THE EFFECT OF EDUCATION ON THE HEALTH OF CHILDREN UNDER-FIVE YEARS: SOME EVIDENCE FROM GHANA

BY

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DECLARATION

This is to certify that this thesis is the result of research undertaken by **MAXWELL AGYEMANG** towards the award of Master of Philosophy degree in Economics in the Department of Economics, University of Ghana. I hereby declare that with exception of references made to works of other researchers, which have been duly acknowledged, this thesis is entirely my own work under the guidance of my supervisors and neither part nor whole of it has been presented for another degree elsewhere.

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ABSTRACT

The conditions of child health have improved around the globe with the passage of time. Though this improvement in children's health has also been witnessed in Ghana, it has been slow and unevenly distributed across the country. Ghana's child health indicators are still below the average conditions that prevail worldwide. The under-five mortality rate in Ghana is still higher than the average rate around the world and a relatively higher percentage of the children below age five in Ghana suffer from Acute Respiratory Infection, diarrhoea and fever than their counterparts in other parts of the world. On the average, a child in Ghana is more at risk of stunting, wasting or being malnourished than the average child worldwide.

Considering the immense significance of children to the survival of our society, the development of a strong labour force and the future economic development, policies must be developed to remedy the situation. Health is multidimensional in nature, ranging from biological to social and psychological dimensions. A number of factors have been investigated to determine their effect on child health and maternal education is one of the prominent factors that have often been mentioned. However, the influence of maternal education on child health in Ghana is largely unknown and as a result, child health policies in Ghana have ignored maternal education.

This study investigates the effect of maternal education on under-five mortality, prevalence of ARI, incidence of diarrhoea and occurrence of fever using logistic regression. The findings reveals that higher maternal education significantly reduces the occurrence of mortality, incidence of diarrhoea, prevalence of ARI and occurrence of fever among children below age five in Ghana. Hence, the study urges policy makers to encourage higher female education through the use of direct and indirect incentives. Education should also be made accessible to every female, whilst the disparity in economic and social conditions that prevail among households should be evened out.

DEDICATION

I dedicate this work to the entire Agyemang family as well as friends whose tireless efforts and support have carried me through my graduate studies.

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I thank God Almighty for his amazing grace and blessings that have carried me safely through this programme even at the time I treaded a very precarious path. I want to also extend special appreciation to my supervisors Dr. Louis Boakye-Yiadom and Dr. Edward Nketiah-Amponsah who through their amazing support, tolerance and guidance nurtured my simple ideas into this final piece.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ARI	Acute Respiratory Infection
BMI	Body Mass Index
CDF	Cumulative Density Function
DPT	Diphtheria, Pertusis and Tetanus
DRC	Democratic Republic of Congo
GCMH	Ghana Commission on Macroeconomics and Health
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GSGDA	Ghana Shared Growth and Development Agenda
GSS	Ghana Statistical Service
GFATM	Global Fund to fight AIDS, Tuberculosis and Malaria
IFLS	Indonesian Family Life Survey
JHS	Junior High School
KDHS	Kenyan Demographic and Health Survey
LPM	Linear Probability Model
MDGs	Millennium Development Goals
MDAs	Ministries, Departments and Agencies
MoH	Ministry of Health

NUHDSS	Nairobi Urban Health and Demographic Surveillance System
NLSY79	National Longitudinal Survey of Youth 1979
NLSY79CY	National Longitudinal Survey of Youth 1979 Children and Young Adults
NHSP	National Health Survey of Pakistan
ORT	Oral Rehydration Therapy
OLS	Ordinary Least Square
OECD	Organisation for Economic Co-operation and Development
PMI	President's Malaria Initiative
RHN	Regenerative Health and Nutrition
RBM	Roll Back Malaria
SRH	Self Reported Health
SOWC	State of the World's Children
U5M	Under-five Mortality
UK	United Kingdom
UN	United Nations
UNICEF	United Nations Children's Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.0 Background

Health has become paramount on the global development agenda in recent years as the international community seeks to achieve a better world with decent standard of living. This is evident in the numerous health programmes that governments and development agencies have pursued to address the health challenges like child and maternal mortality, outbreaks of epidemics, malnutrition and risky health behaviours. Counting from the Alma Ata declaration in 1978 at Kazakhstan, programmes such as Roll Back Malaria (RBM) partnership launched in 1998, the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) set up in 2002 and the President's Malaria Initiative (PMI) launched in 2005 by the United States (US) have all been pursued in an attempt to improve health around the globe. Even the Millennium Development Goals (MDGs) have largely focused on improving health (WHO, 2009).

The considerable priority that has been given to health issues emanates from the immense economic benefits of good health and especially, the realization of the injurious consequence that ill health has on the poor and most vulnerable in society due to loss of income and high healthcare costs. Children especially those under five years are the most handicapped individuals in our society and hence achieving better health for children must be a social responsibility.

Better child health is not only crucial for improving the health conditions of the entire society but also, it is fundamental to achieving a better world in this 21st century. Childhood is the foundation of the world's hope for a better future and the preservation of current human race depends on better health of the young generation. According to UNICEF (2007) "the true measure of a nation's standing is how well it attends to its children - their health and safety, their material security, their education and socialization into the societies in which they are born." In spite of these obvious fact, "the childhood of many are under treat and our collective future is been compromised" as noted by Kofi Annan in the 2005 UNICEF report. He also noted that whilst poverty denies children their dignity, endangers their lives and limit potentials, diseases are also taking their love ones from them and killing them as well.

There is no doubt that Africa is the poorest continent in the world. The high poverty in Africa has aggravated the problems of poor health among children and women on the continent and has therefore often placed the continent at the centre of many health promoting programmes. Ghana is involved in this struggle to promote good health and has implemented programmes such as free health care for pregnant women and a national health insurance scheme. The nation in 2006 also adopted and piloted the concept of Regenerative Health and Nutrition (RHN) from Dimona which is a community of African Hebrews in Israel as part of efforts to reduce the incidence of preventable diseases. Furthermore, development programmes like the Vision 2020 implemented in 1996 and Ghana Shared Growth and Development Agenda (GSGDA) of 2010 have all focused on improving health and nutrition (National Development Planning Commission, 2010). In spite of all these

health programmes, the nation is still in search of solutions to the myriad of health problems especially those facing children and women.

Education is one social factor that is widely known to have a large and persistent effect on the health of a population. In fact, the health of a population is the product of the interaction of their environments, psycho-social conditions, genetic inheritance and socio-economic statuses of which education is crucial. It is reported that age-adjusted mortality rate of high school dropouts between ages 25 and 64 in the US as at 1999 was twice as large as the mortality rate of those from colleges (National Vital statistics report, 2001). According to Higgins et al (2008), those with low education are more likely to die younger and are at higher risk of poor health throughout their lives. Grossman (2005) claims that "years of formal schooling completed are the most important correlate of good health". He explains that education increases one's efficiency to use healthcare to generate better health outcomes. Hence the more enlightened an individual is, the more likely the individual can use medical resource to stay healthy. Schultz (1999) also recognizes that there is a correlation between a parent's higher education and lower child mortality.

A casual glance of the educational statistics and under-five mortality rate across the ten regions of Ghana provides some support for the positive correlation between improved education of parents and good child health. In 2008, the Northern Region ranked the highest with 65.7 percent of its female population being uneducated whilst the Greater Accra region was the least with 7.7 percent uneducated female population. The under-five mortality rate for the northern region and the Greater Accra region in 2008 were 137.0 and 50.0 per 1000

live births respectively (Ghana Health Service, 2009). Similarly, as the educational attainment of mothers improved from 1988 to 2008, the percentage of children who suffer from diarrhoea and ARI declined over that time period. The proportion of female adults in Ghana who had some level of education rose from 60.3% in 1988 to 71.8% in 2003 whilst the percentage of children who suffered from ARI declined from 20% to 10%. Over the same period between 1988 and 2003, the percentage of children who suffered from diarrhoea declined from 26.3 percent to 15.2 percent (GSS, 2003)

1.1 Statement of the Problem

In recent times, Ghana has made some gains in improving the health conditions among children. However, the nation is far from solving these health problems which is evident in the fact that the country lag behind in terms of achieving the health objectives of the MDGs. The conditions of child health in Ghana are worse than the average conditions around the globe. The incidence of under-five mortality in the country as at 2009 was 69 per 1000 live births whilst the global average value was 60 per 1000 live births that year (WHO 2011). Furthermore, about 28.6 percent of children below five years in Ghana are estimated to be stunt whilst 20.3 percent of these children are under weight (GHS and GSS, 2009). Diseases, mainly diarrhoea and Acute Respiratory Infection (ARI) are afflicting pain and suffering on Ghanaian children on daily basis. According to the Ghana Demographic and Health Survey (GDHS) conducted in 2003, 15.2 percent of children under-five years suffered episodes of diarrhoea whilst 10 percent of the children suffered from ARI. The nation's poor child health problems are further characterized by a wide disparity in health status of children at varying geographical areas or economic circumstances.

Remedies for these health problems cannot continue to emphasize on increasing health spending since the bulk of health expenditure in Ghana comes from the national purse and the Government of Ghana is faced with huge financial constraint. There is also the problem of inefficiency that characterizes government spending and as such the financial and social sectors of the economy must be reconciled to design a comprehensive scheme to solve the health problems.

Such a scheme must be broader and multi-sectoral in nature so as to recognize and integrate the contribution of other sectors of the economy to health. Education is one sector that has been found to be a major contributor to the health of children as reported by Schultz (1993), WHO (2004), Grossman (2005) and Higgins et al (2008). Since highly educated parents are more likely to earn higher income, these parents are able to allocate more resources to the health of their children. Even when all parents are provided with equal resources for the health of their children, the highly educated ones are able to effectively use these resources to derive higher health benefits. This is because the highly educated mothers are able to access and use health knowledge much better than mothers with lesser education. For the fact that the highly educated parents are more likely to lose higher income in the event that they have to skip work to attend to a sick child, they have higher incentive to invest in the health of their children.

Policy makers in some countries, upon recognizing the effect of education on health have incorporated formal education into their health policies that target children. For instance, the US has included targets for high school completion rate as part of its national health policy

whilst the Government of Britain has raised the compulsory schooling age to 18 so as to reap the potential health benefit (Seager, 2009). In Ghana, the integration of education into health policy is very subtle. The national health policy by way of addressing health needs of children only emphasizes the need for a healthy environment and the maintenance of regularly mandatory exercise in schools (MoH, 2007). Consequently, the US and Britain have better educational attainment for their population as well as better health conditions for their children. Between 2000 and 2010, whilst female net primary school enrolment in Ghana was 76 percent, the US and United Kingdom (UK) boasted of 93 percent and 100 percent respectively for the same period. Under-five mortality in those two countries were far lower at 5 per 1000 live births for UK and 8 per 1000 live birth for US compared to 69 per 1000 live birth for Ghana (WHO, 2011)

A possible explanation for the little premium placed on education in Ghana's health policies is the fact that the contribution of education to health in the country may not be known and relatively little research has been done in this area. For example, an investigation by the Ghana Commission on Macroeconomics and Health (GCMH) into cross-sectoral factors that affect health ignored education and focused on health insurance, access to water and sanitation, and human resources capacity at village level (WHO, 2004). Studies that have investigated the relationship between health and education in Ghana are scanty and have focused mainly on educational effect on health behaviours (Addai, 2000 and Tagoe and Dake, 2011). The present study explores another side of the relationship between education and health in Ghana. It focuses on the effect of mothers' education on the health of their children.

1.2 Research Questions

This study seeks to find answers to the questions on how education affects children's health in Ghana. In particular, it seeks to address the following questions:

- What is the effect of mother's education on under-five mortality?
- How is fever among children aged under-five years influenced by a mother's education?
- Does the education of mothers affect the occurrence of diarrhoea?
- Are children of highly educated mothers less prone to Acute Respiratory Infections (ARI) compared to those of less educated mothers?

1.3 Objective of the Study

The study explores the relationship between education and health in Ghana. The overall objective of this study is to determine the contribution of education to health stock in Ghana so as to inform policy and programmes on achieving good health. In specific terms, the study will seek to find the effect of educational attainment of mothers on the following health outcomes among children under-five years in Ghana

- Incidence of under-five mortality
- Occurrence of diarrhoea
- Incidence of fever
- Presence of ARI

1.4 The Scope of the Study

The study attempts to find the effect of educational attainment of mothers on the health outcomes of children under-five years. The present study focuses on maternal education. According to Caldwell (1979) "Maternal education is the single most significant determinant of the gapping differences in child mortality such that no other socio-economic determinant of child mortality has the impact of maternal education and in their totality they do not even come close to explaining the effects of maternal education." The study also seeks to find the marginal effect of mother's education on the incidence of mortality, presence of ARI, diarrhoea and fever among children under five years.

The study only focuses on quantitative measures of the relationship between educational attainment and the health of children. The qualitative measures of the effect of educational attainment on health outcomes is not considered in this work

1.5 Justification for the Study

The study considers child health because of the inherent long term economic and social benefits associated with better child health outcomes. At a time when the indicators of child health in Ghana is below the world average and there are ongoing efforts to find policies that improve this situation in the country, a study of this nature is very crucial. The study looks at a health variable that is ignored in Ghanaian health policies, so the findings of this study will inform policy in this area.

At a broad level, there is the belief that activities of the health and educational sectors should be efficiently coordinated since the two sectors are closely related and they also take a huge

proportion of the national budget. The World Bank reported that countries spend one third of their budgets in the health and education sectors (World Development Report, 2004). In the 2012 national budget of Ghana, the health and the education sectors took 35.67 percent of the annual budgetary allocation to government Ministries, Departments and Agencies in 2012 (MDAs) (Ministry of Finance and Economic Planning, 2012). The outcome of the study will contribute to this discussion

The study adds to existing literature by studying the effect of educational attainment of mothers on child health in Ghana

1.6 Organization of the study

The study is made up of six (6) chapters. The second chapter presents an overview of child health and maternal education in Ghana, whilst chapter three reviews the empirical literature on the effect of education on child health. Chapter four focuses on the theoretical framework, data and statistical methodology employed for the study and chapter five presents and discusses the main findings from the study. The sixth and final chapter discusses the conclusions and policy recommendations based on the results obtained from the study.

CHAPTER TWO

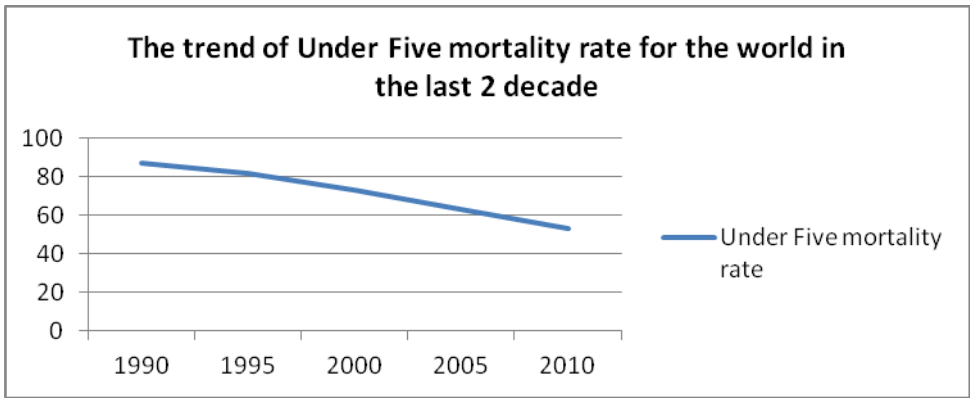
OVERVIEW OF CHILD HEALTH AND MATERNAL EDUCATION

2.1 Introduction

Education and health are two significant factors that affect human capital and the wellbeing of individuals. An assessment of the history of human society reveals a tremendous improvement in the wellbeing of man. However, many societies mainly developing ones like Ghana are confronted with the challenges of poor child health and low level of female education. There are a lot of discussions on how the education of mothers affects the health of children. This chapter presents an overview of child health and maternal education as witnessed in the world, Africa and Ghana.

2.2 The Situation of child health and maternal education globally

Since the convention of the right of the child was adopted after the United Nations' general assembly in 1989, substantial progress has been made in improving the health conditions among children globally. The convention consolidated the gains from the Alma Ata conference in 1978 and formed a key building block for the MDGs which were functioned to achieve better health conditions among children. Currently, health conditions among children are better than they were two decades ago. The number of children who die before their fifth birthday globally has declined from 12 million in 1990 to an estimated figure of 6.9 million in 2011. This represents a 41 percent decline of global under-five mortality rate from 87 deaths per 1,000 live births in 1990 to 51 in 2011 (You, New and Wardlaw, 2012)



Source: UNICEF 2012

Figure 2.1 Trend of Under-Five Mortality rate in the World

The diagram above shows the declining global trend of under-five mortality in the last two decades after the adoption of the convention of the right of the child.

Aside the declining under-five mortality rate observed around the globe, the disease burden and epidemics that beleaguered children have also declined over the years. Improved vaccines together with increased immunization have reduced the recorded cases of diseases. UNICEF in its 2012 report of the State of the World's Children (SOWC) estimated that about 2.5 million under-five deaths are averted annually through immunization against Diphtheria, Pertussis and Tetanus (DPT) and measles.

Indeed some progress has been made in improving the health of children globally but it is still insufficient. According to UNICEF (2012), on average 19,000 children below five years die daily whereas a total of 6.9 million of them die annually around the world. A lot of these children also suffer from several diseases mainly respiratory infections, diarrhoea and malaria.

Currently, respiratory diseases predominantly pneumonia is the world's leading cause of death in children under age five. It is estimated that two million children die yearly from pneumonia worldwide. This means that more children die from pneumonia than AIDS, malaria and measles combined (UNICEF, 2010). The second most dangerous disease that torments children worldwide is diarrhoea. In 2010, approximately four billion global cases of diarrhoea were reported among children below five years and it is believed that the disease led to more than 1.5 million under-five mortality (representing 17 percent of the global cases). Malaria and malnutrition also greatly affect children worldwide. WHO in 2006 estimated malaria cases to be around 250 million worldwide of which one million death cases were reported. This translates into a child dying of malaria every 30 seconds. In a WHO, World Bank and UNICEF joint report prepared by De Onis et al (2012), 165 million children under-five years were estimated to be stunted in 2011 whilst 16 percent of them were underweight in that year. The problem of malnutrition and hunger among children persist in many regions of the world. In addition to this, 270 million children live in what amounts to a health care desert – lacking access to even the most basic healthcare provisions (UNICEF, 2004). It is regrettable when one considers the fact that a lot of children suffer and die from diseases that are easily preventable such as pneumonia, diarrhoea and malaria.

The progress in improving child health is further undermined and derailed by unequal health conditions experienced by children in different regions of the world. The rich economies of developed countries experience greater and rapid improvement in child health than the struggling economies of developing countries. UNICEF in its 2012 report – levels

and trends in child mortality – asserts that the fraction of under-five mortality that occurs in Africa and Asia is not only large but also growing. For instance, in 1990 the possibility of a child below five years dying in Sub-Sahara Africa was 12.1 times higher than in developed countries, however this probability has risen to 16.5 times that of developed economies in 2011. Furthermore, of the 24 countries that still had under-five mortality rate above 100 per 1000 live births in 2011, none is a developed country. According to UNICEF (2004), many children in developing countries succumb to respiratory, diarrhoea and early childhood ailments which are virtually nonexistent in developed countries. The health disadvantages that confront children in developing countries are staggeringly higher than their counterparts born in developed countries.

2.3 The trend of female education in the world

There exist a symmetrical relationship between the global trends of child health and that of female education. Just as progress has been made in improving child health, the recent trends in female education provide some optimism (UNICEF, 2006). There has been increased participation by females at various levels of education. The last three decades have witnessed increase in female enrolment at college level by sevenfold (World Bank, 2011). Many countries have achieved gender parity at primary school level and even the World Bank estimates that 53 percent of primary school pupils around the world are females.

Though this is a significant improvement in female education, gender disparity in education has not been totally eradicated. In many countries especially developing countries, girls are confronted with schooling disadvantages. The female-male enrolment ratio falls

dramatically as one continues the gender enrolment comparison up the educational ladder. Given this continuous decline in female-male ratio up the educational ladder, and the fact that the general enrolment is lower in developing countries than in developed countries, it is not surprising that disparity in female literacy is observed across the various regions of the world. Table 2.1 shows female literacy rate for various regions of the world.

Table 2.1 Female Literacy Rate among the Various Regions of the World

Region	Adult literacy rate (%)		Number of adults unable to read and write (in thousands)		
	Total	Female	Total	Female	Female %
Developed	99.0	98.9	8,358	4,921	58.9
Commonwealth of independent states	99.5	99.4	1,061	750	70.7
North Africa	67.3	58.1	36,290	23,408	64.5
Sub Sahara Africa	62.5	53.6	175,871	110,123	62.6
Latin America and the Caribbean	91.0	90.3	36,065	20,111	55.8
Eastern Asia	93.8	90.7	70,233	51,577	73.4
Southern Asia	61.9	50.9	412,432	261,764	63.5
South-Eastern Asia	91.9	89.5	32,782	21,685	66.1
Western Asia	84.5	76.9	21,332	15,271	71.6
Oceania	66.4	62.6	1,750	967	55.3
World	83.4	78.9	796,165	510,577	64.1

Source: UNESCO Institute for Statistics

The developed and rich regions host the highest female literacy whilst the poorer regions have lesser percentage of their female population being literate. This is because the richer regions have more resource and are able to invest more in education. Differences in cultural and social factors have also contributed to the disparity in female literacy among the regions.

2.4 Child health and maternal education in Africa

When one compares the past to present times, it will be observed that health conditions of children in Africa have improved. Children born in Africa now have higher chance of surviving than those born just a decade ago.

Despite the fact that better health conditions have been achieved among children in Africa, the progress that has been made is the least in any part of the world. The region lags behind the rest of the world as it continues to be the region with the highest under-five mortality, high disease burden among children and the worse growth and development of children.

According to Kinney et al (2009), although the population of Africa is just about 11 percent of the world's population, the region accounts for 50 percent of all the under-five mortality that occur across the globe. The assertion by Kinney et al (2009) re-echoes Anyanwu and Erhijakpor (2007) assertion that out of the total of 10 million cases of under-five mortality that occurred globally in 2006, nearly five million of those cases representing 50 percent occurred in Africa. The region is also currently witnessing a situation in which every 1 in 9 children born in the region dies before age five. This is more than 16 folds of the average of 1 in every 152 birth for developed regions and far more than 1 in 16 for Southern Asia (UNICEF, 2012). When the trend of under-five mortality in sub-Sahara Africa is compared to other regions in the world, it comes off worse. In 2011, under-five mortality for Sub-Sahara Africa stood high at 109 per every 1000 births relative to the world's average of 51 per 1000 births. The improvement in under-five mortality has been slower in Sub-Sahara Africa than the other parts of the world and as a result, it has widened the under-five

mortality rate between the region and the rest of the world. Table 2.2 below shows how Sub-Sahara compared to some selected MDG regions through time.

Table 2.2 The Trend of Under-five Mortality Rate in Sub-Sahara Africa and Other Regions of the World

Region	1990	1995	2000	2005	2010	2011
Developed regions	15	11	10	8	7	7
Developing Regions	97	91	90	69	57	32
North Africa	77	59	45	34	26	25
Sub-Sahara Africa	178	170	154	133	112	109
Latin America and the Caribbean	52	43	34	26	22	19
Eastern Asia	48	45	35	24	16	15
Southern Asia	116	102	88	74	63	61
World	87	82	73	63	53	51

Source: UNICEF, 2012

The region's worse child health is not limited to unfavourable under-five mortality alone but also disproportionately high disease burden. As indicated earlier, Sub-Sahara Africa inhabits only 11 out of every 100 people in the world, yet approximately 90 percent of all malaria deaths including those among children under age five occur in the region (UNICEF, 2010). Similarly, 37.5 percent of all cases of measles and 32.2 percent of all neonatal tetanus cases were recorded in Africa in 2009 (WHO, 2011). The region together with Asia accounts for the vast majority of deaths due to pneumonia and diarrhoea. Out of 2197000 cases of

pneumonia and diarrhoea that resulted in under-five mortality in 2010, 1078000 representing 49 present, occurred in sub-Sahara Africa (UNICEF, 2012). Furthermore, children in Africa are more likely to be either stunted or underweight. The 2011 world health report estimates that 30 million out of 115 million children under five years (representing 26 percent) who are under-weight lives in Africa. The region is greatly lagging behind the rest of the world in terms of improving the horrific health conditions that stare children in the face.

The trend of female education in Sub-Sahara Africa also mimics the progress in child health in the region. With the passage of time, female education has improved and more women in the region can read and write now than it was twenty years ago. In the 2011 World Health Statistics, adult literacy in the region is reported to have increased from 51 percent for the period of 1990-1999 to 63 percent in 2000-2008. According to Burris and Duncan (2009), the number of school-aged children who were not in school between 2002 and 2006 decreased by 18 million (representing 19 percent) from 115 million to 93 million. This fact is re-echoed by World Bank report which asserted that the number of out-of-school girls in Sub-Sahara Africa has decreased from 25 million in 1999 to 17 million in 2008. Female to male primary completion ratio between 1990 and 2008 increased from 0.78 to 0.91 for Africa (World Bank, 2011).

Indeed there has been progress in female education in Africa but it has been the slowest in the world and it is very unevenly distributed. In most of sub-Saharan Africa (excluding Southern Africa), women's literacy rates ranged from about 50–60 percent between 1990 and 2007. This is much lower when compared to the increase from 76 to 84 percent of

literacy rate among women in Europe (Kinney et al, 2009). Table 2.3 shows how Sub-Sahara Africa compares to other parts of the world in terms of gross percentage of females who completed secondary education.

Table 2.3 How Female Education in Sub-Sahara Africa Compares to Other Selected Regions

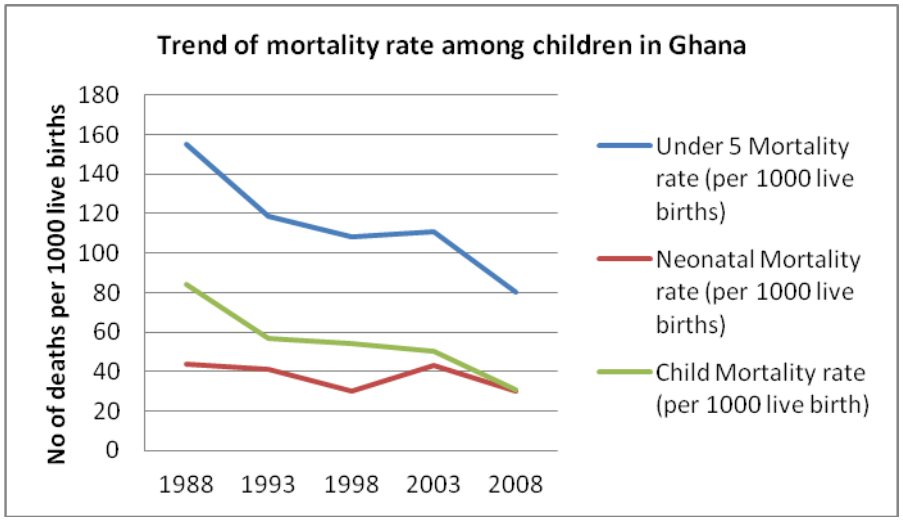
Region	Gross Percentage of females with Secondary education	Percentage of males with Secondary education
Africa	38	44
Sub-Sahara Africa	30	37
Asia	58	63
Latin America and Caribbean	94	88
World	65	55

Source: SOWC, 2011

2.5 Trend of Child health and Maternal Education in Ghana

The health conditions including child health have significantly improved in Ghana. Saleh (2012) opines this fact by asserting that Ghana's achievements in improving health are admirable when compared to other sub-Saharan countries but lags behind when compared to the global average conditions. The tendency of children dying or falling sick in Ghana are to a larger degree better now than they were in past.

From the time of Ghana's independence to 1988 when the first Demographic and Health Survey was conducted in the country, the country's under-five mortality rate fell progressively. The next twenty years that followed also witnessed a decline in the rate from 155 per 1000 live births in 1988 to 108 per every 1000 live births in 1998. The phenomenon however picked up slightly to 111 in 2003 (Johnson, Ruststein and Govindasamy, 2005) but has since fallen to 78 per 1000 live births (UNICEF, 2012). The diagram below shows the trends of under-five mortality, neonatal mortality and child mortality in Ghana as measured by the last five demographic health surveys.

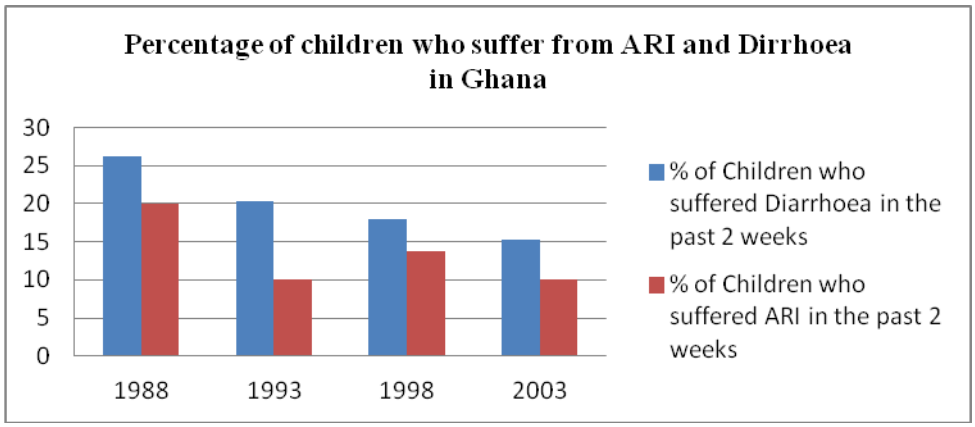


Sources: GDHS 1988, 1993, 1998, 2003, 2008

Figure 2.2 Trend of Mortality Rate among Children in Ghana

This has translated into a decline in the risk of a child born in the country dying before his fifth birthday. Hill (1993) reports that the probability of a child under-five years to die in Ghana was 0.371 in 1936. This fell to 0.164 in 1980, 0.111 in 2003 and 0.080 in 2008 as per the Ghana Demographic and Health Surveys in 2003 and 2008.

There has also been consistent improvement in reducing disease burden faced by children born in Ghana and today they are faced with lesser risk of falling sick than it was in the past. The percentage of children who suffer from diarrhoea and ARI in recent times has been declining consistently over time. Whereas approximately 26 out of every 100 children below the age of five stood the risk of being infected with diarrhoea in 1988, the risk faced by children in the same age category fell to 15 out 100 in 2003. In terms of ARI, twenty percent of children were reported to have shown the symptoms of ARI in 1988. This fraction has subsequently fallen and ranges between 10 to14 percent in 2008 (GDHS 2008). The trends of the proportion of children who were reported to be ill from ARI and diarrhoea between 1988 and 1993 is shown in the graph below.

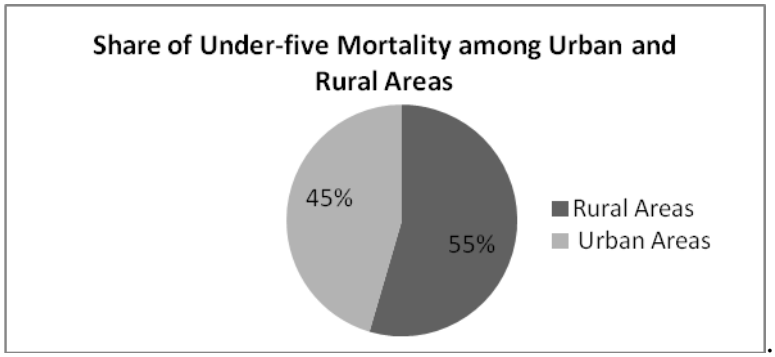


Source: GDHS 1988, 1993, 1998 and 2003

Figure 2.3 Trend of Prevalence of ARI and Diarrhoea among Children in Ghana

Despite the fact that some progress has been made in reducing under-five mortality and the incidence of diseases among children in the country, the improvement has been slow. The nation's under-five mortality rate of 78 per 1000 children is still above the global average of

51 (UNICEF, 2012). Furthermore, the nation is characterized by a wide variance in the incidence of diseases among rural and urban dwellers in the country. The rate is higher in the rural area of the country than in the urban settlements.



Source: GDHS 2008

Figure 2.4 The Urban - Rural Distribution of Under-Five Mortality in Ghana

The pie chart shows the fraction of under-five mortality that occurred in the urban and rural areas respectively in 2008. Under-five mortality is higher in rural Ghana where 55 percent of the phenomenon occurred.

Furthermore, a gapping disparity in child health is also witnessed across the ten regions of Ghana. The Greater Accra and other regions in the south and middle belt of the country have favourable child health conditions than the three regions in the northern part of the country. This difference in child health observed across the regions in the country is epitomised by the pattern of under-five mortality within these regions. This disparity in child health among the regions can largely be explained by the difference in the economic conditions prevailing in these regions. The regions in the south and middle belts are richer than the regions in the northern regions in Ghana. Table 2.4 shows the trend of under-five mortality among the regions over the last 2 decades.

Table 2.4 The Trend of Under-Five Mortality Across the Regions in Ghana

UNDER FIVE MORTALITY BY REGIONS OF RESIDENCY					
Region	**1988**	**1993**	**1998**	**2003**	**2008**
Upper West	**221.8**	**187.7**	**155.6**	**208**	**142**
Northern	**221.8**	**237**	**171.3**	**154**	**137**
Central	**208.2**	**128**	**142.1**	**90**	**108**
Eastern	**138.1**	**93.2**	**89.1**	**95**	**81**
Ashanti	**144.2**	**97.6**	**78.2**	**116**	**80**
Upper East	**221.8**	**180.1**	**155.3**	**79**	**78**
Brong Ahafo	**122.6**	**94.6**	**128.7**	**91**	**76**
Western	**151.2**	**131.8**	**109.7**	**109**	**65**
Volta	**132.7**	**116.4**	**98**	**113**	**50**
Greater Accra	**103.8**	**100.2**	**62**	**75**	**50**
National	**155**	**119**	**108**	**111**	**80**

Source: GDHS 1988, 1993, 1998, 2003 and 2008

The Greater Accra region has consistently had lower rate of under-five mortality whilst the Upper West and the Northern region have experienced high rate of under-five mortality. Possible explanation to this phenomenon is the fact the Greater Accra Region has more healthcare facilities and more health workers per square area, richer population and more educated people. The percentage of literate female population is higher in the Greater Accra Region.

Female education in Ghana has improved albeit slow progress in recent years. The literacy rate among women in the country has increased whereas the discriminatory barriers that hindered the girl child from going to school have greatly been eliminated. The proportion of females without any formal education has declined from the national average of 39.7 in 1988 to 21.2 in 2008. In spite of the reduction in the percentage of females without education, the urban female population in Ghana tends to be more educated than their rural counterparts. It was estimated in 2008 that one out of every ten females in the urban areas of Ghana was without formal education. However, this fraction of females in rural areas of Ghana who have never had formal education is three times that of the urban centres. The ten regions also show varied percentage of females without education. Greater Accra has the lowest level of female illiteracy with a percentage of 7.7 whilst 65.7 percent of females in northern region have never had formal education (GHS, 2010).

The trends of child health and female illiteracy have both fallen over time and are more favourable in urban areas than in rural areas. A casual glance of the distribution of female illiteracy and under-five mortality rate across the ten regions of Ghana show a positive correlation between them. This is depicted in the following scatter diagram which is constructed from the data obtained from the 2008 GDHS.

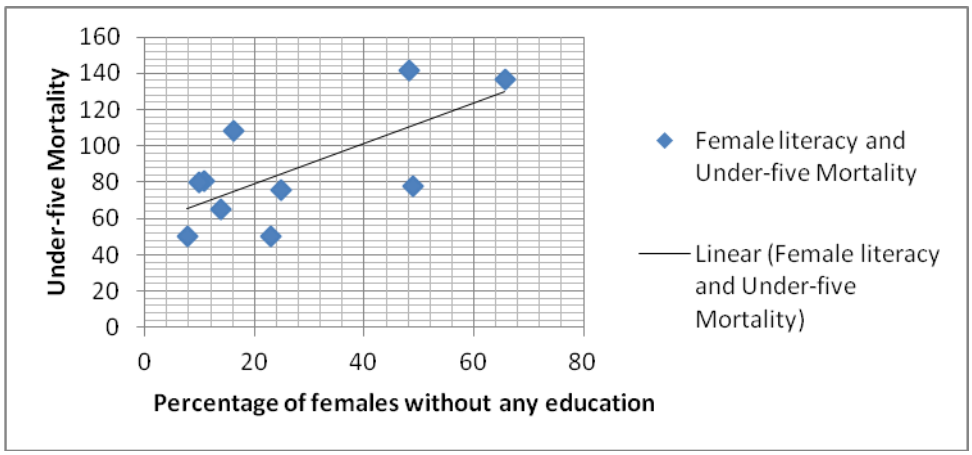


Figure 2.5 Under-Five Mortality and Female Illiteracy Relationship in Ghana

In 2008, the northern region was ranked the highest with 65.7 percent of its female population being uneducated whilst the Greater Accra region had the least uneducated female population of 7.7 percent. The under five – mortality rate for the northern region and the Greater Accra region in 2008 was 137.0 and 50.0 respectively (Ghana Health Service, 2009). Education and health are seemingly positively correlated in the country.

2.6 Conclusion

The global trend of child health has generally improved as under-five mortality and the prevalence of diseases that beleaguer children are declining with the passage of time. Children born in today's world are at less risk of dying or falling sick than it was in the time past. Despite the improvement in child health, many children are still vulnerable and susceptible to dying or falling sick. The progress in bettering the health conditions of children has been characterized by severe disparity of health among the various regions of

the world. The richer countries have made rapid progress whilst developing countries stagger in their pursuit of good health for their children.

Sub-Sahara Africa remains the worse place in the world for a child to be born. Children in this region face a high risk of dying or suffering from the pain of avoidable diseases. Every 1 out of 10 children born in Sub-Sahara Africa die before he or she attains five years. The region also accounts for high proportion of pneumonia, diarrhoea and malaria cases reported among children. Again, most children in the region are either under weight or stunted as a result of malnutrition. Clearly, one cannot be excited about the progress that has been extremely slow. Whilst children in the region are challenged in terms of health conditions, the female population in region also has the highest proportion being illiterate. The barriers to girl child education persist and the region lags behind the rest of the world in terms of female education. Effective policies ought to be designed to hasten the process of attaining good health conditions for children in the region as well as achieving desirable level of literacy among women in the region.

The case of child health and female education in Ghana reminisce that of Sub-Sahara Africa. Though the country compares favourably to the average conditions in Sub-Sahara Africa, it falls short when compared to the rest of the world. A child below five years in Ghana stands a 7.6 percent risk of dying whilst the average global risk of such a child dying is about 5 percent. Children in Ghana are more prone to suffering diarrhoea, pneumonia and malaria than the average global case. Interestingly, the health risk varies for children across the country. Children who are fortunate to be born and live in urban areas have higher

possibility of surviving beyond age five and living healthier lives than those born in rural areas of Ghana. Across the regions, those children living in the northern regions of Ghana are greatly disadvantaged in terms of health. Education of women in the country also follows a similar pattern and an attempt to relate child health problems and female illiteracy among the ten regions of the country reveals a positive correlation.

Given that the health of the children of any nation is a significant determinant of the future wealth of that nation, improving the health of the children should be given an utmost priority. However, policy makers ought to find out how to promote child health. Can better child health be advanced in Ghana by increasing maternal education? An enquiry to ascertain a precise answer to this question is worth it.

The next chapter reviews various relevant literatures on the effect of maternal education on child health.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter presents a broad review of the literature on the effects of education on the health of children under-five years. The study commences with a review of the relationship between education and health. Emphasis is placed on the effects of mother's education on the health status of children later on.

Contrary to what seems to be the case, there is no absolute consensus among researchers regarding the exact effects of education on the health status of people. This disagreement among researchers is more pronounced when the discussion is centred on the effects of mother's education on the health status of her children.

In fact, a number of arguments have been raised regarding the relationship between education and health, the effects of education on health status of people and more importantly, on the effects of parent's (or mother's) education on the health status of their children. Empirical studies have been conducted to support either side of the argument. This section will look at the empirical studies conducted on the theme. But prior to this, the current study presents the theoretical perspective underpinning the research.

3.1. Theoretical Review

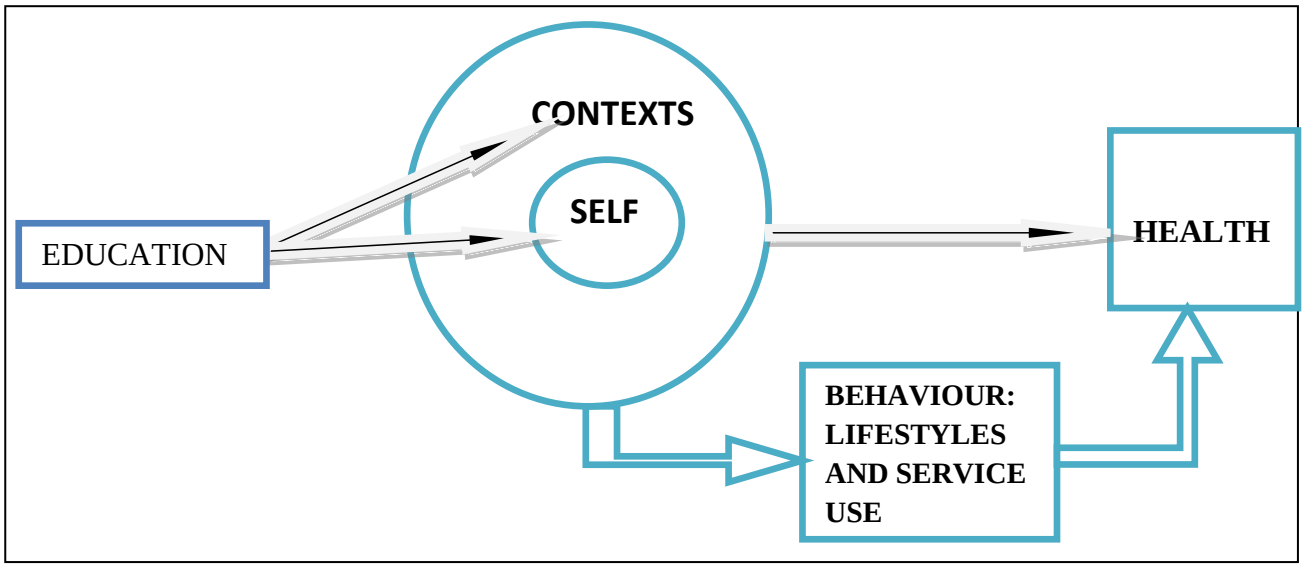
3.1.1 Psycho-social concept of the relationship between education and health

A number of theories have being espoused in an attempt to explain the relationship between education and health in general. Feinstein et al (2006) developed a conceptual framework depicting the education and health relationship that considers key aspects of psycho-social development, health behaviours, social context and qualification. The model was base on Bronfenbrenner's ecological perspective (Bronfenbrenner, 1979; 1986). Founded of the idea that an individual exist in several spheres of life and interacting contexts of which each of them have implications for his health, this model highlights the channels through which health is affected by education. Health as considered in the model is not merely the absence of disease but rather "state of complete physical and social well-being" as defined by the WHO constitution (WHO, 1946). This conceptualisation of health relies on psychological measures of health based on self-report rather than absence of morbidity. As such, one's health depends on his or her self concept or personality. Among other things like competencies, capabilities and identity capital, the self consist of belief, valuation of the future and resilience. These components of the self – belief, valuation of the future and resilience – influence one's health.

However, one's concept of him or herself however does not exist in isolation but in a social context in which the individual experiences dynamic interaction with others in terms on social relation. The social context varies from a small immediate group such as family to a larger distant group like a nation.

The model explains that education influences the individual's personality or his or her self concept as well as the context in which the individual find him or herself. For instance a more educated individual is more likely to believe in him or herself, behave well, have an optimistic view of the future and related better to others than a less educated person. This implies that education affects one's self concept and then conveys the effect of education onto how the individual behaves. In terms of context, a highly educated society will have improved sanitation, better social order and better economic system than less educated society. The model explains that the impact of education on the self and the context affect the health of the individual directly or indirectly.

Education improves one's belief in himself and value of the future which boost his state of mind and thus his health. Also the improved self concept improves his health behaviour in terms of low alcohol consumption, lower tendency to smoke and engage in safe sex. Furthermore, such individual will make better health investment in terms of usage of health service. In the broader term of context, education improves the social relation which in turns improves the health of the individual. For instance improved education improves the sanitation of the society which then positively affects the health of the individual. This psycho-social relationship between education and health is depicted in the diagram below.



Source: Feinstein et al (2006)

Figure 3.1 A Diagram Showing the Psycho-Social Perspective of How Education Affect Health

In brief, the theoretical framework shows that education affects the personality as well as the context in which the individual relates with others. The individual's personality (including state of mind) and the context have implications on the person's health. Also, what the individual thinks of himself and his relationship with others influence his behaviour in the form of lifestyle and service use which affects his health.

3.1.2 Education as a social determinant of health

Related to the psycho-social concept of education and health is a social determinant theory espoused by Higins et al (2008). In this concept, education is identified to be an important social determinant of health. The benefit of education exceeds economic gains to include better health outcome. People's participation in the educational process improves their involvement in social engagements and hence produces a vital channel for achieving a safer,

cohesive and healthier society. On the micro level, the individual experience and the social skill produced by education help the person to be able to better access information and service and use them to improve his or her health as well as the family's health. To depict the entire interdependence of health and education, the theory adds the economic influence of education on health. Education and health are explained to be influenced by a number of mediating factors which are classified as either social or economic factors and are not specific to health or educational policies.

3.1.3 The Grossman Model of health

The Grossman's model of "demand for health" (Grossman, 1972) also provides a theoretical basis for the association between health and education. The model on demand for health provides the conceptual framework for analyzing the interaction of socioeconomic factors that influence the demand for and production of health.

According to the model, health can be considered as a commodity and hence demand for health can be viewed as demand for a commodity 'health' whilst in a similar manner, health can be viewed as a product that is produced from factor inputs.

The theory explains that utility is derived from good health as much as satisfaction is derived from other consumption goods. Good health is therefore desirable and the more of it that an individual gets, the higher the welfare of the person. Hence an individual's utility function depends on his or her health stock and all other goods consumed. Thus,

$$U = f(H_t, Z_t) \quad t = 0, 1,...,n \qquad 3.1$$

Where U is the individual's level of utility, H_t is health stock at time t and Z_t is index for all goods in time t.

The indifference curve which shows health and consumable goods choices that gives the same level of utility, exhibits all the characteristics of a normal indifference curve. It exhibits diminishing marginal utility or benefit which means that additional units of successive "health goods" yields lesser utility to the consumer. Hence, the consumer will give up a smaller amount of "consumable goods" for every extra unit of "health good" if his utility is to remain the same. Given that he enjoys the same "consumable goods", an increase in "health good" moves the consumer to a higher indifference curve and raises the welfare of the individual. Consequently individuals prefer more of better health to less of it.

The individual can increase his health stock by investing in his health in the form of usage of health services, exercises and better dieting. However, the individual's health stock also depreciates with time and the relationship between the individual's present and future health stock is expressed as;

$$H_{t+1} - H_t = I_t - \delta H_t \qquad 3.2$$

Where I_t is health investment at time t (present period), δ is depreciation in health stock, H_t is health stock at time t (present period) and H_{t+1} is health stock at future time.

Furthermore, a person's ability to obtain more utility is constrained by the prices of health goods, prices of consumer goods and his limited income which depends on his labour hours and the wage rate paid to the person. Hence, the individual maximises his utility subject to the constraint:

$$wT_w = (\text{Income}) = P_M M + P_Z Z \quad 3.3$$

Where W is wage rate, T_W is labour hours, P_M is price of health inputs, M is quantity of health input, P_z is price index of all goods and Z is quantity index of all consumer goods.

The Grossman model also indicates that the consumer goods and health goods in the individual's utility functions are produced. Hence, individuals produce their health status by combining health inputs such as food, environment, medical care, exercise, water, heat among others. This relation uses the economics concept of production function which expresses the relationship between health input and health outcome. The model expresses individual production functions for health stock (health investment) and consumer goods as;

$$I_t = f(M_t, TH_t, E) \quad 3.4$$

$$Z_t = f(X_t, T_t, E) \quad 3.5$$

Where M is medical care use, TH_t is time spent seeking health, E is education, X is vector for factors of production and T_t is time for producing consumer goods.

The production function gives the relationship between the stock of health one can achieve with combinations of health inputs for a given state of technology and education over a given period of time. Therefore improvement in the state of technology increases the efficiency in producing health output from a given amount of health inputs thereby producing more health. Similarly, better educated individuals are in a better position to understand and implement information about their health. Therefore the ability to turn health inputs to desired health outcomes depends on the state of the quality and amount of education. Higher education leads to higher health outcome from a given set of health inputs

which implies that greater education leads to greater efficiency. Since this study focuses on the influence of education on child health, emphasis will be on this production concept of health.

The theory recognizes the income constraint of the individual which limits his or her ability to consume as well as produce as much health goods as he or she may desire. The individual has limited income and time whilst health inputs are also obtained at a price. Consequently, the individual can consume quantities of health goods and consumer goods that are permissible by his income and time. In a similar way, since health depends on health inputs which are obtained at a price, the consumer can produce limited health given his income and time. In terms of time, all persons have equal time period to distribute among the labour hours, leisure period, investment in health and time spent on sick bed. Thus,

$$T_0 = 365 = T_I + T_W + T_L + T_S \qquad 3.6$$

Where T_0 is the total number of days available to everyone in a year, T_I is time invested in health, T_L is time for leisure, T_W is time for work and T_S is time spent on sick bed

Hence total time available to an individual less leisure is;

$$T_0 - T_L = 365 = T_I + T_W + T_S \qquad 3.7$$

In its entirety, the Grossman model posits that a person demands "health good" for the intrinsic value that it possess for improving welfare whilst the health stock of the individual is a product of health inputs and the production of the health stock depends on the quality and volume of education. However, the quantity of health that the individual can consume and produce is limited by the individual's income, time and the prices of health inputs.

3.1.4 Mother's education and child health model

McCray and Royer (2006) in their inquiry into the effect of female education on fertility and infant health built a model reminiscent of the Grossman model that relates mother's education and child health.

The model expresses infant health to be dependent on maternal choice variables (such as smoking while pregnant) and maternal endowments like the genetic constituents of the mother. The maternal endowments are fixed but the maternal choice depends on the educational level of the mother which affects her use of health inputs. Education affects the fertility rate of women and their child investment choices through their involvement in the labour market and life choices. Whereas education is a vehicle through which the earnings of women are increased, it also serves to increase the knowledge women have on healthy pregnancy behaviours, use of medical inputs, preventive and curative care and contraceptive use.

Thus, the demand for health inputs is influenced by resources, endowments, and the demand for schooling where resources refers to non-schooling factors that affect a mother's choice of health inputs such as income.

The model recognizes child health as a product of genetic factors, economic factors, health input and social factors like mother's education. It highlights the potential for heterogeneous education effects as there are several mechanisms by which education could potentially improve infant health

3. 2 Review of Empirical Literature

This section presents a review of empirical works on the relationship between health and education, and this is achieved under four specific groups. The review of the empirical works begins by considering the causal relationship between health and education and the mechanisms through which each of them affects the other. These discussions help to explore the general relationship between health and education. Building on the relationship between the two social factors, the effect of education on mortality with emphasis on how maternal education affects child health is also discussed next, followed by how health affects morbidity among children. The final categorization of the review of empirical literature is a consideration of studies that focus on the influence of education on anthropometric characteristics.

3.2.1 The causal relationship between health and education

The controversies over the relationship between education and health even commence at the fundamental question of the causal relationship between education and health. There is no agreement on the causal relationship between health and education. Some researchers argue that better health leads to better educational outcome whilst there are others who harbour the opposite view that higher education leads to better health. Some researchers also maintain that the causal relationship between education and health is difficult to determine because both education and health are influenced by other factors in similar ways.

The first view of education being dependent on health is supported by the work of Miguel and Kremer (2004) which investigated the effect of a mass treatment of deworming in

Kenyan schools. Though their work could not show that the treatment lead to a change in school performance, it indicated an increase in school participation by 25 percent.

Contrary to the view that education depends on health, some studies argue that education has a causal effect on health.

Fayissa, Danyal and Butler (2011) used the National Longitudinal Survey of Youth 1979 (NLSY79) panel data set from 1979-2006 for a cross-section of 12,686 individuals to investigate the effect of educational attainment on the health status of an individual as measured by "the inability to work for health reasons." Employing a wide variety of models including the fixed-effects model, random-effects model, between-effects, and the Arellano-Bond dynamic models to control for unobserved heterogeneity, educational attainment is found to have a statistically significant and positive effect on the quality of an individual's health status (Fayissa, Danyal and Butler, 2011).

On the other hand, Silles (2009), using school reform as an instrumental variable, employed regression discontinuity and found that additional years of schooling reduce the long term effect of education on self-reported illness in the United Kingdom.

A study by Oreopolus (2003) on the effect of increasing the number of years of compulsory schooling years on health in England and Ireland supports the causal effect of education on health. Similar studies by Arendt (2005) and Spasojevic (2003) in Demark and Sweden respectively yield similar results.

An enquiry by Curie and Moretti (2002) into the openness of college education to women and its effect on educational attainment and child mortality reveals a causal relation between mothers' education and child health. They found that mothers with education have healthier children and hence concluded that the health of a child depends significantly on maternal education.

The third perspective about the causal relationship between health and education argues that both health and education depend on other socioeconomic factors which in turn cause them to move in the same direction. Proponents of this view argue that because of the presence of these other mediating factors, the difference in health status among groups of people with different educational attainment cannot be solely attributed to education.

Clark and Royer (2010) in an attempt to estimate the health effects of education exploit two changes to British compulsory schooling laws that generated sharp differences in educational attainment among individuals born just months apart. Using regression discontinuity methods, they confirm that the cohorts just affected by these changes completed significantly more education than slightly older cohorts subject to the old laws. However, the study finds little evidence that this additional education improved health outcomes or changed health behaviours. As a consequence, the authors concluded that it is very hard and inappropriate to attribute these findings to the content of the additional education. Differently put, the study results suggest a caution in respect of health interventions that focused on increasing educational attainment, a target of recent health policy efforts.

Cultler et al (2006) also argue that since the number of people who could not participate in schooling because of poor health has reduced with time, the gradient of education should diminish. Yet, the gradient of education is increasing and it suggests that changes in health are not entirely explained by changes in education. Unobservable variables such as family background, genetic characteristics and work environment all influence health status as well as education.

Lillard, Simon and Ueyama (2006) used an IV approach to examine the causal effect of mother's high school education on child health using the 1979-2002 waves of the National Longitudinal Survey of Youth 1979 (NLSY79) and the 1990-2002 waves of the National Longitudinal Survey of Youth 1979 Child and Young Adult (NLSY79CY). Instrumenting education with a rich set of education policy variables, it was found out that a mother who completes high school is more likely to report that her child was ill enough to need a doctor. Across samples of mothers who dropped out of high school and those who completed high school, the study finds no difference in the date of their children's last routine health check up, percentiles for weight-for-age, height-for-age, Body Mass Index (BMI)-for-age, or in the probability of children at risk of overweight and of being overweight. Examining the possible mechanisms, the authors found that mother's high school education increases mother's age at child's birth, health insurance coverage and child care use indicating a suggestive evidence of a much more complex set of behaviours that are causally related to education (child care use, health insurance status, fertility decisions) and that likely affect child health. In this regard, the authors were quick to caution that much more work needs to be done before one can strongly conclude that child health does or does not systematically vary with differences in maternal education.

3.2.2 The mechanism through which education affects health

Related to the contrasting views of the causal relationship between education and health is the discussion on the channels through which education affects health. A number of studies try to explain how higher educational attainment affects health outcome and vice versa as observed in health – education relationship in general as well as from mothers to their children.

Altindag, Cannonier and Mocan (2010) conducted an investigation of the allocative efficiency hypothesis by analyzing whether education improves health knowledge using data from the 1997 and 2002 waves of the NLSY97. The survey design allows us to observe the increase in health knowledge of young adults after their level of schooling is increased by differential and plausibly exogenous amounts (Altindag, Cannonier and Mocan, 2010). Using nine different questions measuring health knowledge, the study finds weak evidence that an increase in education generates an improvement in health knowledge for those who ultimately attend college. For those with high school as the terminal degree, no relationship is found between education and health knowledge. As a result, of these findings the authors concluded that the allocative efficiency hypothesis may not be the primary reason for why schooling impacts health outcomes and that further investigations are needed to handle these contrasting results.

In a study that aimed at exploring whether there is any relation in education, gender, and health for Pakistan, Asghar, Attique and Urooj (2009) using data collected by Pakistan and Medical Research Council under National Health Survey of Pakistan (NHSP 1990-1994) employed both exploratory data analysis and ordinal logistic regression. The authors find evidence that individuals with higher education level tend to have better health status than

persons with lower level of education. There is also evidence of gender being an important determinant of health in Pakistan. Thus, Asghar, Attique and Urooj (2009) asserted that education affects health not because of the knowledge and practices one can learn at school, but rather it shapes an individual's life and can alter the characteristics of an individual to be healthier. After controlling for employment, individual characteristics, socio-economic status, they still found education to be a significant determinant of the Self Reported Health (SRH). However, the group with less than primary education is barely significant whilst the other groups of educational level are highly significant.

Angeles, Guilkey and Mroz (2003) explain that education could serve as a proxy for such unobservable determinants as ability, motivation and parental background, as these factors are the most likely important determinants of a woman's educational attainment. The authors posit that, the above reasoning is true owing to the fact that the estimated impact of education on fertility most likely includes the impacts of these unobserved factors as well as the true education effect. Using the 1993 Indonesian Family Life Survey (IFLS), Guilkey and Mroz (2003) compare the estimated impacts of education on fertility from a simple model that assumes the exogeneity of education on one hand and an unobserved factor model that allows for endogeneity of schooling on the other. The findings provide key evidence that the importance of female education as a means of reducing fertility is unambiguously positive. However, the researchers cautioned that using empirical model that does not control for endogeneity would overstate the results for Indonesia due to the phenomenon of self-selection of a woman's educational status (Angeles, Guilkey & Mroz, 2003).

Caldwell (1994), in explaining how greater maternal education evolves into better child health indicated that educated mothers are more likely to take their children to a health centre for preventive and curative care. Furthermore, the study argues that educated mothers want to take control of things and feel more responsible to ensuring good health for their children. These actions which seem more deliberate, Caldwell (1994) argues that they are rather internalized and form part of the subconscious of educated mothers as they journey through the formal education process. The uneducated mothers on the other hand tend not to understand the formal health institutions and modern science medicine and hence patronize less of it.

3.2.3 Education and mortality

One dominant measure of health outcome is the population's mortality rate. Several studies have been undertaken to understand and measure how educational attainment affects the possibility of an individual dying. Whilst some of these studies have been conducted across different countries, others have focused on the households within a particular country or society.

Abuqamar, Coomans and Louckx (2011) examined the impact of parental education on infant mortality in Gaza. To achieve their objective, the researchers conducted face to face interviews with 550 mothers of infants of whom 275 of them had their babies living and the other 275 agonizing from the tragedy infant mortality. The authors employed logit analyses to identify the relationship between health behavioural factors and infant mortality. The result of a binary logistic regression showed that the families with lower educational level had a much higher risk of infant mortality. There was a positive statistical association

between parental education and survival of infants. These findings underscore the importance of explicit attention to health education.

Osei-Kwakye et al (2010) use case control study to examine the determinants of under-five mortality among mothers in the Builsa district in the Upper East Region of Ghana. The Upper East Region has experienced significant decline in under-five mortality than any other region in the country and the researchers sought to find out factors that have contributed to this success. The researchers by matching 60 mothers with a control group of 120 mothers on the basis of age, sex and place of residence, gathered data to estimate the determinants of under-five mortality in the district. They found education not to be a significant determinant of under-five mortality in the district but rather, they found that children who have never had vitamin A supplement were 10 times more likely to die, whilst children born to mothers who have previously experienced child death were 8 times more likely to die too. Hence, they argued that health personnel should pay more attention to mothers who have experienced child death before. Though their work is a pioneering study in Ghana, it is limited to a small district in the Upper East Region and cannot be used to generalize for the entire country.

The study conducted by Kan (2010), was primarily motivated by his conviction that although a negative relationship between schooling and health has been observed by social scientists, these associations may not necessarily represent a causal effect due to the presence of omitted variables or reverse causality from health to education. Taking advantage of a compulsory education reform in Taiwan, Kan (2010) attempted to identify the impact of education on health, as measured by mortality using data from the 2000 Population Census and the 1999–2008 death records of Taiwan, where there was an

extension of compulsory education from six to nine years. The results of the study suggest that education does have an impact on mortality for men, but not for women.

Also, Mondal, Hossain and Ali (2009) studied the influencing factors on infant and child mortality of suburban and rural areas of Rajshahi District, Bangladesh. A multivariate technique is employed to investigate the effects of those variables (i.e. socioeconomic and demographic) on infant and child mortality using primary data. The study results reveal that several socioeconomic, demographic and health-related variables affect infant and child mortality. Multivariate analysis results indicate that the most significant predictors of neonatal, post-neonatal, and child mortality levels are immunization, ever breastfeeding, mother's age at birth and birth interval. Parents' education, toilet facilities and treatment places are significant predictors during neonatal and childhood period while father's occupation is significant at post-neonatal periods. Specifically, risk of neonatal mortality is 31.4% lower among the women having primary education and 52.3% lower among the women having secondary and higher education than those having no education. It is observed that the risk of child mortality is 32.0% lower among households having hygienic toilet facilities than those who do not have such facilities. Similarly, risk of child mortality decreased with increased female education and wider access to safe treatment places. So, attention should be given to female education and expansion of public health system for reducing the risk of infant and child mortality.

Through an analytical cross-sectional design through secondary data analysis of the 2003 Kenyan Demographic and Health Survey (KDHS) dataset for children, Mustafa (2008) fitted series of logistic regression models to select the significant factors affecting infant mortality both in urban and rural areas. The study reported breastfeeding, ethnicity and sex of the

child as the significant determinants of infant mortality in the urban areas while birth order and intervals were the significant determinants of infant mortality in the rural areas. The study recommended that the focus of interventions in child health should be on the social and economic empowerment of women via education and employment while breastfeeding promotion should be encouraged (Mustafa, 2008). In the words of the author, "policies and efforts have to be put to improve women education and occupation environment" (Mustafa, 2008).

Employing a panel regression on data from Demographic and Health Surveys for 22 developing countries, Desai and Alva (1998) also examine the effect of maternal education on three markers of child health: infant mortality, children's height-for-age, and immunization status. In contrast to other studies, this study argues that although there is a strong correlation between maternal education and markers of child health, a causal relationship is far from established. Specifically, introducing controls for husband's education and access to piped water and toilet attenuate the impact of maternal education on infant mortality and children's height-for-age. This effect is further reduced by controlling for area of residence as maternal education continues to have a statistically significant impact on infant mortality and height-forage in only a handful of countries. However, maternal education remains statistically significant for children's immunization status in about one-half of the countries even after individual-level and community-level controls are introduced.

3.2.4 Education and diarrhoea

To assess the association between maternal illiteracy and frequency of childhood diarrhoea, Shukr, Ali, Khanum and Mehmood (2009) conducted a cross sectional study using data on 200 mothers of children between 1-2 years of age. One hundred children belonged to breastfed group and 100 to bottle-fed group. All mothers lived in houses with piped water supply, filtered drinking water in immediate neighbourhood and latrines inside the house. Husbands' educational status varied between matriculate to intermediate and earning between Pak Rs 7000-9000/month. The incidence of diarrhoea was analyzed for both groups of children after stratifying mothers' education into 4 categories nil to class 3, class 4 to 9, metric and intermediate to graduate. Results obtained indicate that, for the breast-fed group the frequency of diarrhoea annually varied from 0.41 for highly educated mothers (intermediate to graduate) to 2.182 for uneducated mothers ($p=0.001$). As a consequence, the authors concluded that the frequency of diarrhoea was more in less educated mothers. This suggests that one of the interventions aiming to reduce diarrhoea should be to improve maternal education status.

Sastry and Burgard (2008) examine changes in diarrhoea prevalence and treatment in Brazil between 1986 and 1996. Over the ten-year period, there was a small decline in diarrhoea prevalence but treatment with Oral Rehydration Therapy (ORT) increased greatly. According to Sastry and Burgard (2008), the decline in diarrhoea prevalence was largely due to changes in the effects of several key covariates, such as breastfeeding, with only a modest role played by socioeconomic change, infrastructure improvements and other behavioural factors. Also, ORT treatment of diarrhoea was essentially unrelated to child and family characteristics, suggesting that the large increase was due to the success of public health

efforts to promote its use widely. In conclusion, the authors consider the results of the study to suggest that the most effective policies for reducing diarrhoea prevalence are likely to further increase education and the promotion of breastfeeding.

Mensah et al (1998) conducted a study into the risk factors associated with the incidence and persistence of diarrhoea in the slums of Accra. The researchers selected 95 children at birth and followed up on them until they were 2 years to gather data on the incidence of diarrhoea among the children. Data collected also included socioeconomic factors such as mothers' education and sanitation. The study found that more but brief episodes of diarrhoea occurred at the early stage of life whilst long lasting diarrhoea occurs later in the lives of the children. Most episode of diarrhoea occurred after the rains in June and August. Mothers' lack of education, unemployment among mothers and presence of pets at home were found to significantly increase the risk of the child to suffering from diarrhoea. Also lack of education and presence of pets were found to be the major cause of persistent diarrhoea among children in the slums of Accra. The study by Mensah et al (1998) is however limited to the urban slums of Accra and does not hold for the entire nation's situation.

3.2.5 Education and fever

In a study aimed at assessing mothers' education (measured by knowledge and ability to recognize fever in their child, as well as management instituted at home) Oshikoya and Senbanjo (2008) sampled 144 mothers whose children were less than 12 years old and had fever. The findings from data obtained through interviewed with a structured questionnaire give evidence to the hypothesis that mother's education is a strong and enduring determinant of child's health status measured in this study which is the incidence of fever among children

Thuilliez (2010) investigates how schooling affects occurrence of fever. The study utilizes cross-sectional regression model to estimates the effect of school performances (which uses class repetition as a proxy) on the prevalence of fever in Mali. Data from the demographic and health surveys conducted in 2001 and 2006 is grouped by the researcher to provide the needed clusters for the cross-sectional analysis. The result reveals an association between low school performance (in the form of frequent repetition) and high prevalence of fever.

In an inquiry to uncover the sources district spatial variations of childhood diarrhoea and fever morbidity in Malawi, Kandala et al (2006) use individual data of children from the Malawi Demographic health survey conducted in 2000. The authors modelled the spatial effect through Bayesian approach and employed geo-additive probit model to control for the spatial dependence. Children living in cities whose parents had relatively higher education were found to be less affected by fever. Maternal education attainment was found to be a highly significant socio-economic determinant of the occurrence of both fever and diarrhoea.

3.2.6 Effect of education on anthropometric measures

Abuya, Ciera and Kimani-Murage (2012) conducted a study on 5156 children aged 0–42 months using the Nairobi Urban Health and Demographic Surveillance System (NUHDSS). Employing a binomial and multiple logistic regressions to estimate the effect of education on health, maternal education was revealed as a strong predictor of child stunting with some minimal attenuation of the association by other factors. The other factors including child birth weight and gender, marital status of mother, equal power of mother over the household, pregnancy intentions, health seeking behaviour of mother and social economic

status of the household are also independently significantly associated with stunting. The study concluded that mothers' education persists as a strong predictor of child's nutrition even after controlling for other factors.

Also, Aslam and Kingdon (2012) investigated the relationship between parental schooling on the one hand, and child health outcomes (height and weight) and parental health-seeking behaviour (immunization status of children), on the other. While establishing a correlational link between parental schooling and child health is relatively straightforward, the authors reveal that confirming a causal relationship is more complex. Using unique data from Pakistan, the following 'pathways' are investigated: educated parents' greater household income, exposure to media, literacy, labour market participation, health knowledge and the extent of maternal empowerment within the home. The findings are that while father's education is positively associated with the 'one-off' immunization decision, mother's education is more critically associated with longer term health outcomes in OLS equations. Also, Instrumental variable (IV) estimates suggest that father's health knowledge is most positively associated with immunization decisions while mother's health knowledge and her empowerment within the home are the channels through which her education positively impacts her child's height and weight respectively.

Emina, Kandala, Inungu and Yazoume (2011) similarly, examine the association between maternal education and child nutritional status in the Democratic Republic of Congo using data from the 2001 Democratic Republic of Congo (DRC)-Multiple Indicators Cluster Survey. Analyzing data based on chi-square tests and logit generalized estimating equations, the results showed that maternal education is associated with a lower prevalence of simultaneous multiple-malnutrition. In contrast, the prevalence of single malnutrition

indicators "stunting only" or "wasting only" is higher among children whose mothers have secondary education or higher. However, depending on the indicator, the association disappears or appears only after controlling for the province of residence and as a consequence, the authors were quick to warn that future studies on the determinants of children's nutritional status should be based on a clearly defined nutritional indicator. In addition, only national policies integrating education, access to food and use of health service are pivotal to improve child health and nutrition.

Further, Cutler and Lleras-Muney (2010) using a variety of data sets from two countries, examine possible explanations for the relationship between education and health behaviours, known as the education gradient. Their results show that income, health insurance, and family background can account for about 30 percent of the gradient. Knowledge and measures of cognitive ability explain an additional 30 percent. Social networks account for another 10 percent. The researchers argue that their proxies for discounting, risk aversion, or the value of future do not account for any of the education gradient, and neither do personality factors such as a sense of control of oneself or over one's life. Thus, in a nutshell, the authors generally agree to the assertion that, education affects health outcome strongly and positively, although different components of education influence health at varying degrees.

A study by Oyekale and Oyekale (2009) which sought to analyze the effect of mothers' educational levels on child malnutrition used data from the 2000 End-Decade Multiple Indicator Cluster Survey by the UNICEF for Gambia and Niger. Analyzing data with the Foster-Greer Thorbeck approach and Probit regression, they obtained results to the effect that stunting, wasting and underweight are higher in Niger rural and urban areas, while the

severity and depth of stunting, wasting and underweight are higher among children whose mothers had no secondary education for all the countries. The Probit analysis reveals that attainment of secondary education by the mothers, alongside other variables such as urbanization, presence of pipe water, presence of mother and father at home, polio vaccination, breast feeding and access to radio and television significantly reduce the probability of stunting, wasting and underweight. Infection with diarrhoea, fever and age at first polio vaccine were found to significantly increase stunting, wasting and underweight. In this regard, the authors highly recommended that to reduce malnutrition and achieve the MDGs in Gambia and Niger, institutional arrangements for catering for secondary education of girls and ensuring consistency in child health programs must be strengthened, among others.

Medrano, Rodriguez and Villa (2008) used the 1993 South Africa Integrated Household Survey to study the effect that mother's education through the knowledge channel has on children's health using height for age Z-scores as health measure. Under a two-stage least square methodology the authors find that an increase in 4 years on mother's education (approximately 1 standard deviation) will lead to an increase of 0.6 standard deviations on her child's height for age Z-score. They also find evidence to support the hypothesis that mother's education is more important for children older than 24 months of age.

De Walque (2007) tests the hypothesis that education improves health and increases people's life expectancy by analyzing the effect of education on smoking behaviours. To account for the endogeneity of smoking, the study develops an instrumental variable approach which relies on the fact that during the Vietnam War, college attendance provided a strategy to avoid the draft. The results indicate that education does affect smoking

decisions. Specifically, educated individuals are less likely to smoke, and even among those who have smoked before, the educated ones are more likely to have stopped.

In a study, Abuya, Kimani, and Onsomu (2012) sought to determine the effect of maternal education on child health in Kenya, as measured by complete immunization and nutritional status using the Kenya Demographic Health Survey (KDHS, 2003). After controlling for confounding variables, children born to mothers with primary education were 2.17 times more likely to be fully immunized compared to those whose mothers lacked any formal education, ($p<0.001$). For nutrition, unadjusted results reveal that children born to mothers with primary education were at 94% lower odds of having stunted growth compared to mothers with no primary education, ($p<0.01$). Overall, maternal education though was a significant determinant of complete child immunization; it was not significant predictor of nutritional status. Despite these mixed results, the authors admitted that policy implications for child health in Kenya should focus on increasing health knowledge among women for better child health outcomes (Abuya, Kimani, and Onsomu, 2003)

3.3 Conclusion

Some conceptual frameworks have been developed to examine the relationship between health and education. Feinstein et al (2006) uses a psycho-social perspective where education is considered to influence the individual's self concept which in turn influences the health behaviour and health choice of the individual. Higins et al (2008) develop a similar concept that focuses more on social settings. In this model, education is argued to influence individual's social participation which in turn influences health in several

directions. Also, Grossman's model of health demand greatly explains the relationship between health and education. Because health has utility and also affects the individual's ability to be productive, individuals produce as well as invest in their health. As part of a broad model of health, Grossman argued that individuals produce their health using health inputs, exercise, nutrition etc. However, the individual's ability to produce health depends on technology and education. Hence, in a state when everything is unchanged, higher education will lead to healthier individuals.

The chapter also reviewed empirical studies on health and education and explored how these studies validate or nullify the theories and proposed relationship between health and education. Categorising the reviewed literature under the themes; general relationship between health and education, effect of education on mortality, how education affect morbidity and effect of education on anthropometric characteristics, a consistent pattern is evident. Though, there are divergent opinions over the causal relationship between health and education many researchers believe that both health and education are affected by social, economic and psychological factors. Hence in addition to each variable affecting the other, there are other transmission mechanisms. The literature reviewed reveals that, using dynamic regression model or bivariate model mostly logistic model, education significantly affect morbidity, mortality, health behaviour and anthropometric characteristics either directly or indirectly. Maternal education is found to significant affect mortality, morbidity and anthropometric measures among children.

The next chapter discusses the methodology employed for the study.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter details the methodology used for this study. The theoretical concepts underpinning the research, the econometric estimation technique and the data set used for this enquiry are also discussed in this chapter.

Several studies have investigated the effect of education on health by finding out how structural changes in a country's educational system have affected the health of a group of persons belonging to each educational system (Clark and Royer, (2010) and Silles (2009)). These studies often used standard regression discontinuity framework to capture the effect of the educational structure change. Other studies which have engaged in a cross country comparison to examine the effect of education on health regularly use instrumental variables (Arendt (2008) and Oreopoulos (2006)). The binary models are relatively popular when the study utilizes micro level data to investigate the relationship between education and health within a particular nation. These models have the advantage of providing the relative effect of education and other socioeconomic factors on health. Because this study seeks to determine the relative effect of education on selected child health indicators in Ghana and rely solely on micro level data for the analysis, the logistic regression model provides a better estimation method to achieve these objectives.

4.2 Theoretical Framework

4.2.1 The Relationship between Health and Education

Many conceptual frameworks have been developed to explain the relationship between health and education. These include those which viewed the effect of education on health from a psychological perspective where education influences the self-concept of the individual and his or her social participation which in turn affects the health status of the individual. Related to this psychological perspective are other frameworks that emphasize the effect of education as a social factor that influences health. Models by McCray and Royer (2006), Higins et al (2008) and Brunello et al (2011) are popular models that examine the relationship between health and education with emphasis on the social determinants of health. All these psychological and socioeconomic models are grounded on the classical work of Grossman (1972) which created the theoretical framework of human capital model for the demand for health where health is demanded as well as produced.

Though the model developed by McCray and Royer (2006) is specific for child health and mother's education, it is characterised by complexities and it is more suitable for panel studies. Due to its simplicity, the model developed by Brunello et al (2011) is adopted and modified for this study.

4.3 The Model

Based on the Grossman (1972) health demand theory, Brunello's model posits that the stock of health capital enters the utility function as a consumption good because better health increases utility. In other words, households obtain utility from better health (H) of children, consumption goods (C) and risky health behaviours (B) of parents. Thus, utility is denoted

as U(C, H, B) and it is concave in its arguments. The marginal utility of health is characterised by diminishing marginal utility and the marginal utility of consumption (U_C) and marginal utility of risky health behaviours (U_B) vary with health. The utility of the household is depicted as

$$U = U(C, H, B) \quad (1)$$

In addition to healthy children generating utility for the household, children's health is also a human capital. It determines the amount of time and resource that the household can devote to other markets. In an event a child falls sick, the household will have to devote its scarce time and resources to care for the child. The health of the child depreciates over time, and this requires the household to invest in the child's health using health inputs such as medical care, diet, and vaccination. The relationship between the health inputs and health outcome of the child is shown by the production function of child health.

As illustrated by Grossman in his model, whereas medical inputs (M), diet, exercise and other health behaviours affects health, education (E) acts as a catalyst that positively influence the stock of individual health (H). In the case of child health, the health stock of the child can be improved with the use of medication, proper nutrition, use of health equipment and other behavioural characteristics of parents whereas the education of the parent increases the efficiency of health production. For instance, educated parents will be able to properly administer medicine to children than less-educated parents. Lleras-Muney (2005) and Currie and Moretti (2003) all provide evidence that education affects health.

In addition to generating good child health using medical inputs (M) and education (E), the health stock of children (H) also depends on the behaviour of their parents (B) as well as

unobservable traits of the household (such as genetic features, environment, and occupation of key members of the household) which is denoted by μ.

This relationship between health stock of children, medical input, education and the other unobservable factors is expressed by the relation:

$H = F(M, E, B, \mu)$ (2a)

From the above relationship a linear specification of the health production function of children can be expressed as;

$$H = \alpha M + \beta E - \theta B + \gamma\mu \quad (2b)$$

Rationally, households seek to increase their utility from consumption, subject to their child health production function and to their budget constraint. The budget constraint of individuals in this case is given as;

$$P_1 M + P_2 C + B = Y(E, Z) \quad (3)$$

where Y is income of the household, which depends on education and a vector of observable controls Z, P_1 and P_2 are the vector of prices for medical input (M) and consumption goods (C) as well as the price of risky health behaviour (B) which is normalized to 1. If an internal solution exists, the necessary conditions for a maximum are

$U_C - \lambda P_1 = 0$ OR $U_C = \lambda P_1$ (4)

$U_B - \theta U_H - \lambda P_2 = 0$ OR $U_B - \theta U_H = \lambda P_2$ (5)

where λ is the Lagrange multiplier.

The concavity of the utility function implies $U_{HH} < 0$. Since the marginal utility of consumption increase with improved health conditions of the child and the marginal utility of risky behaviours of the parent rises with higher health of the child, $U_{CH} > 0$ and $U_{BH} > 0$. By totally differentiating (3) and (4) and using (1) we find that higher education reduces health damaging behaviours of parents if the following condition holds;

$$|U_{HE}| > \beta\left[\left(\frac{|U_{BH}|}{\alpha} - \frac{|U_{CH}|}{p_2}\right) + |U_{BH}|\right] \quad (6)$$

Households with better education usually earn higher income per a given period of time and have higher expectations for the future than less-educated households. As such, the higher-educated households' value of time is higher and hence, they are expected to suffer a greater loss of satisfaction if they have to take time off to take care of a sick child. Conversely, they should derive a higher utility from better health stock of a child. This is because the resources and the time that they are able to conserve from parenting a healthy child give them a higher utility. Due to this, it is logical to assume that the marginal utility of good child health increases with an increase in education (E). In other words, $U_{HE} > 0$

The optimal consumption plan for the household in implicit form is given by

$$C = C(E, P_1, P_2, \mu, Z) \quad (7)$$

$$B = B(E, P_1, P_2, \mu, Z) \quad (8)$$

Using (8) in (1) and in the utility function yields the "reduced form" health equation for the household

$$H = H(E, P_1, P_2, \mu, Z) \quad (9)$$

and the indirect utility function V = V(E,P_1,P_2,μ,Z). The marginal effect of education on health in (9) is the "education gradient" (HEG). Assuming that the cost of education Γ(E,W), where W is a vector of cost of education shifters, is convex in the years of education, optimal education is given by

$$V_E(E, P_1, P_2, \mu, Z) = \Gamma_E(E,W) \quad (10)$$

4.4 Empirical Estimation

From the discussions so far, the health of a child depends on a number of socio-economic factors as well as the health behaviours of the parent. The relationship between the health stock of the child and education as well as behaviours of the mother is estimated using the regression model:

$$H_i = C + \beta E_i + \alpha_i X_i + \delta_i B_i + \varepsilon_i$$

Where H_i is a measure of child i's health, E_i is the educational level of child i's mother, X_i is a vector of or the socio-economic characteristics that includes geographical area of residence of child i's mother, B_i is a vector of health behaviours of child i's mother, C is a constant term and ε is the error term. (Culter and Lleras-Muney, 2006)

In specific terms, child health will be estimated as

$$U5M = C + \beta E_i + \alpha_1 M_i + \alpha_2 R_i + \alpha_3 W_i + \alpha_4 G_i + \alpha_5 Z_i + \alpha_6 V_i + \alpha_7 A_i + \varepsilon_i$$

$$Fe = C + \beta E_i + \alpha_1 M_i + \alpha_2 R_i + \alpha_3 W_i + \alpha_4 G_i + \alpha_5 Z_i + \alpha_6 V_i + \alpha_7 A_i + \varepsilon_i$$

$$ARI = C + \beta E_i + \alpha_1 M_i + \alpha_2 R_i + \alpha_3 W_i + \alpha_4 G_i + \alpha_5 Z_i + \alpha_6 V_i + \alpha_7 A_i + \varepsilon_i$$

$$Dir = C + \beta E_i + \alpha_1 M_i + \alpha_2 R_i + \alpha_3 W_i + \alpha_4 G_i + \alpha_5 Z_i + \alpha_6 V_i + \alpha_7 A_i + \varepsilon_i$$

Where the health outcome of children is measured independently as under-five mortality (U5M), fever (Fe), diarrhoea (Dir) and presence of ARI (ARI). Each of these health outcomes is estimated as depending on mother's educational level, mother's health behaviours and household socio-economic characteristics which are:

E_i: Maternal educational level

M_i: the income/wealth of the household

R_i: area of residence of household

W_i: presence of treated water

V_i: vaccination of the child

G_i: gender of the child

Z_i is region of residence

A_i: antenatal visit

ε_i: the error term

α_1, α_2, α_3, α_4, α_5, α_6, α_7 and δ_1 are parameters which measures the relative effect of the explanatory variables on each of the individual health outcomes of children.

4.5 Estimation Technique

Studies where the unknown variable or the regressand is qualitative and dichotomous or binary variable, the binary models of Linear Probability Model (LPM), logit or probit are employed. The LPM which allows for the use of Ordinary Least Square to estimate the parameters is plagued with a number of challenges. It is characterized by hetroscedasticity, non-normality of the disturbance term, low R^2 and non-fulfilment of $0 \leq (Y_i/X_i) \leq 1$ restriction of binary models. Though these challenges can be surmounted with a number of

remedies, the LPM assumes that the marginal or incremental effect of the explanatory variables remain constant throughout (Gujarati, 2004). This makes the LPM an unattractive binary model of estimation, though it is the simplest one.

The logit and probit models overcome the problems that the LPM poses. When using micro level data, the standard OLS estimation is not feasible for both the logit and probit. The maximum likelihood method is used to estimate the parameters.

To assess the association between the health outcomes among children and the educational level of their mothers, the study like many other health economics studies that employ micro level data, uses the logit model. The logistic regression predicts the probability of an event occurring (Green, 2003). This statistical model provides a good description of the relationship between the probability of a response which has two outcomes and the variable or variables that influence(s) this outcome.

The logit (natural logs) regression expresses the odds of the unknown binomial variable as linearly dependent on the explanatory variable and this linear relationship is derived from the logistic Cumulative Density Function (CDF).

Given that the probability density function (λ) of the logit distribution is $(l) = \frac{e^{-1}}{(1+e^{-1})^2}$, $-\infty < l < \infty$

Whilst the cdf ($\wedge$) of logit distribution is $P=p(L \leq x', \beta) = \wedge(x', \beta) = \frac{1}{1+e^{-(x',\beta)}}$

The Pr $[y_i = 1|x] = p = \wedge(x', \beta) = \frac{\exp(x',\beta)}{1+(x',\beta)}$

$$P_r[y_i = 0|x] = 1 - p = 1 - \Lambda(x', \beta) = 1 - \frac{\exp(x', \beta)}{1 + (x', \beta)} = \frac{1}{1 + (x', \beta)}$$

The odds ratio = $\frac{p_i}{1 - p_i} = \exp(x', \beta)$

The log odds ratio = $\ln\left(\frac{p_i}{1 - p_i}\right) = x', \beta$

Therefore the Logit(p_i) = $\beta_0 + \beta_i x_i$

Where:

P_i is chance of an outcome,

β_0 is the intercept,

β_i are the coefficient of the explanatory variables

X_i are the independent variables

The model is adopted to provide a good description of the relationship between the occurrence or otherwise of bad health outcome among children and the level of their mother's education as well as all the other factors that influence child health. Applying the model to address the objectives of the study, P_i represents the child health outcomes of U5M, Fe and ARI, β_0 is the intercept, β_i are the coefficients of the explanatory variables whilst X_i are the independent variables.

For each child health measure, the study focuses on only two possible outcomes – whether each outcome occurred or not. For instance, the GDHS finds out from households whether they have ever experience U5M or not in the preceding five years. Also mothers are asked if their children ever experienced fever or not. In these binary possibilities of the unknown, the logit offers an appropriate model for estimation. The presence of each of the stated child

health outcomes is assigned the value 1, whilst the absence of the health outcome is given a value of zero.

The effect of maternal education on each child health outcome is investigated by using the marginal effect. In the logit model, coefficients of explanatory variables measure the change in log-odds due to a unit change in the independent variable rather than the marginal effect. However, the effect of the explanatory variables can be measured in relative terms using the marginal effect of the logit relation: $h_i(x_i,\beta) = \Lambda(\beta' x)[1-\Lambda(\beta' x)]\beta_i$. These estimates will predict the effect of maternal education on each child health outcome.

4.6 Definition of explanatory variables and their expected results

The explanatory variables in the study are categorical variables where each variable is captured as a dummy variable and one of the categories is used as a reference category. Table 4.1 below shows the categorization of explanatory variables and their reference categories.

Maternal Education: This measures the highest educational level completed by the mother. Maternal education is categorized into; no education, primary education, middle school or Junior High School (JHS) and secondary education and beyond. Improved educational attainment increases the efficiency of producing health as mothers with a higher level of education are expected to be able to utilize medical input, nutrition and exercise in a better way to improve the health of their children. Teicher (2005) argues that mothers with little education are more likely to lose their children to sickness or disease. Similarly, Gubhaju

(1986), Zakir and Wunnava (1997) and Currie and Moretti (2003) all posit a positive relationship between higher female education and better child health. Hence, it is expected that children born to mothers with secondary education and beyond to have better health conditions as opposed to those born to mothers with lower educational level. No education is selected as the reference category.

Wealth of household: Even in the face of a national health insurance policy in Ghana, income influences one's ability to afford certain health care services. The cost of transportation to health centres and cost of diseases that are not covered by the national health insurance, limits the healthcare usage of the poorer households. The household's wealth is included as an explanatory variable to find the effect of household's wealth on the "probability of a child suffering from poor health conditions". The 2008 GDHS measured the wealth index of the household based on the household's ownership of selected assets, the labour income and non labour income of the household. Weights are assigned to these assets based on the information given, and together with the labour and non labour income, the household wealth quintile is determined. Households are categorized into lowest, second, middle, fourth and richest wealth quintiles based on the score. The present study simplifies this categorization by combining the lowest and second into a single group labelled as poor. The middle and fourth quintiles are combined to form a rich category whilst the fifth quintile is classified as the richest group. Economic theory predicts a negative nexus, implying that the higher the income of the household, the lower the probability of the child having poor health. This is consistent with the findings of Benefo and Schultz (1996) which postulate a

negative effect of household income on child mortality and health status in general. The poor wealth quintile serves as the reference category for this explanatory variable.

Residency: The environment in which the child is born and raised is deemed to greatly influence his or her chances of survival and overall health conditions. As noted by Yi et al (2011), chances of survival for children and adults are higher in cities than in rural areas. The urban areas in Ghana are generally endowed with better health facilities and hygienic conditions than the rural places. Consequently, mothers in urban areas easily get access to medical care for their children than their counterparts living in rural areas who have to commute long distances to access less-equipped medical centres. Using the rural areas as the reference category, children born and brought up in urban areas are expected to have a relatively lower probability of falling sick and/or dying.

Treated water: The availability of good drinking water is one key factor that affects the health of children. Many children around the world lose their lives or suffer dramatic deterioration of their health due to ailment of diarrhoea, typhoid or dysentery. These diseases that are predominant among children are all water related and the provision of good drinking water can help curb a large proportion of the occurrence of these diseases. Hence, the absence of good drinking water serving as the reference category, it is expected that children who have access to good drinking water will not suffer poor health.

Antenatal Care: Complications in pregnancy that adversely affect the health of the mother and the child can be detected and averted through antenatal care. Timely and frequents visit

to health professionals during pregnancy are very crucial in improving the health of the mother and child. Obstetricians generally recommend that antenatal attendance should begin in the first trimester and it should be made monthly up to the seventh month of pregnancy, after which visits should be every two weeks for the eighth month, and then weekly until delivery. This recommendation amounts to at least 12 to 13 visits during the full course of the pregnancy. The World Health Organisation (WHO) however recommends a minimum of four visits per pregnancy. It is expected that the more antenatal visit a mother makes, the more healthy the pregnancy will be and the higher the health of the child that is born. This variable is categorised into only two groups, namely: no attendance and ever attending antenatal care. No attendance is made the reference category in this group and it is expected that children of those mothers who made antenatal visits will have higher health status.

Immunization: Until the child is born, he or she receives protection from diseases through anti bodies that are passed on to him or her from the mother. Once the child is born, the body system of the child must develop its own immune mechanism to protect him or her against diseases. The immune system of the newly born baby is generally weak and immunization provides a means of boosting the child's immunity and resistance to diseases. As a result children who are immunised are expected to have a higher health status than those who are not immunised. According to WHO (2003), immunization saves millions of lives annually and millions of deaths among children could be averted if all children had access to vaccines. Ssewanayana and Younger (2004) also argue that increasing immunization is the most effective way of improving child health. For this study, children are categorized into those who are immunised and those who are not. The GDHS adopted

the WHO and UNICEF guidelines for vaccinating children where a child is deemed fully immunised only if he or she has received the following vaccinations: one dose each of BCG and measles, three doses of the polio vaccine, and three doses of DPT as well as vaccine against yellow fever.

Gender: Health risk among children generally varies among males and females. In absence of gender-based discrimination in the care and treatment of young children, girls are expected to have better health stock than boys due to biological factors that tend to favour girls, especially in early infancy. According to Mat Lazim et al (2012) there is consistently a higher mortality rate among male across all age groups in Malaysia. The gender of children is controlled for as the study estimates the effect of maternal education on child health. Female is set as the reference category

Regional distribution: Children born in each of the ten regions of Ghana do not face the same health challenges. Some regions are endowed with economic and social factors that favour good health than others. Children who are born or live in the regions with better economic and social conditions that favour good health are expected to be subject to a lower risk of dying or falling sick. Whilst the Greater Accra region and Ashanti region are the two top regions with favourable health conditions, the Northern region, Upper East region and Upper West region are least endowed regions. Hence the possibility of under-five mortality and risk of a child falling sick is expected to be greater in the three regions in northern Ghana. The Upper West region is made the reference category for the other regions.

Categories of Variables

Table 4.1: Variables and their reference categories

Variable	Categories	Reference Category
Under Five Mortality	Under–Five Mortality No child death	No child death
Occurrence of Fever	Case of Fever No case of fever	No case of fever
Presence of ARI symptoms	Showing symptoms of ARI No symptoms of ARI	No symptoms of ARI
Maternal Education	No education Primary Education Middle school/JHS Secondary school and beyond[1]	No education
Household Wealth	Poor Middle Richest	Poor
Gender of the Child	Female Male	Female
Residence	Rural Urban	Rural
Treated Water	Use of treated water No treated water	No treated Water
Treated Bednet	Use treated bednet Don't use treated bednet	No treated bednet
Regional Distribution	Upper West Region Upper East Region Northern Region Brong Ahafo Region Ashanti Region Volta Region Eastern Region Western Region Greater Accra Region Central Region	Upper West Region
Antenatal Care	No Attendance Attended Antenatal Care	No attendance
Immunization	Completely immunised Not completely immunised	Not completely immunised

[1] Secondary school and beyond is used inter-changeably with higher education

4.7 Source of Data

An estimation of the relative effect of maternal education on child health in Ghana requires a nationwide data that covers several economic, social and geographical variables. The 2008 GDHS which is the most recent nationwide health survey designed to provide data for the purpose of monitoring the population and health situation in Ghana, provides a superior source of data for the estimation. The survey gathered information on child and maternal health, nutritional status of women and children, health behaviours, fertility preferences and other national health measures. It provides an update for other four demographic and health survey carried out in 1988, 1993, 1998 and 2003.

The 2008 GDHS covered a nationally representative sample of about 12,323 households and it was jointly carried out by the Ghana Statistical Service (GSS) and the Ghana Health Service (GHS) using three types of questionnaires, namely; household questionnaire, women's questionnaire and men's questionnaire.

The 12,323 households were drawn from 412 clusters using probability sample. Employing a two-stage sample design, the first stage used systematic sampling to select the 412 clusters from a master sampling frame based on the 2000 Ghana population and housing census whilst the second stage employed the same systematic sampling to 30 households listed in each cluster. Security challenges prevented data collection in one of the selected clusters. However, the research design allowed for a large number of completed interviews so that estimates from the survey provided an acceptable representation of key health indicators for the nation.

4.8 Conclusion

The chapter commenced by taking a brief glance at the estimation techniques employed for empirical studies of education and health relationship. Considering the data set available and the scope of this study, the binary model, specifically the logistic regression model is selected for its relative advantages. The chapter subsequently discussed the theoretical model that anchors the research. Though Brunello's model of health production function is based on the classic Grossman model, it provides a detailed relationship between education and health whilst it is devoid of complexities. The model is adopted and modified to suit the investigation into the effect of maternal education on selected health outcomes of children in Ghana. The explanatory variables that affect child health and how they are expected to influence child health are also discussed. The part of the chapter describes the data that will be used for the empirical estimations. The next chapter discusses the results.

CHAPTER FIVE

ESTIMATIONS AND DISCUSSIONS OF RESULTS

5.0 Introduction

Studies that have centred on health outcome most often express the effect of the explanatory variables in relative terms. To investigate the effect of maternal education on child health outcomes, this study determines the relative effect of formal education of mothers on the occurrence of mortality, diarrhoea, fever and ARI among children below five years. The relationship between maternal education and each of these child health outcomes is expressed using the logistic regression model. The coefficient of the marginal effects of maternal education in each model explains the relative impact of mothers' formal education on that particular child health indicator.

This chapter commences by first considering the descriptive statistics of the regression variables whilst the second part of the chapter focuses on the empirical estimations and discussions of the results.

5.1 Descriptive Statistics for Regression Variables

The 2008 GDHS asked women who had given birth within the five years that preceded the survey questions pertaining to maternal and child health. The data obtained which are relevant to this study are summarized in Tables 5.1 and 5.2

Table 5.1: Distribution of Child Health Outcomes

Variable	Frequency	Percent	Cumm. Freq
Under 5 Mortality Prevalence			
No	2084	92.05	92.05
Yes	180	7.95	100
Prevalence of Fever			
No	1793	79.20	79.20
Yes	471	20.80	100
Prevalence of Diarrhoea			
No	1733	76.55	76.55
Yes	531	23.45	100
Prevalence of ARI			
No	2112	93.29	93.29
Yes	152	6.71	100

Source: Author's Computation from the 2008 GDHS

From Table 5.1, the proportion of mothers who experienced under-five mortality within five years prior to the survey was 7.95 percent while 92.05 did not lose any child below five years to death. Again, the proportion of mothers who reported that their children had fever within two weeks to the survey represents 20.80 percent while those who indicated that their children did not have fever was 79.20 percent. In terms of the prevalence of diarrhoea, the results show that 23.45 of mothers reported that their children below age five had suffered diarrhoea two weeks prior to the survey. 76. 55 percent of the mothers reported otherwise.

Table 5. 2: Descriptive Statistics of Categorical Regressors

Variable	Frequency	Percent	Cumm. Freq
Mothers' Education			
No education	712	31.45	31.45
Primary	556	24.56	56.01
Middle/JHS	783	34.58	90.59
Secondary +	213	9.41	100
Location			
Urban	938	41.43	41.43
Rural	1326	58.56	100
Regional Distribution			
Upper East Region	128	5.65	5.65
Upper West Region	64	2.83	8.48
Northern Region	314	13.87	22.35
Brong Ahafo Region	235	10.38	32.78
Eastern Region	199	8.79	41.52
Western Region	204	9.01	50.53
Ashanti Region	427	18.86	69.39
Greater Accra Region	283	12.50	81.89
Central Region	215	9.50	91.39
Volta Region	195	8.61	100
Gender of babies delivered in last five years			
Females	1569	52.01	52.01
Males	1448	47.99	100
Have bed nets			
No	1629	71.95	71.95
Yes	635	28.05	100
Attend Ante-Natal Care			
Never	94	4.15	4.15
Had ANC	2170	95.85	100
Have Treated Water in House			
No	1,210	53.45	53.45
Yes	1,054	46.55	100
Wealth			
Poor	1,060	46.82	46.82
Middle	880	38.87	85.69
Richest	324	14.31	100
Immunization			
Not immunized	361	15.95	15.95
Full immunized	1903	84.5	100

Source: Author's Computation from the 2008 GDHS

Table 5.2 shows the descriptive statistics of the categorical regressors. In terms of mother's educational level attained, the 2008 GDHS shows that the proportion of mothers with no education is 31.45 percent whilst 24.56 percent of the mothers had only primary education. Those who had up to middle school certificate or JHS constituted 34.58 percent and the remaining 9.41 had at least secondary school education.

It is also shown that a higher fraction of the mothers interviewed in the survey resided in rural areas. Approximately 58.56 percent lived in rural areas of Ghana whilst 41.44 lived in urban towns and cities. Whilst 46.55 percent had access to treated water, 53.45 percent lacked treated water. Furthermore, 28.05 of the mothers indicated that their household had slept under treated nets the night before the survey. The remaining 71.95 did not sleep in treated nets.

The proportions of mothers who constitute poor, middle and richest wealth categories are 46.82 percent, 38.87 percent and 14.31 percent respectively.

In terms of use of medical services, 15.95 percent of the mothers indicated that they did not fully immunize their children whilst 84.05 percent ensured full immunization of their children. 4.15 percent of mothers did not seek antenatal care during the period of their pregnancies.

5.2 Empirical Estimation and Discussion of Results

Based on the study's objectives, four separate estimations have been carried out and the marginal effects are presented in Tables 5.3, 5.4, 5.5 and 5.6. Again, the logit estimations of maternal education on the various child health outcomes are reported in appendices. This is done together with the discussions of the results.

Using the 2008 GDHS data, a logistic regression model is carried out to estimate the effect of maternal education on mortality, the presence of ARI, the incidence of diarrhoea and the prevalence of fever among children. The effect of maternal education is estimated by running a separate and independent logistic regression for each child health indicator. Each regression model controls for the effect of household wealth, area of residence, gender of children, regional variation, availability of treated water, immunization, availability of treated mosquito net and antenatal care. The estimation for each of the child health outcomes reports the coefficients, standard errors, the z-value as well as their significance.

5.2.1 The effect of maternal education on under-five mortality

Table 5.3: Marginal Effects of Under-Five Mortality

Variable	dy/dx	Std. Err	Z-Stats
Primary Education of mother	-0.021	0.105	-0.205
Secondary Education of mother	-0.052***	0.014	-3.714
Higher Education of mother	-0.066**	0.027	-2.444
Gender of child (Male)	0.007	0.110	0.063
Upper east region	0.031	0.521	0.059
Northern region	0.311	0.621	0.501
Brong-Ahafo region	-0.051	0.047	-1.085
Eastern region	-0.717	0.621	-1.155
Western region	0.048	0.042	-1.143
Ashanti region	-0.082*	0.047	-1.745
Greater Accra	-0.197***	0.021	-9.381
Central region	0.182***	0.047	-3.872
Volta region	-0.087	0.231	-0.377
Urban Location	-0.077***	0.016	-4.813
Middle Wealth quintile	-0.019*	0.01	-1.903
Richest wealth quintile	-0.038**	0.014	-2.714
Attend Ante-natal	-0.015***	0.002	-7.501
Household has bednet	-0.031***	0.009	-3.444
Household has treated water2	-0.082**	0.039	-2.103
Immunization	-0.118**	0.013	-9.077

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

The estimated logit model relating under-five mortality and the independent variables is well-specified since the p-value of the chi-square is significant at less than 1 percent[2]. This implies that at least one of the parameter estimates is significantly different from zero.

The estimated result of the marginal effect of the model which expresses the probability of the occurrence of under-five mortality for each independent variable relative to the reference category is shown in table 5.3. From the estimated marginal effect result, additional attainment of formal education among mothers is found to reduce the possibility of a child to die prior to his or her fifth birthday. Relative to no education, mothers with middle school or JHS as well as Secondary education and beyond, significantly reduce the probability of under-five mortality among their children. The marginal effect of increasing educational attainment of mothers with primary education, middle school or JHS education and secondary and higher Education are -0.021, -0.052 and -0.066 respectively. The estimated marginal effect of -0.021 for primary education means that compared to children born to mothers with no education, the probability of under-five mortality occurring among children born to mothers with primary education is about two percentage point lower. Similarly, the probability of under-five mortality is approximately five percentage points lower for children born to mothers with JHS or middle school education than children born to mothers with no education. For children born to mothers with secondary school or higher education, the probability of under-five mortality to take place among them is approximately seven percentage points lower than children whose mothers who never had formal education.

[2] See Appendix A

The estimated coefficient for primary school attainment for mothers is not statistically significant. This is expected since complexities that characterise application of knowledge that will significantly reduce the risk of under-five mortality, requires a higher cognitive skill than what primary education can provide.

The results of the entire model are consistent with health economics theories. The Grossman (1972) model explains that education increases the efficiency with which one produces health outcome. In the case of maternal education and child health status, the higher educated mother will be able to access health information better, make better use of health services and will be able to adhere to health directives much better as well. The psycho-social perspective also explains that education improves the sanity, confidence and the self-image of the mother as well as the social context in which the mother finds herself. The highly educated mother is more likely to belong to a social group where medical services for her child are readily available. Furthermore, the mother with higher education has a higher expected future earning and will invest more in the health of her child to avoid future losses that may arise due to the loss of her child.

In terms of empirical studies, the finding contradicts an earlier study by Osei-Kwakye et al (2010) which found education not to be significant determinant of under-five mortality in the Builsa district of the Upper East Region of Ghana. Considering that majority of the women in the Builsa district have primary education, the findings of Osei-Kwakye et al (2010) is to be expected.

Conversely, the results of the present study is consistent with results obtained by Abuqamar, Coomans and Louckx (2011), Kan (2010), Mondal, Hossain and Ali (2009), Mustafa (2008) and Desai and Alva (1998) who have carried out similar studies in other parts of the world.

In addition to middle school or JHS and higher maternal education, urban location, higher household wealth, use of antenatal care, availability of treated water and use of treated mosquito nets all significantly reduce the probability of the occurrence of under-five mortality.

Though the results shows that relative to female children, their male counterparts are more at risk of dying before they reach age five, the estimate is not statistically significant.

The estimation also shows a child born in the Ashanti Region and Greater Accra region has a higher chance of surviving beyond age five than a child born in the Upper West region of Ghana. The possibility of under-five mortality is 8.2 percent and 19.7 percent lower than Upper West region for Ashanti Region and Greater Accra Region respectively. On the other hand, the probability of a child born in Central regions of Ghana to die within his or her first five years of life is 18.2 percent points higher than a child born in the Upper West region of Ghana. The variation in the occurrence of under-five mortality is partly explained by the differences in the socioeconomic conditions that prevail in these regions.

5.2.2 How fever among under-five children is influenced by mother's education

Table 5.4: Marginal Effects of Fever

Variable	dy/dx	Std. Err	Z-Stats
Primary Education of mother	-0.101*	0.052	-1.942
Secondary Education of mother	-0.037**	0.011	-3.364
Higher Education of mother	-0.148**	0.068	-2.176
Gender of child (Male)	-0.107	0.124	0.863
Upper east region	0.031	0.521	0.059
Northern region	0.311	0.621	0.501
Brong-Ahafo region	-0.197***	0.052	-3.788
Eastern region	-0.111***	0.021	-5.285
Western region	0.848	0.811	1.046
Ashanti region	-0.745***	0.056	-13.30
Greater Accra	-0.977***	0.414	-2.408
Central region	0.128***	0.025	-5.120
Volta region	-0.017	0.231	-0.074
Urban Location	-0.044***	0.014	-3.143
Middle Wealth quintile	-0.020***	0.003	-6.667
Richest wealth quintile	-0.021**	0.009	-2.333
Attend Ante-natal	-0.086**	0.031	-2.774
Household has bednet	-0.154***	0.032	-4.813
Household has treated water2	-0.089***	0.017	-5.235
Immunization	-0.457***	0.128	-3.570

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

The logit model relating the incidence of fever among children below five years and the educational attainment of their mothers is well specified since the Probability value of the Chi-square is significant at less than 1 percent[3]. In this regression, any form of formal education for mothers - from primary education to secondary and higher education - when compared to no education for mothers, significantly reduces the probability of a child contracting fever. As depicted in Table 5.4, the marginal effect of maternal education on the incidence of fever among children in Ghana are -0.101, -0.037 and -0.148 for primary education, middle school education and above middle school respectively. This means that the probability of incidence of fever among children whose mothers attained up to primary education is about 10 percent lower than children born to mothers with no education at all. Similarly, relative to no education, JHS or middle school and secondary school education among mothers both reduce the probability of incidence of fever among children by 3.7 percent and 14.8 percent respectively.

This result is in line with economic theory where educated mothers are expected to know more and undertake more preventive health care measures for their children. Hence when compared to mothers with no education, the educated mothers are more likely to immunise their children against all forms of fevers, use mosquito bed nets for their children and insist on achieving a more hygienic environment at home. Furthermore, educated mothers will most likely provide their children with nutritious diet which will boost the frail immune system of their children. As such, the body mechanisms of these children born to educated mothers are able to withstand the infections.

[3] Refer to Appendix B

This particular finding of the present study is consistent with the findings of Shikoya and Senbanjo (2008) who found mothers' education to be a strong and enduring determinant of the incidence of fever among children below 12 years.

The estimated results in Table 5.4 also shows male children are 10.7 percent higher at risk of suffering fever than female children. Higher household income, attendance of Anti-natal, availability of bednet, presence of treated water and immunization all reduces the risk of a child to suffer fever. Regional variations are also accounts for the difference in the occurrence of fever. Whilst children born in Central Region significantly have a higher possibility of catching fever than those living in Upper West Region, those in Ashanti Region, Greater Region, Eastern Region and Brong Ahafo Region are at a lower risk of suffering an episode fever.

5.2.3 Does education of mothers affect the occurrence of diarrhoea?

To estimate the effect of maternal education on the occurrence of diarrhoea among children below five years, the phenomenon is regressed on maternal education and other social factors[4]. Table 5.5 shows the marginal effect of maternal education on the incidence of diarrhoea

[4] See Appendix C for the logistic estimation of diarrhoea

Table 5.5: Marginal Effects of Diarrhea

Variable	dy/dx	Std. Err	Z-Stats
Primary Education of mother	-0.038**	0.006	-6.333
Secondary Education of mother	-0.002**	0.001	-2.010
Higher Education of mother	-0.022	0.011	-2.002
Gender of child (Male)	-0.045***	0.014	-3.214
Upper east region	0.066	0.547	0.121
Northern region	0.481	0.669	0.719
Brong-Ahafo region	-0.077***	0.024	-3.208
Eastern region	-0.241**	0.101	-2.386
Western region	0.448	0.282	1.589
Ashanti region	-0.545***	0.066	-8.258
Greater Accra	-0.074***	0.017	-4.353
Central region	0.108	0.205	0.527
Volta region	-0.037	0.319	-0.116
Urban Location	-0.100***	0.012	-8.333
Middle Wealth quintile	-0.122**	0.052	-2.346
Richest wealth quintile	-0.129***	0.190	-6.789
Attend Ante-natal	-0.022*	0.012	-1.833
Household has bednet	-0.002**	0.001	-2.001
Household has treated water2	-0.023**	0.011	-2.091
Immunization	-0.241***	0.029	-8.310

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

The estimated results show that primary education, JHS education and above JHS education for mothers, all significantly reduce the risk of diarrhoea occurring among children younger than five years. Other factors such as household's higher wealth, use of treated water and

urban location are found to significantly affect the occurrence of diarrhoea. The possibility of male children to suffer diarrhoea is 4.5 percent lower than female children whilst only children born in Ashanti Region, Greater Accra Region, Brong Ahafo Region and Eastern Region are at a significantly lower risk of suffering diarrhoea than Upper West Region.

The marginal effect of maternal primary education, middle school or JHS and higher education on the incidence of diarrhoea as reported in Table 5.5 are -0.038, -0.002 and -0.022 respectively. This posits that, relative to no formal education, attainment of primary education by mothers reduces the risk of suffering from diarrhoea by 3.8 percentage points whilst JHS or middle school education for mothers reduces the probability of the occurrence of the disease by 0.002. Higher education also reduces the risk of incidence of diarrhoea among children by 0.022 relative to no education. This shows that higher education reduces the risk of suffering from diarrhoea. Given that mothers with higher education are more likely to live in a cleaner environment and use health knowledge effectively, the incidence of diarrhoea is expected to be low among children nurtured by such educated mothers. Secondly, the administration of ORT will be more effectively done by educated mothers than those with no education.

The result of this present study re-echoes the outcome of a study conducted by Mensah et al (1998) on the factors associated with the incidence of diarrhoea in slum areas of Accra. The researchers found mothers' lack of education to significantly increase the incidence of diarrhoea among children. They also argue that the lack of education increases the persistence of diarrhoea among children. Sastry and Burgard (2008) have also found that mothers' education and breastfeeding to be the most significant determinants of diarrhoea among children in Brazil.

5.2.4 The effect of maternal education on the incidence of ARI

Acute Respiratory Infection (ARI) is one the chronic diseases that afflict children and causes death among them. The result of the marginal effect of maternal education on the occurrence of ARI is reported in Table 5.6 below.

Table 5.6: Marginal Effects of ARI

Variable	dy/dx	Standard Error	Z-Stats
Primary Education of mother	-0.031**	0.002	-15.50
Secondary Education of mother	-0.073**	0.012	-6.083
Higher Education of mother	-0.329**	0.121	-2.719
Gender of child (Male)	-0.014	0.010	-1.400
Upper east region	0.052	0.223	0.233
Northern region	0.186	0.398	0.467
Brong-Ahafo region	-0.021	0.041	-0.512
Eastern region	-0.618*	0.328	-1.884
Western region	0.421**	0.211	1.995
Ashanti region	-0.225***	0.096	-2.344
Greater Accra	-0.014***	0.005	-2.801
Central region	0.112	0.175	0.640
Volta region	-0.079	0.636	-0.124
Urban Location	-0.043***	0.013	-3.308
Middle Wealth quintile	-0.021	0.002	-10.50
Richest wealth quintile	-0.182***	0.029	-6.276
Attend Ante-natal	-0.043	0.013	-3.307
Household has bednet	-0.099***	0.021	-4.714
Household has treated water2	-0.037**	0.013	-2.846
Immunization	-0.190***	0.081	-2.346

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

The model is well specified as the regressors adequately explain the variation in the dependent variable[5]. The results show that an educated mother reduces the likelihood of the incidence of ARI among children relative to a mother without education. The marginal effects of primary, middle school and above middle school educational attainment of mothers on the occurrence of ARI are -0.031, -0.073 and -0.329 respectively. This indicates increasing marginal effect in education and suggests that the efficiency of maternal education in reducing the prevalence of ARI increases with higher educational attainment.

The above result is generally expected when one considers the complexity of ARI. According to Hadi (2003), delayed treatment, poverty, malnutrition, overcrowding and air pollution are the causes of persistent ARI among children. Compared to mothers with no or lower education, those who have higher education will be able to access and understand medical information concerning ARI. Highly educated mothers have higher prospects of getting the necessary characteristics to overcome the problems of poverty, malnutrition, delayed treatment of the disease and overcrowding.

Again, the estimation results show that attendance of ante-natal care decreases the prevalence of ARI. Attendance of ante-natal care enables complications in pregnancies to be identified and treated. Also, essential medicines are administered to pregnant women to reduce the risk of these women and their children from being afflicted with diseases. The immune system of the pregnant women and their babies are strengthened and these reasons could possibly explain the inverse relationship between attendance of ante-natal care and prevalence in ARI.

[5] Refer to Appendix D

Regional differences also significantly affect the risk of a child to suffer ARI. The possibility of a child in Greater Accra Region to suffer the disease is 1.4 percent lower than that of a child in Upper West Region. Similarly, the chances of a child to be afflicted with AIR in Ashanti Region and Eastern Region are 22.5 percent and 61.8 percent lower than a child in Upper West Region respectively.

5.3 Conclusion

This study examines the effect of maternal education on child health by focusing on how the educational attainment of mothers affects under-five mortality, fever, diarrhoea and ARI among children. Data from the 2008 GDHS was analysed using logistic regression. The model controlled for household income, area of residence, regional variation, gender of the child, antenatal care, immunization of the child, the availability of treated water and the use of treated mosquito nets to increase the precision of the estimates.

Educated mothers were found to significantly reduce all the four child health measures relative to mothers without education. Whilst primary maternal education and beyond was sufficient to reduce the incidence of fever, diarrhoea and ARI among children, more than primary education for mothers is required to significantly reduce under-five mortality in Ghana.

The next chapter provides the summary of the study and the policy recommendations.

CHAPTER SIX

SUMMARY AND POLICY RECOMMENDATION

6.0 Summary

Improving the health of children is not just a virtuous responsibility of the state but it also holds great economic benefit to the society. Several millions of dollars are spent every year to treat diseases that threaten the health of children in Ghana. Households lose valuable income as they have to sacrifice productive time to cater for sick children. Furthermore, economic development depends significantly on the quality of human capital of which a healthy childhood is a fundamental building block. In recognition of the immense benefits of healthy childhood, there are ongoing deliberate efforts to improve child health around the world. For Ghana to catch up with this global advancement in improving child health, the nation will have to put up effective policies to advance the course of better child health in the country.

Indeed, health conditions among children and educational attainment of females have improved over the years around the globe. A quick glance at the health statistics reveals that a fewer number of children die yearly now than it was in the past and also there are fewer reported cases of diseases among children in recent years. The global average rate of under-five mortality has declined from 87 per 1,000 live births in 1990 to 53 per 1,000 live births in 2010 (WHO, 2011). In terms of female education, there has also been an increase in female literacy rate in recent years, and as a result there are more educated mothers now than it has ever been in the history of humanity. Female literacy rate has increased by about 10 percentage points globally over the past 20 years (UNESCO, 2010)

However, these advancements in better child health and improved female education are not uniform across the world. The richer economies of developed countries have achieved better child health conditions and female education than less developed countries. There are more children who are malnourished, vulnerable and deprived of essential medical services in developing economies than in the developed countries (UNICEF, 2004). Again, a larger percentage of the female population who cannot read and write lives in developing countries of southern Asia and Sub-Saharan Africa.

To estimate the effect of maternal education on child health, the present study adopts a theoretical framework developed by Brunello et al (2011). The model is based on Grossman (1979) health demand theory where individuals demand and produce health as well. Health is produced by the individual using medical inputs, health choices and consumable goods. The health production function expresses the relationship between medical inputs, health choices and consumable goods and health outcomes. Education determines the efficiency with which health inputs are turned into health outputs.

As it is with most health economics studies that use micro-level data, the present study employs a logistic regression model to find the effect of maternal education on the occurrence of mortality, fever, diarrhoea and ARI among children below five years in Ghana. The model estimates the probability of a child below five years dying, being infected by diarrhoea, fever and ARI. Data from the 2008 GDHS was used for the study.

Recognising the effect of household wealth, gender of the child, regional differences, the presence of treated water, immunization of children, the availability of treated nets, antenatal care and residential area on the health of the child, the model controls for all these variables.

In the case of under-five mortality, higher education of mothers is found to significantly reduce the risk of a child below five years dying in the country. Though primary school education for mothers did not significantly predict the probability of a child dying, middle school/JHS and secondary schooling and beyond are found to be significant determinants of under-five mortality in Ghana. In addition to higher education, urban location, higher household wealth, antenatal care, immunization, treated water and treated mosquito bed nets were all estimated to significantly reduce under-five mortality in Ghana. Children living in relatively endowed regions of the Greater Accra and Ashanti have high chance of survival relative to those in Upper West Region whilst those in Western Region are at significant disadvantage than those in the reference category of Upper West Region.

The effect of maternal education on the prevalence of diarrhoea was also estimated from a logistic model. Compared to no education, primary education, middle school or Junior High School education and secondary education and beyond for mothers were all found to significantly reduce the probability of a child falling sick from diarrhoea. The estimates from the present study find urban location, higher household income, antenatal care, treated water and immunization to significantly reduce the probability of a child being infected with diarrhoea. Regional difference is also found to significantly influence the likelihood of a child to suffer diarrhoea.

The prevalence of fever among children who are yet to turn five years in Ghana is significantly reduced by higher education of mothers. The study's analysis reveals that the higher the level of education of the mother of an under-five child, the lower probability of getting a fever. The finding of the present study also finds factors such as higher household wealth, treated water, immunization, treated bed nets, antenatal care and urban residence to

significantly reduce the prevalence of fever among children. Also children in Greater Accra Region and Ashanti Region are found to be less likely to contract fever.

In terms of ARI prevalence among children in Ghana, the educational attainment of mothers has significant predictive effect. Children born to mothers with higher educational attainment are at a lesser risk of getting ARI than children born to mothers with no formal education.

These findings strongly add to the global evidence that lower educational attainment of mothers significantly increase the poor child health witnessed in the form of child mortality and high prevalence of morbidity among children.

6.1 Policy Recommendation

Given the immense economic and social benefits that an improved child health can bestow on Ghana, deliberate policies ought to be pursued to increase the pace of the progress in improving child health and equitably distribute these gains across the nation. Based on the findings of the present study the following recommendations are made.

Even though primary education among mothers is found to significantly reduce the risk of children suffering from diarrhoea, ARI and fever, it does not significantly predict the risk of children dying in Ghana. As such education among women should be encouraged with an emphasis on junior high school and beyond rather than primary education as Junior High School education and beyond were found to significant improve all the four child health outcomes examined in this study. This can be achieved by giving incentives such as scholarships to females to enable them attain higher education. Families should be

encouraged to send their young females to school by redistributing free material goods such as food to female children who go to school. Cultural practices that discriminate against female schooling, sexual harassment of females in schools and prejudices towards girls in schools should be eliminated through the establishment and strict enforcement of laws.

The study also reveals that Children in the regions endowed with better economic and social facilities have favourable health chances that those in the deprived regions. Hence policies should be instituted to ensure improvement of social and economic conditions in the less endowed regions. Such policies should emphasis on equitable allocation of resources.

As shown in this study, the educational attainment of mothers in the urban centres greatly exceeds that of their counterparts in the rural areas and this has resulted in the urban areas enjoying better progress in child health. On this basis, policy makers must focus largely on improving female education in the rural areas so as to bring the conditions of child health in those areas at par with that of the urban areas. This can be achieved by increasing the number of educational workers in the rural areas, developing the educational infrastructure in the rural areas and supplying enough relevant teaching and learning materials to schools found in the rural areas.

It is also revealed by the study that better child health is not achieved solely by female education, but other factors like treated water, immunisation, treated bed nets, higher household wealth and antenatal care all positively impact on child health. However, the effectiveness of these factors depends on education. As such, policy makers must devise

schemes to improve the entirety of these factors but more so, the focus must be on female education which increases the scale of better child health returns on all these factors. This can be achieved through an effective planning and budgeting process. Furthermore, the development of a comprehensive and integrated curriculum of study that harnesses the development of the social, economic and cultural aspects of the society can increase the effectiveness of female education.

6.2 Limitations of the study

The present study is constrained by a lot of missing data that made it difficult for other health behavioural characteristics such as alcohol consumption, vegetable intake, smoking and exercise by mothers to be included in the regression model. Though this setback did not affect the significance of the model, the accuracy of the model could be improved with the inclusion of these characteristics.

The estimation was also limited by the difficulty in isolating the effect of mothers' education from other social, economic and psychological factors that affect child health. Maternal education affects the household's wealth, the availability of treated water, the use of treated bed nets and the tendency to seek antenatal care among others. This affects the precision of the estimates.

The 2008 GDHS did not include relevant data that allows for biological characteristics to be included in the model. Since the probability of a child to fall sick or die is also influenced by the genetic characteristics, the precision of the estimates are affected.

The researcher suggests that future studies should seek to effectively include biological characteristics that influence child health to accurately determine the effect of education.

6.3 Conclusion

This study has investigated how educational attainment of mothers affects the probability of children dying before age five, suffering from diarrhoea, fever or Acute Respiratory Infection (ARI). The estimation from the 2008 GDHS reveals that higher educational attainment of mothers reduces the prevalence of these diseases among children as well as increases the chances of these children surviving beyond their fifth birthday.

On the basis of the findings, it is recommended that policy makers should not just encourage female education, but rather emphasize on higher female education beyond primary school.

REFERENCES

Abuqamar M., Coomans, D, and Louckx, F (2011), "Health behaviour and health awareness in infant mortality in the Gaza Strip", *The European Journal of Public Health* 22 (4): 1101-1262

Abuya, B.A., Ciera, J.M. and Kimani-Murage E, (2012), "Effect of mother's education on child's nutritional status in the slums of Nairobi" *BioMedical Center Pediatrics* 12(80)

Abuya, B.A., Kimani, J.K., & Onsomu, E.O. (2010). "Influence of maternal education on child health in Kenya". 75th Population Association of America (PAA), April 15 -17- National *Conference Proceedings*, 86: 317

Adams, S. (2002), Education attainment and health: Evidence from a sample of older adults, *Education Economics*, 10, 97-109.

Altindag D. T., Cannonier C. and Mocan, N. H (2010), "The Impact of Education on Health Knowledge," *National Bureau of Economic Research working paper series*, *Working Papers* 16422, National Bureau of Economic Research, Inc

Angeles, G., Guilkey, D. K and Mroz, T. A (2003), "The Effects of Education and Family Planning Programs on Fertility in Indonesia", *MEASURE Evaluation Project, United States Agency for International Development (USAID)*

Anyanwu J. C. and Erhijakpor A. E. O. (2007), "Health Expenditures and Health Outcomes in Africa" *African Development Bank Economic Research Working Paper* No 91

Arendt, J.N. (2005), "Does Education Cause Better Health? A Panel Data Analysis Using School Reforms for Identification", *Economics of Education Review*, 24: 149-160.

Asghar Z., Attique N. and Urooj A, (2009) "Measuring impact of education and socio-economic factors on Health for Pakistan" *The Pakistan Development Review* 48(4): 653–674

Aslam M. and Kingdon G. G. (2012), "Parental Education and Child Health—Understanding the Pathways of Impact in Pakistan" *World Development* 40(10): 2014–2032

Benefo, K, and Schultz P. T. (1996), "Fertility and Child Mortality in Cote d'Ivoire and Ghana" World Bank Economic Review 10(1): 123-158

Bronfenbrenner, U. (1979), "The Ecology of Human Development", *Harvard University Press*, Cambridge, MA

Bronfenbrenner, U. (1986), "Ecology of the Family as a Context for Human Development: Research Perspectives", *Developmental Psychology*, 22: 723-742.

Brunello G. et al (2011), The Causal Effect of Education on Health: What is the Role of Health Behaviours? *Institute for the study of labour studies (IZA):* Paper No. 5944

Caldwell C. D. (2004), "How is greater maternal education translated into lower child mortality?" *Health Transition Review*, 4(2): 224-229

Caldwell, J.C. (1979), "Education as a Factor in Mortality Decline: An Examination of the Nigerian Data" *Population Studies* 33(3):395-413

Clark, D. and Royer, H (2010), "The effect of education on adult health and mortality: Evidence from Britain", *National Bureau of Economic Research working paper series*, Working Paper 16013

Cochrane, S. H., Joanne L. and O'Hara D. J. (1980), "The Effects of Education on Health." *World Bank Staff Working Pa-per* No. 405, Washington, DC

Collier, P., Dercon S., and Mackinnon J., (1997), "A density versus quality in health care provision: the use of household data for budgetary choices in Ethiopia", *Centrum voor Econoische Studies Working Paper 97.19* Katholieke Universiteit Leuven: Leuven

Currie, J. and E. Moretti (2002), "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings and Longitudinal Data", *National Bureau of Economic Research* Working Paper 9360.

Currie, J and Moretti E. (2003) Mother's education and the intergenerational transmission of human capital: evidence from college openings, *Quarterly Journal of Economics*, 118:1495-1592.

Cutler, D.M. and Lleras-Muney A., (2010), "Understanding differences in health behaviour by education", *Journal of Health Economics* 29, 1-28

Cutler, D., and Lleras-Muney A., (2008) "Education and Health: Evaluating Theories and Evidence." In J. House,R. Schoeni, G. Kaplan, H. Pollack, eds., Making Americans Healthier: Social and Economic Policy as Health Policy. New York: Russell Sage Foundation.

Cutler, D.M. and Lleras-Muney A., (2006), "Education and Health: Evaluating Theories and Evidence", *National Bureau of Economic Research* Working Paper 12352.

Damien de Walque (2006) "Does education affects smoking behaviours? Evidence using the Vietnam draft as an instrument for college education", *Journal of Health Economics* 26: 877–895

De Onis M., Brown D., Blössner M. and Borghi E. (2012) "Levels and Trends in Child Malnutrition", UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates

De Walque, D. (2007) "Does education affects smoking behaviors? Evidence using the Vietnam draft as an instrument for college education", *Journal of Health Economics* 26: 877–895

Desai, S. and Alva, S., (1998) "Maternal education and child health: Is there a strong causal relationship?" *Demography* 35: 71-81.

Emina J. O., Kandala N. B., Inungu J. and Yazoume Y (2011) "Maternal education and child malnutrition in Democratic Republic of the Congo", *Journal of Public Health and Epidemiology*, 2 (12),

Fayissa B., Danyal S. and Butler J. S. (2011) "The Impact of Education on Health Status: Evidence from Longitudinal Survey Data", *Department of Economics and Finance, Middle Tennessee State University Working Paper Series*

Feinstein, L., Sabates R., Anderson, M. T., Sorhaindo A., and Hammond C, (2006) "What are the effects of education on health? Measuring the effects of education on health and civic engagement," *Proceedings of the copenhagen symposium*

Garene M. and Gakusi E (2005) "Under-five mortality trend in Africa: Reconstruction from demographic sample survey", *Demographic and Health Research, DHS* working paper volume No 28.

GHS (2010) "The health sector in Ghana, Facts and figures"

Greene W.H. (2002). "Econometric Analysis, Fourth Edition", *Prentice Hall*, New York

Grossman, M. (2005) "Education and Non-market Outcomes" *National Bureau of Economic Research* Working Paper 11582, Cambridge, MA

Grossman, M. (1975) "The Correlation between Health and Education" *National Bureau of Economic Research* Working paper No.22

Grossman, M. (1972) "On the Concept of Health Capital and the Demand for Health", *Journal of Political Economy*, 80: 223-255

GSS (2003) "Ghana 2003 demographic health survey key findings"

GSS and GHS (2009) "Ghana demographic health survey 2008 preliminary report" Measure DHS Macro Int. Inc

Gubhaju, B.B. (1985), "The Effect of Previous Child Death on Infant and Child Mortality in Rural Nepal", *Studies in Family Planning* 16(4): 231-236.

Gujarati, D.N., (2004), "Basic Econometrics", Fourth edition, *McGraw-Hill*, New York.

Hadi A. (2003) "Management of acute respiratory infections by community health volunteers: experience of Bangladesh Rural Advancement Committee", *Bulletin of the World Health Organization* 81:183-189
Higgins c., Lavin T. and Metcalfe O. (2008) "Health Impacts of Education: a review" *Institute of Public Health,* Ireland

Jankowska M. M., Benza M. and Weeks J. R., (2013) "Estimating spatial inequalities of urban child Mortality", Demographic research 28(2): 33-62

Johnson K., Rutstein S. and Govindasamy P. (2005) "The stall in mortality decline in Ghana – Further Analysis of Demographic and Health Survey data", ORC Macro

Jurges H. et al (2009) "Does schooling affect health behaviour? Evidence from educational expansion in Western Germany", *IZA Discussion* Paper No 4330

Kan K. (2010) "The impact of education on mortality: evidence from a compulsory education reform", Institute of Economics, Academia Sinica, 1- 33

Kandala N., Magadi A. M., and Madise J. N. (2006) "An investigation of district spatial variations of childhood diarrhoea and fever morbidity in Malawi" *Social Science and Medicine* 62(5): 1138-1152

Kinney M.V.E, Lawn JE, Kerber KJ (2009) "Science in Action – Saving the lives of Africa's mothers, newborns and children", ASADI

Lillard D. R., Simon K. and Ueyama M. (2006) "The Effect of Maternal Education on Child Health" American Economic Association Annual Meetings

Lleras-Muney, A. (2005) The Relationship between Education and Adult Mortality in the United States. *Review of Economic Studies,* 72(189-221).

Mat Lazim, S. S., Bujang, M. A., Abdul Hamid, A.M., Zolkepali, N.A., Hamedon, N. M., and Haniff J (2012) Mortality rates by specific age group and gender in Malaysia: Trend of 16 years, 1995 – 2010 *Journal of Health Informatics in Developing Countries,* 6: 1-9

McCrary, J. and Royer H. (2006) "The Effect of Female Education on Fertility and Infant Health: Evidence from School Entry Policies Using Exact Date of Birth." *National Bureau of Economic Research* Working Paper No. 12329

Medrano P., Rodríguez C., and Villa E. (2008) "Does Mother'S Education Matter In Child'S Health? Evidence From South Africa," *South African Journal of Economics,* 76(4): 612-627

Mensah P., Armar-Klenesu M., Yeboah-Manu D and Ablordey, A. (1998) "Risk Factors for Persistent Diarrhoea in Accra" *Ghana Journal of Pediatric Gastroenterology & Nutrition* 27(2): 254

Miguel, E., and M., Kremer (2004) "Worms: Identifying impacts on education and health in the presence of treatment externalities", *Econometrica,* 72(1): 159–217
Ministry of Finance and Economic Planning (2012) "The 2012 Budget Statement and Economic Policy of the Government"

Ministry of Health (2007) "National Health Policy: Creating wealth through health"

Mondal, N. I., Hossain, K., and Ali K (2009) "Factors Influencing Infant and Child Mortality: A Case Study of Rajshahi District, Bangladesh", *Journal of Human Ecology,* 26(1): 31-39

Mustafa H (2008). "Socioeconomic Determinants of Infant Mortality in Kenya: Analysis of Kenya DHS 2003", *Journal of Humanities and Social Science*, 2: 1934-722

National Development Planning Commission (2010) "Ghana Shared Growth and Development Agenda (GSGDA), Costing Framework (2010-2013), Volume II costing and financing of policies and strategies"

Osei-Kwakye K., Otupiri E., Owusu E. D., Browne E.N.L., and Adjuik M. (2010) "Determinants of under-five mortality in Builsa District, Upper East Region", *Ghana Journal of Science and Technology*, 30 (1): 45-53

Oshikoya K.A and Senbanjo I. O. (2009) "Pathophysiological changes that affect drug disposition in protein-energy malnourished children" *Nutrition and Metabolism* (Lond) doi: 10.1186/1743-7075-6-50

Oreopoulos P. (2003) "Do dropouts drop out too soon? Evidence from changes in school-leaving laws" *National Bureau of Economic Research* Working Paper 10155

Oyekale A. S., and Oyekale T. O. (2009). "Do Mothers' Educational levels matter in child malnutrition and health outcomes in Gambia and Niger?" *The Social Sciences* 2009. 4 (1): 118-127

Romer, P. (1986), "Increasing Returns and Long-Run Growth," *Journal of Political Economy*, 94 (5): 1002–1037.

Sala-i-Martin, X. (1997), "I Just Ran Two Million Regressions," *American Economic Review*, 87: 178–183.

Schultz T. P (1993) "Returns to women's education" The John Hopkins University Press, Baltimore

Sastry, N. and Burgard S. (2008). "Changes in Diarrheal Disease and Treatment among Brazilian Children, 1986 to 1996." PSC Research Report No. 08-645.

Seager A. (2009) Schooling –leaving age may rise to 18 in effort to tackle

Shapiro, D. (1996) "Fertility Decline in Kinshasa." *Population Studies.* 50(1): 189-103.

Shukr R. I., Ali S., Khanum T. and Mehmood T (2009) "Is there a link between maternal illiteracy and childhood diarrhea?" *Rawal Medical Journal* 34(2):199-202

Silles, M. A. (2009), "The Causal Effect of Education on Health: Evidence from the United Kingdom." *Economics of Education Review*, 28(1), 122-128

Spasojevic, J. (2003), "Effects of Education on Adult Health in Sweden: Results from a Natural Experiment", *Ph.D Dissertation*, City University of New York Graduate Center.

Ssewanyana, S and Younger, S. D. (2004), "Infant Mortality in Ugandu: Determinants, Trends and the Millennium Development Goals" African Development and Poverty Reduction: *The Macro-linkage, Forum Paper*, October.

Tagoe H. A. and Dake F. A (2011) "Healthy lifestyle behaviour among Ghanaian adults in the phase of a health policy change", *BioMed Centre, Globalization and Health*, 7:7

Teicher, S. A. (2005) "Gains for girls, but many still shut out" *SAfAIDS* 11(2):9-10

Thuilliez J. (2010) "Fever, malaria and primary repetition rates amongst school children in Mali: Combining demographic and health surveys (DHS) with spatial malariological measures" *Social Science & Medicine* 71 (2), 314–323

UNDP (2012) "2010 Ghana Millennium Development Goals report", UNDP Ghana and NDPC/GoG

UNICEF (2004) "The state of the world's children 2005: Children under threat"

WHO and UNICEF (2012) "Building a future for women and children, 2012 report: come down to 2015, maternal, new born and child survival"

UNICEF (2004) "Childhood under treat" The State of the World's Children 2005, United for children

UNICEF (2006) "Women and Children - The Double Dividend of Gender Equality" The State of the World's Children 2007, United for children

UNICEF (2007) "Child survival" The state of the world's Children 2008, United for Children

UNICEF (2009) "Celebrating 20 Years of the Convention on the Rights of the Child, Statistical Tables" The State of the World's Children special edition

UNICEF (2010) "Facts for Life Fourth Edition", New York,

UNICEF (2012) "Pneumonia and diarrhoea tackling the deadliest diseases for the world's poorest children"

United Nations (2010) "The World's Women 2010, Trends and Statistics", *Department of Economic and Social Affairs* ST/ESA/STAT/SER.K/19

WHO and UNICEF (2012) "Building a future for women and children, 2012 report: come down to 2015, maternal, new born and child survival"

WHO (2003a), National health indicators.

WHO (2004) "Macroeconomics and Health: an update"

WHO (2009), "World health statistics 2009" WHO Press

WHO (2011) "World Health Statistics 2011", WA 900.1

WHO (1946), "Who Definition of Health", International Health Conference, WHO, Vol. 2, New York

World Bank (2011) "World development report 2012 Gender Equality and Development", The World Bank Washington DC

Yi B, Wu L, Liu H, Fang W, Hu Y, Wang Y. (2011) "Rural-urban differences of neonatal mortality in a poorly developed province of China" *BioMed Center Public Health* 11: 477.

Zakir, M and Wunnava, P. V. (1999), "Factors Affecting Infant Mortality Rates: Evidence from Cross-sectional Data" *Applied Economics Letters*, 6, 271-273.

You D., New J. R. and Wardlaw T. (2012) "Levels and trend in Child Mortality Report 2012, Estimates developed by the United Nations Inter-agency Group for Child Mortality Estimation", UNICEF

APPENDICES

APPENDIX A

Logit Estimation of Under-Five Mortality Results

Variable	Coefficient	Std. Err	Z-Stats
Mother's Education			
Primary	-0.023	0.034	-0.068
Middle School/JHS	-0.217**	0.102	-2.127
Secondary Educ. and above	-0.882***	0.312	-2.827
Gender of child			
Male	0.012	0.294	0.041
Region of residence			
Upper east region	-0.025	0.102	0.245
Northern region	0.118	0.487	0.242
Brong-Ahafo region	-0.872	0.582	-1.498
Eastern region	0.912	1.001	0.911
Western region	0.019	0.011	1.727
Ashanti region	-0.044***	0.013	-3.385
Greater Accra	-0.222***	0.031	-7.161
Central region	-0.066***	0.023	-2.870
Volta region	0.184	0.204	0.902
Area of Residence			
Urban Location	-0.439***	0.118	-3.720
Wealth Quintiles			
Middle Wealth quintile	-0.102***	0.015	-6.801
Richest wealth quintile	-0.458***	0.061	-7.508
Attend Ante-natal	-0.137***	0.012	-11.42
Household has bednet	-0.071**	0.022	-3.227
Household has treated water	-0.188***	0.017	-11.06
Immunization	-0.128***	0.044	-2.909
Constant	0.199**	0.048	4.146
LR Chi2 (11)	**71.15**		
Prob.>chi2	**0.000**		
Pseudo R-square	**0.427**		

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

APPENDIX B

Logit Estimation Results of the Occurrence of Fever

Variable	Coefficient	Std. Err	Z-Stats
Mother's Education			
Primary Educ. of mother	-0.119*	0.061	-1.942
Secondary Educ of mother	-0.881***	0.242	-3.631
Higher Educ of mother	-0.512**	0.177	-2.888
Gender of child			
Male	0.021	0.311	0.066
Region of residence			
Upper east region	0.067	0.044	1.523
Northern region	0.457	0.821	0.557
Brong-Ahafo region	-0.112***	0.034	3.294
Eastern region	-0.048*	0.025	1.921
Western region	-0.126***	0.030	-4.142
Ashanti region	-0.109**	0.049	2.213
Greater Accra	-0.787***	0.251	-3.142
Central region	0.099**	0.049	2.020
Volta region	-0.009	0.007	-1.286
Area of Residence			
Urban Location	-0.128*	0.065	-1.955
Wealth Quintile			
Middle Wealth quintile	-0.237**	0.107	-2.218
Richest wealth quintile	-0.802*	0.408	-1.966
Attend Ante-natal	-0.074***	0.011	-6.969
HH has bednet	-.815***	0.181	-4.477
HH has treated water2	-0.486***	0.168	-2.899
Immunization	-1.004**	0.192	-5.218
Constant	4.882***	0.424	11.53
LR Chi2 (11)	**89.78**		
Prob.>chi2	**0.0073**		
Pseudo R-square	**0.331**		

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

APPENDIX C

Logit Estimation Results of the Occurrence of Diarrhoea

Variable	Coefficient	Std. Err	Z- Stats
Mother's Education			
Primary Education of mother	-0.177***	0.059	-2.959
Secondary Education of mother	-0.441***	0.101	-4.363
Higher Education of mother	-0.940**	0.466	-2.019
Gender of child			
Male	-0.054***	0.015	-3.694
Region of residence			
Upper east region	0.023	0.014	1.655
Northern region	0.244	0.199	1.224
Brong-Ahafo region	-0.181***	-0.037	-4.891
Eastern region	-0.085**	0.039	-2.128
Western region	0.087	0.926	0.094
Ashanti region	-0.631**	0.299	-2.104
Greater Accra	-0.743***	0.113	-6.551
Central region	0.008	0.007	1.094
Volta region	-0.012	0.007	-1.547
Area of Residence			
Urban Location	-0.157***	0.053	-2.987
Wealth quintile			
Middle Wealth quintile	-0.497***	0.121	-4.121
Richest wealth quintile	-1.008***	0.206	-4.887
Attend Ante-natal	-0.816**	0.133	-6.125
HH has bednet	0.089	0.079	-1.125
HH has treated water2	-0.341*	0.171	-1.996
Immunization	-0.067**	0.028	-2.418
Cons	3.090***	0.434	7.112
LR CHI2 (11)	**112.21**		
Prob.>chi2	**0.0000**		
Pseudo R-square	**0.439**		

Source: Author's Construct from GDHS, 2008.

*, **, *** imply significance of 10%, 5% and 1% respectively

APPENDIX D

Logit Estimation Result of Acute Respiratory Infection (ARI)

Variable	Coefficient	Std. Err	Z–Stats
Mother's Education			
Primary Education of mother	-0.042**	0.020	-2.101
Secondary Education of mother	-0.280**	0.105	-2.667
Higher Education	-1.501*	0.793	-1.893
Gender of child			
Male	-0.029	0.018	-1.654
Region of residence			
Upper east region	0.045	0.037	1.225
Northern region	0.112	0.061	1.858
Brong-Ahafo region	-0.009	0.034	-0.262
Eastern region	-0.723*	0.343	-2.108
Western region	0.244***	0.043	5.671
Ashanti region	-0.211***	0.026	-8.240
Greater Accra	-0.108***	0.048	2.241
Central region	0.082	0.138	0.594
Volta region	-0.092	0.049	1.842
Area of Residency			
Urban Location	-0.070**	0.013	-5.228
Wealth			
Middle Wealth quintile	-0.033**	0.015	-2.251
Richest wealth quintile	-0.917**	0.282	-3.254
Attend Ante-natal	-0.052*	0.026	-1.965
Household has bednet	-0.044	0.036	-1.239
Household has treated water2	-0.275*	0.144	-1.916
Immunization	-0.613**	0.289	-2.114
Constant	0.080***	0.011	7.258
LR Chi2 (11)	**74.67**		
Prob.>chi2	**0.0000**		
Pseudo R-square	**0.358**		

Source: Author's Computation from the 2008 GDHS

*, **, *** imply significance of 10%, 5% and 1% respectively