

**"CHILDHOOD MORTALITY AND POVERTY IN  
KENYA: LEVELS, PATTERNS AND DIFFERENTIALS"**



BY

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**A PROJECT SUBMITTED IN PARTIAL FULLFILLMENT FOR THE  
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UNIVERSITY OF NAIROBI**

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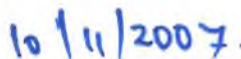
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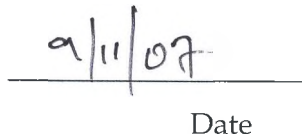
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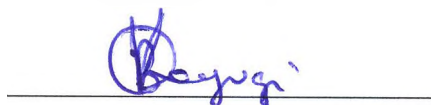


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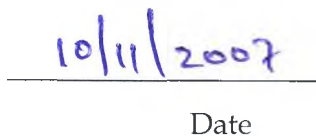


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## DEDICATION

I wish to dedicate this research project first, to my dear and beloved children; *Harriet, Vivian, Neville* and *Euclide* and with a hope they will emulate this; my dear beloved *Branice* for her love and moral support, typing of the project and encouragement to throughout the study, *Josephine* for the daily moral support and preparations, for the sleepless nights endured throughout the period the period of study period.

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## **"ABSTRACT"**

This research project focused on the estimation of the current levels of childhood mortality (measured by Under-five) in Kenya, generally, and in light of poverty, using secondary data from the 2005/06 Kenya Integrated Household Budgetary Survey (KIHBS 2005/06), which was conducted by the Kenya National Bureau of Statistics (KNBS) in the Ministry of planning and National Development.

The main objective was specifically, to assess childhood mortality levels, patterns and differentials with respect to poverty in Kenya. This was done by investigating how childhood mortality was related to some of the households' socio-economic and environmental characteristics such as; poverty status (food, absolute and hardcore), place of residence, region of residence and educational level. Indirect estimation method was applied to the data. Estimation of the probability of dying between birth and certain exact childhood ages  $q(x)$ , was done using the Trussell variant form of the Brass technique. This method focuses on number of children ever born (CEB), children dead (CD) and number of women aged 15-49; from births histories of women in the age group 15 – 49 interviewed in the survey. Estimates of childhood mortality rates were obtained by various factors that were thought to influence and affect them.

Moreover, household's socio-economic characteristics are known to have significant impact on child mortality. Outcome measures include childhood and under-five mortality rates. The socio-economic variables selected for the study were poverty (absolute poor and non-poor), place of residence; other proximate variables are toilet facility, source of drinking water, cooking fuel etc. The framework adopted in this study was based on the one developed by Mosley & Chen (1984) for studying child survival in developing countries.



The results of the analyses are presented and discussed in chapter 4. The results from the Trussell estimation indicated that childhood (U-5) mortality is still high in Kenya; and that poverty increases levels of childhood mortality. With respect to the first objective, levels of childhood mortality in Kenya are still high with regional variations maintaining the trends of high, medium and low mortality zones. U-5 mortality ranged from 46 to 145 per 1,000 live births (without poverty); and from a low of 30 to a high of 168 when poverty is included in the estimations. Sex differentials ranged from a low 59 (males) in Nairobi to a high of 199 (males) in North Eastern province. Further, the findings show that childhood mortality, as measured by ( $q_5$ ), is much lower than that of 115 obtained in the 2003 KDHS. The findings further suggest that female U-5 mortality is higher than that of male mortality in two provinces of Kenya: Coast and Nyanza, which is in contrast with findings often cited in literature. Thus, the female advantage has been reversed according to this study in these two regions, as male child mortality is normally higher than that of female.

The results thus confirm the study objectives that poverty is negatively associated with childhood mortality when other conditions are constant. Another observation made that was contrary to expectation was that of higher mortality rates among the non-poor households than the poor, observed in two provinces: North Eastern and Central. In conclusion, the study findings also pointed out some measures that could be taken to reduce childhood and under-five mortality. First, reduction of poverty levels in general and specifically food and absolute was necessary if the levels and differentials in childhood mortality were to be lowered in Kenya. Secondly, improvement in rural settings to levels that approach those of urban ones for instance health care facilities and improvement in infrastructure. Thirdly, more effort needs to be put in place especially in the high mortality zones of Coast, Nyanza and Western to stem the high mortality levels if Millennium Development Goal number four (MDG 4) is to be achieved in Kenya by 2015.



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## LIST OF ABBREVIATIONS

IMR	Infant Mortality Rate
U5MR	Under-five Mortality Rate
MDGs	Millennium Development Goals
ICPD	International Conference for Population and development
KDHS	Kenya Demographic and Health Survey
CBS	Central Bureau of Statistics
CDF	Constituency Development Fund
KNBS	Kenya National Bureau of Statistics
UN	United Nations
KIHBS	Kenya Integrated Household Budget Survey
ARI's	Acute Respiratory Infections
NASSEP	National Sample Survey and Evaluation Programme
GoK	Government of Kenya
CBN	Cost of Basic Needs
FEI	Food Energy Intake
FAO	Food and Agricultural Organization
DfID	Department for International Development
USAID	United States agency for International Department
SR	Sex Ratio
UNDP	United Nations Development Programme
WMS I	Welfare Monitoring Survey I, 1992
WMS II	Welfare Monitoring Survey II, 1994
WMS III	Welfare Monitoring Survey III, 1997
FGT	Foster, Greener and Thorbeck
KShs	Kenya Shillings
CEB	Children Ever Born
CD	Children Dead
U5M	Under-Five Mortality
U-5	Under Five

## CHAPTER ONE

### INTRODUCTION AND PROBLEM STATEMENT

#### 1.1 General Introduction

Childhood mortality has been a common agenda for public health and of the international development agencies and of late, it has received re-newed attention as part of the United Nations Millennium Development Goals (MDGs) (UN 2002). Among the 8 goals, goal No 4 is concerned with the reduction of child mortality by two thirds by 2015. Infant mortality which refers to deaths in the first year of life is an important indicator of social wellbeing, which reflects multiple social determinants of health. General mortality levels have declined all over the world partly due to advancement in medical technology coupled with improvements in sanitation and standards of living. The UN (2002) indicated that infant deaths declined from 156 deaths per 1,000 births in 1950 to 63 in 1994 and to 55 in 2002.

Initial Kenyan studies, showed declining trends in infant mortality in the 1960s, 1970s and 80s. This decline has been reversed during the 1990s which may be attributed partly to the decline in the socio-economic development witnessed in the mid 1980s and 1990s. The poor socioeconomic conditions led to increased poverty in the same period. This made the population have less access to basic needs like food, water and health care. These together with the emergence of HIV/AIDS have substantially contributed to the increasing levels of infant and child mortality.

#### 1.2 Background to the Study

Close to 11 million children die every year before reaching the age of five, or 20 per minute, 30,000 per day. Nearly 4 million of these die in the first 28 days of life (WHO, 2007). Globally, a total of 10.5 million children under 5 years of age were estimated to have died worldwide in 2000 and the great majority of

these deaths occurred in developing countries (WHO, 2004). Under-five mortality is also unacceptably high in many countries, the burden of which is mainly borne by the poor. Whereas country characteristics are known to influence this mortality, it is unknown whether these have a different impact on the poor and the rich.

Though reliable information on the actual causes of childhood death in Kenya is lacking, the leading causes of under-five mortality in Kenya have been pneumonia, malaria, measles and diarrhoeal diseases, which are estimated to have been responsible for some 60 percent of disease burden (Murray and Lopez, 1996).

Infant and child mortality levels in Kenya are still high compared to the world standards; although comparable to other developing countries. Kenya is ranked 52nd among the world's 226 nations ranked according to under-five mortality (WHO, 2002).

Kenya experienced a downward trend in the levels of infant and child mortality in the 1960s, 1970s up to the early 1990s. This trend is slowly reversing and a cause of worry as this implies that the gains made over the years are being eroded. This trend is also manifested at regional administrative levels. Data from the recent Kenya Demographic and Health Survey (CBS Kenya, 2004) show an IMR of 77 deaths per 1,000 live births and an under-five mortality of 115 deaths per 1,000 live births. This implies that one in every nine children born in Kenya dies before attaining his or her fifth birthday. In general, both infant and under five mortality are increasing.

**Table 1.0:** Levels of Infant and Under-five Mortality Rates, Kenya: 1962-2003

Survey and Year	IMR	U5MR
Census 1962	-	219
Census 1969	119	190
Census 1979	88	157
Census 1989	66	125
KDHS 1989	60	89
KDHS 1993	62	96
WMS II 1994	59	91
WMS III 1997	-	-
KDHS 1998	71	105
Census 1999	77.3	-
KDHS 2003	77	115
KIHBS 2005/06	-	95*

Source: WMS I & II, POPULATIONS CENSUSES 1962, 1969, 1979, 1989, 1999; KDHS 1989, 93,98,2003 AND

\* Estimated from (KIHBS)

According to UNICEF (2000), the level of under-five mortality in Sub-Saharan Africa (SSA), was 173 per 1000 live births compared to 70 per 1000 that was internationally adopted in the 1990 world summit for children. Causes of infant child mortality are multidimensional, especially in developing countries, where there are great, variations between social, economic and demographic groups of people even inside one country.

Reasons on why infant and child mortality rates remain high in many SSA countries, despite numerous actions, plans and interventions made is still scanty. The major issues that require consideration in this study include the continued high levels of childhood and under-five mortality in Kenya which are linked to poverty according to available literature.

Thus despite various studies, actions and interventions being taken; firstly, the levels of infant mortality in Kenya are still un-acceptably high and on the increase, according to available studies. Secondly, most of the Kenyan Population estimated at 16.7 million (46 per cent) live below the poverty line. This acting through other intermediate factors like accessibility to health services, poor housing and sanitation, malnutrition; may impact directly or indirectly on infant and child mortality.

### 1.3 Problem Statement

The relatively high and increasing rates of infant and under-five mortality are a concern, not only to Kenya, but also to Africa, other developing countries and the rest of the world. This study therefore anticipates to estimate the current levels and patterns of infant and child mortality in Kenya; and also assess the effects of some the socio economic, bio demographic and environmental factors such as:- maternal education, poverty, place of residence, drinking water source and main cooking fuel on infant and child mortality.

Childhood mortality rates have declined considerably over the past few decades in most of the Sub-Saharan Africa (SSA) but since the 1990s; mortality rates have started to increase again in parts of the continent. This new trend has been attributed to the effects of the AIDS epidemic (Hill et al. 2001, Adetunji, 2000) and Drug-resistant malaria.

Furthermore, the Government of Kenya in its Sessional Paper No. 10 of 1965 (RoK, 1965); identified poverty, ignorance and diseases as major challenges among others, that were facing Kenya. People define, view and experience poverty in different ways as poverty is multi dimensional and manifests itself in various forms and may be defined in absolute or relative terms (GOK, 1997 & 2000, various reports). Based on the basic report on well-being in Kenya (2005/06), poverty measures are based on consumption rather than income.

The KIHBS 2005/06 captured some basic demographic characteristics of household members that included age, place of residence, sex, household headship, marital status etc. The results showed that the population distribution is 50.7 per cent females and 49.3 percent males, which is exhibited across all provinces except North Eastern and Rift Valley. The sex ratio is 97, dependency ratio is 84, mean household size stands at 5.1 members compared to 4.4 as recorded in the 1999 census.



In this study, the poverty lines adopted will be those used in the KIHBS reports that were based on the Cost-of-Basic Needs (CBN) method, (KNBS, 2007). Using headcount ratio, the poverty estimates are categorized into 3 basic measures as:- food poverty, overall/ absolute and hardcore poverty. Poverty influences health as it greatly determines an individual's environmental risks as well as access to resources in order to deal with those risks. Many households in the developing world are exposed to disease causing pathogens in their immediate environment. More than 1 billion people in the developing world live without adequate shelter, 1.4 billion lack access to safe water while another 2.9 billion have no adequate sanitation facilities (WDI, 2004), all of which are essential for hygiene.

Infant mortality rates in Kenya area still very high comparatively and have increased by 30 percent between 1989 and 2003. The International Conference for Population and Development (ICPD, 1994) in Cairo, Egypt, proposed a programme of action that called for the promotion of child health and survival while reducing disparities within region and the elimination of excess and preventable mortality among infants and children. The 30 percent rise in IMR is over two times the ICPD target of 35 deaths per 1000 live births (CBS et al. Kenya, 2004).

In 2000, Kenya was one of the UN member states identified as one of the four pilot countries where the millennium project was to be implemented. Among the 8 MDGs, goal No. 4 is concerned with reduction of child mortality by two thirds by 2015 (i.e. from 41 per 1000 in 2003 to 13 per 1000 by 2015. Despite numerous interventions, there is little evidence existing to show why the infant and child mortality rates are increasing in Kenya. If Kenya is to lower rates of infant child mortality and also achieve MDG on child mortality, there is need to understand the factors that are contributing to this high levels of mortality. Thus, being ranked among those with high level of child mortality in the world, coupled with a population almost half (46 percent-16.6 million)

of which is poor, raises concern over the association between these two phenomena.

### **1.3.1 Study Purpose**

The purpose of this study is to explore and find out the current levels and patterns of infant and child mortality, to determine the inter-play of poverty on childhood mortality and to investigate the effects of some socio-economic and environmental factors on childhood mortality in Kenya.

### **1.4 Research Questions**

In order to address the issues stated above, the following research questions will be asked:-

1. What are the current levels and patterns of childhood mortality by poverty levels in Kenya?
2. How does child mortality rates relate to poverty levels in Kenya at national, sub-regional and at urban /rural level?
3. What are the sex differentials in childhood mortality in Kenya, its regions and in its rural/urban places?

### **1.5 Objectives of the Study**

The main objective of this study is to assess the relationship between childhood mortality and poverty on the basis of levels, patterns and differentials in Kenya and by its sub-national levels (Provinces).

The specific objectives are: -

1. To estimate the current levels and patterns of childhood (U-5) mortality in Kenya by its sub-national levels (Provinces) and by place of residence.
2. To explore the relationship and interplay between childhood mortality (as measured by U-5 or q5) rates with absolute poverty measures in Kenya generally; and at provincial and rural/urban levels.

3. To examine sex differentials, in childhood mortality in Kenya by its regions and places of residence.

## **1.6 Justification**

This study was inspired by an attempt to use a new secondary data source, the Kenya Integrated Household Budget Survey 2005/06 (KNBS,2007), to assess the contribution of poverty to childhood mortality and see what aspects of poverty measures are associated with childhood and under-5 mortality in Kenya. The current levels have been estimated from the 1999 Census data and the 2003 KDHS.

## **1.7 Scope and Limitations**

Due to limitations in time and financial resources, it will not be possible to carry out a survey to collect primary data. The study will therefore utilize secondary data from the 2005/06 Kenya Integrated Household Budget Survey, which is a relatively new and comprehensive data set that was conducted by the Kenya National Bureau of Statistics, KNBS (formerly CBS), which is government statistical department.

However, analysis will be done up to provincial sub level for a substantive estimation of childhood mortality. This being a secondary data base, it may suffer from errors of under or/and over reporting especially on CEB and CD. Data quality and the small number of cases involved in some instances may affect some of the results obtained.

## CHAPTER TWO

### LITERATURE REVIEW AND CONCEPTUAL/THEORITICAL FRAMEWORK

#### 2.1 Introduction

There has been a long and sustained global interest in infant and childhood mortality that stems from the fact that it is an important indicator for the overall social and economic well being of a country or a society. The previous chapter laid down the context of the research problem and identified the research problem.

In this chapter, literature is reviewed to find out factors that have been identified to have significant effects on childhood mortality and thereby form a basis for this study and also presented is the conceptual framework for the study. The literature reviewed will be both theoretical and empirical as evidenced by studies done in Kenya and other parts of the world.

#### \* 2.2 Theoretical Literature.

Theoretical frameworks can be used to present health productive functions which capture the relation between health outcomes and the household behavioral variables (Schultz, 1984). A demographic framework, the Mosley and Chen (1984) framework, has most influenced public policy through their view of “distal” socio-economic factors such education and income as factors influencing disease incidence and outcomes as measured by five broad groups of “proximate” determinants of child survival; namely maternal factors nutrient deficiency, environmental contamination, injury, and personal illness control. The proximate determinants perspective views mortality as an end point that is influenced by biomedical and socio economic factors and this implies a need for an integrated approach to the study of child health and mortality.

These frameworks (Mosley and Chen, 1984, Schultz, 1984) have made distinctions between socio economic factors (cultural, social, economic, community, regional) and bio-medical factors (i.e. hygiene, sanitary measures and nutrition). The socio-economic factors act indirectly as they operate through the biomedical factors. These biomedical factors are intermediate variables that link the socioeconomic factors and child mortality (Mosley and Chen, 1984, Jain, 1988)

### **2.3 Empirical Literature**

Although infant and child mortality declined steadily between 1962 and 1989, data from the 1999 Kenya Population and Housing Census exhibited an upsurge. The census data also confirmed the conclusions on mortality trends drawn from the Demographic and Health Surveys. This upsurge is attributed to the vertical transmission of HIV/AIDS especially in the under 5 mortality (GOK 1999 Census Report, Vol. III).

A number of studies have found that membership in a higher socio economic status (SES) group has a significant effect on different demographic outcomes such as lower infant and child mortality (Doctor, 2003). Most of these studies have analyzed the association between socio- economic status and children's survival by focusing on data on asset ownership, which includes, for example, owning, a bicycle, radio or television; housing characteristics. These household characteristics are conceived to have a direct or indirect role in shaping child mortality differentials. A number of studies have been carried out on infant and child mortality using census and survey data. In Kenya, most of these studies have used indirect methods, mostly the Trussells technique; Preston method and Coale-Demeny model life-tables; whereas others have used Survival models to estimate childhood mortality.<sup>^</sup>

Early estimates of poverty in Kenya were based on: - integrated rural surveys, Household Budget Surveys, Participatory Poverty Assessment (PPA), Welfare

Monitoring Surveys (WMS I, II, III of 1992, 1994, 1997 respectively) and most recently, the Kenya Integrated Household Budget Survey (KIHBS, 2005/06). The KIHBS 2005/06 used the CBN method in establishing the current poverty indicators. According to the study the food poverty line for Kenya is estimated from consumption data, where the food poverty line is estimated as the cost of consuming 2,250 kilo calories per adult equivalent per day. This translates to monthly adult equivalent to Kshs 988 and Kshs 1,474 for rural and urban areas respectively.

The overall poverty lines are Kshs 1,562 for rural and Kshs 2,913 for urban areas. The survey found that nationally food poverty stood at 46 percent, implying that this number were unable to meet their basic daily energy requirement (2,250 Kilo Calories per adult equivalent per day). Absolute (Overall) poverty stood at 45.9% whereas hard core poverty was at 19 percent of all Kenyans. Some of the proximate indicators of poverty, that is, factors associated with poverty in the study include: area of residence (urban rural), household demographics, (sex of household head), education, household size, age of household head, expenditure, health water and sanitation, energy and environment. For instance, education levels are inversely related with the incidence, depth and severity of poverty whereas the depth and severity of poverty is also higher as household size increases (KNBS, 2007).

Using the Living Standards Index (LSI) based on household characteristics on the 1987 Malawi census data, Doctor (2003) found that mortality was higher for children from poor households. Applying the same method to the 1998 Malawi census, there was reversal in that mortality was higher among the rich households which he attributed to the AIDS epidemic and also due to observed high mortality levels in all households and high social class groups in Malawi.



The idea of using information on household possession as a measure of household wellbeing is that, household with piped water, flush toilets, cemented floor, use electricity for cooking or those possessing certain durable goods like radio, telephone, VCR television; are more likely to achieve good health status than those without their facilities or those that rely on surface water, pit latrines, rudimentary floors etc. (Bawah, 2002)

(Oropesa, R.S et al, 2001) in their study on poverty, prenatal care, and infant health in Puerto Rico, concluded that infant health outcomes are unrelated to both family poverty and neighborhood poverty. However, poverty compromises the health and well being of most vulnerable member of any society - infants and children.

#### **2.4 Summary of Literature Review**

From the foregoing literature review, it is evident that several studies have been done that contributed significantly to the understanding of factors that associated with infant and child survival in the world at large, developing countries and Kenya in particular. However fewer studies have tried to link and find the interplay between poverty and infant/child mortality.

#### **2.5 Conceptual Framework**

This study endeavors to use the Mosley & Chen (1984) framework as it has been a widely adopted model in the studies done on child survival. Being flexible, the model can be modified to suit particular situations. The framework can be used to explain mechanisms through which various determinants operate to affect mortality. It encompasses socio-economic determinants that operate through intermediate variables that directly influence the risk of mortality.



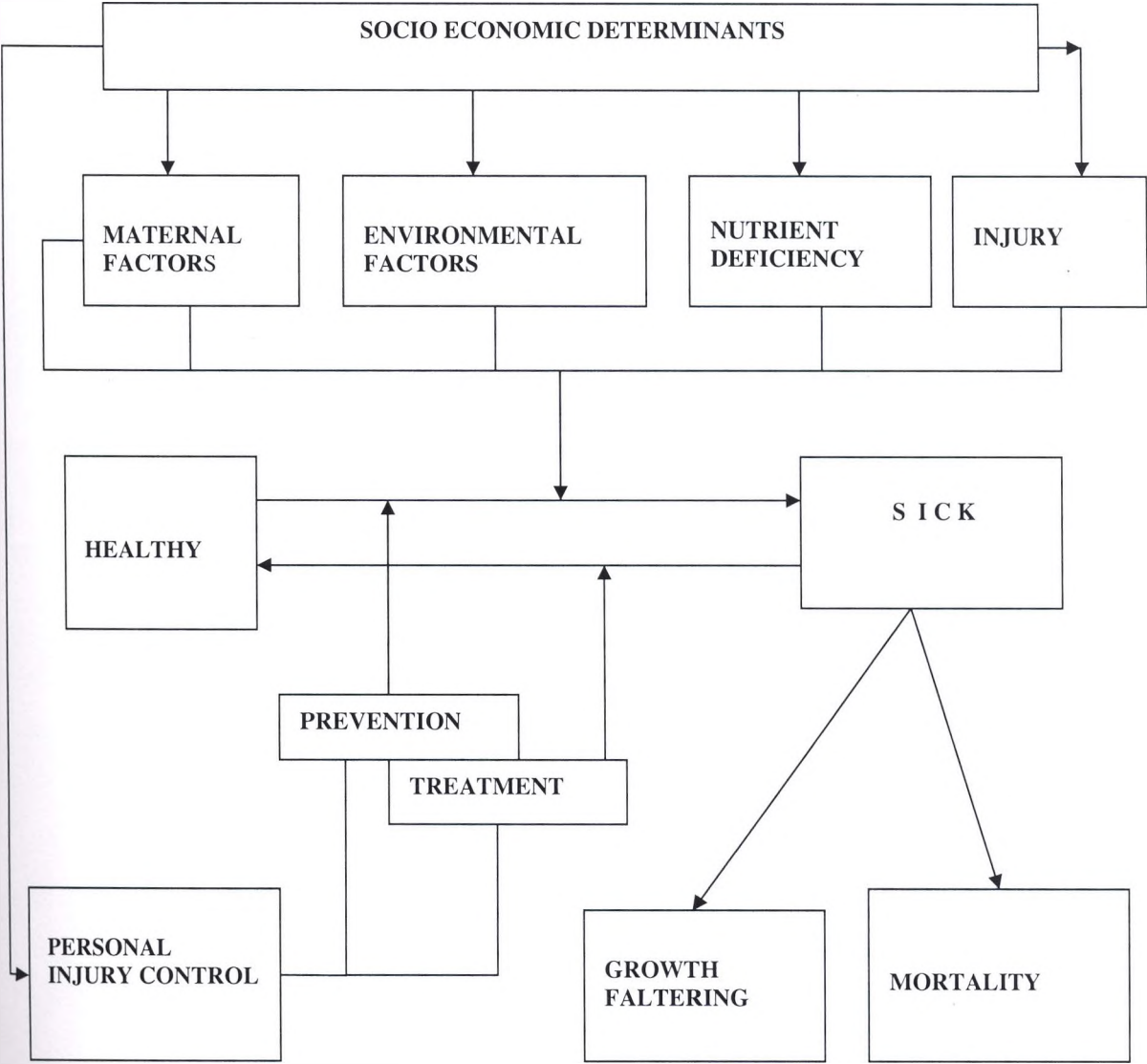
The Mosley & Chen (1984) framework operates on among others, the basis that:-

1. Reduction in any survival probability in any society is by the operation of social, economic, biological and environmental forces.
2. Socio-economic determinants (explanatory variables) must operate through one or more proximate determinants that in turn influence the risk of disease and the outcome of the disease process.

The level of childhood mortality in any population is the interaction between hazards present in the environment and the ability of the population to defend itself against them. In this respect, poverty levels, measured by poverty lines as being either poor or non-poor in absolute terms; will determine the population's environment i.e. shelter, housing, water sources, sanitation facilities- thus determining their exposure to disease risk factors. The way they deal with these risk factors will depend on their standard of well being and hence ultimate health outcome.

The nutritional status of an individual exerts effects of lowering resistance to infections /diseases (Lakhan, 1987). Poor families are undernourished and live under unhygienic and unsanitary conditions (Neumann & Bwibo, 1987). If the diet intake of expectant, nursing mothers and infants/children is inadequate; this will have a bearing on the survival status of newborns. Again, the nutritional status of a household may depend on the number of household members.

FIGURE 1: A FRAMEWORK SHOWING THE OPERATION OF THE FIVE GROUPS OF PROXIMATE DETERMINANTS ON THE HEALTH DYNAMICS OF A POPULATION.



Source: Mosley and Chen (1984)

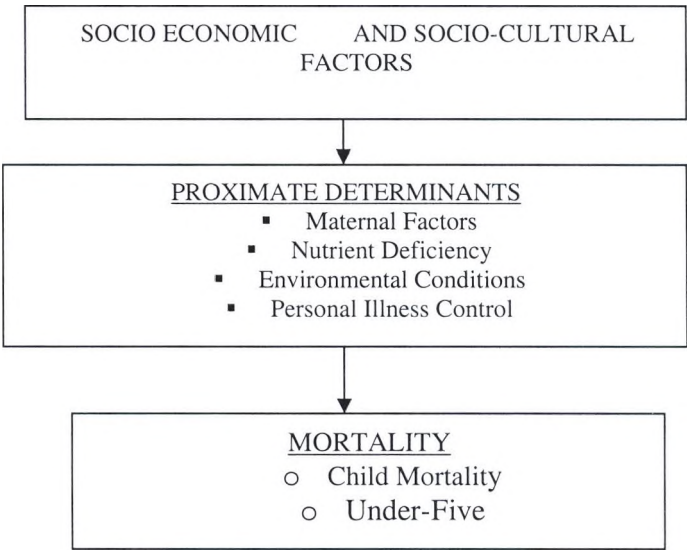
As can be seen from figure 1 above, death is a complex phenomenon as it is a cumulative series of biological insults rather than the outcome of a single biological event. Socioeconomic factors like mother’s education, poverty level, place of residence all act together to affect the nutritional/diet intake this will in turn produce a healthy or sick child. The kind of preventive medication used and treatment received will also depend largely on the socioeconomic

status (poor or rich) of the household which may be modern or traditional. Hence the health of the child will culminate in either death or survival. It has been suggested that socioeconomic and geographical variations in early childhood mortality are usually closely associated with adequate health and medical services and adequate nutrition.

The diseases leading to the fatal outcome – for example infant and child - constitute the proximate causes of death. The occurrence of these diseases is ultimately determined by macro-level, socioeconomic, environmental, bio demographic factors such as income, poverty or level of well being- which are the distal determinants of mortality. For example, the level of poverty in a household may increase or decrease exposure to risk factors like poor nutrition during pregnancy or nutrient intake for new-borns; or by decreasing access to protective factors such as antenatal, delivery and post natal care.

2.5.1: Modified Conceptual Framework

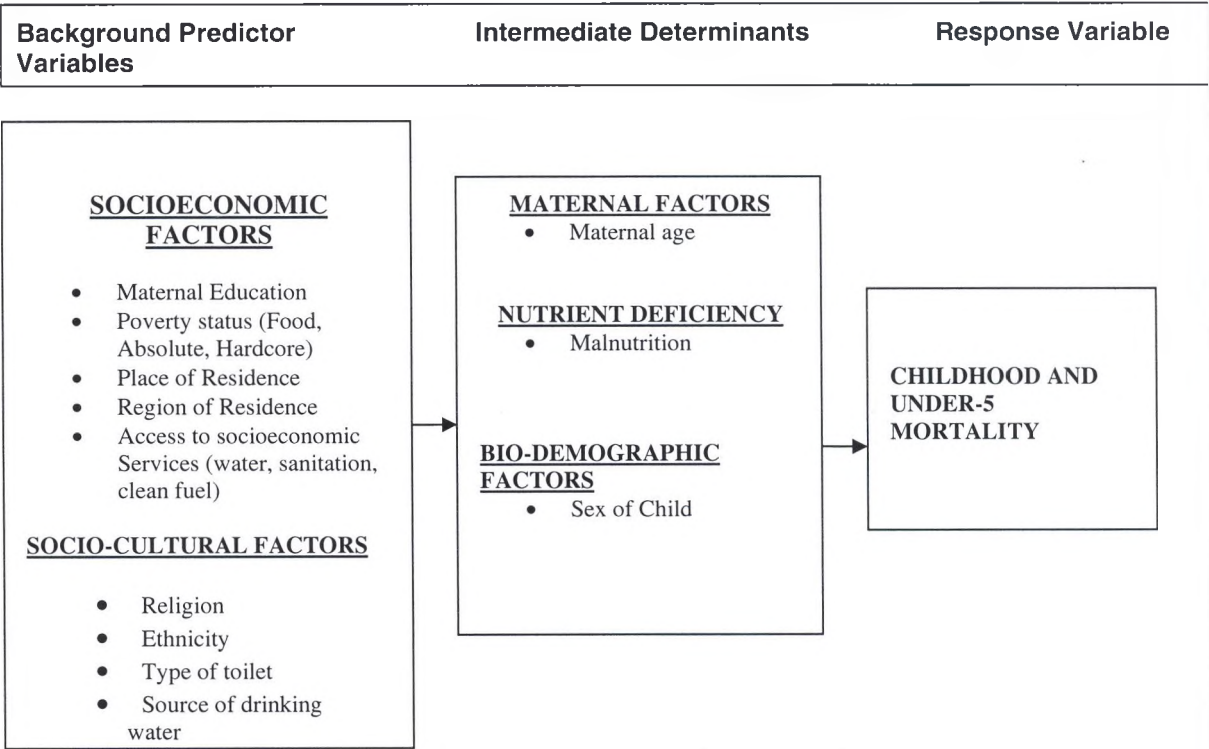
Figure 2: Modified Conceptual Model



Source: Adopted and modified from Mosley and Chen, 1984.

2.5.2: Operational Framework

Figure 3: Operational Framework



Source: Modified from the Conceptual Framework and Mosley and Chen (1984) Framework.

2.5.3Definition of Key Concepts

- **Childhood mortality:** consists of deaths occurring among children from birth until exact age 5. It has 3 components: Infant Mortality, Child mortality (q4) and Under-5 Mortality. In this study q5 will be used as a measure of childhood mortality.
- **Under-Five (U5M or q5)** - the probability of dying between birth and exact age 5.
- **Child mortality ( ${}_4q_1$ ):** the probability of dying between exact ages one and five years
- **Socioeconomic factors** – refers to the prevailing individual & communal conditions of relevance like mother’s education, poverty levels, residence(urban-rural), region

- **Environmental factors**- these refer to the surroundings within which households live. Includes sanitation, source of drinking water, type of toilet facility, source of cooking fuel.
- **Bio-demographic** – refers to biological and demographic characteristics of the mother that may have an influence on child death, e.g. age of mother.
- **Food poverty (line)**: the cost of consuming 2,250 Kilo calories per adult equivalent per month; or the inability to raise (Kshs 988 (rural) and Kshs 1,474 (urban) per adult equivalent per month for food purposes.
- **Absolute poverty line**- Kshs1, 562 for rural and Kshs2, 913 for urban, per adult equivalent per month. This is also referred to as overall poverty measure.
- **Hardcore poverty**- Refers to the inability to meet ones food requirements even if one was to use all his/her expenditure on food alone.

#### 2.5.4 Definition of variables

From the concepts defined above, the following variables have been selected for this study.

1. **Maternal Education**: This variable will refer to the level of formal schooling of the mother. It will have categories None, Primary education and Secondary + (plus) as reported in the survey.
2. **Poverty Status (Absolute/Overall)**: These are defined in the concepts above.
3. **Place of Residence**: distinguishes between urban or rural habitat. Urban is associated with better socio-economic well being and better child survival status.
4. **Region of Residence**: refers to the 8 (eight) provinces or regions that Kenya is administratively divided into. These are: - Nairobi, Central, Coast, Eastern, North Eastern, Nyanza, Rift Valley, and Western Rift Valley Provinces.
5. **Toilet/Sanitation Facility**: This variable will have two categories, safe and Unsafe. It is intended to capture households' environmental status

that are key in determining likelihood of disease causing pathogens and also as proxy to household's poverty levels.

6. **Religion:** This will refer to the religious affiliation of the mother. Four categories will be created: - Catholic, Protestant/Other Christian, Muslim and Other religion. Religion creates individual attributes that affect his/her attitude towards family size, health seeking behaviour; which have an effect on the survival status of a young child.
7. **Ethnicity:** It refers ethnic grouping the mother belongs to. It measures the socio-cultural aspects of a society in which a child is born and lives. Its beliefs, practices and attitudes affect indirectly a child survival status.

## 2.6 Operational Hypotheses

1. Childhood mortality in Kenya is likely to be affected by the poverty level/status of a household, the higher the poverty level, the higher the mortality rates.
2. Children born to households that are poor are more likely to experience higher child mortality compared to their counterparts from non-poor households.
3. Absolute Poverty levels influence childhood mortality in Kenya and its regions.
4. Food poverty is likely to affect childhood and under-five mortality
5. The poverty status of a household is likely to negatively affect the survival status of an infant or child.
6. Childhood and under-five deaths are likely to be higher in poor rural households than in urban poor households.



## CHAPTER THREE

### DATA AND METHODOLOGY

#### 3.1 Introduction

This chapter presents, the design of the KIHBS survey, sampling procedure, scope and limitations of the survey, data quality issues, methodology and data analysis methods adopted to achieve the study results. This study utilized secondary data and information on household and individual characteristics (like child births and deaths) from the Kenya Integrated Household Budget Survey (KIHBS), of 2005/2006; which was conducted for a period of 12 months, between May, 2005 and May, 2006 by the Kenya National Bureau of Statistics (KNBS-formerly CBS).

This Survey collected data on: welfare statistics, poverty, demographics, socio-economic aspects of the Kenyan population including education, health, energy, housing water and sanitation, agriculture, consumption and expenditure among others; that were required to measure, monitor and analyze progress in improving living standards in Kenya. Fertility data was collected from a total of 15,705 women aged between 15 – 49 years.

#### 3.2 Survey Design and Sampling Procedure

The 2005/06 KIHBS was a representative national survey carried out by the Ministry of Planning and National Development through the Kenya National Bureau of Statistics (KNBS- formerly CBS). Financial and technical assistance was provided by the World Bank and German technical Cooperation (GTZ). Funding was provided by various development partners namely DfId, USAID, EU, DANIDA and UNDP.

The survey was conducted within the National Sample Survey and evaluation Programme, phase IV (NASSEP IV) frame. The Frame is owned and



maintained by the Kenya National Bureau of Statistics, a department in the ministry of Planning and National Development. The frame consists of 1,800 clusters (sampling units) each of which has about 100 households. A total of 1,343 out of the 1,800 primary sampling units were selected for this survey each consisting of 10 households; thus giving a total number of 13,430 (8,610 rural & 4,820 urban) households. The sample design facilitates representative estimates at national, provincial, district as well as rural/urban categorization. The overall coverage and response rate was 98 percent. The data used in this study was a subset of KIHBS data set comprising of the following modules:-household identification, household membership, education, household consumption and expenditure and the health-fertility-mortality modules.

### **3.3 Scope and Limitations of the Survey**

- The KIHBS survey was designed to provide district estimates. This implies that for certain variables, e.g. children per household, the estimates may not be very reliable as a result of the small samples from some districts.
- The use of value of assets, rental value for owner occupier, and value of own consumption of goods and services, were all based on estimates given by the respondents. The interpretation of such values calls for caution.

### **3.4 Data Quality**

Assessment of data quality was done on the number of children ever born (CEB). Sex Ratios (SR) at births were examined to assess levels of over reporting and under-reporting. Some of the rates obtained were compared to those reported in other studies like the 1999 Kenya population Census and the Kenya Demographic and Health Survey (2003). Cases of under and over reporting were found in some portions of the data used, but, the overall sex ratio for Kenya did not show any bias or any serious errors.

3.5 Methodology

In order to achieve the research objectives of determining childhood mortality levels and associations with its determinants, the following approach was adopted:-

3.5.1 Indirect Methods

Estimation of current levels and patterns of child hood mortality from the KIHBS data was done using information on CEB and the proportions of children dead tabulated by age groups of mothers. The survey data consists of children ever born/surviving for women aged 15-49 years who were distributed by five-year age groups. This was converted into mortality rates by specific ages of childhood,  $q_{(x)}$ ; using the Trussell (1975) variant of the original Brass technique and the Princeton North Model of Life Tables.

The method has the assumption that fertility and mortality patterns are constant in the recent past. The available data will accommodate this model. The argument behind this method (technique) is that, the proportion of children surviving depends on the level of childhood mortality in a given society. Three sets of data are required for this method: Children ever born (CEB) classified by age of mother, children dead (CD) by age of mother and number of women by age group. Given these three sets, this technique converts the proportions dead among the CEB to these women into conventional measures of mortality. The parameters estimated from it are  $q_1$ ,  $q_2$ ,  $q_3$ ,  $q_5$ ,  $q_{10}$ ,  $q_{15}$  and  $q_{20}$ . However, only  $q_5$  is considered in this study.

3.6 Data Analysis

3.6.1 For indirect estimation, the Trussell variant form of the Brass technique was applied (UN, 1983). The basic form of the estimation equation proposed by Brass and modified by others is as follows:

$q(x) = k(i)*D(i).....(1)$

Where,  $q(x)$  = is the probability of dying between birth and exact and exact age x.

$(x)$  = exact age  $x$ ; or  $1.0 - l(x)$

$D(i)$  - the proportion dead among children ever born to women in successive five-year age groups.

$K(i)$  - Set of multipliers for each age group of mothers and is given by

$$\{k(i) = a(i) + b(i) \cdot P1/P2 + c(i) \cdot P2/P3 \dots \dots \dots (2)\}$$

to adjust for non mortality factors.

$(i)$  - Group of women in the reproductive age group (15-49);  $i=1$  is 15-19,  $i=2$  is 20 - 24,  $i=3$  is 25-29....up to  $i=7$ .

$l(x)$  - the probability of surviving to exact age  $x$

$P_i$  = Parity by age group for  $i=1, 2, 3$  or  $\{=CEB(i)/FP(i)\}$

$a(i)$ ,  $b(i)$  and  $c(i)$ = are *constants or coefficients for estimation of child mortality multipliers of Trussell Variant (Manual X, UN, 1983 pg 78; Table 48).*

CEB = Number of children ever born by women in age group  $i$ .

$FP(i)$  = Female Population in age group  $i$ .

The computational procedure involves calculation of average parity per woman ( $P_i$ ), the calculation of proportions of children dead ( $D(i)$ ), calculation of multipliers  $\{k(i)$  -Trussell multipliers}, calculation of the probabilities of dying ( $q(x)$ ) and surviving  $l(x)$  and finally, the calculation of the reference period  $t(x)$ , which is the number of years prior to the survey and is given by the equation:

$$t(x) = a(i) + b(i) \cdot (P1/P2) + c(i) \cdot (P2/P3) \dots \dots \dots (3)$$

The analyses in this study are based on estimates of  $q_5$  (under-5 mortality) to constitute our childhood mortality variable i.e. the probability of dying between birth and exact age five.

### **3.6.3 Unit of Analysis**

The unit of analysis in the study will be the households with women aged 15-49 years enumerated during the survey for the indirect analysis. The set contains a women's file and their birth histories. Estimates of childhood mortality were made using indirect method in which a total of 15,705 women in the child bearing age group 15-49 were sampled. A total sample of 37,368 Children Ever Born (CEB) was extracted of whom 3,778 had died (CD).

## CHAPTER FOUR

### LEVELS AND DIFFERENTIALS IN CHILDHOOD MORTALITY

#### 4.1 Introduction

This chapter presents the levels and differentials in childhood mortality based on indirect estimates of childhood mortality described in chapter 3. The first section presents descriptive data of the study population followed by discussions of the results on the levels, patterns and differentials in childhood mortality by area and region of residence as well as by poverty status. The second section deals with discussions on the findings from the Trussell estimates of childhood mortality. The third and last part of this chapter is concerned mainly with findings on levels and differentials in childhood mortality as measured by  $q(5)$  in Kenya, by poverty status.

#### 4.2: Background Characteristics of the Study Population

The data for the analysis of childhood mortality is derived from the population of number of children born and dead from reports on women aged 15-49. These characteristics are presented in Table 4.1 below. Overall, 54 percent of the mothers interviewed were found to be below 25 years of age while those considered for most parts of the analysis (25-34 years), were only 24 percent. A total of 15,705 women were reported in the reproductive age group 15-49 of whom the majority, 25 percent were young mothers (15-19) while those aged 45 and over were the least.

However, the number of Children Ever Born (CEB) among the former were the least. The most number of CEB were reported to women in the age groups 25-49 who had combined total births of 34,021 children. Out of the 38,008 births, 3,813 had died giving the proportion dead as 0.1003. The proportion dead increases with the age of mother since the older the women the higher the expected number of children ever born (CEB) and children dead (CD).

**Table 4.1:** Background Characteristics of the Study Population

Percent Distribution of Study Women by Background Characteristics, KIHBS, 2005/06					
Variable	Percent	Number of Women	CEB	CD	Proportion Dead
<b>Mothers Age</b>					
15-19	25.5	4,010	630	34	0.0540
20-24	20.3	3,197	3,357	241	0.0718
25-29	16.0	2,525	5,780	563	0.0974
30-34	12.3	1,932	6,951	664	0.0955
35-39	10.1	1,587	7,239	746	0.1031
40-44	8.8	1,389	7,634	844	0.1106
45-49	6.7	1,065	6,417	721	0.1124
Total	100.0	15,705	38,008	3,813	0.1003
<b>Place of Residence</b>					
Rural	66.7	10,475	28,301	3,049	0.1077
Urban	33.3	5,230	9,707	764	0.0787
Total	100.0	15,705	38,008	3,813	0.1003
<b>Region of Residence</b>					
Nairobi	4.4	807	1,056	58	0.0549
Central	10.3	1,887	3,067	126	0.0411
Coast	10.2	1,858	4,140	460	0.1111
Eastern	18.7	3,416	6,994	592	0.0846
North Eastern	4.1	752	1,836	175	0.0953
Nyanza	15.4	2,811	6,162	1,011	0.1641
Rift Valley	25.1	4,591	9,584	693	0.0723
Western	11.9	2,180	4,979	611	0.1227
Total (Kenya)	100.0	18,302	38,008	3,813	0.1003
<b>Poverty Status</b>					
<b>Food</b>					
Poor	48.3	8,819	19,302	2,005	0.1039
Non-Poor	51.7	9,449	18,677	1,808	0.0968
	100.0	18,268	37,979	3,813	0.1004
<b>Absolute</b>					
Poor	47.1	8,602	20,129	2,239	0.1112
Non-Poor	52.9	9,666	17,850	1,574	0.882
	100.0	18,268	37,979	3,813	0.1004
<b>Hardcore</b>					
Poor	20.0	3,645	8,876	1,003	0.1130
Non-Poor	80.0	14,623	29,103	2,810	0.0966
	100.0	18,268	37,979	3,813	0.1004

**Source:** Computed from KIHBS, 2005/06 Data (KNBS)  
 CEB Refers to Children Ever Born, CD stands for Children Dead.

The data further shows that, the majority (67 per cent), of the mothers interviewed were from rural areas. Regional variation show that almost one quarter (25.1 percent) were from Rift Valley province followed by Eastern 18.7 percent and third was Nyanza with 15.4 percent of the respondents.

This is expected as these provinces carry the largest proportion of the national population base. North Eastern and Nairobi had the smallest sample sizes considered in the survey with almost equal proportions of 4.1 and 4.4 percentage points respectively. The proportions of children dead are highest in the provinces of Coast, Nyanza and Western, which are traditionally the high mortality zones in Kenya.

Next, by poverty status, the population can be categorized into three poverty measures: food poor/non-poor, absolute poor/non-poor and hardcore poor/non-poor. For the purpose of this study, only absolute poverty status is considered and it captures the ability to afford food and non-food items per adult equivalent per months (KShs 1,562 and 2,913 for rural and urban respectively, are the poverty lines). The study population thus had 47 percent of the women absolute poor and the rest non-poor. According to poverty status, it is observed that almost half of the population studied was poor by absolute standards. Further, the proportion of CD is also highest among this group, at 0.1112 (See also Annex 8).

**4.3 Summary Measures in Levels and Differentials in Poverty Status by Place and Region of Residence.**

The KIHBS 2005/06 report (Table 4.2) indicates that all poverty measures and indicators are lowest in urban areas compared to those of Kenya and rural areas. Levels of food poverty are higher in rural areas than urban by 17 percent and stood at 47 percent overall. The report further shows that 50 percent of all individuals in rural Kenya were absolute poor while the study population consisted of 52 percent absolute poor. In urban areas, only 34 percent were absolute poor. This means that there were 1.5 times more poor people in rural areas than urban.



**Table 4.2:** Summary of poverty measures (Individual) by Region, KIHBS 2005/06

Region	Poverty Measure	National	Rural	Urban
National	Food	46	47	40
	Absolute	47	50	34
	Hardcore	20	22	8
Regional	Region	Poverty Measure		
		Food	Absolute	Hardcore
	Nairobi	30	21	4
	Central	31	31	12
	Coast	63	70	36
	Eastern	45	52	23
	North Eastern	65	74	46
	Nyanza	46	48	21
	Rift Valley	49	49	21
	Western	51	53	24

**Source:** KIHBS REPORT, 2005/06, (KNBS, 2007).

The study data had 37 percent of the urban being absolute poor; which is 1.4 times lower than the rural poor. Food poverty measures (Annex 6) are close to those of absolute poor in both areas of residence. Hard core poverty is less common in both urban and rural areas. Thus the number of hardcore non-poor is over three times that of the poor (16 rural and 89 percent in urban respectively).

Regional assessment of the population covered in KIHBS indicated two provinces; North Eastern and Coast to be zones with high levels food poverty (65 and 63 percent respectively), followed by Western, Rift Valley, Nyanza and Eastern in that order; while Central was the least poor, with 31 percent rating. By absolute poverty standards, the same provinces (North Eastern and Coast) ranked first and second respectively, while Central retained its least poor position. Compared to the study data in table 4.1, the pattern is closely similar to that mentioned above. Nairobi and Central Provinces exhibited the lowest levels of poverty by all 3 poverty indicators compared to the other 6

provinces. On the other hand, North Eastern, Coast and western emerged as the leading in all three poverty indicators with North Eastern highest with 78 percent absolute poor, 71 percent food poor and 47 percent hardcore poor. Nairobi, though not rural in nature had 12 percent absolute, 22 percent food and only 1 percent hardcore poor was the least poor overall.

When compared to the national figures of 47, 48 and 20 percent for absolute, food and hardcore poor respectively, North eastern province was found to be 1.7 times more absolute poorer and 6.5 times more than Nairobi. The other three provinces; Rift Valley, Nyanza and Eastern had moderate to average poverty indicators by all the 3 poverty measures approximating the national aggregates.

The next section provides discussions on results contained in table 4.3. It presents information on childhood mortality by sex, place of residence, region of residence and by poverty status. Also included are the time-locations for the parameter estimate, under-5 mortality ( $q_5$ ). This is necessary for the study of mortality differentials across population subgroups. The key findings of the study are contained in Tables 4.3, 4.4 and 4.5, details of which are discussed under each table.

#### **4.4 Childhood Mortality Levels (National)**

The Trussell variant form of Brass technique was applied to this data and estimates of childhood mortality  $q_5$  were obtained; at national, regional, area of residence and by poverty levels and other background characteristics. The study excluded estimates of childhood mortality  $q_1$ ,  $q_2$ ,  $q_3$  and  $q_4$  as estimates from data of mothers in the ages 15-24 (young mothers) are generally subject to un-usually high mortality risks; and also the numbers of CEB and CD among them are normally small.

For q(3) and q(4): childhood mortality before ages 3 and 4 respectively, these are also discarded as the numbers in sample may not give realistic figures using this data and method. Thus q(5); the probability of dying before exact age 5, is used as the main measure of childhood mortality in the present study. Table 4.3 below presents estimates of under-five mortality in Kenya, by its provinces and areas of residence; and by sex and time locations.

**Table 4.3:** Demographic and Socio-Economic Differentials in Childhood Mortality

Background Characteristics		U5M Rates-q(5)			Time Location
		Male	Female	Total	
<b>Region</b>					
	<b>Kenya (Total)</b>	<b>103</b>	<b>87</b>	<b>95</b>	<b>1999.8</b>
	Nairobi	59	35	46	1996.8
	Central	65	40	52	2001.1
	Coast	115	117	116	2001.0
	Eastern	98	86	92	2000.7
	North Eastern	199	123	134	2002.6
	Nyanza	138	152	145	1998.1
	Rift Valley	80	56	68	1999.1
	Western	126	88	108	2000.0
<b>Residence</b>					
	<b>Rural</b>	112	93	103	2000.0
	<b>Urban</b>	78	71	75	1999.2

**Source:** Computed from KIHBS, 2005/06 Data\_ (KNBS)

As shown in Table 4.3 above, a national under-5 mortality rate of 95/1000 was obtained. This refers to the probability of dying before attaining exact age five. This value is much lower than those estimated in other studies 1999 Census (CBS, 2000) and, KDHS 2003 (CBS et al, 2004).

On the other hand, the estimated overall under-5 mortality rate was 95 per 1000 live births. This is much lower than the national value of 116/1000 obtained in the 1999 census and 115/1000 from the 2003 KDHS. This rate suggests a 21 percent drop in the level of U-5 mortality in the country from

the previous estimates. This could be attributed to exclusion of HIV prevalence effects, which currently stands at 5.1 percent. Thus the results from survey data differ from that of the census, showing some decrease in the level of U-5 mortality from 116 to 95. This value differs only slightly from that of childhood mortality of 93, which is expected. Comparatively, the rural/urban differential indicate that under-5 mortality rate in rural areas (103) is higher than both national (95) and urban (75) rates. However, the effects of HIV/AIDS have not been considered in this analysis; which could raise these estimates as has been established in other studies, like the KDHS of 2003 and Kenyan Census of 1999. These figures underscore the prevailing high levels of childhood mortality in Kenya.

#### **4.5 Differentials in Childhood (Under-5) Mortality.**

This section looks at differentials in childhood mortality in general and by region and place of residence as well as by sex as outlined in Table 4.3 above. Previous studies indicate differences between the mortality of male and female children are nearly always expected in all populations (CBS et al [Kenya], 2004).

##### **4.5.1 Regional Differentials in Childhood Mortality**

Provincial differentials in under-5 mortality ranged from 46 to 145 per 1000 live births in Nairobi and Nyanza respectively. This is similar to the trend in 1999 census with the exception of Nairobi replacing Central with the least rate. This implies that children born in Nairobi are 3-times better off than those in Nyanza in terms of the risks of under-5 mortality. Three other provinces with rates of 134 (North-Eastern), 116 (Coast) and 108 (Western) join Nyanza to form regions of high under-5 mortality in the country. Nairobi and Central are the low mortality zones while Rift Valley and Eastern with rates of 68 and 92 respectively, are the medium mortality zones. Thus half the country has areas with mortality that are above the national level with the other half below.

However KIBHS data estimates are much higher than the census ones for each individual province in the high mortality zones except for Nyanza which showed a drop to 145/1000 from 194/1000. The same estimates for Nairobi is almost half that 1999 census, but this can be attributed to the small number of children dead (60) in the 25-34 age brackets of mothers in the sample.

#### **4.5.2 Rural/Urban Differentials**

Under-5 mortality estimated by place of residence of mother ranged between 75 in urban and 103 in rural. Rural Kenya recorded an U5MR of 103, which is 37 percent more than that estimated for urban areas. These rates are still lower than those registered in KDHS 2003, indicating a drop in under-5 mortality levels. Wide male-female differentials exist in rural areas while the urban ones are minimal. The male child deaths rates of 112/1000 in rural areas compares pretty well with the national of 115(KDHS) and 116(Census). The rural mortality rate is also similar to that of the high mortality regions enumerated above, while the urban (75/1000) is nearer the medium mortality zones. Rural area mortality is 37 percent (or 1.4 times) higher than that of urban, showing that rural born children are more disadvantaged in terms of child survival than their urban counterparts.

In conclusion it can be argued that high levels of U5 mortality are associated directly or indirectly with rural residence as well as being born in high zones; while low levels are experienced in urban areas of residence and being born in Nairobi or Central Province.

#### **4.5.3 Sex Differentials in Under-5 Mortality**

At the national level, the findings show higher male child mortality (103/1000) than female (87/1000) in agreement with earlier similar findings, that generally show higher male mortality than female especially at younger ages. In this case, male mortality is found to be 18 per cent higher than female. Though this agrees with estimated 1999 Population Census figures, both the

male and female estimates are much lower than those of 119 and 113 respectively obtained in the census.

The table further presents levels and patterns of U5 mortality by sex of children dead at provincial level. There were contradicting findings in only two provinces (Coast and Nyanza, where female U-5 mortality exceeded male mortality, but the rest portrayed expected outcomes of higher male than female deaths. In six of the eight provinces: Nairobi, Central, Eastern, North Eastern, Rift Valley and western; male childhood mortality was higher than their corresponding values for, both sexes, per individual province. For female children, all values estimated were lower than those for both sexes per province except Coast and Nyanza; where the difference was negligible in Coast and only 5 per cent in Nyanza. The highest male under-5 mortality was recorded in North Eastern province at 199/1000, which is the highest overall obtained, while for females it stood at 152/1000 in Nyanza province.

#### **4.5.4 Rural/Urban Sex Differentials in Childhood Mortality**

In developing countries, it is known that standards of living are generally worse-off in rural areas than in urban areas. This may be attributed to unaffordability of proper health care and distribution of the healthcare facilities. Children born to mothers who reside in rural areas are subject to high mortality risks of 112 for males and 93 for females per 1000, which are well above the national averages of 103 and 75 per 1000, respectively. In urban areas, there is a small female advantage across the sexes, as both have almost equal mortality levels; though lower than the rural ones. Both male and female mortality levels are higher in rural than in urban areas.

#### **4.5.5 Summary**

In summary, childhood mortality for both sexes was highest in Nyanza province (145/1000) followed by North Eastern and Coast in third place, while the lowest was Nairobi province at 46 per 1000 live births. Rural areas



had higher rates than urban as well. Sex differentials show at national level, most provinces and in both rural and urban areas, the female children have advantage over male as far as early childhood mortality is concerned. North Eastern province had the highest mortality recorded of 199/1000 which was among male children; while the lowest of 35/1000 was in Nairobi, among females.

#### 4.6 Levels and Differentials in Childhood Mortality by Poverty Status

One of the aims of this study was to examine the relationship and interplay between childhood mortality and poverty in Kenya. In this section levels and differentials of childhood mortality by poverty status are presented and discussed. The results of childhood/U-5 mortality by poverty status are presented in Table 4.4 below, which forms the basis of our discussions, first at national level and then by sex differentials.

<b>Table 4.4: Childhood Mortality (q5) Rates by Poverty Status, Kenya 2005/06</b>				
	Under-Five Mortality (q5)			
	Male	Female	Both Sexes	Time Location
<b>Kenya (Overall U-5M)</b>	<b>103</b>	<b>87</b>	<b>95</b>	1999.8
<b>Absolute</b>				
Poor	123	100	111	2000.1
Non-Poor	83	74	79	1999.4

**Source:** Computed from KIHBS, 2005/06 Data\_ (KNBS, 2007)

##### 4.6.1 National Childhood Mortality by Absolute Poverty Measures

Results as provided in Table 4.4 show that the levels of childhood mortality are higher among the poor than the non-poor by absolute poverty measures. Taking the national mortality aggregate of 95/1000, the rate obtained by poverty status of 111/1000 is above this level. It indicates that the levels increase with poverty to 111, but decrease to 79/1000 with non-poverty measures. Further, there exists a gap between rates for the poor and non-poor



of 41 per cent. This pattern is quite expected in a sense, and underscores the correlation between mortality and poverty.

In addition, the results show that children born to mothers who are absolute poor have higher under-5 mortality rates than those born to non-poor mothers in similar settings. Alternatively, absolute poverty status increases the levels of U-5 mortality by 17 percent; while its absence lowers it by the same margin, compared to the national rate of 95/1000. Within individual poverty measures, differences between the rates for the poor and non-poor are high among the absolute poor (111 compared to 79).

While the levels and patterns of U-5 mortality are higher for the poor than the non-poor, they are only marginally above the estimated national of 95.

Within individual poverty measures, differences between the rates for the poor and the non-poor are highest for the absolute poor (111 compared to 79).

In conclusion, the findings indicate that children born to poor mothers have higher probabilities of dying before their fifth-birthday, compared to those whose mothers are non-poor in agreement with what the study hypothesized.

#### **4.6.2 Sex Differentials in Childhood Mortality by Poverty Status**

The effects of poverty on childhood (U5) mortality showing sex differentials are discussed in this section. From the same (Table 4.4), a national under-5 mortality of rate of 95/1000 was obtained, with male child rates higher than female, 103/1000 compared to 87/1000; and for comparison purpose, estimates obtained without poverty are also included. Under-five mortality is also found to be higher among male children in the country as a whole and also in both rural and urban areas. The difference is more pronounced in rural areas where an under 5 mortality of 103/1000 was obtained compared to 93/1000 for rural. There exists also a big difference in mortality between the poor and non-poor among the male children and overall U5 mortality

(95/1000), of 40 and 32 per cent respectively. Comparing male and female childhood mortality levels among the absolute non-poor, the female advantage is maintained, although the difference is minimal (only 12 per cent) showing that the care accorded to both male and female children in non-poor households is almost the same. Comparatively, among the poor, female children have a 23 per cent advantage over males. However, the rates for males and females (non-poor) are not significantly different from the average of 79 per 1000 by poverty status. Finally, when compared with the national level (95), the sex differentials show that with poverty, mortality increases slightly more for males than, by 20 per cent, than for females, which is 15 percent. This means that male children are affected more by poverty than the female.

In conclusion, the findings illustrate that using the national estimated U-5 mortality of 95; poverty has slight negative effect on mortality as an estimated 111 out of 1000 children die before attaining age five (or 16 more deaths per 1000 births). The highest impact is felt among the absolute poor male children, whose rate is raised substantially to 123 from 103 per 1000 live births. Among the non-poor, the rates are much lower for males, females and for both sexes combined. It is also noted that the female advantage over male is maintained.

#### **4.6.3 Childhood (U-5) Mortality Levels by Poverty Status in Regions and Areas of Residence**

This section looks at U-5 mortality in Kenya by poverty status nationally and in the regions and areas of residence. The details are contained in Table 4.5 below. As mentioned earlier, poverty is likely to have a negative effect on child survival. This is likely because of the fact that absolute poverty comprises of depravity of both food and non-food items. Thus, mortality may rise as inadequate food intake may cause body immune system to weaken and thus result in diseases that may be fatal.

**Table 4.5:** Under-5 (U5MR) Mortality Differentials by Poverty Characteristics

Region of Residence	Under-5 Mortality (Without Poverty)	Under-5 Mortality with Absolute Poverty	
		Poor	Non-Poor
Kenya	95	111	79
Nairobi	46	99	41
Central	52	30	57
Coast	116	132	77
Eastern	92	126	49
North Eastern	134	101	150
Nyanza	145	168	140
Rift Valley	68	90	51
Western	108	108	100
Place of Residence			
Rural	103	116	91
Urban	75	82	69

*Source: Computed from KIHBS, 2005/06 Data\_ (KNBS, 2007)*

From Table 4.5 above, the levels and differentials in under-5 (childhood) mortality in Kenya with and without poverty status are presented. The rates are further categorized by the eight regions and the two broad areas of residence of Kenya, rural and urban. Overall, the results show that levels of U5M rose from 95 (with no poverty), to a high of 111 per 1, 000 live births (with absolute poverty). Patterns show that those children born in absolute (overall) non-poor households had lower U5M rates of 79/1000 compared to the poor (111) and the national estimated average (95). It therefore implies that absolute poverty has the effect of raising under-five mortality in Kenya, while its absence lowers it.

#### 4.6.3.1 Provincial Estimates

Next, at provincial level, four provinces, Nyanza, North Eastern, Coast and Western had the highest U5M levels of 145, 134, 166 and 108 respectively, without poverty measures considered; while Nairobi and Central had the lowest rates of 46 and 52 respectively. When absolute poverty is considered,

Nyanza province still tops the rankings with a high rate of 168/1000; an increase of 23 more deaths per 1000 from the previous figure of 145. In addition to Nyanza, four other provinces Coast, Eastern, Western and North Eastern also had rates above 100 in the same category. However, the North eastern provincial rates show interesting patterns in this poverty category as the rate drops to 101 among the poor and rises to 150/1000 among the non-poor, which is not within expectations. But this should be considered with care as the sample from the province is quite low. In addition, results for Central province also depict the opposite of what is expected in that the non-poor suffer higher U5M rates than the poor. This raises concerns over the way the well-off raise their children: by leaving young children to the care of caretakers or too much use of processed foodstuffs or the feeding habits.

#### **4.6.3.2 Rural/Urban Differentials**

Among the rural born children, it was estimated that 121 out of 1000 children born die before age five compared to only 83 in urban areas among the poor. For the non-poor, the rates are 83 and 69 respectively. These when compared to those estimated without poverty of 103 and 75 indicate that poverty raises the levels of U5 mortality in both rural and urban areas and that the urban areas have advantage over the rural ones. The highest rate by rural/urban differential is among the poor, 121. This can be attributed to the fact that absolute poverty is also higher in rural than urban areas (KNBS et al, 2007).

Therefore, from the fore-going, U-5 mortality is increased by poverty measures with highest rate 186/1000 children dying before attaining age 5, observed in children born to absolute poor mothers in Nyanza province, 111/1000 nationally and 121/1000 in the rural areas of residence. However, without poverty considerations, Nyanza still tops with a rate of 145/1000 among the provinces and rural areas lead with 103 by area of residence. Still with poverty inclusion, the lowest rates are observed in Central province (30/1000); while among the non-poor, Nairobi has the least with a rate of

41/1000. Furthermore, there are discrepancies observed in provincial results for Central and North Eastern, where the non-poor had higher U5 mortalities than the poor, which is quite contrary to known theory and expectations. Of the three poverty measures, hardcore had the minimum increase in U-5 of only three more death per 1000 nationally. The results also indicate that being absolute non-poor in any area of residence (rural/urban); in all provinces except Central and North Eastern, has the effect of reducing the levels on U-5M below the national average. Overall, the general picture observed is that mortality rises with poverty inclusion at national level; in most of the regions and in both rural and urban areas of Kenya.

#### **4.7 Discussions/Summary**

In general, it was established that poverty by its absolute nature, has substantial negative effects on childhood (U-5) mortality in Kenya at national, provincial and residential area (rural/urban). The findings further show that with poverty, there are no reversals in known patterns of childhood mortality with respect to male-female differentials, where male mortality exceeds female mortality (Hiligman 1983; UN Secretariat 1988) with and without poverty measures; except in two provinces, Coast and Nyanza. The reversed trend though unique to these two provinces, has been observed in studies done in South Asia (Preston 1990, Ghosh, 1987) and was attributed to male child preferences. The present cases could be attributed to parental care or cultural considerations at childhood level.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary of the research findings, conclusions and recommendations for both policy makers/implementers and for further research.

#### 5.2 Summary

The present study set out to estimate the current levels, patterns and differentials in childhood mortality in Kenya. It also specifically sought to examine the interplay of poverty on childhood mortality levels, patterns and differentials using the 2005/06 KIHBS data. The study also estimated the levels of childhood mortality (as measured by the probability of dying before attaining age five); at national, regional, place of residence and by poverty status in the country.

In all cases above, sex differentials were also investigated. Due to the limitations in the data source, only indirect estimates were made. The Trussell-variant form of the Brass technique; discussed in chapter 3, was employed to assess the childhood mortality rates.

This analysis produced results of childhood (q(5) or U-5) mortality rate of 95 per 1,000 live births which was lower than that of 116/1000 obtained in the 1999 Kenya Population Census or 115/1000 in the 2003 KDHS. However, this being a survey, the results could differ from that of census due to sampling errors.

The rural areas recorded higher childhood mortality rates than urban, and also above the national estimate. The urban estimated rates were lower than those for both the national and rural areas respectively.

Without poverty considerations, childhood mortality levels at provincial (regional) level indicated high mortality zones in Nyanza (145), North Eastern (134), Coast (116) and Western (108) provinces and a 2-province low mortality zone in Nairobi (46) and Central (52). The other three constitute medium mortality zones. When estimated with poverty inclusion, the trend is maintained but with Eastern Province joining the high mortality zone. Nairobi province moves from the low zones and approaches the high mortality zones with a 99/1000 rate. This trend is similar to that observed in other studies like the 2003 KDHS.

From the findings, it can be argued that high levels of U5 mortality are associated directly or indirectly with rural residence as well as being born in high zones; while low levels are experienced in urban areas of residence and being born in Nairobi or Central Province.

### **5.3 Conclusions**

As earlier stated, the study aimed at examining child hood mortality against poverty status in order to assess how the levels, patterns and differentials in mortality vary with the effects of poverty. Thus, based on the findings of the study, the following conclusions can be made:-

With respect to the first objective, levels of childhood mortality in Kenya are still high with regional variations maintaining the trends of high, medium and low mortality zones. U-5 mortality ranged from 46 to 145 per 1,000 live births (without poverty); and from a low of 30 to a high of 168 when poverty is included in the estimations. Sex differentials ranged from a low 59 (males) in Nairobi to a high of 199 (males) in North Eastern province.



The second aim of this study was to examine the relationship and interplay between childhood mortality and poverty in Kenya. The findings indicate that children born to poor mothers have higher probabilities of dying before their fifth-birthday, compared to those whose mothers are non-poor in agreement with what the study hypothesized. Using the national estimated U-5 mortality of 95; poverty has slight negative effect on mortality as an estimated 111 out of 1000 children die before attaining age five (or 16 more deaths per 1000 births). The highest impact is felt among the absolute poor male children, whose rate is raised substantially to 123 from 103 per 1000 live births.

Among the non-poor, the rates are much lower for males, females and for both sexes combined. It is also noted that the female advantage over male is maintained. Patterns show that those children born in absolute (overall) non-poor households had lower U5M rates of 79/1000 compared to the poor (111) and the national estimated average (95). It therefore implies that absolute poverty has the effect of raising under-five mortality in Kenya, while its absence lowers it.

Differentials showed that, childhood mortality for both sexes was highest in Nyanza province (145/1000) followed by North Eastern and Coast in third place, while the lowest was Nairobi province at 46 per 1000 live births.

Sex differentials show at national level, most provinces and in both rural and urban areas, the female children have advantage over male as far as early childhood mortality is concerned. There was higher mortality for both sexes among the poor over the national estimated average of 95/1000. North Eastern province had the highest mortality recorded of 199/1000 which was among male children; while the lowest of 35/1000 was in Nairobi, among females. Contrary to known theory and expectations, it was found that female

childhood mortality was higher than male when categorized by poverty in Central and North Eastern provinces.

The mother's place of residence has a socio-economic impact on the survival status of a child. The study found urban residence to be associated with lower childhood mortality than rural, supporting the premise that urban residence is associated with lower early childhood deaths.

Regional variations show high mortality in Coast, Nyanza, and Western and to a lesser extent in North Eastern provinces; for both mortality measures. Low mortality zones emerged as Nairobi and Central provinces.

The results thus confirm the study objectives that poverty is negatively associated with childhood mortality when other conditions are constant. The highest impact of poverty on childhood mortality is felt in Nyanza (168) and Eastern (132) provinces; while the least is in Central province where only 30 out of 1000 children are estimated to die before age five.

## **5.4 Recommendations**

In view of the results and conclusions from this study, the following recommendations are necessary:-

### **5.4.1 Recommendations for Policy**

Based on the first objective discussed in section 1.5 of chapter 1, the current levels of under-5 mortality in Kenya are still high at national and provincial levels as well as in rural areas of Kenya. This calls for action from planners and programme managers, to put in place health related programmes (for instance increased immunization coverage) targeting all children below 5 years of age. There is also need to address causes and sources of absolute poverty at national level in general, but, specifically in the high mortality zones like Nyanza province, Western province, Coast province and some

parts of Nairobi where food poverty; a component of absolute poverty, is high.

Rural areas of the country may require more resources, probably through the Constituency Development Fund (CDF), to address basic household needs (food and non-food) at grass root level since these members of society seem to be more deprived. This can be achieved by creating an environment for income generating activities, more food production; subsidy on agricultural inputs or removal of some taxes on the same in order to enhance food production and self-sufficiency, for the majority.

#### **5.4.2 Recommendations for Further Research**

Some of the findings from this study were contrary to expectations and no plausible explanations could be found for them. For instance, there were high U-5M rates among the non-poor mothers/households than the poor in 2 provinces. More studies need to be under taken to establish the actual truths.

Secondly, there were observed cases, in Coast and Nyanza provinces; where the known female child deaths advantage over male was reversed in levels of U-5 mortality. This calls for further research in these specific areas. It could also be worthwhile to establish the effects of poverty on infant and maternal mortality in the high mortality zones of Kenya.

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**APPENDIX 1: Background Characteristics of the Study Population.**

Percent Distribution of Study Women by Poverty Status, KIHBS, 2005/06						
	Overall Poverty		Food Poverty		Hardcore Poverty	
	Percent	Number	Percent	Number	Percent	Number
<b>Place of Residence</b>						
Rural						
Poor	51.8	6,438	50.6	6,289	24.2	3,004
Non-Poor	48.2	5,999	49.4	6,148	75.8	9,433
	100.0	12,437	100.0	12,437	100.0	12,437
Urban						
Poor	37.1	2,164	43.4	2,530	11.0	641
Non-Poor	62.9	3,667	56.6	3,301	89.0	5,190
	100.0	5,831	100.0	5,831	100.0	5,831
<b>Region of Residence</b>						
Kenya						
Poor	47.1	8,602	48.3	8,819	20.0	3,645
Non-Poor	52.9	9,666	51.7	9,449	80.0	14,623
	100.0	18,268	100.0	18,268	100.0	18,268
Nairobi						
Poor	12.3	96	21.9	171	1.3	10
Non-Poor	87.7	686	78.1	611	98.7	772
	100.0	782	100.0	782	100.0	782
Central						
Poor	29.2	549	33.5	630	9.1	171
Non-Poor	70.8	1,334	66.5	1,253	90.9	1,712
	100.0	1,883	100.0	1,883	100.0	1,883
Coast						
Poor	55.5	1,031	53.8	999	23.4	435
Non-Poor	44.5	825	46.2	857	76.6	1,421
	100.0	1,856	100.0	1,856	100.0	1,856
Eastern						
Poor	49.6	1,696	50.0	1,708	22.8	778
Non-Poor	50.4	1,720	50.0	1,708	77.2	2,638
	100.0	3,416	100.0	3,416	100.0	3,416
North Eastern						
Poor	77.7	584	70.9	533	46.5	350



Non-Poor	22.3	168	29.1	219	53.5	402
	100.0	752	100.0	752	100.0	752
Nyanza						
Poor	43.5	1,222	44.6	1,255	16.9	474
Non-Poor	56.5	1,589	55.4	1,556	83.1	2,337
	100.0	2,811	100.0	2,811	100.0	2,811
Rift Valley						
Poor	49.2	2,258	51.0	2,338	20.6	947
Non-Poor	50.8	2,330	49.0	2,250	79.4	3,641
	100.0	4,588	100.0	4,588	100.0	4,588
Western						
Poor	53.5	1,166	54.4	1,185	22.0	480
Non-Poor	46.5	1,014	45.6	995	78.0	1,700
	100.0	2,180	100	2,180	100.0	2,180
Age of mother						
Less than 24						
Poor	49	4,792	51.3	5,027	21	2,067
Non-Poor	51	5,000	48.7	4,765	79	7,725
	100	9,792	100.0	9,792	100	9,792
25-34						
Poor	42	1,846	39.7	1,765	16	703
Non-Poor	58	2,601	60.3	2,682	84	3,744
	100	4,447	100.0	4,447	100	4,447
Over 35						
Poor	49	1,964	50.3	2,027	22	875
Non-Poor	51	2,065	49.7	2,002	78	3,154
	100	4,029	100.0	4,029	100	4,029

APPENDIX 2: Demographic and Socio-Economic Differentials in Childhood Mortality

Background Characteristics	q(3)				Q(5)			
	Male	Female	Total	Time Location	Male	Female	Total	Time Location
<b>Residence</b>								
Rural	87	119	103	2002.1	112	93	103	2000.0
Urban	74	73	73	2001.5	78	71	75	1999.2
<b>Region</b>								
Kenya (Total)	83	104	93	2001.9	103	87	95	1999.8
Nairobi	49	34	42	2000.7	59	35	46	1996.8
Central	38	48	43	2002.3	65	40	52	2001.1
Coast	147	79	114	2002.0	115	117	116	2001.0
Eastern	54	60	57	2002.2	98	86	92	2000.7
North Eastern	80	98	87	2002.7	199	123	134	2002.6
Nyanza	105	97	101	2001.0	138	152	145	1998.1
Rift Valley	64	66	65	2001.6	80	56	68	1999.1
Western	122	90	106	2002.0	126	88	108	2000.0

Source: Computed from KIHBS, 2005/06 Data\_ (KNBS)

APPENDIX 3: Childhood and Under-Five Mortality Rates by Poverty Status, Kenya 2005/06

Poverty Status	Childhood Mortality (q3)				Under-Five Mortality (q5)			
	Male	Female	Both Sexes	Time	Male	Female	Both Sexes	Time
<b>Food Poor</b>								
Poor	90	140	115.1	2002.3	116	98	107.2	2000.5
Non-Poor	78	78	77.6	2001.5	92	78	84.6	1999.2
<b>Absolute Poor</b>								
Poor	92	124	108	2002.1	123	100	111	2000.1
Non-Poor	75	85	80	2001.7	83	74	79	1999.4
<b>Hardcore Poverty</b>								
Poor	79	223	152	2002.3	94	102	98	2000.3
Non-Poor	84	75	80	2001.8	105	83	94	1999.7

Source: Computed from KIHBS, 2005/06 Data\_ (KNBS, 2007)

APPENDIX 4: Childhood Mortality (q<sub>3</sub>) Differentials by Background Characteristics

	Overall (Kenya)							
	Childhood Mortality(q3)	Food Poverty		Absolute Poverty		Hardcore Poverty		
		Poor	Non-Poor	Poor	Non-Poor	Poor	Non- Poor	
Place of Residence								
Rural	103	130	81	118	86	167	82	
Urban	73	76	72	80	69	60	75	
Region of Residence								
Kenya	93	115	78	108	80	152	80	
Nairobi	42	84	37	99	35	na <sup>1</sup>	48	
Central	43	27	45	24	48	79	39	
Coast	114	144	76	139	72	143	98	
Eastern	57	242	51	212	55	368	53	
North Eastern	87	61	95	69	84	71	75	
Nyanza	101	105	107	91	119	69	113	
Rift Valley	65	59	74	53	82	71	68	
Western	106	92	116	105	104	59	115	

Source: Computed from KIHBS, 2005/06 Data\_ (KNBS, 2007)

**APPENDIX 5:** Table 4.5: Under-5 (U5MR) Mortality Differentials by Background Characteristics

	Overall	Overall Poverty		Food Poverty		Hardcore Poverty	
	Under-5						
	Mortality	Poor	Non-Poor	Poor	Non-Poor	Poor	Non-Poor
<b>Place of Residence</b>							
Rural	103	116	91	121	83	102	103
Urban	75	82	69	83	69	76	75
<b>Region of Residence</b>							
Kenya	95	107	85	111	79	98	94
Nairobi	46	120	26	99	41	na <sup>1</sup>	57
Central	52	79	33	30	57	34	50
Coast	116	131	83	132	77	123	102
Eastern	92	104	73	126	49	77	88
North Eastern	134	107	120	101	150	89	128
Nyanza	145	181	132	168	140	186	146
Rift Valley	68	78	67	90	51	76	71
Western	108	95	117	108	100	118	101

Source: Computed from KIHBS, 2005/06 Data\_(KNBS)

**APPENDIX 6:** Summary of Poverty Measures (Individuals) by Region, Kenya

Region	Poverty Measure	National	Rural	Urban
National	Food	46	47	40
	Absolute	47	50	34
	Hardcore	20	22	8
Regional	Region	Poverty Measure		
		Food	Absolute	Hardcore
	Central	31	31	12
	Coast	63	70	36
	Eastern	45	52	23
	North Eastern	65	74	46
	Nyanza	46	48	21
	Rift Valley	49	49	21
	Western	51	53	24

**Source:** KIHBS, 2005/06 Basic Report (KNBS, 2007)

**APPENDIX 7: Under-5 (U5MR) Mortality Differentials by Poverty Characteristics**

Region of Residence	Under-5						
	Mortality (Without Poverty)	Food Poverty		Absolute Poverty		Hardcore Poverty	
		Poor	Non-Poor	Poor	Non- Poor	Poor	Non- Poor
Kenya	95	107	85	111	79	98	94
Nairobi	46	120	26	99	41	na <sup>1</sup>	57
Central	52	79	33	30	57	34	50
Coast	116	131	83	132	77	123	102
Eastern	92	104	73	126	49	77	88
North Eastern	134	107	120	101	150	89	128
Nyanza	145	181	132	168	140	186	146
Rift Valley	68	78	67	90	51	76	71
Western	108	95	117	108	100	118	101
Place of Residence							
Rural	103	121	83	116	91	102	103
Urban	75	83	69	82	69	76	75

**Source:** Computed from KIHBS, 2005/06

*Data\_ (KNBS)*

**APPENDIX 8** Proportion Dead by Region, Area of Residence and by Poverty Status

Age Group	Proportion Dead								
	Kenya	Nairobi	Central	Coast	Eastern	North Eastern	Nyanza	Rift Valley	Western
15-19	0.0543	0.0000	0.0222	0.0556	0.0313	0.1600	0.0552	0.0634	0.0526
20-24	0.0718	0.0594	0.0609	0.0619	0.0570	0.4910	0.1161	0.0598	0.0659
25-29	0.0974	0.0526	0.0418	0.1118	0.0565	0.0785	0.1167	0.0706	0.1095
30-34	0.0956	0.0577	0.0474	0.1063	0.0870	0.1128	0.1609	0.0716	0.1065
35-39	0.1028	0.0952	0.0331	0.1074	0.0986	0.0792	0.1696	0.0840	0.1239
40-44	0.1106	0.0314	0.0405	0.1110	0.0820	0.1135	0.2236	0.0769	0.1309
45-49	0.1124	0.0276	0.0391	0.1408	0.1079	0.1134	0.1795	0.0645	0.1724

**APPENDIX 8 Continued**

Age Group	Proportion Dead					
	Poor	Non Poor	Rural Poor	Rural Non-Poor	Urban Poor	Urban Non-Poor
15-19	0.0568	0.0511	0.0574	0.0571	0.0548	0.0388
20-24	0.0797	0.0652	0.0828	0.0763	0.0724	0.0428
25-29	0.1103	0.0849	0.1186	0.0903	0.0852	0.0747
30-34	0.1103	0.0807	0.1180	0.0848	0.0854	0.0708
35-39	0.1091	0.0956	0.1074	0.1086	0.1147	0.0678
40-44	0.1193	0.0994	0.1238	0.1134	0.0981	0.0607
45-49	0.1240	0.0983	0.1247	0.1105	0.1210	0.0543