Fertility as a Determinant of Household Poverty in Kenya: a Comparative Analysis of Central, Nyanza, Western, and Eastern Regions

BY

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DECLARATION

This research paper is my original work and has not been presented for a degree award in any other University.

Signed:………………………………….. Date:…………………………………………………

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

Signed:………………………………….Date:……………………………………………….......

Prof. Tabitha Kiriti Nganga

DEDICATION

In loving memory of my mother, Mrs Grace Adhiambo Oburu, dedicated to my father Mr. Wilson Opanga, brother George Oburu and sister Beryl Akinyi and to my grandmother Roselida Oburu. To my aunt, Mrs Damaris Oburu and family to whom I owe so much because of her selfless and immense contribution to my education.

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ABBREVIATIONS AND ACRONYMS

CBR: Crude Birth Rates

CBS: Central Bureau of Statistics

CDR: Crude Death Rates

EA: Enumeration Area

EU: European Union

GFR: General Fertility Rate

HDI: Human Develpmment Index

HPI: Human Poverty Index

HPR: Headcount Poverty Rate

IMF: International Monetary Fund

KDHS: Kenya Demographic and Health Survey

KIPPRA: Kenya Institute for Public Policy and Research Analysis

KNBS: Kenya National Bureau of Statistics

KPHC: Kenya Population and Housing Census

MPI: Multidimensional Poverty Index

MDGs: Millenium Development Goals

NASSEP: National Sample Survey and Evaluation Program

NGOs: Non-Governmental Organisation

OLS: Ordinary Least Squares

TFR: Total Fertility Rate

UN: United Nations

UNDESA: United Nations Department of Economics and Social Affairs

UNDP: United Nations Development Program

UNICEF: United Nations Children Fund

WFS: Worl Fertility Survey

ABSTRACT

The study used 2014 Kenya Demographic and Health Survey data to provide a detailed analysis of fertility and poverty rates in Kenya. Poverty rates were calculated using Multidimensional Poverty Index in order to compute groups of population who are poor and non poor as measured by deprivation rates. The overall objective of the study was to investigate the relationship between fertility and household poverty while the specific objectives of the study are; to investigate the effect of fertility on household poverty and probability of households with high fertility entering into poverty. These objectives were achieved through critical analysis of various indicators at the household level.

Some parts of the country have recorded increase or stalled rates of poverty and it is important to understand regional poverty dynamics and its determinants. In regional comparison, multidimesional calculations of poverty showed that many households were still deprived of education, health and standards of living at different degree. In health deprivation, Central region was least deprived at 17%, followed by Western region at 20% and Nyanza region at 30%. Eastern region was mostly deprived at 33%. In education deprivation, Central region was least deprived at 4% while Eastern region was mostly deprived at 11%. Nyanza and Western regions had deprivations of 10% and 8% respectively. In standards of living deprivation, Central was least deprived while Eastern region had the highest deprivation levels. The result also showed that fertility is positively related with household deprivations whereby giving birth to one more child will increase the household deprivations in the three components. Households with high fertility are more likely to enter into poverty at 1.024%.

From the analysis, the positive relationship of fertility and household poverty shows that many households still live in poverty; hence fertility is still a challenge to the country's economic development. Therefore argent intervention policies should be enhanced to reduce fertility. The study shows that majority of deprived households were in Nyanza, Eastern and Western regions, therefore intervention measures are required in these regions. The government should improve education system so that households can acquire quality education for economic development. The government should also enhance health provisions and strongly advocate for modern contraceptive use to reduce fertility.

CHAPTER ONE: INTRODUCTION

1.0 Background

Poverty, population growth and their relationships are two subjects that have been studied over the years by many scholars. The relationship has been studied through two different approaches. The first approach studies the relationship at the macro level (the relationship at the country or regional level) while the second approach studies it at the micro level (the relationship at the household or individual level) (Merrick, 2001). According to Merrick (2001), there is a presumed positive poverty and population growth relationship at the macro level.

Malthus (1798); Coal and Hoover (1958); and Kelly (1988) assert that poverty and population growth are positively related. Malthus argue that uncontrolled fertility could lead to lower per capita income while Coal and Hoover argue that population growth should be controlled in order to attain sustainable economic performance and improve living standards.

1.1 Global fertility Situation

Generally, there has been an increase in global population over the years, by mid-2015, the population had reached 7.3 billion human inhabitants compared to 5.7 billion people reported in 1994 (UNDESA, 2015). Although the population growth rate is actually down as of 2013, at around 1%, compared to a recent pick of 2.2% in 1963, the overall world population continues to grow rapidly.

Table 1 shows that in the last two decades, the world's population increased by approximately 1.6 billion people. World's population distribution shows that Asia has 60% of the population, 16% of the population lives in Africa, Europe contributes up to 10%, Latin America and the Caribbean contribute 9%, and the rest of the population (about 5%) lives in North America and Oceania. The most populous nations are China and India at 1.4 billion and 1.3 billion respectively (UNDESA, 2015).

Table 1: World population (2014)

Regions	Population (Millions)			
	Year 1994	Year 2014	Year 2015	2030 Projections
World	5661	7244	7349	8501
Africa	699	1138	1186	1679
Asia	3432	4342	4393	4923
Europe	729	743	738	734
Latin America and the Caribbean	478	623	634	721
North America	294	358	358	396
Oceania	29	39	39	47

Source: UN, Department of Economic and Social Affairs, Population Division (UNDESA-2015)

According to UNDESA report (2015), male constitute 50.4% of the world's population while 49.6% of the population is made up of female. About 26% of the global population is aged 15 years, population of ages 15-59 years are 62%, and population of age 60 years and over are 12%. (UNDESA, 2015) as shown in the figure 1.

Figure 1: World's population distribution-age and sex (2015)
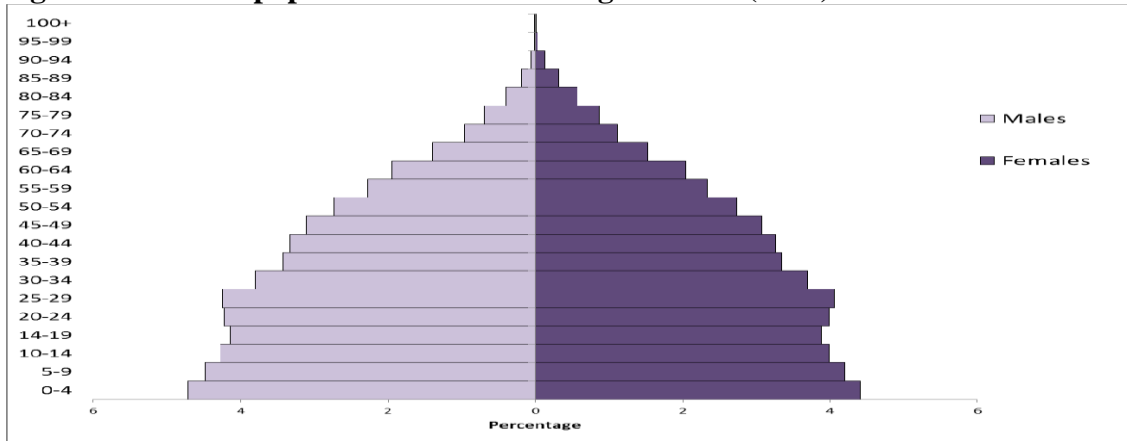
Source: UN, Department of Economics and Social Affairs, Population Division (2015)

Although most countries have been experiencing high population growth, Africa and Asia have stood out with higher growth rates. According to UNDESA (2015), highest population growth is observed in Africa at 2.25 %, the continent is also projected to add 1.3 billion people (more than half of global population growth) to the global population between 2015 and 2050. This is shown in figure 2. On the other hand, the second contributor to the global population is Asia by 0.9 billion people (UNDESA, 2015).

Figure 2: Global average annual rate of population change and projections, 2000-2100
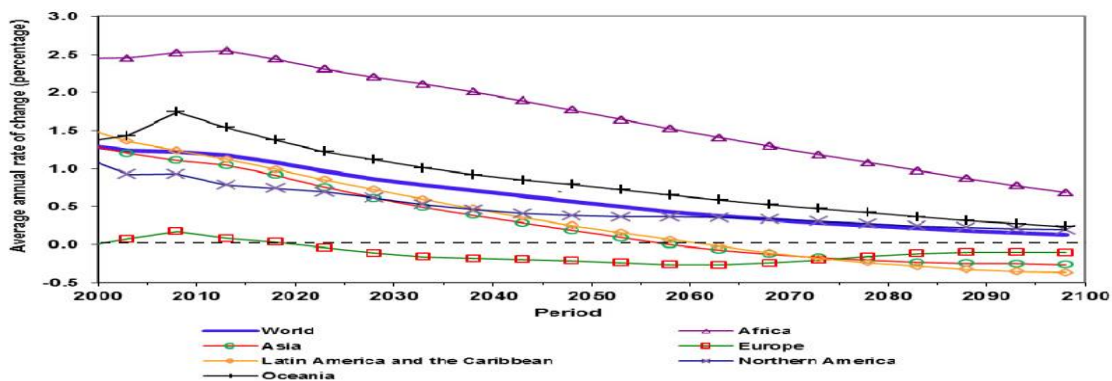
Source: UN, Department of Economics and Social Affairs, Population Division (UNDESA-2015)

1.2 Fertility Situation in Kenya

Total fertility rate (TFR) is the total number of children per female adult in her entire reproductive period (KDHS, 2014). Kenya is experiencing high annual growth rates in population mostly related to high rates of fertility. From the first count done in 1897, the population stood at 2.5 million which by 1948 rose to 5.4 million (KNBS, 2010). The first census done 1969 after independence put population of the country at 10.9 million. This figure has since increased over the years to 39.82 million people reported on Population and Housing Census (PHC) of 2009 (KNBS, 2010). Kenya's total population recorded in 2014 according to the World Bank stood at 44.86 million people, adding about one million people to its population every year.

Kenya's population represents 0.60% of the global population, estimated at 7.3 billion, which means that one person in every 168 people on the planet is a resident of Kenya (World Bank, 2014). Major factors that contribute to population growth in Kenya are Crude Birth Rates (CBR) and Crude Death Rates (CDR) since international migration is very minimal (KNBS, 2010). The current CBR and CDR increases population of the country by about 1 million people annually, there is also a projection that it will double in the next 23 years. Table 2 shows population growth rate in Kenya. Population growth rate as of 2014 to 2015 stood at 2.6% per annum. This is due decreasing mortality and in addition, it is also due to relatively high fertility rates

Table 2: Population size and growth indicators trends in Kenya, 1969-2009

	1969	1979	1989	1999	2009	2010	2011	2012	2013	2014	2015
Population in Millions	10.9	15.3	21.4	28.7	38.6	38.6	39.5	40.7	41.8	44.9	46
Growth Rates per year (in %)	3.3	3.8	3.3	2.9	3	2.6	2.6	2.6	2.7	2.6	2.6
Crude Birth Rates (CBR) (Per 1,000)	50	52	48	41.3	38.4	37.6					
Crude Death Rates (CDR) (Per 1,000)	17	14	11	11.7	10.4	10.5					

Source: KNBS (2009) and World Bank (2015)

Even though TFR in Kenya is high, it has been declining over time but at a very slower rate compared to the average global rate. Kenya Demographic and Health Surveys (KDHS) data show that TFR was 6.7 children in 1989, 5.4 in 1993, 4.7 in 1998, 4.9 in 2003, 4.6 in 20009, and 2014, the survey placed Kenya's fertility at 3.9. This indicates that, a Kenyan woman in her full reproductive period will give birth to about 4 children (KDHS, 2014). This trend is over the population replacement rate of 2.1 and the world's average of 2.5 children. Figure 3 shows trends in fertility in Kenya from 1977 to 2014. Fertility in 1977 was measured using Kenya Fertility

Survey (KFS). From fertility trends shown in the figure, there exists a general decline in TFR from 8.1 in 1977 to 3.9 in 2014.

Figure 3: Fertility trends in Kenya (1977-2014)
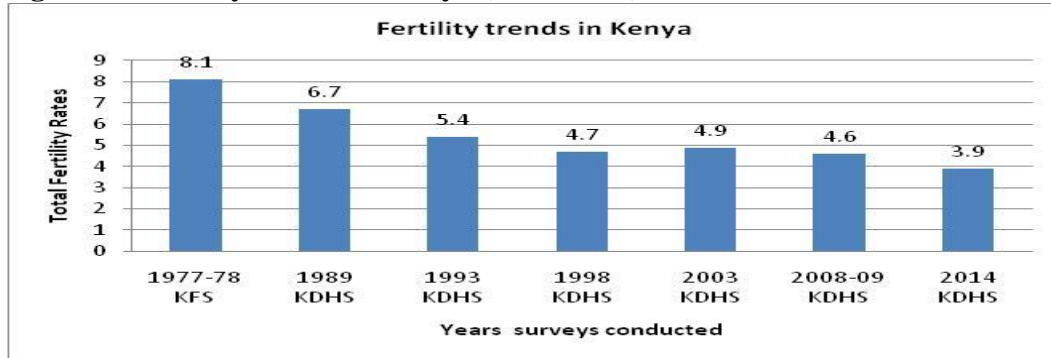
Source KDHS 2014

Different regions in Kenya have experienced different fertility trends; even though fertility has been declining in all the regions, some regions are still experiencing high TFR while others are experiencing low TFR. From 2014 KDHS, regions with lowest TFR are Central at 2.8 compared to 3.4 recorded in 2008/09 and Nairobi at 2.7 compared to 2.8 recorded in 2008/09. The regions with higher TFR are North Eastern at 6.4 compared to 5.9 recorded in 2008/09, Western at 4.7 compared to 5.6 recorded in 2008/09, Nyanza at 4.3 compared to 5.4 recorded in 2008/09, Rift Valley at 4.5 compared to 4.7 recorded in 2008/09, Eastern at 3.4 compared to 4.4 in 2008/09 and Coast region at 4.3 compared to 4.8 recorded in 2008/09. Figure 4 compares fertility rates in different regions of the country (KDHS, 2014).

Figure 4: Regional comparison of total fertility rates (2008/09 and 2014)
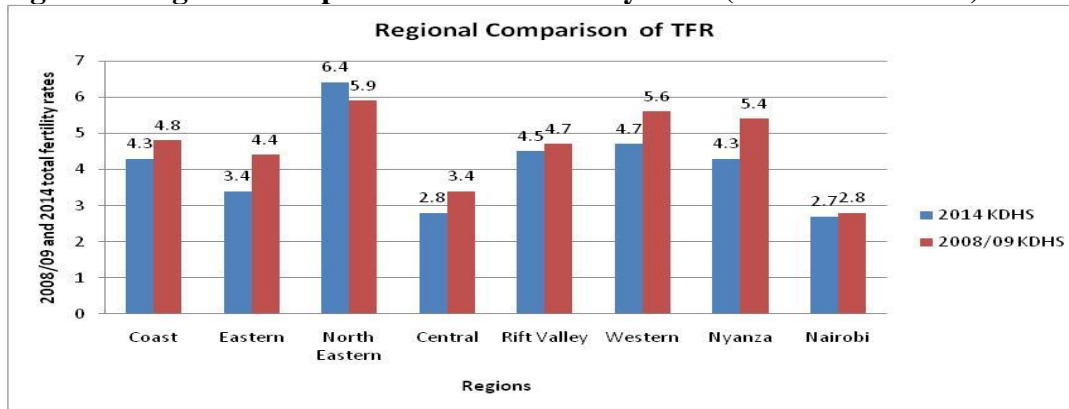
Source: KDHS, 2008/09 and 2014

1.3 Poverty Situation Analysis

Poverty can be defined as lack of household income and consumption as measured by poverty line of $ 1.25 per day (World Bank, 2005). Poverty is multi-dimensional and can be defined in terms of deprivations in health, education and living standards. Health deprivations include deprivation in nutrition and child mortality rates; deprivation in education include the number of years an individual stayed in school and school attendance; and living standards deprivations include lack of electricity, poor sanitation, lack of water, housing condition such as flooring materials, cooking fuel, and household assets ownerships (UNDP, 2010).

According to a report by the World Bank, over the past decades poverty reduction strategies have worked well which have led to its reduction; in 2010 the first goal in the Millennium Development Goals (MDGs) which was to halve the 1990 poverty rate by the year 2015 was attained much ahead of schedule. Even though the goal was attained, there is high number of people still living in poverty (World Bank and IMF, 2015). Estimates of the World Bank show that in the year 2012 about 12.7% (896 million people) of the total global population survived at or below $1.25 a day which is a reduction from 37% (1.95 billion) in the year1990 and 44% (1.99 billion) in the year1981. The world, however, is experiencing progress in global development goals in relation to demographic changes (World Bank and IMF, 2015).

Even though the portion of the population living in poverty has reduced almost by half, from 66% in 1990 to 35% in 2012, progress in poverty reduction has been very slow. For instance, the portion of the global population who survived on less than $1.25 a day in year 2012 was over 2.1 billion as compared to 2.90 billion in 1990. Dramatic reduction in extreme poverty rates has been observed in East Asia, from 80% in 1990 to 7.2% in 2012. In South Asia, extreme poverty rates have reduced from 58% to 18.7%. Poverty rates in Sub-Saharan Africa countries stood at 42.6% in the year 2012. In the last three decades (period between 1981 and 2011), poverty reduced in the developing world by 1.1 million people and generally 753 million people moved above $1.25 a day poverty threshold (World Bank, 2005). In the year 2012, about 309 million extremely poor people lived in South Asia, 388.7 million lived in Sub-Saharan Africa and about 147 million people lived in East Asia and Pacific.

Over three quarters of poor people in the world lives in Africa despite the fact that African countries are considered to be among the fastest growing economies in the world today. In

Kenya, about 21.5 million of the country's populations are living below the poverty threshold of $1.25 a day. This represents about 46.5% of the population (KIPPRA, 2014).

Eight years ago (in the year 2008), Kenya launched its long term development plan, the Vision 2030. The vision was designed to transform the country to an industrialized middle income economy with a high standard of living by the year 2030 and to create a globally competitive and prosperous country. Kenya, in 2014, crossed the threshold becoming one of the largest economies in Sub-Saharan Africa. Despite this achievement, poverty is still a major challenge in the country. According to the global hunger index, about 10 million Kenyan people are estimated to be suffering from chronic food insecurity and poor nutrition. Kenya also still face other challenges such as access to quality health care, good education, availability of clean water for drinking and cooking, availability of good sanitation and good housing condition (Unicef, 2010).

In regional comparison, poverty is of different levels across the country, some regions experience high levels of poverty while others experience low levels (KIPPRA, 2014). According to KIPPRA report on the country's poverty status, some regions records high levels of poverty as high as over 80% while others record low poverty as low as 12%. Counties such as Turkana, Mandera, Wajir, Marsabit, Tana River, and Kwale have high poverty levels of 80% and above. However, on the other hand, poverty levels in some counties such as Kiambu, Kirinyaga, Muranga, Nyeri, Lamu, Meru, Kajiado, Narok, and Nairobi are below 40%. Kajiado County has the lowest poverty at 12%. Poverty gap measure is also lower in regions with low poverty compared to regions with high poverty which means per capita cost of poverty elimination is higher in some countries. The poor individuals living poorer counties make the higher contribution to the poverty gap. Figure 5 shows regional comparison of national poverty as reported by KIPPRA, 2014.

Figure 5: National poverty profile by county
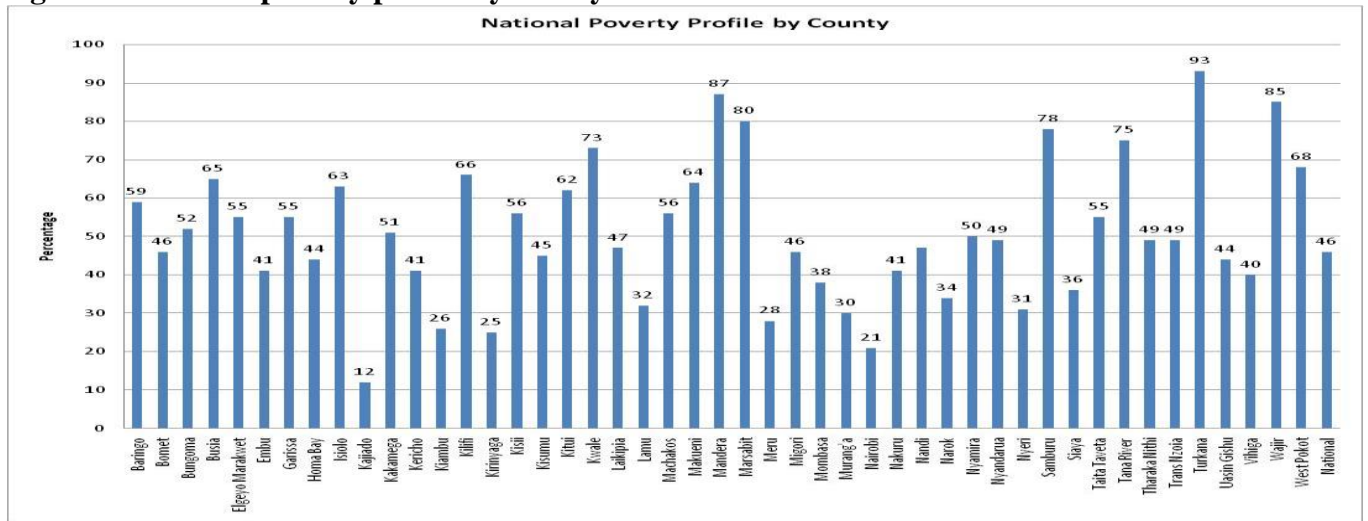
Source: KIPPRA, 2014

1.4 Kenya's Fertility and Poverty in a Comparative Perspective

Whereas fertility in Kenya generally stalled in the late 1980s and early 1990s, fertility rates in Nyanza, Central, Western and Eastern regions have got big differentials. Central region has a rapid fertility decline from 1989 to 2014 while Nyanza, Western and Eastern regions have insignificant decline in fertility (KNBS and ICF International, 2014). Statistics from KNBS show that fertility declined from 6.9 in 1989 to 2.8 in 2014 in Central region, 6.9 in 1989 to 4.3 in 2014 in Nyanza, 8.1 in 1989 to 4.7 in Western and from 7.2 to 6.4 in Eastern region. The statistics show that fertility is still high in Nyanza, Western, Eastern regions due to insignificant decline from 1989 as compared to Central region. In the regions with high fertility, poverty is also widespread and child mortality remains high compared to regions with low fertility, infant mortality is 88 deaths per 1000 live births in Nyanza, 75 deaths per 1000 live births in Western, 60 deaths per 1000 live births in Eastern, and 32 deaths per 1000 live births in Central region (KNBS, 2016).

According to KIPPRA (2014), many counties recorded poverty levels up to 80%. Counties in Eastern region (Marsabit and Samburu) was in this category of high fertility with 80% and 78% poverty rates respectively. On the other hand, many Counties have low poverty levels. Counties with low poverty levels include Kiambu, Kirinyaga, Muarang'a, Nyeri, Lamu, Meru, Kajiado, Narok and Nairobi. Statistics from KIPPRA show that counties in Central region have lower poverty rates compared to counties from Nyanza, Western and Eastern regions. Table 2 shows

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poverty levels and their fertility rates in Central, Nyanza, Western, Eastern regions as reported by KIPPRA economic indicators of 2014 and Kenya Demographic and Health Survey of 2014.

Table 3: Fertility and Poverty comparisons in Kenya

Regions & Counties	Poverty Profile in %age	Total Fertility rate (TFR)	%age of women age 15-49 currently pregnant	μ No. of children ever born to women age 15-49	Regions & Counties	Poverty Profile in %age	Total Fertility rate (TFR)	%age of women age 15-49 currently pregnant	μ No. of children ever born to women age 15-49
Central Region					**Western Region**				
Nyandarua	49	3.5	6.0	4.8	Kakamega	51	4.4	7.3	5.4
Nyeri	31	2.7	4.8	3.3	Vihiga	40	4.5	6.2	5.3
Kirinyaga	25	2.3	4.1	3.4	Bungoma	52	5.0	6.2	6.9
Murang'a	30	3.0	4.3	3.9	Busia	65	4.7	6.8	6.5
Kiambu	26	2.7	5.0	3.6	**Eastern/North Eastern Region**				
Nyanza Region									
Siaya	36	4.2	5.9	5.9					
Kisumu	45	3.6	5.3	5.6	Garissa	55	6.1	11.7	6.8
Homa Bay	44	5.2	6.4	6.2	Wajir	85	7.8	13.6	7.9
Migori	46	5.3	9.0	7.0	Mandera	87	5.2	10.6	6.4
Kisii	56	3.7	5.0	5.1	Marsabit	80	5.0	12.7	6.0
Nyamira	50	3.5	3.2	4.7	Isiolo	63	4.9	6.2	6.1
Nairobi	21	2.7	6.8	3.1	Samburu	78	6.3	11.6	6.5

Source: KIPPRA, 2014

Household poverty and fertility relationship analysis is necessary in establishing causes of wide regional fertility differentials, slow pace of decline in some regions, and stall in fertility decline in the recent past, especially during 1993-2008.

Comparing Central region with other regions with high poverty rates and high fertility provides a good basis for evaluating commonalities and differences of the various channels for which poverty and fertility interact, emphasizing how they relate to the country specific indicators. Selection of the four regions is considered case studies and not a representative sample of the whole country. Kenya Demographic and Health Survey data fills an important gap in the literature, and the study should be seen as a first step in comparing poverty and fertility across counties using recently collected county level statistics.

1.5 Research Problem

The Government of Kenya since independence has recognized that managing its population growth is the key to realize sustainable socio-economic development. The government of Kenya

has developed various population policies, strategies and programs to address challenges in population and achieve economic development. These policies and strategies include; Sessional Paper No. 3 of 2012 on Population Policy for National Development, and Sessional Paper No. 1 of 2000 on National Population Policy for Sustainable Development among others. These policy papers are aimed to achieve high standards of living for Kenyan people by controlling population growth of the country to a sustained level according to the available economic resources. Various international development organizations, Non-Governmental Organizations (NGOs), and private sector also have made various attempts to reduce poverty through implementation of various development programs.

Despite these attempts and approaches made by the government, NGOs, international organizations and private sector, poverty has remained a bigger threat to many households in Kenya with Kenyans still living in extreme poverty. KIPPRA (2014), indicated that the number of people falling into poverty has increased annually and the figure is projected to go up for as long as poverty persists which has negative implications to the households' security and economic wellbeing.

Counties in Western Kenya, Nyanza and Eastern regions are among the counties with high poverty rates. To reduce poverty in the country, it is important that distinct fertility effects on household economic status be thoroughly examined. Increase in population starts at the smaller units of societies, the household. Therefore to know if increased population affects economic growth of the country, it is important to investigate poverty and fertility at the household level. There could be a possibility that regions that have higher poverty levels are capable of significant economic growth as they may have a lot of economic potential. It is therefore important to seek for interventions to reduce poverty in these regions and bring them at par with other regions.

Several studies have been conducted on factors that determinants poverty; Mwabu et al (2001), and Mariara (2002), of which all focused on determinants of poverty at the national level. Odwe (2014) studied geographical region as a determinant of poverty. Okwi et al (2007) studied factors determining poverty but focused on geographical condition. Atieno (2009) studied factors affecting poverty but focused on population increase, climate change, and environmental degradation. Few studies have focused on fertility as a determinant of poverty using education,

health and standards of living components as human development indicator. Hence the main intention of this research is to investigate poverty and fertility relationship using multidimensional poverty index as measured by United Nations Development Program. The study also investigates determinants of fertility at the household level.

1.6 Research Question

The overall research question was: what is the relationship between fertility and poverty while specific research questions were:

1. What is the effect of fertility on household poverty?
2. Are households with high fertility having high probability of entering into poverty?

1.7 Objectives of the study

The overall objective of this study was to investigate the relationship between fertility and household poverty. Specifically, the study sought to:

1. Analyze the effect of fertility on poverty at the household level
2. Investigate if households having high fertility have high probability of entering into poverty.

1.8 Justification of the Study

This study will enable county and national governments to understand the distinct poverty challenges in Nyanza, Eastern, and Western regions of Kenya. It will also be very helpful to policy makers to understand factors determining poverty levels in these regions which are very critical for policy analysis and designing of effective poverty reduction strategies and policies for these regions.

1.9 Organization of the Study

The study structure is as follows: Literature review on the topic of the study is presented in the second chapter. Chapter three discusses methodology of the study including models, the source of data, response variables, predictor variables, and analytical techniques. Chapter four of the paper presents results of the analysis while Conclusions, Policy recommendations, and recommendations of areas for further research are presented in Chapter Five.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter presents literature review on studies that have been done on poverty, fertility and their relationships. The chapter comprises 4 sections; theoretical literature section, the second section reviews the relationship between poverty and fertility, the third is the empirical literature, and the fourth section gives overview of the literature review.

2.1 Theoretical Literature

Definitions of poverty are dated back to the days of Adams Smith (the father of modern economics). According to Adam Smith (1776), poverty can be described as lack of ability to purchase economic goods necessary for a living. The author considers social and psychological status aspects of poverty to receive tacitly the same strength as the material, purely economic condition. Adams Smith clarified this definition by also considering economic materials necessary of which lack of it a person may be considered poor, he asserts that by necessity, it does not only mean basic commodities that an individual require for support of life but also what a country considers not decent for its people, even those of the lowest state, to live without (Smith, 1776). Rowntree in the early 20th century defined poverty as earnings not enough to obtain the least necessities for keeping merely physical deficiency" (Rowntree, 1901).

One of the most contributors of poverty studies was Amartya Sen. According to the author, poverty is defined using capability approach where households are considered to have a certain inventory of assets that are associated with rights or abilities, with social, political, and economic domain positively or negatively arbitrating in this process of change into the goods and services needed in order to live a descent standards of living. Poverty is caused by lack of indicators to live a valued life such as insufficient education, health and freedom (Sen, 1999).

According to Townsend (1979), poverty can be defined as not having enough resources required to allow participation in income generating activities generally accepted by the society. From this definition, resources of different kinds such as wealth inherited as well as accumulated needs to be examined (Townsend, 1979). The author asserts that different systems such as social security and wage govern the flow of resources accruing to an individual and poverty is an outcome of this system.

The World Bank uses consumption and income levels poverty measurement where one is considered poor if he/she falls below some level of income or consumption (poverty line) which is required to meet basic needs. The same poverty line threshold is used across countries to estimate poverty. Poverty line of $1.25 a day is used for global aggregation and poverty comparison (Worl Bank, 2005). A more detailed definition of poverty by the United Nations Development Program (2010), also considers non-income measure where poverty is defined in terms of deprivation in well being comprising education, health and standards of living dimensions. Low incomes levels may cause inability to acquire basic needs such as education and health necessary for improving living standards. From the non-income measure, poverty includes low levels of education, poor health (includes malnutrition and child mortality) and poor standards of living (includes lack of clean water, lack of access to electricity, poor sanitation, poor cooking fuel, lack of household assets, and condition of dwelling unit) which are relevant in the third world nations than the developed ones (UNDP, 2010).

The United Nations Copenhagen Declaration in 1995 also defined poverty to include low income levels, hunger and malnutrition deprivations, health deprivations, education deprivations, inadequate housing, and lack of participation in decision making (United Nations, 1995).

2.1.1 Theories of Poverty

There are many economic theories of poverty, these includes; classical and neoclassical schools of thought which pioneered the elaborated analysis of poverty in 19th century, theories that came out as a response to the supposition, assumptions and conclusions derived by classical and neoclassical proponents (theories of the economic liberals such as John Maynard Keynes and radical economic theorists such as the Marxist), and then theories employed by other individuals and development institutions like the World Bank and the United Nations.

a) **Classical Theory of Poverty**

This theory was developed during 18th and 19th centuries; it contains notable work of Adam Smith and David Ricardo. It includes theory on both value and distribution of economic goods. According to classical theory of poverty, the real value of an economic commodity was believed to rely on cost connected with production of that particular commodity (Smith, 1776).

The theory asserts that market forces are sufficient in controlling poverty; wages earned by laborers reflect their productivity, a landlord received enough rent, and capitalist farmers

received enough profits, therefore, poverty is seen as consequences arising from poor individual choices that affect their productivity negatively and income.

Poor individual choices can cause extreme poverty to a level that one lacks the means to provide for oneself, but to prevent this, the state can intervene but its intervention can be a source of economic inefficiency; incentives that may be provided through the state intervention may be misaligned between poor individuals and the society as a whole. Economists argue that the state may intervene only through policy prescriptions that will increase productivity of deprived individuals and create more job opportunities for individuals who are not employed to find work. The challenge only comes when the population is too young, sick, and old to participate in the labour (Smith, 1776).

According to Anderson (1990), classical views correspond to the market-espousing, laissez-faire principle that tends to attribute to individual well-being and economic decision making; people are being held responsible for poverty experiences out of their individual deficiencies. Choices that individuals make put a ceiling on their access to economic resources; this puts them at higher risk of entering into poverty (Blank, 2003). These individual deficiencies includes lack of industrious work, low education standards or low competitive market skills in the job market (Rank, et al., 2003), therefore, state intervention is insufficient given that causes of poverty are driven or determined by market forces. Proponents of this approach suggest alternative ways other than incentives for poverty alleviation. Suggested alternative ways to alleviate poverty trap includes a decentralized descent and affordable housing and improved transport, increased wages through tax incentives, and staff training.

b) Intergenerational Theory of Poverty

Poverty is intergenerational, meaning it is passed across generations. This is because of genetic component or upbringing, as claimed in the theory of intergenerational poverty. Children brought up in a dysfunctional families coping up with low economic means, can grow up and still live poverty life even at old age (Blank, 2003). According to Lewis (1965), the society tends to have sub-groups of poor people with distinct traits. Lewis stated poverty can be a persistent way of life passed down from generation to generations along family life.

c) Neoclassical Theory of Poverty

The neoclassical theory built on classical tradition to explain the function played by uneven talents endowments, good skills and human capital which determines individual productivity in generating poverty, within a market based competitive economic system. Lack of skills and human capital hinders productivity which reduces income and in turn causes poverty. Under development in a country or region can include lack of skills and low level of education to increase human capital (Sachs, 2005).

According to Davis (2007), market failures (which include externalities, moral hazard, adverse selection, and incomplete information) may be major players in causing poverty. Poor people are also more vulnerable to shocks such as recessions, sickness, family breakdowns, hence such uncertainty may be also major causes of poverty. Like in the classical theory, neoclassical thinkers discourage the government role in addressing poverty, even though there can be targeted fiscal and monetary policies that can address market failures in some cases.

d) Human Capital Theory of Poverty

The human capital theory result from neoclassical economists and explains education, health and demographic factors as determinants of household poverty. Education is a critical component in skill building for people with low skills (Scott et al., 2000). Not investing in ones skills may lead to low pay at work, hence increased poverty which in turn raises cost of investing in human capital for future generation, hence strengthening the vicious cycle of poverty (Pemberton et al., 2013). Education allows the population to be more efficient at work place for maximum productivity, raises wages of the laborers, and reduces number of unskilled population hence reduces unemployment (Jung and Smith, 2007).

Health and demographics as major components of human capital are determinants of poverty. Poor health reduces probability of finding work or being unable to participate in employment, hence higher chances of entering into poverty (Reinstadler and Ray, 2010). Unhealthy population may be less likely to gather skills and capability to work for good paying jobs which make them only suitable for low-paying job opportunities, hence this reduces the countries overall productivity (Buddelmeyer and Cai, 2009). Income poverty may cause health poverty in that, lower income causes malnutrition and less access to medical services.

Age as a determinant of poverty determines chances of finding employment. Age groups that have lower chances of getting employment are more vulnerable of entering into poverty. According to neoclassical labor market argument, older people have lower marginal productivity than younger people because their skills and marketable knowledge have eroded their human capital stock and physical strength. Age determines poverty in that older people are less likely to be employed hence reduced income for household consumption (Kyzyma, 2013).

The government can therefore intervene through investment in public education that can promote human capital accumulation which can encourage economic growth hence reduce poverty. The government can also provide cash transfers to household with older people. This contrasts the classical and neoclassical conclusion the government's presence in all sectors of the economy should be limited (Phillip et al., 2014).

e) Marxist/Radical Theory

According to Marxists, poverty is caused by capitalism, socialism, and political factors rooted in class division. Blank (2010) asserts that markets in the economy are inherently dysfunctional, hence capitalist societies keep labor costs unnaturally lower than its value added through unemployment threat, therefore, poverty in capitalist economies can be made less severe only strict regulation of minimum wage. According to Marx, capitalists need to have surplus labor causes the presence of unemployed workers, hence this causes artificial lower wages. The primary role of the state is therefore to enhance working condition of laborers and increase minimum wage to ceil from being paid lower wages and abuses of capitalists. Workers who earn less and work under poor work conditions may develop poor health which, in turn, may erode their human capital for optimal production, therefore, their capabilities of entering into poverty increases (Pemberton et al, 2013). Low earnings also prevent individuals from savings, hence lower investment which in turn causes poverty (Pemberton et al, 2013).

The government can set a minimum wage that can offset these effects through provision of a minimum level below which paid wages can never decline. Another method that can help tackle poverty is through unionization. The working population can be empowered through unions that can assist them bargain for better wages and working conditions for them to live a good healthy life (Kyzyma, 2013).

f) Social Exclusion Theory

Poverty can also be caused by social exclusion. Definition by the European Union describes social exclusion as a process where individuals or group of individuals are partially or wholly excluded from full participation in the society where they live. Another definition by Hill and Stwart (2005) defines it as lack of material resources for production by individuals; it is a societal that can encourage lack of participation in economic activities. Proponents of social exclusion have a wide consensus in defining poverty as not participating in consumption, production, political engagement and social interaction in the society (Morazes and Pintak, 2007).

2.1.2 Theories of Fertility

Fertility contributes to the general population growth of a country; it affects the size, structure, and composition of population. Total fertility rate (TFR) of a country can be described as the number of live births a woman would have in her reproductive cycle (this is usually given as 15-49 years) if she was to go through the current rates of age-specific fertility (KDHS, 2014). Fertility measurements include general fertility rate (GFR), age specific fertility rate (ASFT), and crude birth rates (CBR). General fertility rate is given as the number of live births per 1,000 women annually (of age 15-44); age specific fertility rate is given as fertility per age group in five year period, while crude birth rates are given as the number of live births per 1,000 populations annually (KDHS, 2014).

a) Quantity and Quality Theory of Fertility

Many theories have explained fertility transitions that have occurred in many countries (Cleland and Wilson, 1987). Becker (1960) on the conventional theory of consumer behavior asserts that couples behavior is rational just like any other consumer when they decide on how many children to have. It views couples as trying to maximize satisfaction, given a range of goods, their prices, and their own taste and income. He explains that couples view child bearing as consumption goods and that they would have as many children as they could if they are costless in monetary terms and opportunity cost (Becker, 1960). Therefore, there exist a negative fertility and income relationships based on knowledge of contraceptives.

According to Becker and Lewis (1973), there exists a relationship between quality and quantity of children; they assert that increasing quantity of children raises the cost of raising them. Cost of

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raising children includes provision of good housing, provision of education, provision of good health, and provision of sufficient food given the budget constraint of the household, hence there is need to reduce quantity of children for high quality of life (Becker and Lewis, 1973). According to the authors, if children are considered as normal good, then it follows that, if number of children increases then quality of bringing them up increases, therefore, increasing the number of children becomes more expensive. Increasing quantity may make quality become so expensive, because each child increases spending (Becker and Lewis, 1973). According to Tabitha and Tisdell (2003), demand for children takes behavior of a normal commodity at low income while at high income levels, many children takes the form of inferior good.

Knowledge of birth control is another determinant of fertility, in addition to the cost of children (Becker, 1960). There are modern methods of birth control such as contraceptives but before, couples had various ways of controlling births such as impeding age of marriage, reduction of sex frequencies during marriage, or abstaining altogether (Becker, 1960). Becker (1960) asserts that there are possibilities that not all couples have skills of controlling births and that birth control knowledge increases as family income increases. According to Becker's explanation, birth control knowledge variation gives an explanation why there is a reduction in fertility as income decreases; it explains the relationship where income and fertility becomes flat and turns upwards at high income levels. In this theory, income and desired fertility are positively related, but income and realized fertility relationships are initially declining. This is because lower income households are less successful at controlling fertility.

Besides Becker (1960) and Becker and Lewis (1973), there exists different authors who have explained determinants of fertility based on; the probability of a baby surviving to adulthood and household's economic indicators such as need of labour force for agricultural production, education level of the woman, woman's employment, and demographic indicators such as age of first marriage and area of residence.

 b) **Economic Theories of Fertility**
Cohen (1993), in his study on education and fertility relationship, found that education is either curve linear or negatively associated with fertility but with a weak relationship. Analysis of Demographic and Health Surveys data to investigate the relationship confirms the negative

relationship (Cohen, 1993; Martin, 1995). According to Martin, education enables women to make choices about methods of contraceptives to use. Imai and Sato (2008) in their investigation of education and fertility relationship, found a negative relationship. They concluded that the education influence on fertility is more pronounced, hence promotion of women's education and labor force will significantly reduce fertility.

c) Environmental Factors as determinants of Poverty

Fertility is determined by region where one lives. Using data from DHS and World Fertility Survey (WFS) in 30 sub-Saharan African Countries, Garenne and Joseph (2002) asserts that fertility declined in year 1960s and 1970s in urban areas, and 10 years later in rural areas. From this argument, urbanization plays a much bigger role in fertility reduction. Ways of life and survival may be tough in urban areas for large families; therefore, declines in fertility can be observed in countries with more cities and towns (Thomson, 1942; Cleland & Wilson, 1987).

d) Probability of Child Survival

The probability of a child surviving to adulthood is also a determinant of fertility; therefore, child mortality has a significant negative impact on fertility (Jeon et al., 2008). Parents who are faced with high child mortality rates choose to have more children so that if some pass on they still have others left.

e) Age at First Marriage

The age at which a woman enters into her first marriage, is considered a factor which is also critical in determining fertility (Davis and Blake, 1956; Bongaarts, 1982), but according to Durch (1980) and Van de Walle and Foster (1990) there exist inconsistency in the effects of age on fertility as revealed in empirical evidences. There exist a school of thought which argues that female reproductive span of life is determined by age at first marriage; therefore, age at first marriage is significant in determining fertility (either positively or negatively). Another school of thought argues that, age at first marriage may not have much impact on fertility. It argues that couples who delayed marriage may compensate this by reducing the interval of child bearing.

In most cases, age at marriage may not be a determinant of fertility or may not have a notable impact on fertility if a woman decides to start having children regardless of when they marry. Another reason is that if the couple decides to control fertility through contraception, they may decide on how many children to have regardless on the age at first marriage (Ngalinda, 1962).

f) Household Productivity Theory

High levels of fertility can also be observed in societies where families consume only from their own production such as livestock keeping and crop farming (Caldwell, 1980). Children here are expected to add into the labor force and wealth flows. Families with many children are able to till large piece of land for crop farming and can use their children for cattle rearing.

g) Theory of Opportunity Cost

The degree of women empowerment is another determinant of poverty. The acceptable number of children will be affected by women's labor force, when a woman is employed; the opportunity cost in terms of time rises, and adding any child presents will make the woman stay away from work and lose labor hours. In addition, women prefer fewer children than men because they carry a disproportionate share of costs related to bearing and bringing up children. Furthermore, empowered women can decide on exactly the number of children to give birth to according to their preferences (Mason, 2001; Eswaran, 2002; Hirschman & Young, 2001). According to Kiriti and Tisdell (2005), at low income levels and economic development, demand for children behaves like a normal good while at higher income levels; it behaves like an inferior good.

2.2 The effects of fertility on Household Poverty

There is developed literature in the last decades on effects of fertility on household poverty. A household economic well-being and fertility relationship is at the core of Malthusian theory and there have been various studies as well on the relationship (Bengtsson, 2006). Children have been considered in most studies as an essential part of households given various economic activities they engage in for the household consumption. They provide insurance against old age for parents and participate in income generating activities for their households. Many households around the world, especially those living in rural areas have agriculture as the main source of household income, agriculture in these areas are characterized by low technological levels for farming and many households have very little access to state benefits, in such cases many households will demand for many children for labour (Admassie, 2002). The negative effect of this practice is that having many children reduces investment in human capital (Moav, 2005). There is poor access to educational infrastructure, low access to health facilities, and high number of children also reduces savings in the households since consumption will be higher than savings.

Other authors also assert that households at high income levels and wealth tend trade off quality and quantity to have fewer children (Becker and Lewis, 1973). This can also be contributed to by having women in employment which increases the cost of bearing children; they will devote more time in their career than giving birth (Willis, 1973). Increase in female education will also decrease fertility; education will delay age at first marriage. Women married early can have longer exposure to reproductive risks because it makes the woman starts childbearing early which raises her fertility (KDHS, 2014). Therefore expansion of female education will reduce her willingness to give up work for childbearing hence raises the cost of child bearing and in turn reduces fertility (Livi-Bacci, 2000).

Existing research on fertility and poverty relationship in least developed countries are mainly based on cross-sectional data. Some studies find a negative fertility and poverty relationships, where increase in fertility reduces household poverty; other studies on the other hand, find a positive relationship, where increase in fertility increases household poverty. In most cases, theoretical work relating fertility to household poverty conditions predicts a negative relationship between the number of children and household's food and essential non-food consumption-having a higher number of children, other things being equal, means that the resources available to the households are divided among more household members (Chelachew, 2014). There are various negative effects of fertility on household poverty, low fertility allows households to have fewer children; this will allow them to invest intensively in them to produce needed human capital for growth and development. Smaller households are able to finance larger amounts of human capital investments in health and education in their children (Becker and Lewis, 1973). Coal and Hoover (1958) asserts that savings and investments are derived from lower proportions of children, following reduction of fertility; hence approach of family planning programs has been justified from this thesis.

2.3 Empirical Literature

There are many studies and analytical works done on determinants of poverty in different countries across the world. In Kenya, there are many studies done on determinants of poverty, Mwabu et al., 2005 used 1994 Welfare Monitoring Survey data to study determinants of poverty at the household level, Geda et al. (2001) also used 1994 Welfare Monitoring Survey data to study determinants of poverty at the household level, Mariara et al., used Welfare Monitoring

Survey III (WMSIII) data collected by the Central Bureau of Statistics (CBS), now KNBS, to study regional and institutional determinants of poverty in Kenya. Another study is by Achia et al., 2010 used data from 2003 KDHS to study a logistic regression model to identify key determinants of poverty.

Mwabu et al., 2005 employed binomial and polychotomous logit model, used household data to investigate expected determinants of poverty status using the data from 1994 Welfare Monitoring Survey. The list of predictor variables used was categorized as follows: *Property related category* which includes land and livestock holding; *Household characteristics category* which included status of employment, age gender, educational level, household size; and *other categories such* as time spent to fetch water and to obtain energy, place of residence of the household-whether in rural or urban or in a particular province. A logit model is used against these potential explanatory variables with Poverty as the dependent variable (Mwabu et al, 2005).

Model and approach followed by Mwabu et al. describes different status of poverty of different groups of populations, it explains why some populations are poor, non-poor and extremely poor. Sub-groups of the population are identified in various steps. The first step identifies poor population and non-poor population and the second step examines the likelihood of entering into extreme poverty subject to being identified as poor. Mwabu et al., justified the choice of their model and approach on the following ground, attention is focused on the extreme poverty verses average poverty. This is done after designing processes that lead to generation of extreme and average poverty. The process can be handles by an ordered probit or logit model. Grouping of sub-samples of the population using total food poverty lines is made as cut-off points in cumulative distribution expenditures. The ordered logit model is the appropriate model to be employed in the estimation of relevant probabilities given that the categories have a natural order.

The study by Mwabu et al., (2005) shows poverty at the household level has a strong relationship with education levels of household members, number of people in the household, household involvement in agricultural activities, and place of residence. The approach has some flaws though. Using household size, the model does not give direct poverty and fertility relationship,

there is generalization of the number of people living in the household but do not analyze fertility in the household in relation to poverty indicators in households such as education, household savings, household food consumption, agricultural activities and household items ownership. Specifically, the model does not show how fertility affects household consumption, household income and savings, and access to health facilities.

Secondly, the model and approach finds that education is negatively related to poverty, but doesn't explain how fertility is related to educational level, are households with higher fertility able to educate their children? Higher education leads to lower level of poverty, hence lower fertility increases chances of households taking their children to school, hence reduce poverty.

Thirdly, the model doesn't explain how households that engage in agricultural activities are poorer than those that do not engage in agricultural production.

The broadest approach to being poor or not being poor is expressed by Sen (1999). Sen asserts that household economic well-being comes from ability to be productive in society, therefore, status of poverty rises as a result of lack of household productive capacity, and so have insufficient incomes, low education levels, or poor health, and poor standards of living.

Another approach to poverty study has focused on welfare and inequality based on very limited household data. Geda (2001) study of poverty was based on measurement, profile, and poverty determinants which employed a household welfare functions, estimated using household expenditures per adult equivalent. The author runs regressions of two categories using two predictor variables; overall expenditures and food expenditures, where in each, three questions are calculated which are dissimilar by type of predictor variables. Dependent variables include household expenditures, total household expenditure gap, and square of the total household expenditure gap. A set of similar dependent variables is also used for food expenditure, with independent variables being similar in all cases.

There is one weakness in Geda model of determinants of poverty; the main assumption is that expenditures in consumption are associated negatively with absolute poverty at all poverty levels; therefore, factors which raises expenditures in consumption contribute to decrease in poverty. However, we should be more cautious on this assumption. For example, level of poverty

is not affected through increased consumption level households which are already beyond the poverty line.

Geda et al. (2001) identified the following as factors that are important in determining poverty at the household level: mean age, household size, if lives in rural or urban, education level, agricultural production (livestock production and crop farming), water and sanitations, and unobserved region-specific factors. The model fails to analyze how the household size affects consumption expenditure but instead regresses consumption expenditure against household size.

2.4 Overview of the literature

Economic theories of fertility hold that place of residence, employment, woman's age, agricultural production, education, poverty, and mortality rate influence fertility. Household wellbeing has been cited as a major factor that shape fertility decision (Becker, 1960). On the other hand, Poverty as measured by MPI is determined by nutrition, child mortality, years of schooling, school attendance, electricity, sanitation, water, dwelling unit condition (flooring), cooking fuel, and household assets (UNDP, 2010).

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlines the theoretical aspect of fertility and poverty, it outlines, specifically measurements of both poverty and fertility and goes ahead to specify models to be used in measuring both fertility and poverty and how they affect one another.

3.1 Theoretical Framework

Poverty has traditionally been measured using income and consumption expenditures where a basket of goods and services are valued at current prices. From this approach of poverty measurement, the basket of goods and services is considered minimum requirement to live a non-impoverished life, therefore people who cannot meet that minimum requirement are considered poor. Income and consumption poverty provides useful insights on understanding measurements and determinants of poverty but poverty can be defined more broadly to include deprivations in health, education and standards of living. Income measurement of poverty is not able to capture the multiple aspects that contribute to poverty.

This study uses the multidimensional approach for poverty measurement which is non-income measure. From multidimensional measure, a household is considered poor due to low level of education, malnutrition, child mortality, poor cooking fuel, lack of access to water, and lack of access to electricity, sanitation, household characteristics, and household assets ownership. These are the indicators used by United Nations Development Program (UNDP) to compute Multidimensional Poverty Index (MPI). This study therefore follows model developed by UNDP in 2010.

3.2 Conceptual Framework

United Nations Development Program developed Human Poverty Index (HPI) in 1990 as the first non-income measure of poverty which was used to develop Human Development Reports (HDR) but it has since been revised to include more indicators. The revision introduced Multidimensional Poverty Index (MPI), developed in the year 2010 which was designed to measure acute poverty (UNDP, 2010). Figure 6 summarizes the relationship among the indicators of poverty used in the model.

In the framework, independent variables are age, fertility, education, nutrition, child mortality, cooking fuel, sanitation, water, electricity, floor, and household assets (UNDP, 2010). In the conceptual framework, these variables will determine if a household is poor or non-poor with fertility as the main determinant. Independent variables have immediate effects on decision making, savings and investment. High fertility will influence savings and investment which in turn have an overall effect on poverty. If a household spends all its income on consumption and other household expenditures, then it will have little or nothing at all to save for investment. Fertility will also influence decision making on education, health provision, provision of food and descent clothing.

Figure 6: Conceptual framework for determinants of poverty

Independent Variables	Intermediate Variables	Dependent Variables

Demographic Characteristics
- Age of the woman
- Fertility

Socioeconomic status
- Education
- Nutrition
- Child mortality
- Household characteristics (Floor)
- Access to water
- Sanitation
- Access to Electricity
- Cooking Fuel

- Decision making
- Savings and Investment

- Poor
- Non-Poor
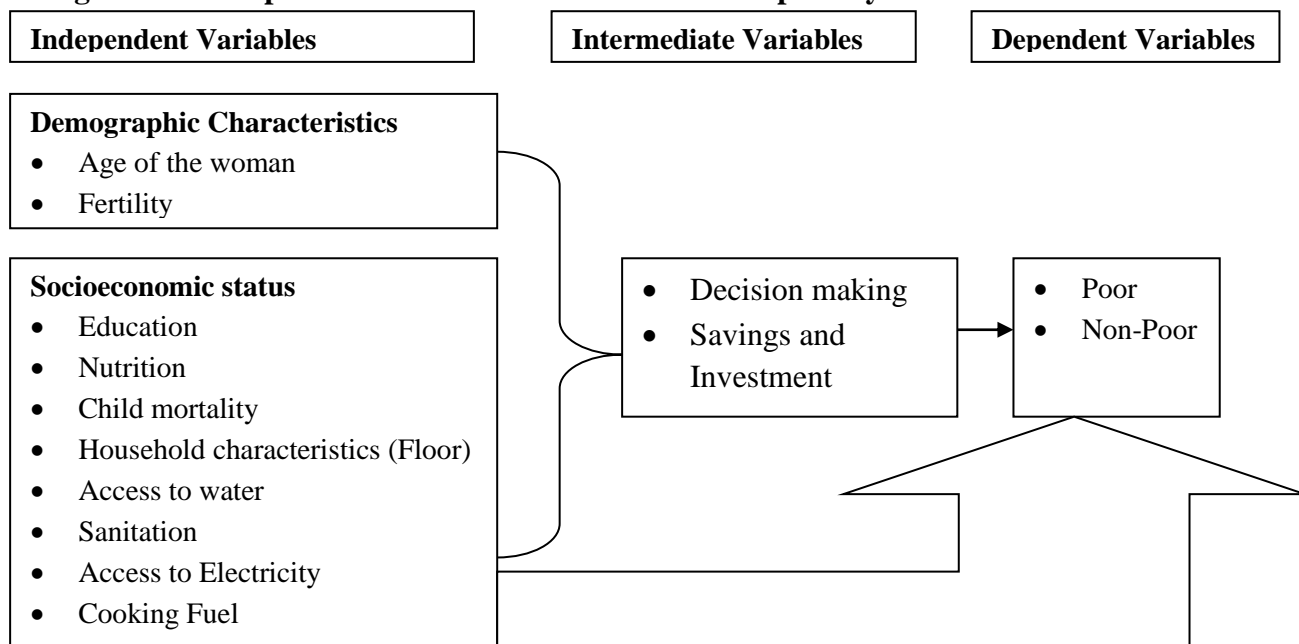
The following, as reviewed in the literature, can be considered to be possible determinants of poverty in the household; nutrition, child mortality, years of schooling, school attendance, access to electricity, sanitation, access to clean water for cooking and drinking, dwelling unit condition, cooking fuel, and household assets.

3.2 The Multidimensional Poverty Index as a measure of Poverty/deprivation

Deprivations are measured by MPI in three basic dimensions: Education, Health, and standards of living. Indicators used for education deprivation includes years spent in school and school attendance. The two indicators complement each other where checks completed years of schooling of household members which measures level of their understanding and knowledge.

School attendance indicator looks at whether children in the household are attending school. For health, MPI uses two indicators: nutrition and child mortality. Malnourished children are exposed to health problems such as cognitive and physical development effects and may not learn well at school or may not go to school at all. Adults who are malnourished may not perform well at work. MPI considers six indicators for standard of living: availability and access to clean water for household consumption, access to good sanitation, availability of health friendly cooking fuel, availability of electricity, flooring materials, and ownership of household assets such as radio, television, motorbike, car, truck, and refrigerator.

3.4 Model Specification

The Multidimensional Poverty Index (MPI) model is a non-income poverty measure model which identifies deprivations in the household in three dimensions: Education, health and standards of living. The three dimensions have 10 indicators. For Education, deprivation is measured using two indicators, years of schooling and school attendance. For health, it is measured using two indicators as well, nutrition and child mortality. For standards of living deprivation is measured using six indicators; electricity, sanitation, water, floor, cooking fuel, and household assets ownership.

In the MPI model, each person in the household is assigned a deprivation score according to the household's deprivation in each of the 10 indicators. Each indicator has a deprivation cut-off.

Let the deprivation cut-off for each indicator be denoted by z_i, and deprivation indicators be denoted by x_i where i are different levels of indicators from indicator 1 to 10, i.e., $i = 1,2,3,………10$. Therefore a person is considered deprived if his/her achievement in indicator x_i is below the cut-off of that particular indicator, that is, if $x_i < z_i$.

The weights of each indicator in the MPI are determined as follows: Indicators within each dimension are weighted equally, such that each of them receives a $^1/_3$ (33.3%) weight. Indicators within health and education dimension receive a $^1/_3 \div 2$ (16.7%) weight and each indicator within the living standards dimension receives a $^1/_{18}$ weight ($^1/_3 \div 6$) which is 5.6%. In identification of multidimensionally poor households, each indicator deprivation scores are summed to obtain the household deprivation score, denoted by c.

The poor and non-poor households are distinguished by cut off of $1/3$ or 33.3% of the weighted indicators.

If $c \geq 33.3\%$ then that household (and its every member) is multidimensionally poor

If $33.3\% < c \geq 20\%$ then that household is considered to be near multidimensional poverty

If $c \leq 20\%$ then the household is multidimensionally non-poor

If $c \geq 50\%$ are severely multidimensionally poor households

Taking the level of deprivation as:

$Deprivation\ score = f(Education, health\ and\ standards\ of\ living\ indicators)$

Assume;

$c = deprivation\ score,$

$w = weight\ of\ the\ indicator, and$

$x = indicators\ in\ each\ dimension$

Therefore, $c = f(x_1, x_2, \ldots.. x_n)$

c can be expressed as;

$$\boldsymbol{c = w_1 x_1 + w_2 x_2 + w_3 x_3 + \cdots + w_n x_n + \varepsilon} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 1$$

Where n is the number of indicators and ε is the error term

Given by equation 1, household deprivation scores are identified by summing the deprivation scores of all the indicators

A household is therefore considered multidimensionally poor if and only if it is deprived in all or some combinations of indicators whose weighted sum is 33.3% or more of the dimensions. It is also considered multidimensionally non-poor if sum of weighted indicators is less than 33.3%, this is given as:

$$f(c) = \begin{cases} \textbf{Poor}, & c \geq 33.3\% \\ \textbf{Non} - \textbf{poor}, & c < 33.3\% \end{cases}$$

The MPI is given in two components; The Headcount Ratio and the Intensity of poverty

Head count ratio is the proportion of the multidimensionally poor in the population as given by equation 2

$$H = \frac{q}{n} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 2$$

Where q is the number of people who are multidimensionally poor and n is the total population

The intensity of poverty A, is determined by summing up the weighted component indicators on which households are deprived. For households whose deprivations are greater than or equal to 33.3% (Poor households), deprivations are given by equation 3:

$$A = \frac{\sum_{i=1}^{n} c_i}{q} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots .3$$

The MPI is the product of both as shown in equation 4

$$MPI = H \times A \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 4$$

3.4.1 Effects of fertility on household poverty

A Logit model was then employed to measure the first objective in order to investigate fertility effects on household poverty. Poverty index generated using MPI was used in regression analysis as the dependent variable while fertility was used as predictor variable.

The variable (Y_i) measures households with high deprivations $(i = 1,2, \dots k)$

$P = P(Y = \frac{1}{X_1, X_2 \dots X_k})$, where X denotes the set of k-explanatory variables (1..k) as shown in Eqn 5

$$ln\left(\frac{P_i}{(1 - P_i)}\right) = \sum_{k=0}^{k=n} \beta_k x_{ik} = \beta_0 + \beta_1 x_{1k} + \cdots \beta_k x_{ik} + e_i \dots \dots \dots \dots \dots \dots \dots \dots 5$$

Where, P_i is defined as the success probability corresponding to the ith observation. The coefficients β_k are the parameters in the model X_i are independent variables and e is an error

term. The observations are assumed to be independent of each other similarly it is also assumed that there are no exact linear dependencies that exist among the explanatory variables. The model is useful in testing the significance of the explanatory variable in explaining poverty status. Explanatory variables are Age and $Fertility$

Therefore the specific model can be written as:

$$ln\left(\frac{P_i}{(1-P_i)}\right) = \sum_{k=0}^{k=2} \beta_2 x_2 = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots\dots.\dots\dots\dots 6$$

Where x_1 is $fertility,$ $x_2 is$ age of the $woman$ and ε_i is the $error$ $term$

The model is useful in explaining significant of explanatory variables (fertility and age) in explaining poverty status as measured by deprivations in the household.

3.5 Data Type and Source

The study used 2014 KDHS, a survey carried out every five years. It is a national survey implemented by KNBS and other partners. Other KDHS exercises were carried out in 1989, 1993, 1998, and 2008-09. The study uses KDHS data because MPI is measured using micro data from household surveys and all its indicators must be computed using data from the same survey.

Definition, Measurement, Expected Sign, and relationship of Variables

The response variable is poverty. HPI as a non-monetary measure of poverty is used to measure poverty, therefore HPI will determine if a household is either poor or non-Poor.

Independent Variables

A set of explanatory variables was included as guided by the literature. Further description and relationship of the variables is shown in table 4.

Table 4: Variables description for determinants of poverty

Variable	Operational Measure	Relationship
Education	=Schooling years	The HHld is deprived if none of its members has completed 5 years of schooling
	=School attendance	The HHld falls under deprivation if there is a child of school-going age but is not currently attending school
Health	=Nutrition	Deprived if members of the HHld are malnourished
	=Child mortality	Deprivation occurs if there has been at least one child death
Standards of living in the household	=If the HHld have or do not have Electricity	The HHld is deprived if it has no electricity
	=If the HHld have or do not have access to clean water source	The HHld is deprived if it lacks access to clean water for Hhld consumption or if location of the water source is more than 30 minutes walk the household
	=If the HHld have or do not have access to Sanitation	The HHld falls under deprivation if it does not have toilet/latrine or if it shares the toilet/latrine with other HHlds
	=Flooring condition of the dwelling unit	The HHld is deprived if the dwelling unit has dirt, sand or dung floor
	=The type of cooking fuel used by the HHld	The HHld is deprived if its cooking fuel is wood, charcoal, or dung
	=Asset ownership	The HHld is deprived if it does not own radio, TV, telephone, bicycle, motorcycle, or refrigerator or if it does not own either a car or a track.
Fertility	=1 high fertility, 0 Otherwise	-ve relationship (HHlds with high fertility are more likely to be deprived than households with low fertility)
Age of the Woman	A continuous variable	-ve relationship

Diagnostic tests

Diagnostic tests were conducted to make sure coefficients of the estimates are efficient and are reliable in making inference. Diagnostic such as heteroscedasticity and correlation were conducted.

4.1 Introduction

This chapter analyses the 2014 KDHS data of Central, Nyanza, Western and Eastern regions at the household level. The sample size consists of 32,172 households out of 36,430 households targeted in the survey. The first part of this chapter gives descriptive statistics of the data and then it proceeds by giving a detailed analysis of regional poverty comparison using multidimensional approach and then analyses the relationship between poverty and fertility using Logit model.

4.2.1 Descriptive Statistics

Table 5 shows sample distribution of individual women respondents in Central, Nyanza, Western and Eastern regions. The distribution is based on the sample size of 32,172 households. Proportion of the women interviewed were 6,678 (7.99%) in Central, 13,109 (15.68%) in Eastern, 12,635 (15.12%) in Nyanza and 8,145 (9.74%) in Western region. The proportion of the sample used in the analysis constituted 48.53% of the total survey sample.

Table 5: Sample distribution by regions

Region	No.	%	Cum.
Eastern	13,109	15.68	15.68
Central	6,678	7.99	23.67
Western	8,145	9.74	33.41
Nyanza	12,635	15.12	48.53
Total	40,567	48.53	

Source: 2014 KDHS Data

4.2.2 Distribution of Household heads

Figure 7 shows distribution of household heads in the four regions. In Eastern region, 17% of the households were female headed while 15% were male headed. In Western region, 9% of the households were female headed while 10% were male headed. In Central region, both female and male headed households were 8% while in Nyanza, 16% of the households were male headed while 15% were female headed.

Figure 7: Distribution of households heads by region
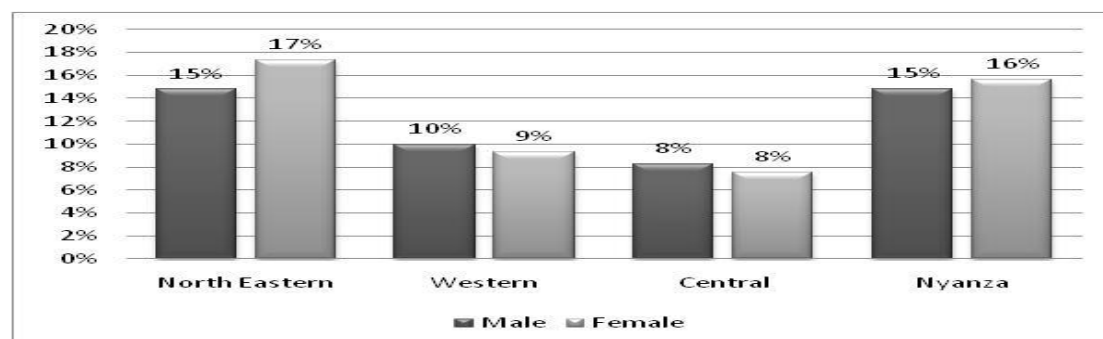
Source: 2014 KDHS Data

4.2.3 Marital status of Women in the Households

The distribution of the household headship was computed using the national sample collected in the survey. Table 6 shows distribution of marital status of all women interviewed in the four regions.

Table 6: Marital status of women in the households

Marital Status	Region								Total	
	Eastern		Central		Western		Nyanza			
	No.	%	No.	%	No.	%	No.	%	No.	%
Never in union	11	1	353	5	179	2	322	3	865	3
Married	5,292	92	4,574	68	5,794	71	10,115	80	25,777	78
Living with partner	37	1	674	10	1,177	14	200	2	2,088	6
Widowed	164	3	325	5	499	6	1,510	12	2,498	8
Divorced	222	4	182	3	81	1	53	0	538	2
No longer living together	12	1	570	9	415	5	435	3	1,432	4
Total	5738	100	6,678	100	8,145	100	12,635	100	33,199	100

Source: 2014 KDHS Data

Table 6 shows that married women constituted the biggest share of the sample at 78%, followed by widowed at 8%. Women living with partners as if married constituted 6% while separated women were 4%. Divorced women constituted 2% of the sample. Only 3% of the women interviewed had never been married at any one time.

In regional comparison, Eastern region constituted the highest proportion of married women at 92% while Central region had 68%, Nyanza and Western regions had 80% and 71% respectively. Women who had never been in union were 1% in Easter region, 5% in Central region, 2% in Western region, and 3% in Nyanza region. The proportion of women who live together with partners as if married were 1% in Eastern region, 10% in Central region, 14% in Western region,

and 2% in Nyanza region. Women who are widowed were 4% in Eastern region, 5% in Central region, 6% in Western region, and 12% in Nyanza region. Divorced women were 4% in Eastern region, 3% in Central region, 1% in Western region, and about 1% in Nyanza region. Separated women were 1% in Eastern region, 9% in Central region, 5% in Western region, and 3% in Nyanza region.

4.2.4 Distribution of Woman's Age

Table 7 shows women's age distribution. The majority of women (21%) fall in the age group of 35-39 years. Other age groups included 30-34 years which constituted 19%, 40-44 years constituted 18%, 20-29 years constituted 17%, 45-49 years were 15%, 20-24 years were 8% and lastly 15-19 years age group constituted 1%.

Table 7: Distribution of women's age

5-year age group	region								Total	
	Eastern		Central		western		Nyanza			
	No.	%	No.	%	No.	%	No	%	No	%
15-19	134	1	34	1	120	1	209	2	1,080	1
20-24	910	7	356	5	626	8	1,158	9	6,638	8
25-29	2,248	17	961	14	1,353	17	2,202	17	14,572	17
30-34	2,500	19	1,235	18	1,445	18	2,519	20	15,779	19
35-39	2,546	19	1,356	20	1,694	21	2,510	20	17,247	21
40-44	2,460	19	1,398	21	1,430	18	2,171	17	15,326	18
45-49	2,311	18	1,338	20	1,477	18	1,866	15	12,949	15
Total	13,109	100	6,678	100	8,145	100	12,635	100	83,591	100

Source: 2014 KDHS Data

According to the proportion of the sample; Eastern region had the highest proportion (13,109) followed by Nyanza region at 12,635, Western region at 8,145, and then Central region at 6,678.

4.2.5 Woman's Education level distribution

Table 8 shows distribution of educational levels by region. From the table, majority (26,498 women) only had up to primary education, followed by 8,298 women with secondary education, 3,786 with no education and lastly 1,990 women with higher education.

Table 8: Distribution of women's education by region

Region	highest educational level					years of schooling		
	No education	primary	secondary	higher	Total	Less than 5 Years of schooling	More than 5 Years of schooling	Total
Eastern	2,864	7,779	1,873	593	13,109	4,604	8,505	13,109
Central	108	4,297	1,842	431	6,678	720	5,958	6,678
Western	479	5,632	1,652	382	8,145	1,876	6,269	8,145
Nyanza	335	8,785	2,931	584	12,635	2,015	10,620	12,635
Total	3,786	26,493	8,298	1,990	40,567	9,215	31,352	40,567

Source: 2014 KDHS Data

Eastern region had the highest number of women with no education (2,864 women), followed by Western region (479 women), Nyanza (335 women) and lastly Central region with 108 women. Nyanza region had the highest number of women with only primary education (8,785 women), followed by Eastern region (7,779 women), Western region (5,632 women), and then Central with 4,297 women. Nyanza region had the highest number of women with secondary education (2,931 women), followed by Eastern region (1,873 women), Central region (1,842 women) and lastly Western region at 1,652 women. Eastern region had the highest number of women with higher level of education (593 women), followed by Nyanza with 584 women, Central region with 431 women and lastly Western region with 382 women.

In terms of years of schooling, 9,215 women had less than 5 years of schooling while 31,352 women had more than 5 years. In Eastern region 4,604 women had less than 5 years of schooling while 8,505 had more than 5 years, in Central region 720 while 5,998 had more than 5 years of schooling. In the Western region 1,876 women had less than five years of schooling while 6,269 had more than five years, and lastly in Nyanza region 2,015 women had less than five years of schooling while 10,620 had more than 5 years.

Figure 8 shows distribution of education levels per region. The figure shows that Nyanza region had the highest number of women with only primary level of education at 22%, followed by Eastern region at 19%, Western region at 14%, and lastly Central at 11%.

Figure 8: Distribution of education levels by regions
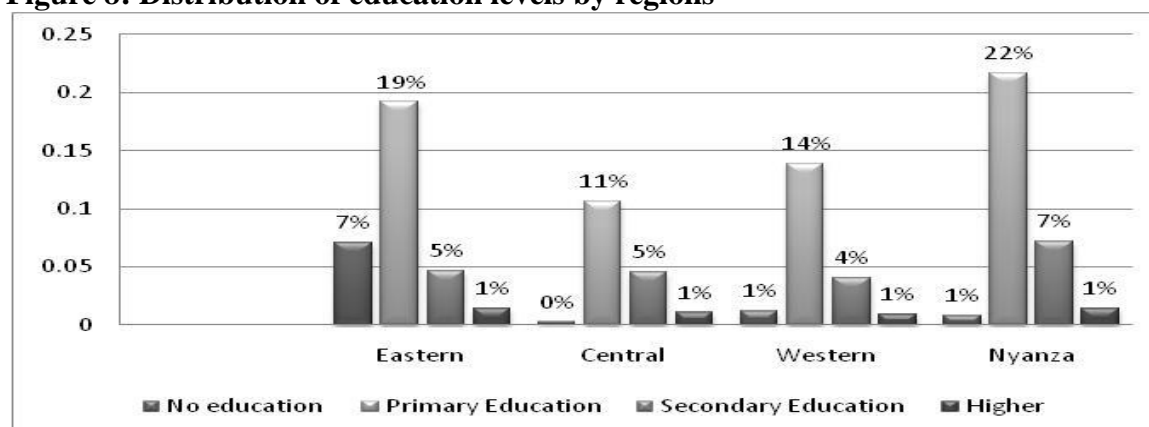
Nyanza region had the highest number of women with secondary education at 7%, followed by Eastern and Central regions at 5% and Western 4%. There were very few women with higher education. As shown in figure 8, the distribution of women with higher education was 1% in all the four regions. Eastern region constituted the most number of women with no education at 7%, followed by Western and Nyanza regions at 1% while Central region recorded less than 1% of the total number of women without education.

4.2.6 Household characteristics

Table 9 shows the number of households with main floor materials. The table indicates that majority of the households, 15,712 households had their main floor made of earth and sand, 12,768 households had main floor made of cement, 10,661 had main floor made of dung, 550 households had main floor made of ceramic tiles, 183 households had main floor made of carpet, 11 households had main floor made of vinyl, asphalt stripes and 47 households indicated that their main floor material was made of parquet and polished wood.

Table 9: Main floor material

Region	main floor material											
	Earth, sand	Dung	wood planks	Palm, Bamboo	Parquet, Polished Wood	Vinyl, Asphalt strips	Ceramic tiles	Cement	carpet	Other	Not household member	Total
Eastern	7,798	337	11	0	20	5	229	4,478	76	12	143	13,109
Central	3,385	22	12	0	10	0	127	3,000	28	0	94	6,678
Western	473	5,812	3	0	7	0	55	1,589	37	0	158	8,134
Nyanza	4,056	4,490	2	0	10	6	139	3,701	42	0	184	12,630
Total	15,712	10,661	28	0	47	11	550	12,768	183	12	579	40,551

Figure 9 shows main materials used for floor constructions for all the households in the four regions.

Figure 9: Main floor materials
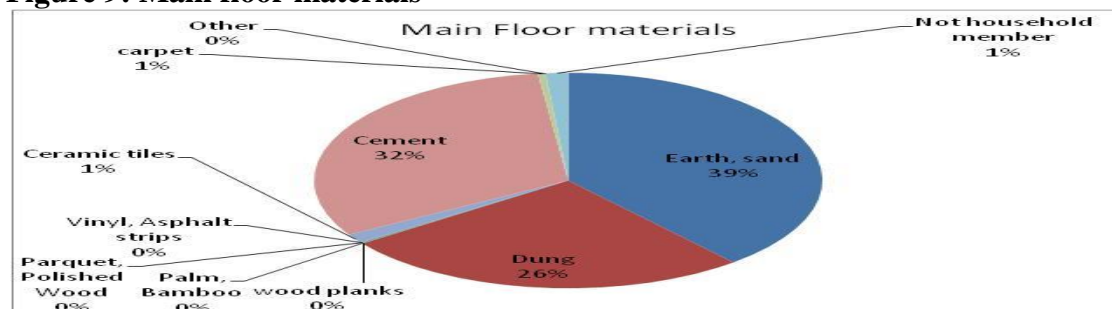
Source: 2014 KDHS Data

From figure 9, 39% of the households had their floors made of earth and sand, 26% had floors made of dung, and 32% had floors made of cement. There were households whose floors were made of carpet and ceramic tiles at 1%. There were also households with almost 1% whose household floors were made of vinyl, asphalt, parquet, polished wood, palm, bamboo, and wood planks.

In Kenya, electricity is still a luxury for a majority of households like in many other African countries. This is shown in table 10 where 83% of the households interviewed in the regions did not have electricity while only 17% had electricity. Eastern and Nyanza regions had the highest proportion of households without electricity at 28% and 27% respectively while Central region had the highest proportion of households with electricity at 6%.

Table 10: Availability of electricity in the households

Regions	Availability of electricity in households				
	Do not have Electricity (Freq)	%	Have Electricity (Freq)	%	Total
Eastern	11,027	28%	1,932	5%	12,959
Central	4,255	11%	2,329	6%	6,584
Western	7,269	18%	716	2%	7,985
Nyanza	10,782	27%	1,658	4%	12,440
Total	33,333	83%	6,635	17%	39,968

Source: 2014 KDHS Data

Availability and access to clean water is also a challenge to majority of households in Kenya. From table 11, majority (19%) of the households used water from river/dam/lake/ponds, 15%

used water from protected springs, 12% used water piped into yard/compound/plot, and 10% used public taps respectively. Other sources of water that households used included tanker truck, cart with small tank, bottled water, tube well, unprotected well and rain water.

Table 11: Availability of water in the households

source of drinking water	Regions									
	Eastern	%	Central	%	Western	%	Nyanza	%	Total	%
Piped into dwelling	452	1	499	1	123	1	214	1	1,288	3
Piped to yard/plot	2,072	5	2,301	6	187	1	320	1	4,880	12
Public tap/standpipe	1,876	5	266	1	616	2	1,364	3	4,122	10
Tube well or borehole	1,387	3	340	1	466	1	548	1	2,741	7
Protected well	781	2	671	2	1,184	3	1,521	4	4,157	10
Unprotected well	2,466	6	219	1	297	1	705	2	3,687	9
Protected spring	136	1	63	1	3,450	9	2,456	6	6,105	15
Unprotected spring	581	1	112	1	487	1	1,439	4	2,619	6
River/dam/lake/ponds	2,410	6	1,308	3	990	2	3,086	8	7,794	19
Rainwater	203	1	665	2	45	1	716	2	1,629	4
Tanker truck	93	1	10	1	5	1	18	1	126	1
Cart with small tank	45	1	28	1	25	1	23	1	121	1
Bottled water	46	1	29	1	11	1	36	1	122	1
Other	417	1	71	1	101	1	0	1	589	1
Total	13,108	32	6,676	16	8,145	20	12,630	31	40,559	100

Source: 2014 KDHS Data

Only 3% had water piped into dwelling, 7% used water from boreholes and 4% relied on rain water. However, 9% of households in the sample relied on the unprotected wells for their water.

4.3.1 Regional Poverty Deprivations measured by Health, Education and Standards of living

Poverty was calculated using Multidimensional Poverty index components; Health, education and standards of living to determine households that are deprived in each component. This section analyses components separately to determine which regions are more deprived in each component.

4.3.2 Regional Health Deprivation Comparison

Two health indicators were used to compute health deprivations. The first indicator looks at nutrition at the household level. Nutritional information is provided for children and women of reproductive age through collection of their weight and height to determine Body Mass Index (BMI). The nutrition indicator used for children relates to being underweight if she is two or

more standard deviations below the median of the reference population. An adult is considered to be undernourished if he or she has a BMI lower than 18.5. Another indicator in the health component is child mortality, where a household has at least one child who has died.

The two indicators have weights of $^1/_6$ each ($^1/_3 \div 2$). Table 13 shows regional deprivation scores, where a household is considered poor if the level of deprivation is $\geq$.3333 (33.33%). From table 13 health deprivations, using deprivation cut off of 33.33%, Central region appears least deprived at 17% while Eastern region on the other hand appears to be highly deprived at 33%, followed by Nyanza at 30% and Western region at 20% respectively.

From table 12, a total of 37,443 households were eligible for health deprivation measurements while 3,124 households were not eligible. Households not eligible were households where no measurement for both women and children under-5 years were carried out and they did not register child mortality.

Table 12: Health deprivations

Region	Not eligible households (with no weight/height measurement and mortality	%	Deprivation cut off ≥0.333333	%	Total
Eastern	666	2%	12,443	33%	13,109
Central	322	1%	6,356	17%	6,678
Western	757	2%	7,388	20%	8,145
Nyanza	1,379	3%	11,256	30%	12,635
Total	3,124	8%	37,443	100%	40,567

Source: 2014 KDHS Data

4.3.3 Regional Education Deprivation Comparison

The MPI looks at education deprivation indicators at two levels; completed years of schooling of household members and whether children are attending school or not. In terms of deprivation cut-offs for this dimension, the MPI requires that at least one person of 15+ years in the household has completed five years of schooling and that all children of school going age are attending grades1 to 8.

From table 13, Central region had the least deprivation at 4% while Eastern region had the highest deprivation at 11%. In Nyanza and Western regions, about 10% and 8% households were educationally deprived respectively. The two indicators had weights of $^1/_6$ each ($^1/_3 \div 2$).

Table 13 shows regional educational deprivation scores, where a household is considered poor if the level of deprivation is ≥.3333 (33.33%).

Table 13: Education deprivations

Region	Deprivation Cut-off < 0.333333	%	Deprivation Cut-off ≥0.333333	%	Total
Eastern	7,377	20%	4,161	11%	11,538
Central	4,565	13%	1,501	4%	6,066
Western	4,449	12%	2,809	8%	7,258
Nyanza	7,850	22%	3,586	10%	11,436
Total	24,241	67%	12,057	33%	36,298

Source: 2014 KDHS Data

4.3.4 Regional Standards of Living Deprivation Comparisons

Table 14 shows regional deprivations in standard of living. The table shows deprivation per indicator used in computing deprivation in standard of living. When computing the deprivations, it is assumed that the cost of basic goods is the same across the regions so that there is a common preference.

From table 14, Central region had the least deprivations in all the living standards indicators, while Eastern region, on the other, hand had the most deprivation in all the indicators. It was found that number of households deprived in electricity in Central region was 12%, Western region at 22%, Nyanza region at 33%, and lastly Eastern region had the highest number of deprived households at 34%.

Deprivation in sanitation shows that, Central region had the least proportion of households deprived at 14%, followed by Western region at 16%, Nyanza at 33%, while Eastern region had the highest proportion of deprived households at 37%.

Deprivation in water shows that Central region had the least proportion of deprived households at 9%, followed by Nyanza at 28%, Western region at 31% while Eastern region had the highest proportion of deprived households.

In dwelling unit condition (computed by condition of the floor), the study found that Central region had the least proportion of deprived households at 12%, followed by Western region at 20%, Nyanza region at 32% while Eastern region had the highest proportion of deprived household at 36%.

Table 14: Standards of living deprivations

Region	de_Elect			dep_Sanitation			dep_Water		
	Hhlds Not Deprived (<.05556)	Hhlds Deprived (≥0.05556)	% (Dep Hhlds)	Hhlds Not Deprived (<.05556)	Hhlds Deprived (≥0.05556)	% (Dep Hhlds)	Hhlds Not Deprived (<.05556)	Hlds Deprived (≥0.05556)	% (Dep Hhlds)
Eastern	2,914	10,195	34%	5,459	7,650	37%	8,787	4,322	32%
Central	3,145	3,533	12%	3,781	2,897	14%	5,475	1,203	9%
Western	1,580	6,565	22%	4,818	3,327	16%	3,864	4,281	31%
Nyanza	2,852	9,783	33%	5,875	6,760	33%	8,830	3,805	28%
Total	10,491	30,076	100%	19,933	20,634	100%	26,956	13,611	100%

dep_Floor			dep_Cooking_fuel			dep_Assets		
Hhlds Not Deprived (<.05556)	Hhlds Deprived (≥0.05556)	% (Dep Hhlds)	Hhlds Not Deprived (<.05556)	Hhlds Deprived (≥0.05556)	% (Dep Hhlds)	Hhlds Not Deprived (<.05556)	Hhlds Deprived (≥0.05556)	% (Dep Hhlds)
4,366	8,743	36%	1,016	12,093	34%	247	12,862	33%
3,832	2,846	12%	2,238	4,440	12%	573	6,105	16%
3,216	4,929	20%	580	7,565	21%	209	7,936	20%
4,856	7,779	32%	694	11,941	33%	581	12,054	31%
16,270	24,297	100%	4,528	36,039	100%	1,610	38,957	100%

Source: 2014 KDHS Data

In cooking fuel the study found that, Central region had the least proportion of deprived households at 12%, followed by Western region at 21%, Nyanza region at 33% while Eastern region had the highest proportion of deprived households at 34%.

In household asset ownership, Central region had the least proportion of deprived households at 16%, followed by Western region at 20%; Nyanza region at 31% and Eastern region with the highest proportion of deprived households at 33%.

4.4 Evaluation of the Logistic model (Diagnostic tests)

Before proceeding with Logistic regression, diagnostic tests were conducted to make sure coefficients of the estimates were efficient and reliable in making inference and to satisfy its assumptions. Diagnostic such as heteroscedasticity and correlation were conducted to satisfy whether the model fits the data.

By definition, collinearity is a situation in the regression model in which two or more predictor variable in a multiple regression are highly correlated. This means one can be linearly predicted from the others with a substantial degree of accuracy.

Table 15 shows collinearity of predictor variables (fertility and age) used to predict household poverty status. F-statistic is highly significant, P-value of 0.5961 indicates that the model fits the data well (P>0.05).

Table 15: Collinearity test

Source	SS	df MS		Number of obs =9014
Model	.091694795	1	.091694795	F(1, 9012) = 0.28
Residual	2940.88869	9012	.326330303	Prob > F = 0.5961
Total	2940.98038	9013	.32630427	R-squared = 0.0000
				Adj R-squared = -0.0001
				Root MSE = .57125
logFertility	Coef.	Std. Err. t	P>t [95% Conf.	Interval]
logAge	-.0094288	.0177874 -0.53	0.596 -.0442961	.0254385
_cons	1.411638	.0589448 23.95	0.000 1.296093	1.527183

Source: 2014 KDHS Data

A collection of random variables is considered heteroscedastic if there are sub-populations that have sufficient variables from others. In this study, heteroscedasticity test was implemented by running Breusch-Pagan test. All the variables that were regressed (Living standards deprivations, Health deprivations, Schooling deprivations, Age of woman at first birth, and Fertility) are tested for heteroscedasticity. We get a Chi-Square distribution with 5 degrees of freedom. The Breausch-Pagan test therefore produces a Chi-Square statistic with 5 degrees of freedom when no hypothesis or heteroscedasticity has been satisfied. That test statistic in this particular case is 41943.14 while the Prob>Chi2 is 0.0000 so we can soundly reject the null hypothesis of homoscedasticity,

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: Living_Standards_Deprivation Dep_Health Dep_Schooling

Age_of_woman_at_first_birth Fertility

chi2(5)   = 41943.14

Prob > chi2 =   0.0000

4.5.1 Estimation of the Logistic Model

Logistic regression was estimated using the sum of all deprivation to determine households that are poor and non-poor and probabilities of households entering into poverty.

4.5.2 Estimation of individual deprivation components with household fertility

As expected, as fertility increases so does deprivations in the standards of living at the household level. This is a positive relationship. As shown by odds ratio, the odds ratio shows by how much the odds of the dependent variable change for each unit change in the independent variable. The odds ratio of less than 1 (<1), shows that the odds decrease as the independent variables increases; therefore there is an inverse relationship. On the other hand, the odds ratio of greater than 1 (>1) shows the odds decrease as the independent variable decreases; therefore there is a positive relationship, but odds ratio equals to 1 (=1) means there is no relationship. Odds ratio tells us the % of change in the odds with each unit of the independent variable, Logistic regression uses maximum likelihood estimator (MLE), iteration predict based on random gauzing before the estimation. Chi-Square tells us if the model is significant.

Table 16 shows a positive relationship between deprivations of standards of living and fertility at the household level given the positive coefficient with odds ratio of 1.03533. The odds ratio of 1.03533 means that household with high fertility are 1.03533 more likely to experience living standards deprivation. In the model, increase number of births by 1 child increases deprivation level by 3.533%. There is a negative relationship between woman's age and living standards deprivations given the negative coefficient and odds ratio of 0.9966139, meaning that one year increase in age decreases likelihood of being deprived of living standards by 0.33861%. P-Value for z test should be less than 0.1 or 0.5 levels of significance. The result shows that the independent variables are statistically significant at 0.007 (fertility) and 0.265 (age of woman) level of significance, which is less than 0.1 and 0.5 respectively.

Iteration 0:   log likelihood = -3937.7391

Iteration 1:   log likelihood = -3933.4502

Iteration 2:   log likelihood = -3933.4458

Iteration 3:   log likelihood = -3933.4458

Logistic regression	Number of obs =9033
	LR chi2 (2) =8.59
	Prob > chi2 =0.0137
Log likelihood = -3933.4458	Pseudo R2 =0.0011

Table 16: Logistic regression of living standrads deprivation and fertility

Living of Standards Deprivations	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	.0347205	.0128845	2.69	0.007	.0094672	.0599737
Age of woman	-.0033919	.0030414	-1.12	0.265	-.0093529	.0025692
_cons	1.615493	.1086185	14.87	0.000	1.402604	1.828381

Living of Standards Deprivations	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	1.03533	.0133398	2.69	0.007	1.009512	1.061809
Age of woman	.9966139	.0030311	-1.12	0.265	.9906907	1.002572
_cons	5.030365	.5463908	14.87	0.000	4.065775	6.223802

Source: 2014 KDHS Data

As fertility increases at the household level, there is high likelihood that the household will be deprived of standard of living. If a household gets many children, it will be deprived in standards of living such as provision of good sanitation, clean water, condition of dwelling unit, cooking fuel usage (it will be expensive to use environmental friendly fuel), and provision of electricity and buy household assets. Increase in number of children puts a lot of pressure on the available households amenities, therefore reduces quality of provision of those basic life materials.

Table 17 shows there is a positive relationship between education deprivation and fertility at the household level given the positive coefficient and odds ratio of 1.01101, meaning that households with high fertility are 1.101% more likely to experience education deprivation. Therefore, increase of number of births by 1 child increases education deprivation level by 1.101%. There is positive relationship between education deprivation and age of woman given positive coefficient and odd ratio of 1.032785, meaning increase in the age of woman by 1 more year increases education deprivation level by 3.2785%. The result shows that the independent variables are statistically significant at 0.343 (fertility) and 0.000 (age of woman) level of significance, which is less than 0.5 and 0.1 respectively).

Iteration 0:   log likelihood = -4472.7202

Iteration 1:   log likelihood = -4407.8481

Iteration 2:   log likelihood = -4407.357

Iteration 3:   log likelihood = -4407.357

Logistic regression   Number of obs = 8585

LR chi2(2)   = 130.73

Log likelihood = -4407.357   Pseudo R2   = 0.0146

Table 17: Logistic regression for education deprivation and fertility

Education Deprivation	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	.0109501	.0115591	0.95	0.343	-.0117053	.0336056
Age of woman	.0322588	.0028355	11.38	0.000	.0267013	.0378164
_cons	-2.311728	.1055744	-21.90	0.000	-2.51865	-2.104806

Education Deprivation	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	1.01101	.0116864	0.95	0.343	.9883629	1.034177
Age of woman	1.032785	.0029285	11.38	0.000	1.027061	1.038541
_cons	.0990899	.0104613	-21.90	0.000	.0805683	.1218693

Source: 2014 KDHS Data

Table 18 shows health deprivation and fertility are positively related given positive coefficients and odds ratio of 1.087964, meaning that household with high fertility are 8.7964% more likely to experience health deprivation. Therefore, increase of number of births by 1 child increases deprivation level by 8.7964%. The table shows positive relationship between health deprivation and age of the woman given the positive coefficient and odd ratio of 1.002909, meaning increase in woman's age by one more year increases deprivation level by 0.2909%. The result shows that the independent variables are statistically significant at 0.000 (fertility) and 0.492 (age of woman) level of significance, which are less than 0.1 and 0.5 respectively.

Iteration 0:   log likelihood = -2422.6098

Iteration 1:   log likelihood = -2411.5444

Iteration 2:   log likelihood = -2411.4583

Iteration 3:   log likelihood = -2411.4582

Logistic regression   Number of obs = 9033

                                   LR chi2(2)   = 22.30

                                   Prob > chi2   = 0.0000

Log likelihood = -2411.4582   Pseudo R2   = 0.0046

Table 18: Logistic regression for health deprivation and fertility

Health Deprivation	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	.0843085	.0183565	4.59	0.000	.0483304	.1202866
Age of woman	.0029053	.0042311	0.69	0.492	-.0053876	.0111981
_cons	2.048482	.1484927	13.80	0.000	1.757442	2.339523

Health Deprivation	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	1.087964	.0199712	4.59	0.000	1.049517	1.12782
Age of woman	1.002909	.0042435	0.69	0.492	.9946269	1.011261
_cons	7.756122	1.151728	13.80	0.000	5.797589	10.37628

Source: 2014 KDHS Data

4.5.3 Estimation of Household Poverty with Household fertility (All components added)

All the three components of MPI (Education, Health and Standard of living) are added to provide general household deprivation to measure poverty. Poverty is a binary variable (a household is either Poor or Non-Poor). Deprivations from the three components are used to compute poverty where a household is poor if the deprivation cut off is 0.333333 (33.33%) The index is then regressed with independent variables (fertility and age of the woman). Table 19 shows the relationships.

Table 19 shows there is a positive relationship between poverty and fertility at the household level given the positive relationship and odds ratio of 1.024396, meaning that household with high fertility are 2.4396% more likely to enter into poverty. Therefore, increase of number of births by 1 child increases poverty level by 2.4396%. The table shows that poverty and age of woman are negatively related given negative coefficient and odds ratio of .9922122, meaning increase in age by one more year decreases poverty by 0.77878%. The result shows that the independent variables are statistically significant at 0.080 (fertility) and 0.016 (age of woman) levels of significance which are all less than 0.1.

Logit Poverty_Status Fertility Age_of_woman

Iteration 0:   log likelihood = -3546.2797

Iteration 1:   log likelihood = -3541.8498

Iteration 2:   log likelihood = -3541.8443

Iteration 3:   log likelihood = -3541.8443

Logistic regression   Number of obs=9033

                        LR chi2(2)   = 8.87

45

Prob > chi2   =0.0119

Log likelihood = -3541.8443   Pseudo R2   =0.0

Table 19: Logistic regression for Household Poverty and Fertility

Poverty	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	.0241037	.0137573	1.75	0.080	-.0028601	.0510674
Age of woman	-.0078183	.0032449	-2.41	0.016	-.0141782	-.0014584
_cons	1.988384	.1169517	17.00	0.000	1.759163	2.217605
Poverty	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
Fertility	1.024396	.0140929	1.75	0.080	.997144	1.052394
Age of woman	.9922122	.0032196	-2.41	0.016	.9859219	.9985426
_cons	7.303723	.8541825	17.00	0.000	5.807575	9.185308

Source: 2014 KDHS Data

4.5.4 Results Comparison with Previous research findings

From empirical literature, there are many studies and analytical works done on determinants of poverty in different countries. These study include: Merrick (2001), which found a positive relationship between poverty and population growth at the household level, Malthus (1798); Coal and Hoover (1958); Kelly (1988) assert that population growth and poverty are positively related. Other studies include; Jung and Smith (2007), found positive relationship between population growth and education, Lewis and Becker (1960) found that giving birth to many children compromises quality of raising them in terms of provision of quality education, health and quality living standards, therefore, fertility is positively related to household poverty.

In Kenya, many studies have studied determinants of poverty at the household level but very few have been done on fertility as a determinant of poverty using multidimensional approach. However there are some studies whose findings can be compared with this study. Mwabu et al., 2005 and Geda, 2005, used 1994 Welfare Monitoring Survey data to study determinants of poverty at the household level. First, the study found that poverty is concentrated in rural areas in general, and particularly in agricultural households, households with high probability of being poor are those that are dependent on agriculture.

Another important finding from Mwabu et al., 2005, is education and poverty. The study found that education attainment of members of the household was a critical indicator that determined poverty. It was found that lack of education accounts of a good probability of being poor, thus promotion of education is very central in addressing extreme poverty at the household level.

The study further found that household size is another determinant of poverty. Households with bigger household members are more likely to enter into poverty than households with few members.

CHAPTER FIVE: SUMMARY, CONCLUSION AND POLICY RECCOMMENDATION

The chapter presents the summary of the findings, conclusions and policy recommendations from the study.

5.1 Summary of findings

This study used the 2014 Kenya Demographic and Health Survey data to investigate impact of fertility on the household poverty as measured by deprivation indicators. A comparative analysis of Central, Nyanza, Eastern and Western regions was employed. A logit model was employed to analyze the relationship given that poverty was a binary variable as measured by deprivation cut off. Deprivation cut off as considered by UNDP is 33.33%; all households with deprivation levels above this cut off were considered poor while those with deprivation below it were considered non-poor. The findings reveal that many households are still very poor given that many of them have deprivation levels of above 33.33%. Many households still live under poverty as they are deprived of quality education, quality health, and standards of living.

The study found that households in Central region are less deprived of education, health, and living standards, while households in Eastern, Nyanza and Western regions are more deprived hence high poverty levels.

However, in the Logit model, it was found that, fertility is a determinant of household poverty given their positive relationship and it was also statistically significant. Age of the woman was found to be negatively related to household poverty, where household deprivation would decrease with increase in the age of the woman.

Poverty was computed in three components: Education, Health and Standards of living. A household was considered poor in each component if its deprivation level was above 33.33%. For education component, it was found that giving birth to one more child will increase education deprivation of the household by 1.101%. For the health component, giving birth to one more child, household health deprivation will increase by 8.7964%. For standards of living, giving birth to one more child leads to an increase in living standards deprivation by 1.66139%. Standards of living includes provision of electricity, good sanitation, provision of clean water,

good dwelling unit (measured by condition of floor), use of clean cooking fuel and household asset ownerships such as radio, telephone, television, car/truck and refrigerator.

The three components were added together and Logistic regression carried out. The result showed that fertility and household poverty are positively related. Adding one more child will increase poverty by 0.9922122%. Moreover, given the positive relationship between household poverty and fertility and high fertility rates in Nyanza, Western and Eastern regions, high poverty levels in the three regions are caused by high fertility levels.

5.2 Conclusions and policy recommendations

Several policy conclusions can be deducted from the findings of the study. From the analysis, the positive relationship of fertility and household poverty shows that many households still live below poverty because high fertility, hence high fertility is still a major problem in the country. Both the national and county governments should therefore enhance urgent intervention policy measures to reduce fertility.

The study shows that majority of the households are deprived in Nyanza, Eastern, and Western regions as compared to Central region due to their high fertility. Intervention measures to reduce fertility and to reduce poverty are necessary in counties of these regions.

Many empirical studies have found that fertility and poverty are positively related, increase in fertility increases household poverty. It is therefore important for the Government of Kenya to embark on investing in education, provide quality health care and empower household for economic development. This would lead to an increase in household economy and lead to a decrease in fertility. In Kenya, this can only to happen if people's attitude towards the value of children is changed because since some households give birth to many children for labor and household support which compromises quality of bringing them up.

From deprivation in education, health and living standards, the desirable path for the Kenya to upgrade Kenyan living standards is through investment in education to improve fertility literacy. Investment in healthcare is also a requirement to reduce child mortality. This is because many parents have many children to replace the dead ones or just in case others die, they can still

remain with some children. Many children are also desired as life insurance, social protection to reduce dependence on children for support in old age.

Fertility can also be controlled through contraceptive use. The government should educate the population on importance of using contraception. Level of current use of contraception is the most widely employed and valuable measure of the success of family planning programmes. Provision of modern methods of contraception to enhance family planning is required. Modern methods include female and male sterilization, IUD, implants, injectables, pill, male and female condoms, and lactation amenorrhea method (LAM). Use of these methods will help in reducing fertility, hence poverty status of households.

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