), Nattey et al (2013), McQuire et al (2002) and Christophe et al (2007). This further confirms the significance of mother's employment status in determining under-five year olds survival probabilities. However this findings contradicts the finding by Kishor et al (1998) which showed that mothers who are employed have a 10 percent higher infant-mortality rate and a 36 percent higher child-mortality rate than mothers who are not employed.

Wealth index had a negative influence on under-five mortality outcomes in this study. This findings were consistent with our expectations since the mere element of predisposition to resources directly influences choices and ability to overcome barriers to access to health care and therefore associated with positive health outcomes of children from these households. These findings were consistent with the work of Filmer and Prichett (1997). In their work, they demonstrated that household incomes influenced child mortality outcomes with high average incomes implying lower under five mortality rates while high income inequality implying high under five mortality. However the degree to which income influences child mortality has not been established so as to conclude that the higher the income the more likely the survival chances of the infant. This is true since it is expected that there will be a certain threshold beyond which wealth and income may not necessarily have an influence on child mortality rates.

Gender had a positive relationship to under-five mortality in this study. We used the dummy variable male=1 and 0 if otherwise implying that males have higher likelihood of dying compared to the females. The explanation to this outcome is thus purely biological and outsides our scope. These results are consistent with the findings of Mustafa et al (2008) who established that breast feeding, ethnicity and sex of the child in that order were increasingly significant in determining infant mortality outcomes.

Education attainment of the mother had negative correlation to under-five mortality in Kenya for the period under study. These results were consistent with the findings of Mariara et al (2012), Mutunga et al (undated) and Alves et al (2005) who demonstrated that education explained more of the under-five mortality rates than other variables that they had considered in their work. Further consistency is noted with Thomas et al (1987), Muluye et al (2012), Schultz et al (1984), Filmer and Prichett (1997) and Nattey et al (2013)

5.2 Policy recommendation

Infant and under-five mortality in Kenya has decreased over the last decades although the rates of decrease is slow if the country was to achieve its millennium development goal. This calls for additional efforts in order for the Millennium Development Goal of reducing under-five mortality by two thirds by 2015. In the 2008/2009 KDHS data, under-five mortality was reported to be 74 per 1000 while the infant mortality alone was 52 per 1000. With the target year fast approaching, this rates are way above the recommended 33 per 1000 for under-five mortality for Kenya.

The aim of this study was to assess the effects of healthcare costs and other correlates under-five mortality also known as child mortality rates. We focused on proxies of health care costs and other variables that could have an effect on child mortality outcome. We also discussed our estimation methodology and we therefore argue that the logit estimation was most appropriate for our purpose.

Our results highlight certain areas where Kenya needs number of possible interventions that could help the country get closer to achieving MDG 4 on time. However we understand by now the challenge the country faces in respect to time but nevertheless it's never to later to realize this dream. While econometric estimates must always be interpreted with caution – owing to problems with the underlying data, simplifications in the modeling of the relationships between variables, and the estimation procedure itself –, we are confident that our results can be a useful tool to inform the necessary policy discussions.

Most importantly, we find that at Kenya's under-five mortality rates strongly correlate with healthcare costs implying that the higher the spending on health care the less likely the country experiences increased under-five mortalities. Like every entity, the country faces varied

challenges with respect to opportunity cost of spending on health care among other needs. However, it's our firm recommendation that the government considers seriously the Abuja declaration which recommended that governments spend at least 15% of their respective budgets on healthcare. For instance, during the current financial year the allocation for the ministry of health was allocated 4.5% of the national budget equivalent to Kenya shillings 47.4 billion way below 15% as recommended by WHO.

This study further affirms the role of education, employment and income in achieving better health care outcomes and reducing child mortalities. With respect to these findings we further add our voice that as long as the government remains constrained with resources, increased investments in education and industry in order to create jobs and therefore incomes is encouraged and strongly recommended. This will not only see a decline in under-five mortalities but shall be a beacon for the country to anchor on as they aim to achieve its development agenda.

Against the backdrop of overall improvements in health care and the reduction in infant mortality, we conclude that boys have benefited relatively more from such developments than girls. Insofar as this uneven development is owing to a cultural preference for boys, a renewed push for the protection of the rights of the girl child can be expected to yield further reductions in infant mortality.

While the number of very young mothers has already declined over the last decade, presumably resulting in lower infant mortality rates, our results suggest that additional efforts to reduce smoking, increase birth spacing, and increase the duration of breastfeeding could make a significant contribution to further reduce infant mortality rates. Public awareness campaigns, such as those already put in place by the government against smoking, could be tailored to the specific target audience of smoking young women and mothers, and stepped up to include campaigns for family planning (in terms of birth spacing) and the benefits of breastfeeding. If applied in a sustained and well targeted fashion with broad geographical and social outreach, such campaigns have the potential to be a cost effective and powerful tool in combating infant and under-five mortality.

Concerning education, our results suggest that additional efforts in increasing girls' and women's education levels – while contributing to the achievement of MDG 3 (promotion of gender equality) – would also create synergies with MDG 4, since a mother's education has a negative and statistically significant impact on infant mortality.

In summary, our study suggests that Kenya needs to build on past achievements by stepping up efforts to further reduce infant and under-five mortality, in order to achieve MDG 4. The most efficient policy interventions are likely to be increased public spending on the health sector especially on the programs that affect mother and child healthcare. The allocation of 4.5% of the national budget is not substantial. In this regard, its upon the government to consult with its policy makers at the ministry of health and other relevant departments for term to have a clear cut policy that aim to reduce infant and child mortality and save Kenyan parents the suffering they undergo in losing their young ones. Increased public spending in these areas could thus be a more efficient tool for achieving the desired development outcome

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