DETERMINANTS OF CHILD SURVIVAL IN KENYA: A COMPARATIVE STUDY

BY

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DECLARATION

This project is my own original work and has not been presented for a Degree in any other University.

MISATI . A .JOSEPH

This project has been submitted for Examination with our approval as the University Supervisors.

Date.....

PROF. Z. S. MUGANZI

Date.....28/11/03.....

DR. L. D. E IKAMARI.

DEDICATION

To my parents Mr. and Mrs. S.A. Mwamba

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Whereas I take full responsibility for the contents and organization of this work, many individuals contributed to its successful completion.

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ABSTRACT

The study attempts to examine whether the determinants responsible for infant and child mortality in the High mortality zone are the same as those affecting child survival in a low mortality zone. Nyanza and Western provinces were taken to represent the former while the three provinces of central, Nairobi and Rift-valley represents the latter.

or when the dates were found to be inconsistent.

The study adopted the Mosley and Chen analytical framework for studying child survival in developing countries. The secondary data used was derived from the birth histories in the Kenya Demographic and healthy survey (KDHS, 1998), in which a detailed questionnaire was designed to elicit information about each child ever born, whether dead or alive. If dead, the age at death was also given. There could have been the problem of women respondents recalling exactly at what age the child died. However, this problem was overcome by imputing dates. This was done especially when the full date of the event was not provided by the respondent

A sub-sample of 8061 births out of the total 23351 from the 1998 KDHS was used for analysis. In order to assess the relationship between the dependent variable and independent variables, cross- tabulation was used. Regression analysis was used to ascertain the effect of predictor variables on the risk of infant and child death in the study areas.

The independent variables selected for the study were maternal education, mothers occupation, age of the mother and preceding birth interval.

Type of toilet facility, housing floor material, and source of drinking water supply were also included. The cultural variables included ethnicity and religion.

The assumption of the study was that the factors responsible for the mortality levels seen in each of the mortality region were similar given the fact that the regions were adjacent to each other.

The major findings of the study was that although mothers occupation was found to be significantly associated with the risk of infant death in the low mortality region, it was not observed to not to be significantly associated with infant mortality in the high mortality region. It was similarly observed that preceding birth intervals and maternal education were important determinants of infant mortality in the high mortality region.

The results indicated that the type of toilet facility, maternal age, source of drinking water, main floor material, mothers age at first birth, religion and ethnicity were not significantly associated with infant death in both mortality regions.

Mother's occupation was found to have a significant relationship with child mortality in both regions. Preceding birth interval was found to be significant in the high mortality region as was the type of toilet facility in the low mortality region.

It is recommended that free or subsidized education at secondary level be provided especially for girls in the high mortality region and policies geared towards increasing the length of intervals between births are initiated. In the low mortality region, the government in conjunction with non-governmental organizations should help initiate appropriate toilet facilities especially in the slum areas. Similarly, favorable policies should be drawn in an effort to enhance women's financial and occupational status.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION AND PROBLEM STATEMENT

1.0 GENERAL INTRODUCTION

The study examines the effect of various socio-economic, demographic, cultural and environmental factors on infant and child mortality in Kenya. It compares the effects of the select variables on the two regions, namely High and low mortality regions. The areas designated as comprising high mortality region are the twin provinces of Nyanza and Western while those regarded as a low mortality region include Central, Nairobi and Rift valley provinces as was covered in the 1998 KDHS. The KDHS data indicated that the two regions cited above have the highest and lowest infant and child mortality levels respectively.

Since the Second World War, rapid mortality declines have taken place in developing countries (Ross et al.1992). The major causes of these declines have been attributed to innovations in Public Health and sanitation, improvements in socio- economic development and technological advancement.

However, despite the substantive gains achieved globally, the progress has been relatively slower in sub Saharan Africa, a fact majorly attributed to declines in economic activities and standards of living(Republic of Kenya 2002).in Kenya ,the declining trend in child mortality experienced in the period 1965-1980 has been reversed -with all indices of childhood mortality pointing to an up turn in mortality. The mortality level of a society is closely associated with the well being and health of the population (Bicego and Ahmad 1996). A community with sufficient and well

distributed resources is more likely to experience lower mortality rates than one with scanty or poorly distributed resources. Of all the mortality measures, the most frequently used indicator of broad socio-economic well-being is the infant/child mortality rate. It stands as a basic measure of how well a society meets the needs of its people. However, in many developing countries 50% in more of early childhood deaths occur at infancy.

In Kenya, available evidence indicate that mortality generally, and infant and child-mortality in particular, has shown considerable declines over the last decade. Under-five mortality for the period 0-4 years before the 1998 KDHS was 112 deaths per 1000 live births. This means that currently, 1 in 9 Kenyan children does not live to the fifth birthday (NCPD et al 1999). In addition, out of every 1000 children born alive 71 die before their first birthday.

Available evidence indicate that there exists great regional variations in infant and child mortality. Certain regions inhabited by particular ethnic groups have higher childhood mortality levels than others. The regions of high mortality are Nyanza and Western Provinces adjacent to Lake Victoria and the Coast Province along the Indian Ocean inhabited by the Luo, Luhyias and the Miji-Kenda respectively. But the challenges of improved survival of babies and children is most acute in Nyanza with a record infant mortality rate of 198.8 per 1000 live births.

On the other hand Central Province has the lowest infant and child mortality, with lower levels observed in the adjacent Rift-Valley and Nairobi Provinces. (Mott 1982, Republic of Kenya 1983, NCPD et. al .1999).

At district level ,Homa -Bay district had more than 200 children dying before their fifth birth day while Nyeri had 52. According to the recently released census

analysis report like other mortality indicators ,infant mortality rate increased from 66 to 68 per 1000 live births between 1979-1989 and 1989-1999 intercensal period (Republic of Kenya, 2002). The increases presents serious policy implications when considered against the goals and targets set out by the current population policy .

In order to address the afore mentioned gloomy mortality situation there is need to reduce poverty levels currently experienced in order to increase the proportion of people with access to quality and minimize the current regional disparities in mortality.

1.1 BACKGROUND TO THE STUDY

The study of infant and child mortality is considered as important for a number of different reasons, among which the following may be mentioned:

i) Its contribution to the total loss of years of human life is substantial both because it occurs early in life and because its level is relatively high;

ii) Its' causes tend to be largely distinct from those which operate at the older ages of childhood,

iii) Its measurement provides a useful index of the status of health and standard of living of a society, and

iv) It is the prevention of avoidable infant deaths which has been the major pre-occupation of health authorities and the success of health programmes could be ascertained on the basis of the observable decline in infant and child mortality (Gaisie, 1973).

Based on the resolutions of the 1994 International Conference on population and Development, in Cairo, Kenya's current population policy dubbed "National Population policy for sustainable development" has the reduction of fertility and mortality, especially infant and child mortality as its major goal. (NCPD 2000). The policy targets to reduce infant mortality rate and under 5 mortality rate to 67 and 104 respectively, by the year 2005. During the four decades prior to 1989, levels of mortality in Kenya declined steadily. Infant mortality declined from 184 deaths per 1000 live births in 1948 to 104 deaths in 1979, and to 62 deaths in 1989. However, available evidence indicate that there was an increase in child mortality during the 1989-1999 intercensal period, with most districts recording a reverse from the declining trend experienced in the previous decade. The infant mortality increased to 74 deaths in 1998.

According to the 1999 census analysis report, regional variations in childhood mortality still exists; with Homa-bay district having more than 200 children dying before their fifth birthday compared to 52 for Nyeri.

In order to halt the current infant and child mortality upsurge, the major causes of death, especially for children must be identified. More important, the causal factors of the high mortality in specific regions should be identified with a view to reducing regional disparities.

1.2 PROBLEM STATEMENT

Infant and child mortality remains a problem of concern in many parts of the world. In developing nations, high levels of infant and child mortality are recognized as problems warranting serious attention.

In Kenya, although, major improvements have been achieved with infant mortality rates reducing from 120 per 1000 deaths in 1963 to 62.5 per 1000 in 1993, it is estimated that 36% of children ever born die before

reaching their fifth birthday (Republic of Kenya, 2002).

Furthermore, the risk of children dying varies widely across provinces (coale and Lorimer 1967, Mott 1979, Ewbank et al 1986). The provincial variations seen in the 1998 KDHS are consistent with those observed earlier in the 1993 KDHS data (NCPD et al 1999). Childhood mortality is exceptionally high in Nyanza Province, where almost 1 in 5 children dies in the first year of life. In 1993, infant mortality rate was 128 deaths per 1000 live births rising to 135 per 1000 in 1999. The child mortality rate was 198.8. On the other hand, the infant and child mortality rates have been seen to be quite low in central province with an infant mortality rate of 27.3 and childhood mortality of 33.9 (NCPD et al 1999.)

According to Kichamu (1986) the major determinants of childhood mortality in Nyanza is Malaria, owing to the presence of Lake Victoria and seasonal flooding providing a conducive breeding ground for mosquitoes. In addition lack of clean water supply, and strong cultural attachment especially among the rural population who hold certain norms concerning sickness, food taboos and poor hygienic practices (Owen 1974, Muganzi

1990). In addition poor infrastructural development, lack of better toilet facilities, better housing and contaminated water have all been attributed to the high childhood mortality. In Central province, maternal education, presence of better toilet facilities, access to and availability of health care facilities, and above average nutrition could help explain the low infant and child mortality levels. (Mott 1979).

Many of the studies that have been done in Kenya in relation to infant and child mortality have concentrated on estimating mortality levels by different socio-economic, demographic and other factors (Kibet 1981, Mott 1982 Ondimu 1987). A few others have been carried out to compare the effects of the various factors on infant and child mortality in various regions in the country, in which case the regions (provinces) are usually grouped into two mortality groups (high and low) on the basis of the infant mortality estimates obtained (Muluye 1995, Ikamari 1996). However, the regions have been known to mask major differences.

This study seeks to examine whether the determinants responsible for infant and child mortality in Nyanza and western are the same as those affecting child survival in Central, Nairobi, and Rift - valley provinces.

1.3 RESEARCH QUESTIONS

The questions this study seeks to address includes the following:-

1. Do similar socio-economic factors such as mothers education level and type of occupation affect infant and child mortality in Central ,Nairobi ,Rift valley and Nyanza and western Provinces?.

2. Do similar demographic factors such as age of mother, age of mother at first birth and previous birth interval affect infant and child mortality in Nyanza ,Western and Central, Nairobi and Rift Valley Province?.

3. Do environmental and sanitation factors such as type of toilet facility, quality (type) of housing floor material and source of drinking water affect infant and child mortality in Nyanza ,western and Central, Nairobi and rift valley Province?.

4. Do cultural factors such as ethnic backgrounds and religion affect infant and child mortality in Central, Nairobi Rift Valley and Nyanza and western Province?.

1.4 OBJECTIVES OF THE STUDY

a) General Objective

The general objective of the study will be to identify the determinants of infant and child mortality in the low and high mortality regions.

b) Specific Objectives

Specifically the study will set out;

i) To assess the influence of maternal education level and type of occupation on infant and child mortality in the low and high mortality regions.

ii) To establish whether age of mother at first Birth and previous birth interval affects infant and child mortality in the low and high mortality regions.

iii) To determine whether Type of toilet facility, quality of housing floor and source of drinking water is an important determinant of infant and child mortality in the low and high mortality regions.

iv) To find out whether religious affiliation and ethnic background of the mother affects infant and child mortality in the low and high mortality Regions

1.5. RATIONALE/JUSTICATION OF THE STUDY.

The Bucharest 1974, international conference on population and development' (ICPD) resolutions on morbidity and mortality emphasized that " the reduction of morbidity and mortality to the maximum feasible extent is a major goal of every human society". In it's recommendations for further implementation in Mexico, 1984, The plan recommends that reduction or, if possible, elimination of differential mortality within countries, particularly with regard to differentials between regions, urban and rural areas, social and ethnic groups and the sexes should be achieved (UN, 1975).

Previous studies on the determinants of infant mortality have often (only) sought to measure directly the impact of the various socio-economic, demographic and environmental factors on infant and child mortality. This study will go further and examine the impact of each of he predictor variables as they impact

differently on each of the two regions perceived to be high and low mortality regions respectively. Such a comparative approach will be useful in determining the policy approach that could be more appropriate in attaining a continued downward trend in infant and child mortality.

Furthermore, infant mortality is considered the most important component of mortality in developing countries because its measurement provides a useful index of the standard of living of a society. It reflects the countries level of socio economic development . The higher the level , the more the country is considered to be of low socio economic status. More so its contribution to the total loss of years of human life is substantial because it occurs early in life and yet, its level is relatively high in third world countries.

Apart from the afore mentioned , the population demographic transition theory has it that decrease in infant and child mortality leads to reductions in fertility (Davanzo and Habitch 1984). Evidence from the 1998 Kenya demographic and health survey indicates that Nyanza, western, and coast provinces which have high infant and child mortality also have high fertility (NCPD 2000). couples can be prompted to respond to child loss by Eliciting a Replacement response. It thus influences the family size . parents will recognize that they do not need to have large families to ensure the survival of a few .,if only infant and child mortality levels are to be reduced to the minimum all over the country . improvements in child survival usually precede fertility decline ; thus , interventions to

improve the health of children will eventually be followed by fertility decline Lastly, as already mentioned studies on determinants of infant and child mortality can provide information for assessing the inequalities among populations in terms of health since the major indicators of health levels include the crude death rate ,infant mortality rate, under five mortality rate, and expectation of life at birth (Khasakhala 1996). The findings of the study will guide health planners in coming up with appropriate policies that can be initiated at the various regions.

1.6 SCOPE AND LIMITATIONS OF THE STUDY

1.6 SCOPE

This is a regional study with particular focus on five of the eight provinces of Kenya, namely Nyanza ,Western Central, Nairobi, and Rift-Valley as was covered by the Kenya Demographic and Health Survey (KDHS) 1998.

The study will be concerned with the mortality experience by children between birth and their fifth birthday.

1.6.2 LIMITATIONS

It is generally acknowledged that data on infant and child mortality for sub-Saharan Africa is of uneven quality and grossly inaccurate. Just like other studies which rely on secondary data, similar limitations such as underreporting, misreporting of children ever born and children dead are expected to contribute to overall errors inherent in 1998 KDHS Being a sample survey, it may not give the overall picture of the study areas.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, related literature on relationship between the selected independent variable and infant and child mortality is presented. Views of scholars and empirical research done is addressed First, under the rest of the world and then Kenya. In addition, each of the variables is reviewed independently. Lastly, the theoretical and operational framework and hypotheses are presented followed by definition of key concepts and variables.

What follows is a review of literature under the rest of the world..

2.1.1 Rest of the World

Various studies have been undertaken on variations on infant and child mortality.

In his explanation of relationships between maternal education and infant mortality in Nigeria, Caldwell (1979) contends that mothers with more education are less likely to be influenced by traditional practices inimical to health care. In the context of African countries, he avers that education has an effect on:-

a)The power balance between the spouses and between generations such that an educated mother has a say in devoting greater resources to children as opposed to parents and grand parents.

b)The degree of fatalism with respect to children's ill health, and ;

c)A confidence in the human capacity to manipulate the world, through knowledge of the location of facilities as well as access to and their utilization.

There are many interactions between maternal education and other factors. Studies have underscored the link between maternal education and use of medical services. In his study in rural India Jain (1985) identified mothers education as an important determinant of the use of medical services.

A study in Indonesia (IDHS, 1997)observed a close association between mother's level of education and infant and child mortality. It was observed that since mothers level of education is closely associated with other socio-economic factors such as income, life-style, health practices, nutrition and living conditions, women with no education and some primary education usually have low income and live in less sanitary housing conditions.

Tekce and Shorter (1984) in a study in Jordan found that maternal literacy is associated with better personal hygiene, greater use of health services and better child nutrition. Cramer (1987) found out that greater risk of child mortality associated with very young maternal age is due largely to the mother's low educational level.

In Philippines, the level of infant mortality, particularly during the neonatal period, and under five mortality is higher among mothers whose ages were less than 20 at the time of delivery, decreasing among mothers aged 20-29, and increasing among mothers of age 40-49 (NSO 1998). The above findings are similar to those of Yemen. where under five mortality was found to be higher for children born to women in youngest age group at 161 deaths per 1000 births compared with 112 deaths per 1000 for children born to other women. (Republic of Yemen 1998)

In Tanzania, a striking relationship was discovered to exist between pace of child bearing and early childhood mortality (Bicego et al 1997). The Data indicated that a short interval between births significantly reduces the child's chances of survival. Mortality among children born less than two years after their preceding siblings was found to be 115 per 1000 live births.

During ages 1-4, children born after a short interval are 51 percent likely to die than their counterpart born after along one. The above findings point to the potential for childhood mortality reduction that could result from successful efforts to improve and maintain adequate birth spacing in a high mortality region such as Nyanza. In Egypt's DHS (2000), it was observed that the length of the previous birth interval is strongly associated with childhood mortality levels. The levels were consistently higher at all ages among children born less than two years after a previous birth. Overall the under-five mortality rate among children born less than 2 years after a previous birth is 130 per 1000 births almost 3 times the level among children born 4 or more years after a previous birth. Most recent studies show that longer intervals are even better for infant survival. Children born 3-5 years after a previous birth are about 2.5 times more likely to survive than children born before two years. (Rustein 2002). In this study, in which over 430,000 children in 18 countries born 3-4 years with those born less 2 years were compared, it was found out that, when a mother spaces her child's births 3-5 years after the previous birth, rather than 3 years, her infant is more likely to survive in each stage of development. The study estimates that in every country, thousands more children could survive each year if women spaced their births at least 3 years apart. In Nigeria, for instance, the study notes, Infant mortality could fall from 75 deaths per 1000 births to 54

deaths - A 28% decline. While under - five mortality could fall from 140 deaths per 1000 to 108 deaths - a 23 % decline.

Similarly, in Pakistan, infant mortality could fall from 90 deaths per 1000 births to 55 deaths - a 39% decline. The under five mortality rate could fall from 117 deaths per 1000 birth to 63 deaths- a 46 % decline. These findings, equally, support the importance of child spacing practices as a means of reducing childhood mortality.

Children are the population group most vulnerable to a surrounding's environmental conditions. Their direct exposure to such conditions is a matter of concern in developing countries. Differentials in Infant and child mortality are influenced by both negative and positive environmental factors.

Environmental factors can be broadly divided into two categories. The first category, which is strongly influenced by community infrastructure, include: source of drinking water, type of toilet facility and sewage system. The second category is more strongly influenced by the socio- economic level of the household; It includes: type of floor material, cleanness of the area around the house and crowding.

Lack of water supply for households leads to smaller quantities of water being used for household purposes than is necessary for the maintenance of health. It is difficult for such households to prevent diseases such as diarrhea, dysentery and skin infection. In addition lack of proper sanitation may contribute to presence of insect vectors such as the housefly and mosquitoes (UN, 1991).

Using data from six countries, a United Nations study (1985) shows that, in general; old housing, deficient sanitary conditions and lack of electricity constitute risk factors for child survival.

In Amman, Jordan, after controlling for other socio economic characteristics of the household, Tekce and Shorter (1984) found that there remains a net negative effect of deficient housing on the mortality of children under three years of age.

Harrington's (1974) study of West African societies views a child's chances of survival as the outcome of a series of factors governing exposure to diseases and those encompassing the course and outcome of diseases among them, he observes, is the type of dwellings which mainly affects mortality through the elements of exposure. Benjamin (1965) argues that the most important effects of housing conditions on health work through their impact on the incidence of infectious diseases, particularly diarrhea, which he found to increase in prevalence in England and Wales with the incidence of crowding.

Farah and Preston (1982) carried out a study on determinants of child mortality in Sudan. The results showed that living in a house made from mud raises child mortality by a statistically significant 6% in the capital city and 7% at the national level.

Analyzing the impact of availability of piped water on child mortality in Brazil, Merrick (1983) found out that access to piped water in the house, when effects of household contextual variables are controlled for, is associated with a reduction in mortality of approximately 20%.

Studying neonatal mortality in Sri-lanka, meegama (1980) examined infant and child mortality in reference to type of lavatory in the household and found that lowest mortality was associated with the presence of a flush toilet and the highest with the absence of a flush lavatory.

2.1.2 KENYA

In Kenya, studies have shown that infant and child mortality varies according to socio-economic factors and proximate variables such as maternal factors, exposure to diseases and use of modern health services (Ikamari 1996). The said socio-economic factors have been seen to influence child survival through "a complex web of pathways", in which case access to and use of health facilities and piped drinking water are some of the mediating factors for majority of the socio-economic determinants.

At the community level, it has been established that in communities where malaria is not endemic, where mean breastfeeding durations exceed 15 months, and where immunization coverage exceed 67% have statistically significant negative association with the risk of infant and child death. In addition, better toilet facility, better quality housing floor material and less contaminated water have been found to have statistically significant negative association with infant death (K'oyugi 1986).

Studies by Hobcraft, Mc' Donald and Rustein (1984) and Mosley (1984) shows that in Kenya the increase in infant mortality associated with a low level of maternal education is greater in the poor regions of the country.

On their Part, Economists have tended to stress the notion that maternal education operates through the allocation of maternal time to market and non-market activities. By enhancing a woman's potential returns from work, increased education can stimulate labour force participation. In turn, the working mother has less time to devote to child care but increase the family's economic resources, which might have a favorable impact on child health.

Using district level variable data, Kibet (1981) sought to investigate factors influencing infant and child mortality at the macro-level. He found out that there existed a significant correlation between infant mortality and child mortality and education. The study concluded that the variations in child mortality levels among districts in Kenya were partly as a result of the existing educational differentials among the districts.

However, in his study on the "impact of household and community level environmental factors on infant and child mortality in rural Kenya". K'oyugi (1992). Observed that maternal education of under 9 years had insignificant protective effects on infant and child mortality. Else where, in his study Ikamari (1996) found out that the children of mothers with at least secondary education in the high mortality region (HMR) had higher childhood mortality than the children of uneducated mothers in the low mortality region (LMR). Specifically it was found that child mortality rates for children of mothers with at least secondary education in the HMR was almost twice that for children of uneducated mothers in the LMR.

Studying death clustering in families in Kenya, Khasakhala (1998) studied factors affecting infant and child survival in families in Kenya. It was observed that ecological zone of residence factors such as pre- maturity, immunization, breastfeeding and region of residence are highly associated with child survival during this period. Similarly in child hood, behavioral and household environmental factors as well as ecological zone of residence are highly associated with child which was not important in the earlier period became important at the childhood stage. The study attributes this to the in experience of younger women in child rearing practices.

Using 1993 KDHS data, Ngura (1998) carried out a study to find out factors responsible for child survival in arid and semi-arid lands in Kenya. The study covered the 3 districts of Kilifi, Taita Taveta, Machakos. The results showed a significant relationship between the incidence of child mortality and current marital status, highest level of education type of floor material, duration of breast feeding, religion, parity and type of toilets facility.

In an effort to examine the environment risks factors of early deaths in Kenya , Ndunyu. (1992) carried out a study in which the results indicated that water supply is a high risk factor in determining mortality of children.

It was, for instance revealed that using of Lake water paused twice the risk of experiencing child mortality vis a vis using piped water. The study further revealed that mothers with no education are affected a great deal move by environmental risk factors then those with primary education. As one moves higher in the educational level, the environmental risk variables cease to be a risk in child hood mortality, confirming the assertion that mothers who have received an education have an advantage of knowledge in how to manipulate the adverse environmental conditions so as to protect their family members for better health.

In a study focussing on identification of factors which affect child survival in Asego Division, Homa-bay District, Nyanza Province, Abuya (1999) found out that only 46% of the respondents had toilet facilities, 56.7% practiced hygienic methods of solid waste disposal.

Similarly, it was revealed that only 48% of the respondents had safe sources of drinking water supply. Maternal education was found to influence infant and child mortality as

Similarly, it was revealed that only 48% of the respondents had safe sources of drinking water supply. Maternal education was found to influence infant and child mortality as mothers with higher education were found to live in cleaner surroundings that reduced the breeding of viruses, parasites and germs which could infect and kill the under-5. It was however noted that, for there to be a significant difference among the various educational levels, one needs to have eight or more years of education for a significant difference to be observed.

Omariba (1993) sought to investigate the impact of socio-cultural, socio-economic, health and environmental factors on child survival. The study showed that health, environmental and socio-economic factors have a close relationship with infant and child mortality environmental factors, particularly type of toilet facility and source of water during the wet season and the socio-economic factor, education significantly affected child survival.

It was however observed that socio-cultural factors such as age at supplementation, lengths of breastfeeding, marital status, marriage type and age at first birth did not show any significant effect on child survival.

Using primary data Keraka (1995) established that women with primary level education have a higher proportion of children dead compared those with no education. In addition, women who breastfed their children for a period of 25-30 months had a higher proportion of children dead then those who breastfed for a period of 1-12 months.

In a study to determine the relative effects of socio-demographic and environmental factors ion infant mortality in Kenya, Bwana (1997) found out that maternal level of education, breast feeding and source of drinking water were the key factors influencing

the mortality risk during childhood. The study revealed that the risk of death before age 5 on the average was more than twice as much for children whose mothers had no education compared with those whose mothers had secondary level of education. In, addition, infants that were breastfed for longer durations, and those with wider preceding birth interval had higher chances of survival compared with those breastfed for shorter periods and born with shorter preceding birth intervals respectively

Mosley (1983) analyzed mortality trends and differentials in Kenya and concluded that child survival is primarily determined by the social and economic resources in the child's family. Maternal education and some indicator of the economic circumstances such as poverty level, according to him, largely captured these family resources. He used infant mortality rates for three education groups and related them to the poverty level of six provinces in Kenya. He found a high correlation coefficients between the two were: 0.88 for no education, 0.96 for 1-7 years of schooling and 0.97 for 8 years and over. The results also indicated that the effects of poverty decreases with increasing education.

2.2 Determinants of infant and child mortality

The survival of a child in the first and subsequence weeks depends on a number of socio-economic, Biological, Environmental and cultural factors. (Venkatacharya and Tesfay 1986). The health of a child in the initial stages of life is also found to vary by age and parity of the mother. Research indicate that children born to young mothers, under 18 years of age, have higher mortality risks owing largely to Biological factors. First parity children are found to have higher mortality as a result of low birth weights whereas higher parity children exhibit higher mortality as a result of behavioral factors (Davanzo et al 1983).

There is also evidence on impact of short birth intervals on infant and child mortality. That short birth intervals, combined with low birth weights will contribute to higher neonatal and post neonatal mortality.

Another important variable that has emerged from cross-country comparisons is mothers education (Caldwell 1979, mensch et al 1983, Simmons and Bernstein 1982) Other studies have established correlation between variables such as literacy, mothers childhood residence and expenditure on health and infant and child mortality. Other factors such as personal hygiene of the mother and child, Toilet facilities, safe water supply and prevalence of diseases in the environment also influence child survival.

2.2.1 Maternal education.

Overwhelming evidence point to the fact that maternal education is inversely related to infant and child mortality (Caldwell 1979, Anker and Knowles 1977.) The major findings of the world fertility survey showed that in virtually every country surveyed, both infant and child mortality decreased consistently with increasing education Halvor Gille 1984). It was for instance found in Cameroon that mothers with no Education had twice as many of their infants die as women with secondary education with 109 per 1000 children of uneducated mothers dying.

Maternal education has also been postulated to affect child survival through improved family relation. That education is perceived to enhance women's state through a reduction of the engendered sex inequality in control of material and non-material resources which usually favour men.

According to the 1999 census data analysis, there was a consistent decline in the proportions of children deed with increasing level of education of mother for all age groups except those in the 15-19 age brackets. The primary level of education of a mother was associated with an average reduction of 25% in childhood mortality relative to the mortality of children whose mothers had never attended school. As for the mothers, who had attended Secondary and tertiary levels of education, the mortality of the children reduced by 31% and 8% respectively. It was however observed that in Nyandarua , Kilifi , Laikipia and Meru Central children of mothers with at least secondary education experience higher mortality compared to those who had attained primary education (Republic of Kenya, 2002).

It was, further, observed that there were wide variations in the reductions by region. For instance, child mortality for women with at least secondary education in Nyanza province was 23% higher than for women with no education in central province. Similarly the mortality of children to mothers with a minimum of secondary education was much higher in several districts in Nyanza such as Suba with 146% and Siava 129% , Then it was for women with no education in Nyeri districts, underscoring the relative influence of other determinants of infant and child mortality other than education

2.2.2 Mothers age.

One of the most important variables known to have an effect on Infant and child mortality is the mother's age at the time of delivery. A very young mother is Biologically not fully mature, so that the probability of pregnancy-related complications is high. Also a young mother, being inexperienced may not be able to take proper care of the young infants. Beyond the age of 30, the risks of pregnancy complications apparently increases

because of the increasing inflexibility of the female reproductive organs (Mooley,1991, Potts and Thapa, 1991).

2.2.3 Previous birth interval

Over the years, research has consistently demonstrated that, when mothers space births at least two years apart, their children are likely to survive and be healthy. Typically, the risks of early childhood deaths are higher among children born after a "too short" birth interval. According to WFS 1984 children born less than two years after the preceding birth are much less likely to live until their fifth birthday than those born within two to three years.

The harmful effects of short birth intervals are explained by the "maternal depletion syndrome", whereby one pregnancy coming too soon after the previous confinement leaves the mother little time to recover her health, especially if the child is breastfed for along time. Moreover, a continuous cycle of pregnancy and lactation leads to a progressively higher risk of low birth-weight babies with decreased chances of survival in the early years.

In a study, whose analysis was based on world fertility survey data involving 26 countries, it was found that the occurrence of a birth less than two years after the previous one increases the mortality rate in the first month of life by at least 50%. The effects of rapid child bearing were equally apparent in the second and twelfth month of life, where the mortality risk was raised by at least 50% in 22 countries and actually doubled in 12 countries .(WFS 1984). The effects of child spacing on mortality were more largely independent of the mothers educational level, there by demonstrating the possibility of reducing mortality by increased child spacing for all educational groups.

2.3 CONCEPTUAL FRAMEWORK

Using a multi-disciplinary approach Mosley and Chen (1984) developed an analytical framework for the study of child survival in developing countries.

He produced a useful classification for the analysis of childhood mortality at the family level making it the more suitable for this study because the child's growth and development are heavily dependent upon the living conditions of the family. As already pointed out, it is actually, these conditions that generate the Biological risk factors that act directly on the child's health.

The major assumption, here, is that the family must solve the problem of how to satisfy the needs of its members, with its available resources. To this end, a pattern of behavior is developed, which constitutes the family's survival strategy. And that all the decisions taken may affect directly or indirectly the survival of a child

The framework indicates, on the one hand, how socio-economic determinants acting at both family level and individual members, operate through the proximate/intervening variables. The proximate variables are grouped into 5 categories

I. Maternal factors in the reproduction process such as age, fertility and spacing of births.

ii. Environmental contamination, which encourages the spread of infectious agents and the incidence of infectious disease.

iii. Nutritional deficiency - due to inadequate supply of nutrients for the child and mother during pregnancy and breastfeeding

iv. Injuries to the child (accidents) and

v.Practices in the care of healthy and sick children, including both traditional and modern medicine.

The socio-economic variables that affect the proximate determinants include the capacity of parents and other economically active family members to generate the income the family needs, a capacity determined by nature of their work and earnings.

Another factor is the parents' capacity to manage the household activities which, directly in indirectly, affect the child's health and the time available to them for this purpose. Hence parents education is an important variable.

A second group here consists of cultural factors, including the power relationships in family decision making, the value assigned to children beliefs about children's illnesses and their treatment - all important determinants on the use of health services.

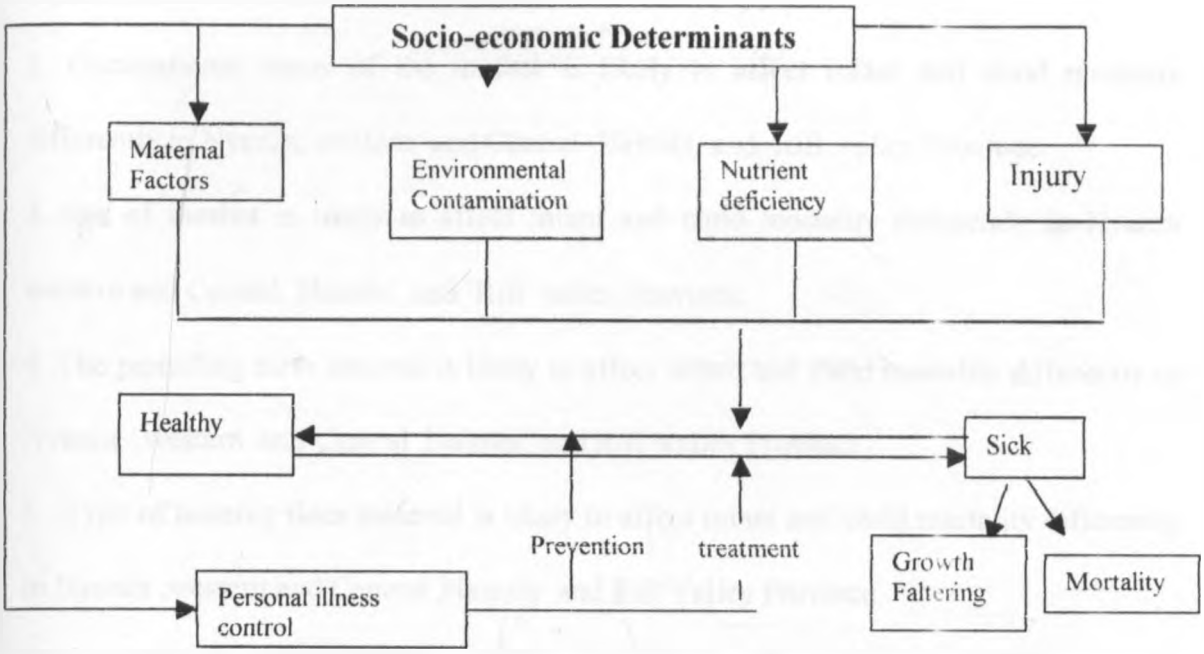
Lastly, the level of family income and way in which it's used are decisive factors in determining family's material living conditions. Important among these conditions are:

i Quality of housing including water supply and lavatory facilities

ii Availability of energy,

iii Personal hygiene and home sanitation

Fig 1 Operation of the five groups of proximate determinants on the health dynamics of a population by Mosley and Chen (1984: 25).



source: Mosley and Chen (1984:25).

2.4 STUDY CONCEPTUAL FRAMEWORK ON DETERMINANTS OF INFANT AND CHILD SURVIVAL

This study is based on the premise that, although the ultimate cause of death is Biological, the determinant of the fatal Biological factors may be a chain of socio-cultural, economic, demographic and environmental factors. The conceptual framework, therefore, is adopted from that proposed by Mosley and Chen (1984:25).

2.5.2 Operational hypothesis

I.Mothers educational level is likely to affect infant and child mortality differently in Nyanza,western and Central,Nairobi,and Rift valley province.

2. Occupational status of the mother is likely to affect infant and child mortality differently in Nyanza, western and Central Nairobi, and Rift valley Province.

3 .Age of mother is likely to affect infant and child mortality differently in Nyanza western and Central ,Nairobi and Rift valley Province.

4 .The preceding birth interval is likely to affect infant and child mortality differently in Nyanza ,western and Central ,Nairobi, and Rift Valley Province.

5 .Type of housing floor material is likely to affect infant and child mortality differently in Nyanza ,western and Central ,Nairobi and Rift Valley Province.

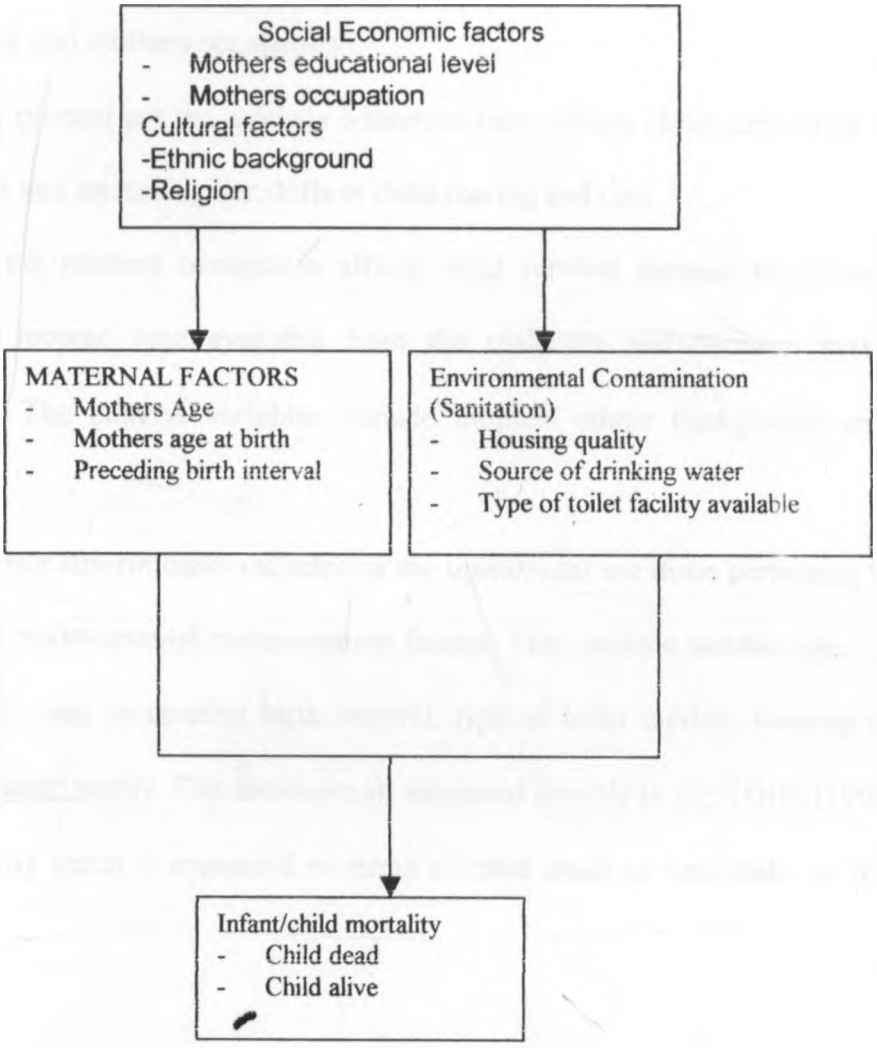
6. Type of toilet facility available is likely to affect infant and child mortality differently in Nyanza,western and Central, Nairobi and Rift valley Province.

7 Source of drinking water supply is likely to affect infant and child mortality differently in Nyanza ,western and Central ,Nairobi and Rift valley Province.

8 Ethnic background of the mother is likely to affect infant and child mortality differently in Central, Nairobi Rift valley and Nyanza and western province.

9 Mothers religious affiliation is likely to affect infant and child mortality differently in Nyanza ,western and Central,Nairobi and Rift valley province.

FIG.2.6 OPERATIONAL FRAMEWORK ON DETERMINANTS OF INFANT AND CHILD MORTALITY



The operational framework presented above is an illustration showing how some socio-economic factors, acting, operating through a group of proximate variables influence/determine child survival. This study has restricted itself to those factors which

the researchers deemed most important predictors in explaining child mortality level in the two region of study.

The socio-economic variables included in the operational framework include mothers educational, and mothers occupation.

As already pointed out the mothers education level affects child survival by influencing her choices and increasing her skills in child rearing and care.

Secondly, the mothers occupation affects child survival through its determination of household income time available from the childcare and decision making in the household. The cultural variables include mothers ethnic background and religious affiliation.

The proximate determinants included in the operational are those pertaining to maternal factors and environmental contamination factors. They include mothers age, mothers age at first birth, and proceeding birth interval, type of toilet facility, housing quality and quality of water supply. The above are all measured directly in the KDHS (1998).

The mortality status is measured in terms of child death or non-death up to their 5th birthday.

2.7 Operational definition of variables and Concepts

1. Infant mortality – It is the deaths that occur to children who are born alive between the time of birth and level not yet celebrated their first birth day per 1000 live births.
2. Child mortality – refers to deaths among children aged between exact age one and under five years.

3. Low mortality region-Refers to the three provinces namely Central,Nairobi ,and Rift Valley which recorded the lowest infant and child mortality rates in the 1998 KDHS.

4. High mortality region-Refers to the two provinces which recorded the highest infant and child mortality rates in the 1998 KDHS. They are Nyanza and Western.

5. Maternal education level – refers to the highest level of formal schooling attained by the mother. It is categorized into no education, primary education, and Secondary level and above.

6. Mother's Religious affiliation – it refers to whether a woman belongs to protestant and other Christians, Catholic, Muslim or others . This is cultural variable which helps in measuring the beliefs and attitudes towards family size and health seeking behavior that directly impact on child health and hence survival .

7. Ethnicity - refers to the ethnic group/ tribe the mother belongs to. I.e. whether Luo, Kikuyu, Kalenjin etc. It measures beliefs and cultural practices that impacts on child health and survival.

8. Mother's occupation – The variable refers to work status category of the mother at the time of the survey. The categories include, not working, professional , self/domestic work or manual.

9. Mother's age -refers to the exact age of the mother at the time of the survey. The variable is categorized into three categories. Those aged less 19 years, 20-34 years and those aged above 35 years and above.

10. Preceding birth interval – refers to the time in months that elapsed between the index child and another birth. It is categorized into ; less 14 months, 15-19 months and above 20 months.

11. Type of housing floor material - A variable indicating the main material used for constructing the floor of the house. It is categorized into cement, mud/dung/sand and others.

12. Source of drinking water – It refers to the main source of water for use in the household. Its used as a proxy to indicate the conditions bearing on disease causing agents at the household level. It is categorized into four piped, well river/stream/lake ,rain and others

13. Type of toilet facility -This refers to the type of facility used to dispose human waste. Like water and floor material, the variable is meant to capture disease causing agents and a proxy for economic status of the household . It is categorized into whether a household uses a pit latrine, flush toilet or the bush.

14. Mothers age at first birth – Refers to the age in years of the mothers at the time her first birth occurred.

CHAPTER THREE

STUDY DESIGN AND METHODOLOGY

3.1 DATA SOURCE

The data for the study was drawn from the Kenya Demographic and Health Survey (KDHS) 1998. The KDHS is a nationally representative survey in which 7881 women age 15-49 and 3407 men aged 15-54 were interviewed. The study was carried out jointly by the NCPD and the CBS with macro international inc. providing technical assistance. The Data collection exercise was carried out between February and July 1998. The survey was designed to produce reliable national estimates as well as urban and rural estimates of fertility and childhood mortality rates among other health and population indicators.

3.2 SURVEY DESIGN

The 1998 KDHS is national in scope. However, the whole of North Eastern Province and four other Districts namely: Isiolo, Marsabit, Turkana and Samburu were excluded. The excluded area accounts for less than 4% of the total population of Kenya.

3.3 SAMPLING

A two -stage, stratified sampling approach was utilized. In the first one, sample points or 'clusters' and then house-holds within sample points from a list compiled during a special KDHS household listing exercise were selected.

The 1998 KDHS sample points were similar as those used in the 1993 KDHS and were selected from a National Master sampling frame called NASSEP-3 maintained by the Central Bureau of statistics.

A total of 536 sample points were drawn, 92 urban and 444 rural.

In order to produce reliable estimates for certain variables at districts level,15 districts namely Bungoma, Nyeri, Machakos, Kisii, Muranga, Nakuru, Kilifi, Kakamega,Kericho, Meru, Nandi, Siaya, South Nyanza, Uasin Gishu and Taita Taveta were over sampled

In total about, 9,400 households were targeted for selection.

3.4 SELECTION OF HOUSEHOLD & INDIVIDUALS

The Central Bureau of Statistics (CBS) began a complete listing of households in all sample points during November 1997 and completed the exercise in February 1998. At the end, listing in 6 out of 536 sample points could not be completed and were thus not included in the survey, due to problems of inaccessibility. Of the six selected clusters eventually not included, 5 are rural and 1 urban. All women aged 15-49 were targeted for interview in the selected households.

3.5 THE SURVEY QUESTIONNAIRE

The survey utilized 3 types of questionnaires. A household questionnaire, A woman's questionnaire and man's questionnaire. This study is based on the information from a sub-sample of 7881 women aged 15-49 using the women's questionnaire and household questionnaire.

The questionnaire was developed in English and then translated into Kiswahili and the Nine widely spoken vernacular languages in Kenya.

Women were asked questions about their background, reproductive history (to arrive at fertility and childhood mortality rates), contraception, pregnancy and breastfeeding, immunization and health, marriage, fertility preferences, husbands background, women circumcision and weight and height of respondent and their living children.

The household questionnaire provides important information about characteristics of the household ;such as the source of drinking water , type of toilet facility materials used to construct the household s dwelling, and ownership of various consumer goods

3.6 RESPONSE RATES

The household response rate (HRR) was 94.6 and 98.9, eligible women response rate (EWRR) 91.5 and 98.4 while the overall response rate (ORR) was 86.6 and 97.3 for central and Nyanza province respectively.

3.7 METHODS OF DATA ANALYSIS

3.7.0 Introduction

This section discusses the major methods that were employed in Data analysis. They include; Frequency distributions and percentages, cross-tabulations and Logistic regression.

3.7.1 Frequency distributions

The frequency distributions and percentages were used to show the distribution of births according to the various categories of the study variables. The frequencies give the first hand picture of preliminary findings of the study.

3.7.2 Cross-tabulations

Cross-tabulation technique is a joint frequency distribution of cases according to two or more classificatory variables.

In this study they were used to show the relationship between independent variables such as maternal education and mothers occupation in each region. Cross-tabulation was preferred for this study due to its appropriateness in comparative analysis and because

they could clearly illustrate the distribution and relationship referred to above according to each category of the selected variable in each mortality region.

The chi-square statistic was then used to test the association between two variables in the cross tabulation tables, i.e. whether they are independent of each other It is computed as follows:-

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$$

The alpha level selected is 0.05. In any observed significance which was less than the Alpha, it was concluded that there is an association between the dependent and the independent variable, while that larger than the alpha value of 0.05 was taken as indicating no association between the two variables.

3.7.3 LOGISTIC REGRESSION

In order to assess the effect of the various factors on the risk of infant and child mortality, logistic regression analysis was applied. It was used in the study to estimate the likelihood of survival for infants and children given the prevailing socio-economic, demographic and environmental situation in the two mortality regions. In its basic form the logistic regression model is shown as:

$$P(x) = \frac{e^{\beta o + \beta 1x}}{1 - {}^{\beta o + \beta 1x}}$$

where

P(x) = The probability of an event occurring.

e = The base of natural logarithm, equal to 2.71828...

$^{\beta o}$ and $^{\beta 1}$ = The coefficients estimated from the Data

x = The independent variables.

It's appropriateness as stated above, aside, the logistic regression has several advantages, rendering it more suitable for this study chief among which can be stated as:

1. Its strength is that it is flexible and an easily adoptable function to use and lends itself to a biologically meaningful interpretation.

2. It is a suitable method for estimating relative risk. The logit co-efficients are the natural logarithms of the relative odds by which the determinants of mortality are different for the risk of dying.

Assumptions of logistic regression

1. The dependent variable is normally distributed.

2. The sample studied is large enough and randomly drawn.

3. The effect of each explanatory variable is the same irrespective of the effect of any other variable unless interaction terms are introduced.

3.7.4 RECODING OF VARIABLES

It became necessary to combine mothers who had attained secondary level of education and those of tertiary category due to the relatively small number of mothers in the latter group in both regions of study. Hence coming up with three broad categories of none, primary and secondary. Similarly mothers occupation were grouped into four categories, maternal age into three categories, preceding birth interval, maternal age at first birth were also transformed into three categories Source of drinking water and mothers religion were grouped into four categories. The regions (provinces) were recoded into two categories, namely the high mortality and low mortality regions respectively as shown in the table below.

Table 3.0 summary of variables and their measurement

1. Child survival	0- Dead 1 -Alive
2. Mother occupation	0- Not working* 1- Professional 2- Self employed domestic 3- Manual
3. Maternal age	1 > 19 2 20-34 3 35+*
4. Preceding birth interval	1. > 14 2. 15 - 19 3. 20+*
5. Maternal education	0 No education* 1 Primary 2 Secondary +
6. Source of drinking water	1. Piped* 2. Well 3. River / stream / lake 4. Rain / others
7. Main floor material	1. Cement* 2. Mud/dung/sand 3. Others
8. Mothers religious affiliation	1. Catholic* 2. Protestant/other Christians 3. Muslims 4. Others
9. Maternal age at first birth	1. >17 2. 18 - 23 3. 24+*
10.Region	1.Nairobi* 2.Central 5.Nyanza 6.Rift valley 7.Western
11.Ethnicity	3 - Kikuyu 1- Kalenjin* 4- Kisii 5- Luhya 6- Luo 2- Kamba 7- Maasai 8- Meru 11- Taita taveta 96- Others

CHAPTER FOUR

INFANT AND CHILD MORTALITY DIFFERENTRIALS

4.0 INTRODUCTION

This chapter deals with the presentation and description of characteristics of the study population and the differentials in infant and child mortality. The chapter is divided into three sections. The first section focuses on the distribution of births by selected background characteristics while the second and the third deals with the differentials in infant and child mortality according to the selected variables in both the high and the low mortality regions respectively.

The chi-square was used to test the strength of association between the dependent variables and risk of infant and child death and their significance. The significance level is at alpha = 0.05 level.

4.1 THE STUDY POPULATION

The study population consists of a sub-sample of 8061 births. The births took place between 1988 and 1998 among women aged 15-49.

As shown in table 4.1 below, 44.4% of all the births occurred to women who were either self employed or engaged in domestic work in the high mortality region and 35.1% in the low mortality region. Distribution by maternal age indicates that the largest number of births were recorded among women aged 20 – 34 in both regions, a finding which

conforms with expectation as the age bracket of 20 – 34 is regarded as the prime age for child bearing among women.

The distribution by maternal education level shows that more than a half of the births (64.5% and 64.6%) occurred to women who had attained primary education level in both regions, while those born to women who had attained secondary level education and above constituted 24.1% and 23.5% introduction he high and low mortality regions respectively.

Distribution by the length preceding birth intervals shows that most births took place after an interval of 20 months in both regions.

The distribution of mother's age at first birth indicates that nearly a half of the births in both regions occurred to mothers whose ages at first birth ranged from 18 – 23 years.

By main floor material 84.5% and 70.3% of the births occurred to mothers whose floor was made up of mud/dung and sand, while the majority of births occurred to mothers who used pit-latrine as a toilet facility in both regions.

The study indicates that in the high mortality region, 60% of the births occurred to women whose main source of drinking water was either a river, stream or lake while those in the low mortality region were 42.2 percent of total births.

Lastly, the results indicates that 8%, 20.3%, 71.7% 59% and 41% of the births occurred to women who had hailed from Nairobi, Central, Rift valley, Nyanza and western provinces respectively.

Table 4.1 Distribution of the Births by selected background characteristics in the mortality regions

Variable	High Mortality Frequency	percentage	Low Mortality Frequency	percentage
Mother's occupation				
0 Not working	1015	28.8	1891	41.9
1 Professional	834	23.6	871	19.3
2 Self employed/ domestic	1567	44.4	1581	35.1
3 Manual	111	3.1	163	3.7
Total	3527	100	4512	100
Maternal age				
1 < 19	132	3.7	153	3.4
2 20 – 24	2312	65.5	3130	69
3 35+	1084	30.7	1250	27.6
Total	3528	100	4533	100
Preceding Birth interval				
1 < 14	175	6.2	238	6.9
2 15-19	288	10.2	301	8.7
3 20+	2388	83.6	2026	84.4
Total	2829	100	3465	100
Maternal Education				
0 No Education	400	11.3	558	12.3
1 Primary	2277	64.5	2929	64.6
2 Secondary +	851	24.1	1046	23.1
Total	3528	100	4533	100
Source of drinking water				
1 Piped	442	12.6	1248	27.8
2 Well	901	25.6	1210	26.9
3 River/ Stream/ Lake	2113	60	1907	42.4
4 Rain / Other	65	1.8	129	2.9
Total	3521	100	4494	100
Main floor material				
1 cement	527	15	1196	26.7
2 mud/dung/sand	2972	84.5	3150	70.3
3 Others	19	0.5	135	3
Total	3518	100	4481	100
Type of toilet facility				
1 Flush	107	3	344	7.7
2 Pit latrine	2815	79.9	3499	78.2
3 Bush / other	599	17	629	14.1
Total	3521	100	4472	100

Mothers religious affiliation				
1 Catholic	891	25.3	1310	29.6
2 Protestant/ other	2569	73	3056	68.9
Christian				
3 Muslim	36	1	41	0.9
4 Others	25	0.7	26	0.6
Total	3521	100	4433	100
Mothers age at First birth				
1>17	1488	41.6	1621	35.8
2 18-23	1891	53.6	2515	55.5
3 24+	169	4.8	397	8.8
Total	3528	100	4533	100
Ethnicity				
Kalenjin	2168	47.8	62	1.8
Kamba	108	2.4	3	0.1
Kikuyu	1382	30.5	10	0.3
Kisii	102	2.3	723	20.5
Luhya	357	7.9	1329	37.7
Luo	188	4.1	1294	36.7
Maasai	112	2.5	3	0.1
Others	110	2.4	112	2.9
Total	4527	100	3528	100

Source : Analysis of the 1998 KDHS data.

4.2 INFANT AND CHILD MORTALITY DIFFERENTIALS IN THE MORTALITY REGIONS

Table 4.2 (a) below shows infant mortality differentials in the high and the low mortality regions. The results indicate that in the high mortality region the lowest mortality rates were recorded among mothers who are classified as 'professionals'.

It is similarly observed that in the high mortality region the infant mortality rates are twice compared with those observed in the low mortality region among professional category.

By maternal age it is observed that in both regions, the highest rates are recorded among infants whose mothers are aged 35 years and over.

In both regions the highest infant deaths are observed among infants belonging to women who had attained no education, while in the lowest rates are observed among women who are categorized as having attained secondary and above level of education.

In the high mortality region, higher rates of infant death have observed among women whose ages were 35 and above.

Turning to infant deaths by preceding both intervals it is observed in both regions that both within an interval of 14 months and below experienced the greatest infant mortality rates.

By maternal education in both the high mortality region and the low mortality region the greatest infant deaths occurred to infants born among women who had received no education.The results equally point out that higher mortality deaths are experienced among infants whose mothers reported that they used the bush for human waste disposal.

By mothers' age at first birth in both the high and low mortality region, the greatest infant deaths are observed among women whose age at first birth was below 17 years.

Table 4.2 infant mortality differentials in the mortality regions.

VARIABLE	HIGH MORTALITY REGION	LOW MORTALITY REGION
Mother's occupation		
Not working	38.4	7.9
Professional	6.2	13.8
Self employed/domestic	48.5	13.9
Manual	36.0	42.9
Maternal age		
< 19	45.5	13.1
20 –34	45.9	12.5
35+	53.5	12.8
Preceding birth interval		
<14	34.3	29.4
15-19	8.7	13.2
20 +	4.5	15.9

Maternal education		
No education	70	16.1
Primary	52.3	13.2
Secondary +	27.0	15.9
Source water		
Piped	36.2	16.0
Well	46.6	8.3
River/stream/lake	52.1	11.0
Rain/other	30.7	15.5
Main floor material		
Cement	36.1	14.2
Mud/dung/sand	50.8	11.4
other	-	-
Type of toilet		
Flush	37.4	8.7
Pit latrine	44.7	10.0
Bush/other	66.7	23.8
Religion		
Catholic	54.9	1.0
Protestant/other Christian	46.7	1.2
Muslim	1.0	1.0
Other	1.0	1.4

Mother's age at first birth		
< 17	60.4	19.1
18 – 23	39.1	1.5
24+	35.5	5.0
Ethnicity		
Kalenjin	1.3	4.3
Kamba	1.0	1.0
Kikuyu	1.0	1.0
Kisii	2.8	6.9
Luhyia	1.4	4.6
Luo	4.5	1.2
Masaai	1.1	1.3
others	1.7	1.0

Source: computed from KDHS 1998 data

As shown in table 4.3 below, child deaths among women who were categorized as 'manual laborers' was almost 5 times compared to those occurring among women of the 'not working' category in the high mortality region.

In the low mortality region more deaths were observed among children of women of in the not working category.

It is equally observed that a greater percentage of child deaths occurred among children born after an interval of 14 months. By maternal education, highest populations of child deaths occurred to children whose mothers had not attained any education.

Turning to child deaths according to mothers' age at first birth, the results indicate that most depths in the high mortality region occurred to children whose mothers were aged 17 years and below.By ethnicity, a greater proportion of child deaths are observed s among the children whose mothers are Luo and Luhya in the high mortality region and Kalenjin in the low mortality region

Table 4.3. Child mortality differentials in the mortality regions

Variable	High mortality rate	Low mortality rate
Mothers occupation		
Not working	14.7	20.6
Professional	14.3	5.8
Self-employed/domestic	14.0	4.8
Manual	72.0	2.5
Maternal age		
>19	15.1	13.1
20-34	16.8	12.4
35+	14.7	4.6
Preceding birth interval		
>14	40.0	25.2
15-19	13.8	8.3
20+	13.4	5.3
Maternal education		
No education	22.5	5.1
Primary	18.4	4.6
Secondary +	7.1	2.2

Source of drinking water		
Piped	4.5	12.8
Well	11.1	13.4
River/stream/lake	9.9	5.7
Rain/other	30.8	15.5
Main floor material		
Cement	32.3	15.8
Mud/dung/sand	12.1	6.0
Other	1.2	1.1
Types of toilet		
Flush	28.0	11.6
Pit latrine	12.4	3.6
Bush/other	25.0	6.3
Religion		
Catholic	20.2	3.7
Protestant/other Christian	14.7	9.1
Muslim	4.0	1.2
Other	1.2	1.0
Mothers age first birth		
<17	20.8	5.5
18-23	12.6	2.9
24+	11.8	1.5
Ethnicity		
Kalenjin	11.5	4.8
Kamba	27.7	1.2
Kikuyu	7.2	1.0

Kisii	19.6	4.0
Luhyia	22.4	3.8
Luo	31.9	1.0
Maasai	2.6	1.1
Others	1.2	1.3

Source: computed from KDHS 1998 data

4.3. CONCLUSION

A comparison of the association of each of the independent variables and the risk of infant death in the two mortality regions revealed that preceding birth interval, mother's age at first birth and ethnicity are significantly associated with the risk of infant death in both the high and low mortality regions.

The study revealed that whereas the mother's occupation, maternal education level and type of toilet facility availed for use in the household are statistically and significantly associated with infant death in the low mortality region, all were not significantly associated with the incidence of infant death in the high mortality region and not so in the low mortality region.

However., maternal age, the main material used for floor construction and religion were found not to be significantly associated with infant death in both regions.

On the other hand, the association between the independent

variables and the risk of child death shows that preceding birth interval, type of toilet facility ,mothers age at first birth and ethnicity are significantly associated with the risk of child death in both regions.

Maternal education and religion are associated with child death in the low mortality region only. Maternal age, source of drinking water supply, main floor material and religion are not significantly associated with child death in both regions.

CHAPTER FIVE

DETERMINANTS OF INFANT AND CHILD MORTALITY IN THE MORTALITY REGIONS

5.0 INTRODUCTION

In this chapter the results of multivariate analysis are presented and discussed. First the results of infant mortality are presented region by region. This is followed by the results on child mortality. Finally a comparative discussion is presented.

5.1 DETERMINANTS OF INFANT MORTALITY

This section represents the results of multivariate logistic regression analysis showing the effects of the independent variables on the risk of infant death in both mortality regions.

5.1.1 LOW MORTALITY REGION

Table 5.1 below shows the results of multivariate logistic regression showing the effects of independent variables on the risk of infant deaths in the low mortality region.

Table 5.1 results of multivariate logistic regression showing the effects of independent variables on the risk of infant death in the low mortality region.

Variable	β	S.E	D.f	Sig	Exp β
1 occupation					
Notworking(R.C)	0.00				1.00
Professional	.1628	.5473	1	.7661	1.1768
Selfemployed/domestic	.2811	.4002	1	.4824	1.3246
Manual	1.5795	.5750	1	.0060 ***	4.8526
2.Preceding birth interval					
<14	-.3396	.6900	1	.6226	.7121
15 – 19	-.7011	.5020	1	.1625	4960
20+ (R.C)	0.00				1.00
1. Maternal age					
< 19	.7324	.6922	1	.0176**	2.0801
20-34	.0137	.6927	1	.0191**	1.0138
35+(R.C)	0.00				1.00
4.Type of toilet facility					
flush(R.C)	0.00				1.00
pit	.9840	.0820	1	.3632	2.6750
bush/other	1.8061	.1556	1	.1181	6.0866
5 Maternal education					
No education(R.C)	0.00				1.00
Primary	-.2035	.4586	1	.6572	.8158

Secondary +	-1.0400	.7771	1	.1808	.3534
6.**Source of drinking water**	0.00				1.00
piped (RC)	.6868	.5132	1	.1808	.5032
well	.4839	.4636	1	.2966	.6164
river/stream/lake	.2250	.0740	1	.8341	.7986
rain/other					
7. **Main floor material**					
cement (R.C)	0.00				1.00
mud/dung/sand	.1493	.4544	1	.7424	1.1610
others	-6.3622	.2260	1	.8083	.0017
8. **Religion**					
catholic(R.C)	0.00				1.00
protestant/other Christian	.3746	.3952	1	.3432	1.4545
Muslim	-6.4383	.6991	1	.8948	.0016
Others	-4.6303	.4861	1	.9541	.0098
9. **Mother's age at first birth**					
< 17	-.3443	.3565	1	.3342	.7087
18 –25	-6.9788	.1165	1	.6650	.0009
24 + (R.C)	0.00				1.00
10.Ethinicity					
kalenjin(R.C)	0.00				1.00
Kamba	.9624	.0989	1	.3811	2.6181
Kikuyu	-.0456	.5085	1	.9286	.9554
Kisii	-6.3967	.0102	1	.8365	.0017
Luhya	.7258	.5303	1	.1711	2.0664
Luo	1.3329	.6543	1	.0416**	3.7921
Maasai	-4.9667	.3923	1	.9770	.0070
Others	-6.3348	.0696	1	.8525	.0018

R.C – Reference Category
*** P<0.01
** P <0.05
* P< 0.1

5.1.2 HIGH MORTALITY REGION

Table 5.2 below shows the results of multivariate logistic regression analysis showing the effects of independent variables on the risk of infant death in the high mortality region.

Table 5.2 results of multivariate logistic regression showing the effects of independent variables on the risk of infant death in the high mortality region

VARIABLE	β	S.E	D.f	Sig	Exp β
1 Occupation					
Not working (R.C)	0.00				1.00
Professional	.1711	.6541	1	.7936	1.1866
Self-employed/domestic	.7241	.6332	1	.2528	2.0628
Manual	.2943	.6319	1	.6414	1.3422
2 Preceding birth interval					
< 14	-.1907	.4310	1	.6582	.8264
15 – 19	.7430	.2382	1	.0019 **	2.0981
20+ (R.C)	0.00				1.00
3 Maternal age					
< 19	-5.6131	.9992	1	.6885	.0036
20 – 34	-.1665	.1925	1	.3869	.8466
35+ (R.C)	0.00				1.00
4 Type of toilet facility					
Flush(R.C)	0.00				1.00
Pit	1.0167	.7232	1	.1597	2.7642
Bush/other	.0059	.2356	1	.9799	1.0059
5 Maternal education					
No education (R.C)	0.00				1.00
Primary	-.8267	.3359	1	.0138**	0.4375
Secondary+	-.4853	.2799	1	.0829*	.6155
6 Source of drinking water					
Piped(R.C)	0.00				1.00
Well	.2175	.0795	1	.8403	1.2430
River/stream/lake	.4875	.0469	1	.6415	1.6282
Rain/other	.6176	.0400	1	.5526	1.8545
7 Main floor material					
Cement (R.C)	0.00				1.00
Mud/dung/sand	.5681	.5612	1	.7827	.3579
Others	.9870	.5594	1	.7633	.4925
8 Religion					
Catholic (R.C)	0.00				1.00

	Protestant/other Christian	.2660	.0695	1	8036	1.3047
	Muslim	-.0022	.0618	1	.9984	.9979
	Others	-4.9997	.7265	1	.6698	.0064
9	Mother's age at first birth					
	17	.4069	.5433	1	.4539	1.5022
	18 – 23	.1582	.5394	1	.7693	1.1714
	24+(R.C)	0.00				1.00
10	Ethnicity					
	Kalenjin(R.C)	0.00				1.00
	Kamba	.5108	.0302	1	.6201	1.666
	Kikuyu	-4.0371	.9019	1	.9079	0.0175
	Kisii	-4.7124	.8820	1	.8215	0.0008
	Luhya	.5526	.8424	1	.5118	1.7378
	Luo	.3144	.7504	1	.6752	1.3694
	Maasai	-4.2895	.7395	1	.9201	0.0137
	Others	0.3338	.4203	1	.1003	1.3963

R.C – Reference Category
*** P<0.01
** P <0.05
* P< 0.1

5.1.3 DISCUSSION AND CONCLUSION

As shown above in table 5.1 and 5.2 mothers occupation status has a significant effect on the risk of infant death in the low mortality region while it shows no significant effect on infant death in the high mortality region.

It is specifically noted that the greatest Increases are by the 'manual' and 'self-employed/ domestic' categories in the low and high mortality regions respectively.

On preceding birth interval, the results show that its effect is only significant in the high mortality region.

Turning to the type of toilet facility and maternal age, the results show that the two variables have no significant effect on infant death in both regions.

Maternal education was seen to have a significant effect in the high mortality region. On the other hand maternal education level was found not to be significantly associated with the risk of infant death in the low mortality region. In both regions, mothers education level shows a reducing effect on infant death. The results indicate that infants born of parents with a primary education level have a lower probability of dying compared to those whose mothers have attained no education.

Contrary to what was hypothesized, the results indicate that source of drinking water, main floor material, mothers age at first birth, religion and ethnicity are not significantly associated with the risk of infant death in both mortality regions. However, in both the high and low mortality regions, it is evident that with reference to the reference category (Kikuyu), being borne of parents of Luo and Luhyia origin shows the highest increases in the odds of death at infancy.

5.2 DETERMINANTS OF CHILD MORTALITY

This section presents the results of multivariate logistic regression analysis showing the effects of the independent variables on the risk of child death in both mortality regions.

5.2.1 LOW MORTALITY REGION.

Table 5.3 below shows the results of multivariate logistic regression showing the effects of independent variables on the risk of child death in the low (central/Nairobi/Rift valley) mortality region.

Table 5.3 results of multivariate logistic regression showing the effect of ndependent variables on the risk of child death in the low mortality region.

VARIABLE	B	S.E	D.f	Sig	Exp β
1. **Occupation**					
Not working (R.C)					
Professional	-.1121	.5421	1	.8362	.8940
Self-employed/domestic	.0683	.3878	1	.8601	1.0707
Manual	1.8412	.5665	1	..0012***	6.3042
2. **Preceding birth**					
interval	-.5674	.6651	1	.3936	.5670
< 14	.9257	.4666	1	.0473**	.3962
15 – 19					
20+ (R.C)	0.00				1.00
3. **Maternal age**					
<19	.6354	.2623	1	.8950	1.8878
20 – 34	-.0313	.2627	1	.8887	.9692
35+(R.C)	0.00				1.00
4. **Type of toilet facility**					
Flush (R.C)	0.00				1.00
Pit	.2922	.1226	1	.2497	1.3394
Bush/other	.1380	.1899	1	.0724	1.1480
5. **Maternal education**					
No education (R.C)	0.00				1.00
Primary	-.0718	.4337	1	.8685	.9307
Secondary+	-1.0414	.7608	1	.1711	.3530
6. **Source of drinking**					
water	-				
Piped (R.C)	- 0.00				1.00
Well	9956	5150	1	.0532*	.3695
River/stream/lake	7591	.4529	1	.0937*	.4681
Rain/other	5101	.0662	1	6323	.6004
7. **Main floor material**					
Cement (R.C)	0.00				1.00
Mud/dung/sand	.2531	.4222	1	.5489	.7764
Others	-6.2250	.4883	1	8208	.0020
8. **Religion**					
Catholic(R.C)	0.00				1.00
Protestant/other Christian	.3566	.3943	1	.3658	1.4285
Muslim	-.5330	.0828	1	.6226	.5869
Others	.9413	.6404	1	.1416	2.563
9.Mothers age at first birth					

<17	-.1796	.3441	1	.6017	8356
18 – 23	-6.9255	.3315	1	.6715	.0010
24+ (R.C)	0.00				1.00
9.Ethnicity					
Kalenjin(R.C)	0.00				1.00
Kamba	.4309	.6957	1	.3420	1.5386
Kikuyu	-1.9092	.0063	1	.8725	.1482
Kisii	-2.5182	.1742	1	.1713	.0806
Luhya	.6755	.9072	1	.3082	1.9650
Luo	.1824	.4678	1	.6779	1.2001
Maasai	.7560	.9872	1	.8972	2.1297
Others	.4291	.8690	1	.5503	1.5359

R.C – Reference Category

*** P<0.01

** P <0.05

* P< 0.1

5.2.2 HIGH MORTALITY REGION

The table below shows the results of multivariate logistic regression showing the effects of independent variables on the risk of child death in the high mortality region.

Table 5.4 results of multivariate logistic regression showing the effects of independent variables on the risk of child death in the high mortality region.

VARIABLE	β	S.E	D.f	Sig	Exp β
1. Occupation					
Not working (R.C)	0.00				1.00
Professional	.0045	.6399	1	.9943	1.0046
Self-employed/domestic	.6608	.6167	1	.2863	1.9364
Manual	.1509	.6198	1	..8077***	1.1628
2. Preceding birth interval	-.8104	. .2391	1	0007***.	.4447
< 14	.0729	4332	1	8664	1.0756
15 – 19	0.00				1.00
20+ (R.C)					
3. Maternal age					
< 19	5.7390	.8472	1	.7172	.0032
20 – 34	-.1711	.1936	1	.3768	.8427
35+ (R.C)	0.00				1.00
4. Type of toilet facility					
Flush (R.C)	0.00				1.00
Pit	.8196	.7093	1	.2479	2.2697
Bush/other	.1411	.2241	1	.5290	.8684
5. Maternal education					
No education (R.C)	0.00				1.00
Primary	-.8839	.3374		.0088	.4132
Secondary+	-.5205	.2799		.0629	.5942

6. Source of drinking water					
Piped (R.C)	.0.00				1.00
Well	3542	.0766	1	.7421	1.4251
River/stream/lake	.6319	.0451	1	.5454	1.8811
Rain/other	.7319	.0384	1	.4809	2.0791
7. Main floor material					
Cement(R.C)	0.00				1.00
Mud/dung/sand	.8307	.5193	1	.0855*	2.2950
Others	-.2063	.5175	1	.0994*	.8136
8. Religion					
Catholic (R.C)	0.00				1.00
Protestant/other Christian	.2990	.0677	1	.7795	1.3485
Muslim	.1212	.6008	1	.9090	1.1289
9. Mother's age at first birth	5.7390	.8472	1	.7172	.0032
<17	-.1711	.1936	1	.3768	.8427
18 – 23					
24+ (R.C)	0.00				1.00
10. Ethnicity					
Kalenjin (R.C)	0.00				1.00
Kamba	.8748	.8240	1	.6382	2.3984
Kikuyu	-1.3634	.7141	1	.7189	.2558
Kisii	-2.6530	.9117	1	.4838	.0704
Luhya	.6455	.6731	1	.6215	1.9070
Luo	.9070	.5522	1	.2833	2.4769
Maasai	.1394	.2986	1	.6400	1.1496
Others	.7065	.9398	1	.4597	2.0269

R.C – Reference Category

*** P<0.01

** P <0.05

* P< 0.1

5.2.3 DISCUSSION AND CONCLUSION

The results in table 5.3 and 5.4 shows that except for mothers occupation, preceding birth interval, type of toilet facility and maternal education level, all the other independent variables have no significant relationship with the risk of child death.

In mothers occupation status, the professional category shows a reducing effect on child mortality in both regions.

Although preceding birth intervals show no significant effect on child death in the low mortality region, birth intervals of less than 14 months indicates an increasing effect on child mortality. Children born after a birth interval of less than 14 months have child mortality risk increased by over 2.5 times in the low mortality region. In the high mortality region, the birth of child after an interval of less than 14 months shows an increasing effect on the risk of child death.

The high child risk may be attributed to the termination of breastfeeding within a few months after birth, resulting in poor child health. This finding supports the essence of the need to further intensify family planning programmes especially in the high mortality region in order to prolong breastfeeding periods as a measure of increasing child survival in Kenya.

On the effect of the type of toilet facility available for use in the household, the results indicate that in the high mortality region, children born in households whose main facility for human waste disposal is a pit latrine more than doubled (2.2697) This implies that

such children are two times more likely to die compared to those in whose household a flush lavatory is available.

In both regions, maternal education indicates that both primary and secondary level of education have a reducing effect on the risk of child death with reference to the category of 'no education'.

In the ethnicity categories, the results indicate that in the high mortality region, child mortality risks are increased for the Luo ethnic group while in the low mortality region the risk of child death is two times more for the 'Maasai' compared to the reference category (Kikuyu).

The above scenario can be attributed to the differences in customs and beliefs which have a direct bearing on child feeding practices as well as the higher poverty levels in these regions.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.0 INTRODUCTION

In this chapter the summary of the research findings, conclusions and recommendations for policy makers and for further research are presented.

6.1 SUMMARY

The study set out to analyze determinants of infant and child mortality in Kenya using 1998 KDHS data. Specifically, it sought to examine whether such determinants were similar and operated at the same magnitude in the two mortality regions designated as the high and the low mortality regions. Also investigated were the relationship between child death and the respondent's background characteristics such as education level, occupation, mothers age, mothers age at first birth, previous birth interval, Type of Toilet facility available in the household, housing floor material, source of drinking water supply, religious affiliation and ethnic background.

In order to determine the association between the independent variables and the dependent variable, bivariate analysis was done involving cross-tabulation and the chi-square test. To find out the effect of the predictor variables on infant and child death, multivariate logistic regression analysis was used.

Four models were run. The first model involved all the independent variables and infant death(0-11months) for the high mortality region, while the second one involved only children (12 – 59 months).

A Similar procedures was followed for the other two models for the low mortality region. Variables having at-value of less than 0.05 at 95% confidence interval were regarded as significant.

To create the dependent variable (Infant/ child death), 60 months were subtracted from the date of the interview and the resulting period was divided into 0-11 months, and 12-59 months to represent infant and child deaths respectively.

In order to increase the number of cases, a ten-year observation period was done by subtracting 120 months from the date of the interview.

The multivariate logistic regression analysis for the low mortality region and the high mortality region on risk of infant death indicates that mothers occupation status has a significant effect on the risk of infant death in the low mortality region but shows no significant relationship with infant death in the high mortality region. Similarly, preceding birth interval and maternal education level were found to significantly affect infant mortality in the high mortality region.

In both regions, primary and secondary education levels were seen to have a reducing effect on the risk of infant death. This finding is important because research findings elsewhere have indicated that the association between infant mortality and maternal education is affected by the differential use of health services. (United Nations 1991.) Thus, the important role of mothers schooling is significant for the purposes of infant and child Mortality reduction policies, because it is a component that can be improved on both regional and national scale.

The type of toilet facility, maternal age, source of drinking water, main floor material, mother's age at first birth, religion and ethnicity were found not to have any significant effect on the risk of infant death in both mortality regions.

Turning to child deaths, mothers occupation was found to have a significant relationship with the risk of child death in both regions. Preceding birth interval shows a significant relationship with child death only in the high mortality region, while the type of toilet facility is significantly associated with child death in the low mortality region.

6.2 CONCLUSION

As already pointed out, the study sought out to examine and compare the effects of the selected socio-economic, demographic, cultural and environmental factors on infant and child mortality in the high and low mortality regions in Kenya.

Based on the findings of the study, the following conclusions can be made:

The variable mothers occupation was intended to capture the effects of resources available for the child health care and hence a proxy for standard of living in the household, the results of this study supports the premise that occupational categories associated with higher incomes lead to a higher standard of living and thus relatively lower risk of infant and child death.

The mothers education variable which was intended to capture the knowledge level of childcare with the underlying assumption that the higher the level of education, the better the child health care practices. The results of this study support the hypothesis that the risk of child death varies with the level of formal education.

In line with the first objective of the study, it can be concluded that whereas mothers occupation is an important determinant of child mortality in both regions, its association with the risk of infant death is only significant in the low mortality region. Similarly maternal education is only significantly associated with infant mortality in the high mortality region.

The second objective of the study was to establish whether age of the mother at first birth and previous birth interval affects infant and child mortality in the mortality regions. The results indicated that mothers age at first birth is not significantly associated with infant and child death in both mortality regions. However, preceding birth intervals were observed to significantly affect infant and child mortality in the high mortality region. It is further observed that shorter birth intervals increases the risk of infant and child death in the high mortality region. This is in line with theory, which holds that when birth intervals are short, the mother terminates breast feeding within a few months after birth, leading to poor child health.

In line with the third objective of the study, the type of toilet facility is found to be a significant determinant of child mortality in the low mortality region only. This is not the case in the high mortality region since its effect is likely to have been captured by other variables specifically mothers occupation.

Lastly, religion and ethnicity were found to have no predictive effects on infant and child mortality in both the high and low mortality regions. However, the results of the logistic regression analysis indicate that religious differentials in infant and child mortality, albeit, of small magnitude, also exist in Kenya.

6.3 RECOMMENDATIONS

In the light of the findings and conclusions of this study, the following recommendations are made:

6.3.1 RECOMMENDATIONS FOR POLICY

The results of the study indicate that maternal education is an important determinant of infant mortality in the high mortality region. It is, therefore, recommended that although the possibility of free universal education has been realized, there is need to implement free or subsidized education at secondary level for girls in the high mortality region.

This will enable the future mothers to acquire the basic hygienic practices. Secondly, the findings of this study underscores the potential for infant and child mortality reduction that could result from increased birth spacing in the high mortality region in Kenya. There is thus an urgent need to formulate policies that could help increase the length of intervals between births.

The community leaders and opinion leaders should be educated on the need to disseminate such knowledge at the community level.

The results indicated that in the low mortality region, the type of toilet facility and mothers occupation are significantly associated with the risk of infant and child death. We recommend that the government in conjunction with non-governmental organizations help initiate appropriate toilet facilities especially in the slum areas where these facilities are deficient.

In addition, since the findings of the study support the premise that occupational categories associated with higher incomes lead to higher standards of living and thus lowering the risk of infant and child death, the government should implement favourable policies that will reduce the current poverty levels and programmes aimed at enhancing women's financial and occupational status.

6.3.2 REC OMMENDATIONS FOR FURTHER RESEARCH

Due to time, data limitations and scope of this study ,several gaps of knowledge are inherent . the following are the suggested areas, which need further investigation .

1.An in-depth study on the effects of parents education (both mother and father) on infant and child mortality in the above areas.

2. A similar kind of study but applying an alternative model such as the Cox Regression to find out whether better results can be obtained

3. comparing results when other variables such as parity , birth order, duration of breastfeeding and age at which supplementation starts.

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