"SOCIO-ECONOMIC DETERMINANTS OF CHILD SURVIVAL IN UPPER MATASIA SUB-LOCATION, KAJIADO DISTRICT, KENYA"

BY

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university;

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DEDICATION

To my parents, Druscilla and Meshack for their all-time love. It is to you I owe my success.

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Nonetheless, I am totally responsible for any mistakes and shortcomings that may appear in this work.

Finally, to God be the glory, to Him alone it is worth.

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ABSTRACT

The study covers Kajiado District with a special focus on Upper Matasia Sub-location of Ngong Division. It investigates the impact of socio-cultural, socio-economic, health and environmental factors on child survival. Two data sets are utilized - secondary data from the 1979 population census and primary data from a survey done at Upper Matasia sub-location.

Chapter one presents background information on Kajiado district and the problem under study. Chapter two presents literature related to the study topic and the theoretical framework, while chapter three presents the methodologies that have been utilized. The Coale and Trussell indirect technique of estimating mortality has been utilized in the analysis of the census data. The q(2) value i.e. the probability of a child dying by exact age two, Infant Mortality Rate and e_0 i.e. life expectancy at birth have been used to depict mortality conditions in the district. The results of the analysis are presented in chapter four. In the analysis of survey data, a method developed by Preston and Trussell in 1982 of calculating mortality index, has been utilized. This ratio of observed to expected deaths, is the dependent variable both in the cross-tabulation and multiple regression analyses. The results of the two analyses are presented in chapter five.

The main finding of the census data analysis is that, rural areas have lower mortality levels and hence higher life expectancies than urban areas. Another important finding is that,

whereas the other divisions - Loitokitok and Central show a declining trend in mortality since 1976, Ngong division exhibits a steep increase in mortality from early 1977.

The results of cross-tabulation and multiple regression analysis show that health, environmental and socio-economic factors have a close relationship with mortality.

Health factors which include immunization, attendance of ante-natal clinic, place of delivery, assistant at birth for home deliveries and treatment of umbilical cord wound significantly affect child survival.

Environmental factors particularly type of toilet facility and source of water during wet season and the socio-economic factor, education, also significantly affect child survival.

Socio-cultural factors which include, age at supplementation, breast-feeding, length of breast-feeding, marital status, type of marriage, and age at first birth on the other hand, did not show any significant effect on child survival.

On the basis of these findings, this study recommends that efforts should be made to increase the number of health facilities, coupled with training of medical personnel especially traditional birth attendants and family planning service providers and public education to sensitise people to the need to utilize health services and also importance of personal hygiene.

Immunization programmes should also be expanded and more ante-natal clinics established with ease of accessibility to the population as the priority.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE
GENERAL INTRODUCTION AND STATEMENT OF PROBLEM

1.0. GENERAL INTRODUCTION

Most mortality studies done in Kenya have been at macro level. Among them are Ondimu (1987), Kichamu (1986), and Kibet (1982) to name but a few. Such studies only describe mortality differentials and fail to explain why these differentials exist, as the data sets which they use are lacking on this aspect. According to Mosley (1984), this reliance on existing data sets has led to loss of interest in research design and data analysis.

Nonetheless, although studies on mortality differentials are important in their own right, there is need to go beyond the mere description of mortality differentials and come up with explanations to the emerging differentials. This calls for household level studies as they are the ones through which this can be realized.

After 1945 most developing countries witnessed drastic declines in mortality levels. This decline, to a great extent has been attributed to government actions such as disease control, improved medical technology and increased availability of medical facilities (Huw, 1991; U.N, 1973). However in the recent decades this decline has not been as rapid and momentous as in the decades just after the second world war. This has been due to change in cause of disease and death. Whereas in the earlier decades disease control which involved a variety of means such as the control and purification of water supply, the disposal of sewage, the use of new drugs, widespread inoculations against communicable diseases and progress in environmental sanitation led to a drastic decline, this has not been the case in the recent decades (Huw, 1991). Environmental causes of disease and hence death have now changed, and become more difficult to manage and control, and new causes of disease and death have arisen and assumed a more prominent role than environmental causes. Certain causes of disease that have recently been identified, like malnutrition are more difficult to manage as often their effect is not as direct as the cases of say malaria and other vector-borne diseases, which were easily managed by use of chemicals like DDT in the case of malaria to kill mosquitos. Again, even malaria has begun showing resistance to some types of quinine, and deaths from it therefore, have continued to increase yearly. If we add decline in government expenditure on health, introduction of cost sharing in health services, and the AIDS pandemic which threatens to wipe whole populations to these problems, the prospects of achieving mortality decline become very bleak.

Due to these factors militating against mortality decline, emphasis has now shifted from disease control to prevention. This is out of the realization that although these recently identified causes of death are difficult to manage, they are preventable. For instance, malnutritionally caused diseases can be prevented if mothers could feed their children on a balanced diet, whereas diarrhoeal diseases can be minimised if drinking water was boiled and food properly prepared. However, the planning for such community based programmes related to disease prevention, calls for an understanding of the community in question in terms of the facilities it has, like water, education, health and agricultural production and the culture of the people. More important however is the need to know the causes of death at the household level, because interventionist programmes that are particular to the disease, beside other programmes, can then be formulated and expected to yield tangible results. Again a household survey will be able to provide information that will not only explain observed mortality differentials, but also the kind that can be used for planning for development of appropriate disease prevention programmes, and those aimed at improving the standard of living of the population in question.

This study utilizes a method developed by Preston and Trussell (1982), to analyze the survey data collected from Upper-Matasia sub-location. The dependent variable is the ratio of observed to expected deaths per woman. The influence of various independent variables on this ratio is investigated using multivariate regression analysis, to determine which of these factors have a more significant impact on it. The 1979 population census data, which was analyzed using the Brass and Trussell indirect technique, provide the general infant and child mortality conditions in the district.

1.1.0 BACKGROUND TO KAJIADO DISTRICT

This study is based in Kajiado district of Rift Valley Province. Phase one of the study which covers the entire district, utilizes the 1979 Kenya population census data. The background characteristics of the area have provided information that is used in explaining the mortality estimates derived from the 1979 population census data, hence enabling us to have a better understanding of those mortality estimates and values.

Phase two of the study involves the analysis of data collected in a sample survey, undertaken in Upper Matasia sub-location of Ngong division.

1.1.1 Geography

Kajiado district is located in the southern tip of the Rift Valley province, and covers a total area of 22,756 square kilometres. It is bordered by Tanzania to the south west and Taita Taveta district to the south east. To the east it is bordered by Machakos district, to the north east by Nairobi, to the north by Kiambu district while to the west it is bordered by Narok district.

Topographically the district is divided into four distinct areas:

1) The Rift Valley: This is a low lying depression on the western side which runs from the north to the south of the district. The depression has a number of important natural features i.e. Lakes Magadi and Natron and Mount Suswa. The

lakes have large deposits of soda ash which is an important economic resource. On the western side of this depression is the Nguruman escarpment which is the source of rivers Oloborboto, Entaposia and Sampu.

2) Athi Kapiti plains: These are made up of open lying land. This area includes Ngong hills standing at 2,460 metres, which are an important catchment area for the Athi river which is fed by the permanent Mbagathi and Kiserian tributaries.

3) Central broken ground: The major distinct feature of this area are, permanent water courses which drain this 20-70 kilometres stretch, lying along the north eastern border stretching along the district to the south west.

4) The Amboseli plains: These are characterised by gently undulating plains with deep reddish brown clay-loams, and flat sedimentary plains with poorly drained cotton soils.

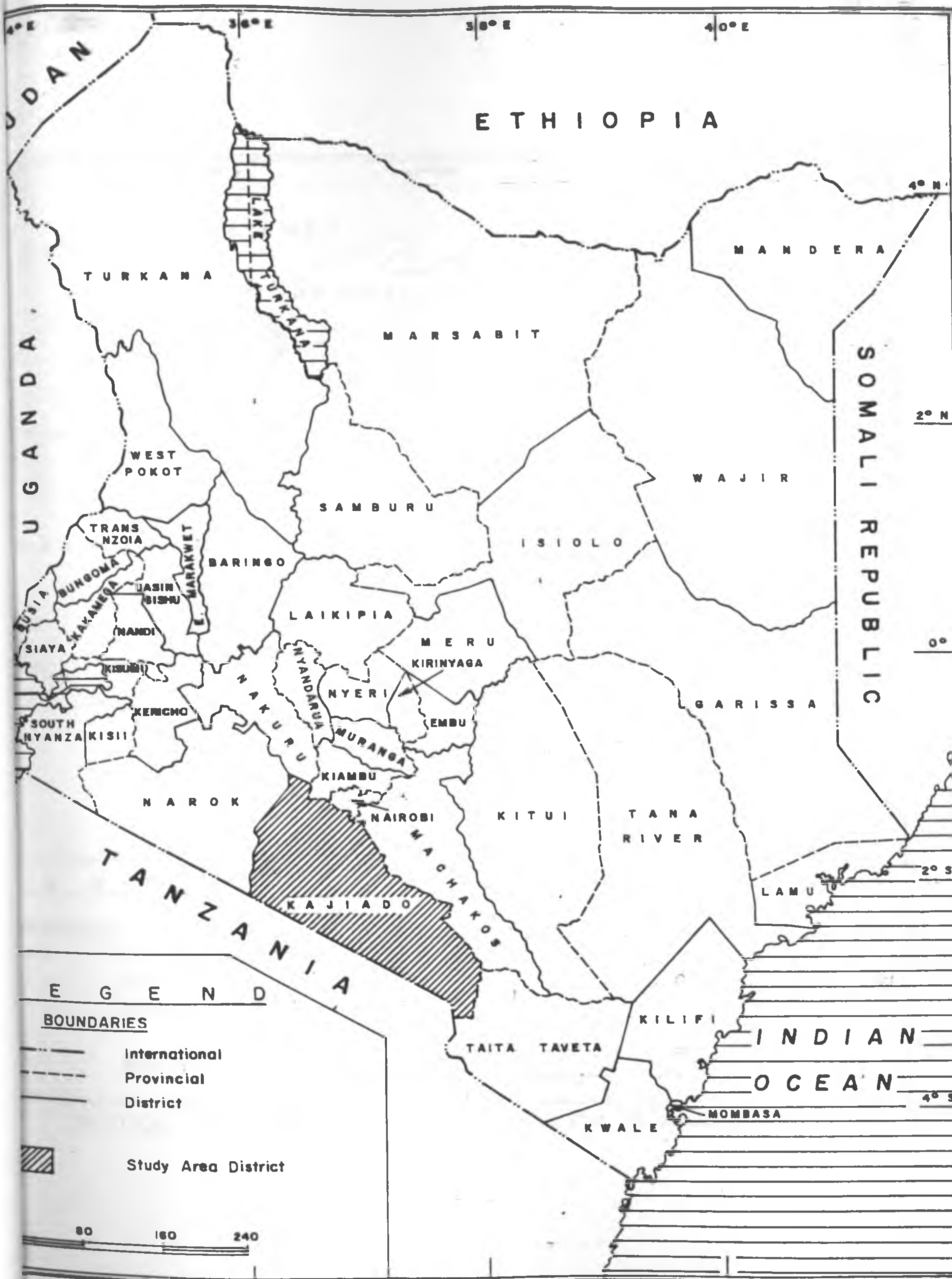
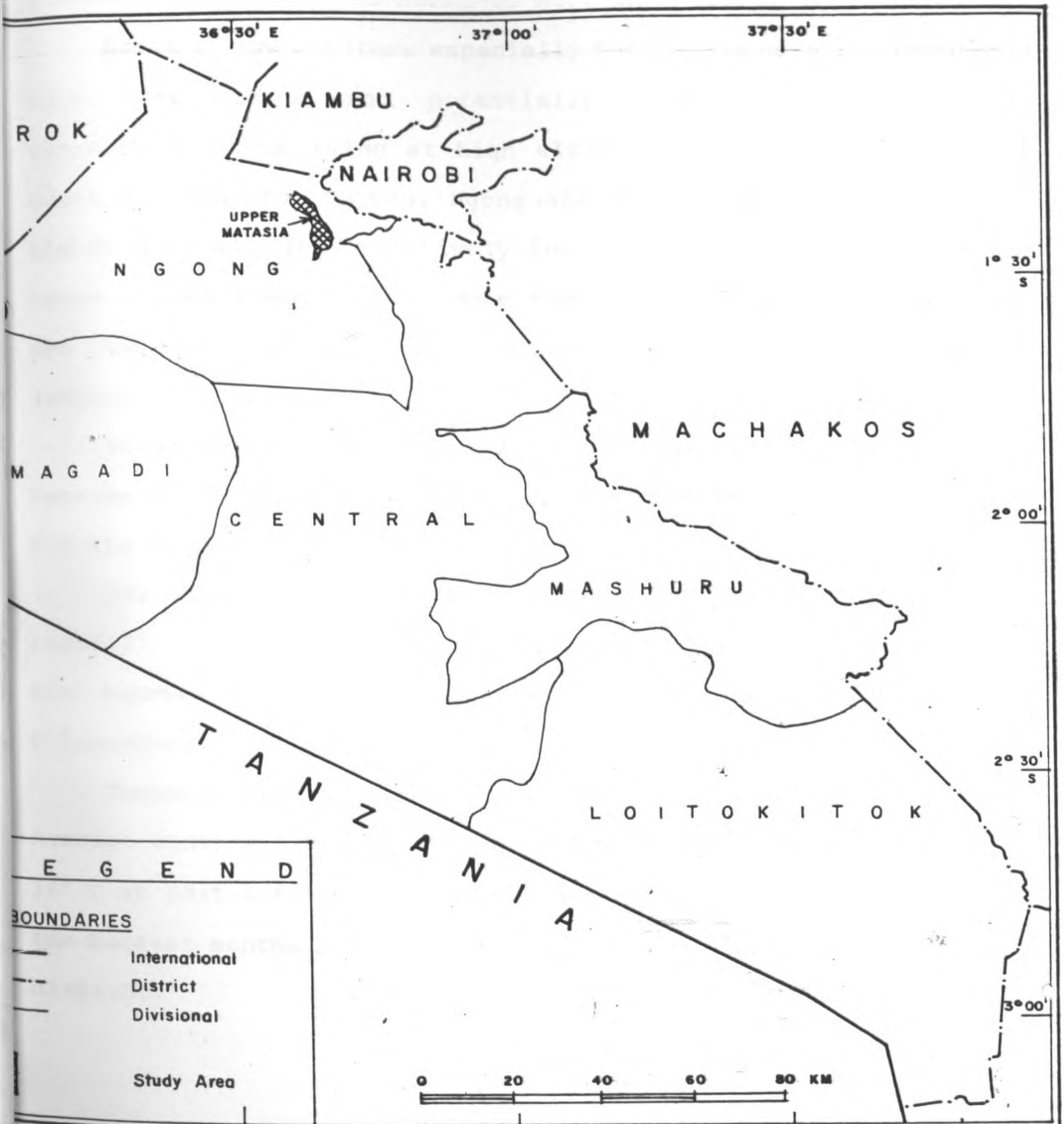


Fig. 1 : LOCATION OF STUDY AREA DISTRICT IN KENYA



: LOCATION OF UPPER MATASIA SUB-LOCATION IN KAJIADO DISTRICT

1.1.2 Ecology and Water Sources

The rainfall pattern is bimodal. Precipitation generally occurs in the months of March to May, and October to December.

Areas of low altitude especially the plains have low rainfall, high temperatures and potentially high evaporation rates. Conversely, areas lying at high altitudes such as the slopes of mount Kilimanjaro, Chyulu, Ngong and Nguruman escarpment receive higher rainfall with relatively low temperatures and evaporation rates. These areas receive more than 600 millimetres of rainfall and due to presence of rich volcanic soils, they can support intensive agriculture.

Areas around lake Magadi receive extremely low rainfall because of the rain shadow effects, caused by the eastern Rift wall and the Machakos hills to the east.

The south-eastern parts of the district also receive low rainfall, probably due to complex dynamics of wind flows through the depression between the Chyulu hills and slopes of mount Kilimanjaro.

Temperatures just as rainfall also vary with the altitude. Average monthly temperatures vary between 30^0 C at Magadi and 16^0 C at Loitokitok. The coolest months are July and August with the hottest months being between November and April throughout the district.

1.1.3 Land Use Patterns

Most of the land in Kajiado district is used for ranching. There are both individual and group ranches. Small holder farming is done in a few places especially Ngong hills, the slopes of mount Kilimanjaro, Nguruman escarpment and limited areas around Chyulu hills. In the latter area, the soils are rich in nutrients and with sufficient rainfall, the area can support intensive agriculture. The expansive Amboseli National park falls in the district and hence it is an important economic asset to the district in terms of revenue.

1.1.4 Demographic Profile

The 1969 census put Kajiado district population at 85,903 people, whereas the 1979 one put its population at 149,005 people. This translates to an intercensal growth rate of 5.66 % per annum according to the CBS estimates. Declining mortality and fertility were hoped to bring the rate lower to 4.88 % per annum in 1988, and 4.66 % per annum by the end of the current plan period of 1989-1993. By 1988 if the above assumptions on declining mortality and fertility held, the total population would have increased to 238,364 people, and is expected to reach 300,503 people by the end of the current plan period ending 1993. Nonetheless, according to the 1989 population census provisional results, the district's population growth rate is 5.64 per cent and the total population of the area is 262,000 (Economic Survey, 1991).

Data relating to population dynamics shows that in-migration into urban centres and high potential agricultural areas has tended to lead to a decline of the ''Maasai'' proportion. Beside the Maasai, other ethnic groups in the district include Kikuyu, Kamba, Luo and Luhya among others.

The population density of the district is very low when compared to high potential agricultural districts in the country. For instance Ngong Division which was the most densely populated area in the district as per the 1979 census, had a mere 13 persons per square kilometre. This is attributed to its high agricultural potential and proximity to Nairobi city. The increase in population density is also relatively modest. For instance it increased by about 4 persons per square kilometre between 1979 and 1988. Therefore, compared to its expansive area this district is underpopulated.

Just as in the country in general, the majority of the population is composed of young people. By the middle of 1993 for instance, 63 % of the population is expected to be made up of people below the age of 40.

1.1.5 Administrative and Political Units

In 1979, the district had three administrative divisions which have since increased to five with the creation of Magadi Division during the 1984-1988 plan period and Mashuru in 1989. The district has a total of 20 locations and 54 sub-locations at the moment which means an increase of two locations and 15 sub-locations over those at the beginning of the 1984-1988 plan period.

1.1.6 Health Facilities

Health facilities in Kajiado district are limited and unevenly distributed in respect to the size and settlement pattern of the population. Due to this latter aspect, a greater majority of the people do not have access to health facilities. The district is served by one district hospital and one private hospital. There are seven (7) government health centres, 23 government dispensaries, four (4) Non-Governmental Organizations health centres and two Non-Governmental Organisations dispensaries. In total there are 72 beds in government health centres and 64 beds in Non- centres. Beside these, there are several private clinics and one chemist shop.

1.1.7 Water Facilities

Water facilities in Kajiado district are unevenly distributed, just as are the health facilities. This fact is reflected more in the distribution of boreholes in which over 200 of the 300 or so in the district, are concentrated in the four northern locations of central Division covered by the Kenya Livestock Development Project (phase 1 and 2) in the seventies. In the other areas, these facilities are sparsely distributed.

This poor distribution of water facilities has led to under-utilization of range resources far away from the watering points and an over-utilization and severe erosion around them.

1.2.1 STATEMENT OF PROBLEM

Kenya has registered significant progress in the areas of health, education, transport and communication, women status and welfare, cooperative movement, water supply, real earnings, nutrition status of the people, and harambee movement, since independence. For instance the doctor population ratio increased from 7.8 per 100000 of the population in 1963 to 13.9 in 1987. The number of hospitals increased from 148 in 1963 to 254 in 1987. The number of beds and cots in hospitals rose from 11430 at independence to 31,356 in 1987. In the education sector, the number of schools rose from 6058 primary and 151 secondary schools in 1963 to 13,849 and 2592 primary and secondary schools respectively by 1987 (Kenya Development plan 1989/93). This increase is consonant with increasing population and level of enrolment. This development has had a positive effect on the standard of living for an average Kenyan, consequently, a reduction in mortality particulary childhood mortality.

Nevertheless, in spite of this development, the distribution of basic necessities in particular those that are important to the health of the people such as health, water and sanitation facilities is uneven. In Upper Matasia sub-location of Ngong Division these facilities are largely lacking, and where present they are inadequate. Many studies have shown that deaths occurring to young children below the age of five are mainly as a result of environmentally caused diseases (Meegama, 1980; Anker & Knowles, 1983; Mahadevan et. al., 1986). Poor environment is reflected in the absence of clean and safe drinking water, poorly constructed and unhygienic lavatories, and congested and poorly ventilated living places. The first two are principal causes of diarrhoeal diseases, which lead to loss of appetite among children making even very mild attacks from some killer diseases, fatal.

Upper Matasia sub-location is an area that is adjacent to Nairobi city. Kichamu's (1986) estimates of infant and child mortality of the district using 1979 census showed that Kajiado district in which the sub-location is situated had the lowest mortality rates in the whole province (Rift Valley). Its infant mortality rate was 66. He attributed this relatively low infant mortality rate to its proximity to Nairobi which enables it to benefit from some of the city's socio-economic development.

Nonetheless, there is need for a study that seeks to find out if this proximity to Nairobi and consequent benefits from the city's socio-economic development is shared by the whole population of the area. Kichamu's findings were also that urban areas had higher infant mortality rates and lower life expectancy than the rural areas. This suggests that certain factors such as unsanitary living conditions, poorly constructed lavatories, unclean drinking water, among others could be responsible for this disparity. Upper Matasia sub-location is adjacent to Ngong Township and hence this urban aspect will be captured. Again since it is adjacent to the city it should be sharing in the city's socio-economic development beside the people adapting certain urban characteristics that may influence their health life positively. This study therefore attempts to investigate the effects of poorly constructed and unhygienic lavatories, unclean drinking water, health factors, socio-cultural factors, and other environmental factors on child survival.

1.2.2 OBJECTIVES OF THE STUDY

The broad objective of this study is to investigate the impact of socio-cultural factors, health factors, socio-economic factors and environmental conditions on child survival.

1.2.3 SPECIFIC OBJECTIVES

1. To determine infant and child mortality levels, trends and differentials in Kajiado district. This will give a general picture of the mortality situation of the district.
2. To determine the impact of socio-cultural factors on child survival.
3. To determine the effect of health factors on child survival.
4. To investigate the impact of environmental factors on child survival.
5. To determine the impact of socio-economic factors on child survival.

1.2.4 RATIONALE OF THE RESEARCH

Most studies on mortality done in the country have generally concurred that there exists regional variation in mortality conditions. Such studies include those that have used the Kenya

Fertility Survey (KFS 1978) data; Kenya Contraceptive Prevalence Survey (KCPS 1984) data; Kenya Demographic and Health Survey (KDHS 1989) and also data from various population censuses. Among these are Mott (1982-KFS data), Ondimu (1987-KCPS data), Kibet (1982) and Kichamu (1986) among others who have used 1979 census data. These studies have tended to generalise on the mortality conditions of a region, categorising an area either as a low or high mortality zone, especially at district level, which might not be the case. In order to avoid this general categorization of areas as having either low or high mortality, this study seeks to bring out mortality variation at lower administrative units i.e. Divisions.

In line with the District Focus For Rural Development strategy; sessional paper Number 4 of 1984 on population policy guidelines and sessional paper Number 1 of 1986 on economic management for renewed growth, the information from this study will help regional planners to prioritize programmes and hence allocate the meagre resources meaningfully, by identifying the most hard hit segments of the population for whom mortality reduction policies should target. This is in line with the government policy of population growth management, in particular through fertility and mortality reduction.

Overall, the study will help bring out the role played by socio-economic, socio-cultural, environmental and health factors on child survival. This is important in the sense that, mortality at young ages could in most cases be avoided. By aiding the understanding of the operation of these factors, it will increase the ability of those who plan and implement health policies, to be better able to deal with mortality promoting factors.

Although the low mortality of the district has been attributed to its proximity to the city of Nairobi, Kichamu (1986) who suggested so only studied socio-economic factors and hence omitted environmental and health factors which are more important mortality determinants. Therefore, before this area can be totally accepted as a low mortality zone there is need for a study that incorporates health, environmental and socio-cultural factors to bring out the real situation of mortality. This study is a departure from the general trend of mortality studies in the country, most of which are macro-level based and hence an attempt to go beyond the mere description of mortality differentials and come up with explanations for the observed mortality differentials.

1.2.5 SCOPE AND LIMITATIONS OF THE STUDY

The area coverage and depth of this study were greatly limited by finances and time. If these were sufficient, an area larger than a sub-location could have been covered in the survey.

The actual interviews in some instances involved interpretation from English to the local languages mainly Kikuyu and Maasai. Errors are likely to have arisen during the course of the interpretation that can affect the quality of data. Cases of non-response in the household survey reduced the target sample size and this is likely to reduce the accuracy of the results.

The collection of data related to some aspects of the population especially socio-economic like income, occupation and father's education are difficult, in such a study where women are the target population and expected to answer on behalf of the spouse in the case of married women or where illiteracy is high. At times when these data are collected it is difficult to determine the approximate size of the household income. Due to this, we only collected and measured one socio-economic component of the population i.e. education level of the mother.

Census data is associated with many errors, which open the estimates obtained from it to suspicion. These errors include under-reporting, non-reporting and mis-reporting of infants and children deaths, inclusion of stillbirths in the number of children born, under-reporting of actual number of children ever born and age mis-reporting.

This study overcame some of the shortcomings associated with census data by carrying out the sample survey in Upper Matasia sub-location. This supplements the information from the census data although it only covers a small part of the district.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.0 INTRODUCTION

In this chapter an attempt is made to review literature related to the study topic. There are many works that have been done globally on infant and child mortality. Nonetheless, since Kenya is a developing country, we have highlighted only studies done in Kenya and other developing countries as these are more relevant to the study. The theoretical framework, hypotheses used in the study and definition of variables are also presented.

2.1 LITERATURE REVIEW

Death among infants and children below the age of five, constitutes the greatest loss to any population, more so, as it occurs in the early years of life. In most developing countries of the world, Kenya being no exception, a very large proportion of deaths is accounted for by infants and children under the age of five (U.N, 1985). Goliber (1989) also contends that in sub-saharan Africa countries, deaths to children under age five make up more than half of the total annual deaths. Regardless of how one interprets it, either in economic, social or psychological terms, the death of a child is costly; both at the family and societal levels. This cost, often psychological, is inestimable. In most African countries for which data is available, child mortality has been found to be declining since the late 1940s'. Whereas in the early 1950s', between 25 and 35 per cent of children died before age five in most African countries, by the late 1970s' most countries were clustered in the range of 15 to 25 per cent (Hill and Hill,1988). Again patterns of change vary greatly among countries. Whereas in Mozambique child mortality appears to have been essentially constant throughout the period, in other countries such as Kenya, Congo and Ghana the probability of dying by age five declined by almost 50 per cent.

Evidence of Kenya's declining mortality level is supported by studies done by Kibet (1981); Anker and Knowles (1983) and Kichamu (1986) among others. These studies show that infant mortality rate which was 184 as per the 1948 population census had declined to 140 in the 1962, 120 in 1969, 104 as of 1979 population census and stood at 70 infant deaths per 1000 live births by 1989.

In spite of this declining mortality trend, infant and child mortality in the country is still high when put on a global perspective. This poor state of mortality not only for Kenya but also for Africa in general spells a gloomy future to every new born child. A child born today in Sub-saharan Africa faces a bleak set of statistics. The odds are one in 10 that he or she will not live more than one year...(McNamara, 1991), among other odds.

There are several studies done in Kenya and elsewhere on the determinants of infant and child mortality. These studies have identified a number of factors as crucial determinants of mortality. These factors include socio-cultural (type of marriage, post partum abstinence, breast-feeding, age at supplementation, ethnic group, religion etc.); biological (genetic diseases, birth interval, post partum amenorrhoea etc.); demographic (parity, migration, age of the mother at time of confinement, child's sex, birth order etc.); socio-economic (female education, female employment, women status, income of the household, medical facilities etc.) and environmental (climatic conditions, ecological balance, nutritional status, sanitation, disease and epidemic, source of water etc.) factors (Anker and Knowles, 1983; Mosley and Chen, 1984; Mahadevan et. al., 1986; Hill and Hill, 1988; Huw, 1991; etc).

Other studies have concentrated on mortality differentials, determining how mortality differs by the various characteristics of the population. Among important mortality differentials are demographic; socio-economic and political; environmental; medical and health care; cultural and geographic factors (Meegama, 1980; Secretariat WFS, 1983). However, differences in mortality levels between say infants whose mothers have higher education for instance, compared to those whose mothers have no or low education reflects a number of other factors including differential access to health care, knowledge about child care and economic resources (Anker and Knowles, 1983). This means that several independent and intervening variables combine to explain mortality differences and not just a set of factors of either.

Environmental factors bring differences in mortality as different environmental conditions seem to favour certain diseases that tend to be fatal, for instance malaria. Living conditions vary from area to area and region to region and these are likely to lead to mortality variation. Environmental factors that promote good health and survival are good and hygienically constructed lavatories, nutritious and well cooked food, and also availability of uncontaminated drinking water, which are important as far as the control of diarrhoeal diseases is concerned.

In the Philippines, the World fertility survey found that availability of sanitation and electricity were highly correlated with child mortality even after controlling for such factors as birth order,maternal age and education (Secretariat WFS, 1983).

In Malaysia, Julie De Vanzo and Jean-Pierre Habitch (1986) in a study of the relative roles of pre-natal care, child health services, infant feeding and family planning in reducing infant mortality carried out between 1946 and 1975 found that:

a) improvement in water and sanitation contributed to infant and child mortality decline in particular among breast-feeding babies. Nonetheless, unlike education these influences have become less important over time especially for babies who are breast-fed. This means that in the absence of breast-feeding, improvement in water and sanitation is crucial to the reduction of infant mortality.

b) the decline of breast-feeding has more than offset the beneficial effects of improvement in water and sanitation as far as infant and child survival is concerned. This indicates that both (working together) breast-feeding and improved water and sanitation lead to greatly improved chances of survival of children.

Meegama (1986) has found that in Colombo municipality, poor sanitary conditions coupled with poor feeding habits were found to lead to convulsions and digestive disorders. Although digestive disorders may not kill, they lead to loss of appetite which means that the child ends up being malnourished opening him/her up to possible death if attacked by a fatal disease which a well nourished body could have managed to withstand.

Access to piped and hence clean water contributes a lot to the reduction of mortality. This is so because it reduces exposure to water borne diseases in particular diarrhoeal diseases.

Saunders and Warford (1983), as quoted by Mahadevan et. al. (1986), in a World Bank aided project have done a comprehensive analysis on the influence of water and sanitation on infant mortality. They have categorised the water borne diseases into five categories a) water borne diseases (cholera, typhoid, amoebiasis etc.); b) water washed diseases (guinea worm, urinary schitomiasis etc.) c) water related vectors (yellow fever, malaria etc.); d) faecal disposal diseases (hookworm & other worms) and e) they have confirmed that the differences in water quantity and quality are associated with differences in the rates of these five categories of diseases. Nonetheless, they found that local climate, geography, culture and sanitation habits are related to water-cum-environment.

Anker and Knowles (1983) have stated that many diseases are waterborne. Therefore, the purer and less contaminated the water supply, the less likely people are to become sick. They conclude that survival rates are higher for households using piped water, because they are better able to keep themselves and their immediate surroundings clean, than in households using river or lake water.

Odhiambo (1991) in a study of health and socio-economic determinants of infant mortality in Kisii district found that the mortality index was lower for women who boiled water than those who didn't. The risk of contracting water borne diseases is lowered by boiling water as the disease causing organisms are killed.

Availability of clean drinking water and its influence on child survival is closely related to availability of an hygienic toilet facility. Anker and Knowles (1983) in their household study in Kenya found further that survival rates were highest in households using water closet and lowest in households using fields. They suggested that in households with hygienic toilet facility diseases were less likely to be transmitted.

Mother's place of residence which is both an environmental and socio-economic factor has been found to be an important determinant of mortality differentials. The children of women living in urban areas generally have lower mortality than those of women living in rural areas (Hill and Hill, 1988).

Urban rural mortality differential is associated with the living conditions of the two places. Such factors as ecological, social, economic, occupational, educational attainment, health conditions, ethnic group membership, geographical place of residence, attitude, marital status and family size may be the actual explanatory factors in urban-rural mortality differential and not just residence in either of the places.

Hill and Hill (1988) say that the regional differentials in mortality exhibited in Africa probably reflect variation in standard of living and also ecological factors associated with aetiologies of important diseases of childhood. For instance, areas in Kenya identified as having excess mortality are economically disadvantaged and are areas where malaria is prevalent (Mott, 1982). This means that this population which is weak as a result of poor socio-economic conditions is further debilitated by disease attacks which are often fatal.

Hazayyin (1982) has also found that for Morocco and Tunisia, mortality is high in rural areas as compared to urban areas.

Sivamurthy and Ma'ayta (1982) using Jordanian household survey of 1972 in the study of infant and child mortality found that rural-urban differential existed. Nonetheless, they add that other important mortality differentials are education of the mother, socio-economic status of the household and religion.

Ondimu (1987) found that there existed urban and rural differential in his study of socio-economic determinants of infant and child mortality in Kenya using the KCPS (1984) data. The urban areas were found to have low infant and child mortality as compared to rural areas. Life expectancy was also found to be high in urban areas than in the rural areas. This variation nonetheless, as he suggested, is influenced by differential distribution of socio-economic facilities that are crucial for survival, in the urban and rural areas. Most medical facilities are concentrated in the urban areas. Most of these facilities are again within relatively easy reach of most of the urban residents. Again in urban areas the provision of basic facilities such as clean water, sewage disposal etc is relatively easier and better than in rural areas, and these seem to be conducive to lower mortality.

Anker and Knowles (1983), have attributed the low mortality in urban areas to use of modern toilets and better water facilities. They further add that increasing urbanization and female literacy as the year 2000 approaches, will imply additional life expectancy and hence low mortality.

Socio-cultural factors are important mortality determinants. Cultural differentials of mortality are related to the priorities given to risk taking; different values attached to the incidence of mortality and morbidity among various sex and age divisions of families and society and relative deserts of such divisions in terms of food and treatment (WHO chronicle, 1980; Mahadevan et. al., 1986). Certain cultural practices such as early weaning have an effect on infant and child health; whereas others like infanticide directly lead to decimation of infants in a population.

The priorities given to risk taking, different values attached to the incidence of mortality and morbidity among various sex and age divisions of families and society and relative deserts of such divisions in terms of food and treatment, vary principally between different ethnic and religious groups. The practices that affect children's health differ from tribe to tribe and from religion to

a. This is to say that infant and child mortality will according to the various tribes or religions in a society variation will be due to the various child care practices; marriage; weaning practices; infanticide; post partum nce; neglect and abuse of children and feeding habits, which e closely related to child death.

ldwell (1983) has found that in southern India most onal explanations of sicknesses and corresponding treatment edded in essentially religious beliefs about the nature of eings and the reasons for their ills. It is these cultural nces that are responsible for mortality differentials and o an obstacle to the attainment of the Alma Ata declaration achieving good health for all by the year 2000. The fact e same declaration insists that there is need to respect nt cultures and their cosmologies makes it even more lt for the goal to be achieved. Since cultural explanations es of illness and treatment differ from one culture to mortality differentials arise.

enja (1986) has shown that cultural perceptions on causes of s affect mortality in infants among the Samia. In this ty malnutritionally caused diseases like marasmus and rkor are associated with people who have broken traditional related to sex and also the bewitched and hence modern intervention is not sought. Instead people look for onal medicine men.

Meegama (1986) has also found that, traditional feeding habits had a negative effect on the lives of infants and small children. In this place also, breast-feeding was limited as most of the women were poorly paid workers who had little time, as they were preoccupied in searching for employment and other means of economic survival, to breast-feed their children regularly. In this case infants were weaned early and were fed on the cheapest condensed milk tins, each of which was made to last four days in tropical conditions. These children also lived in crowded environment. These foods can easily get contaminated and hence jeopardise the health of the child.

Bwire (1990) has found that in Kilifi district community systems related to long breast-feeding and weaning and traditional medical care in rural parts of the district constitute one of the reasons for the prevalence of high infant mortality .

Sivamurthy and Ma'ayta's findings from the Jordanian household survey as regards religion are that although there may be other factors than religion per se accounting for mortality differentials by religion, mortality is high among moslems than among christians.

Odhiambo (1991) has found that catholics had lower ratio of observed to expected deaths than women who were not affiliated to any religion.

Studies on mortality have also confirmed that there exist differentials by marital status. Kichamu (1986) in his study of mortality estimation with special reference to vital registration in central province of Kenya found that the widowed had the highest mortality followed by the divorced then the single. The married had the lowest. In other places the single had the lowest mortality. The high mortality among the widowed is attributed to their high dependency on their husband's income and the low economic status of married women that manifests itself at the death of their husband. On the other hand Mutai (1987), found a variation to the above findings. In a study of Kericho district locations he found that the divorced had the highest infant mortality. They were followed by the married and then the widowed while the single had the lowest. The high mortality among the divorced could as they state a reflection of the poor economic status of the women and also deliberate neglect and mistreatment of children on their part.

Owino (1988) found that for South Nyanza, the married and the widowed had the highest mortality with the single and divorced/separated having the least. This study concurs with the others above that the single had relatively lower mortality, but for the marital status category with the highest, all of them show inconsistencies. Nonetheless, the widowed in South Nyanza just as in Kichamu's study of the whole country had the highest.

The data on marital status as the above studies on Kenya show, are inconsistent. In some areas the widowed have the highest mortality whereas in others the divorced/separated have the highest. However for the single category all of them are consistent that they have relatively lower mortality. These inconsistencies are a reflection of other mortality differentials especially socio-cultural and socio-economic. If these are studied perhaps they will help in the interpretation of why the inconsistencies exist.

Mott (1982) has shown that in polygamous unions in Kenya children receive less attention than those in monogamous marriages leading to their disadvantaged general wellbeing and hence reduced potential for survival.

Ocholla-Ayayo (1991) however contends that polygyny may be associated with cultural quest for more children. Since areas of high fertility (means shorter birth intervals) have been found to be areas of high mortality, from this point of view, polygyny can be held responsible for high mortality where there is a high prevalence of polygyny and high mortality.

Several studies have shown that education is an important mortality determinant and differential (Caldwell, 1979; Brass, 1979; Anker and Knowles, 1983; Caldwell, 1983; Campbell, 1984; Omer Mohammed el Jack, 1985). In the context of culture, as Caldwell (1983) has gone further to contend education is the greatest mechanism for social change. This change does obviously involve people's perception of cause of disease and what remedial steps are to be taken. Education, does therefore in changing people's way of life and their culture influence their health life and consequently mortality.

Unlike in other mortality differentials and determinants, demographers have given precise reasons why there exists mortality differentials by various levels of education. These explanations have to do with what education does to mothers that leads to the chances of survival of their children being improved.

Caldwell (1983) has attributed the inverse relationship between mother's education and child mortality to a number of factors that have to do with what education does to an educated mother. Among these factors associated with education that he has identified as crucial to child survival are:

1) Educated mothers distribute food within the family in closer accord with needs and are less likely to insist that a sick child should get up to work.

2) As concerns conditions of food and water as well as personal cleanliness and contact with infection they are more likely to behave in accordance with beliefs in bacteria rather than religious pollution.

3) Education leads to greater demand for provision of health facilities and services by the government and that the services be provided as efficiently as possible.

4) Educated parents are more likely to have school going children who themselves are more likely to look after themselves better, to be more articulate and make greater demands for care and consumption. Schools also intervene in identifying sickness and demanding care and treatment (This is based on the assumption that educated parents are more likely to send their children to school than uneducated ones).

In general however the importance of education in helping child survival lies in the fact that it is linked to breaks with al family raising habits; less fatalism about diseases; ective child care and medical alternatives and better on of available foods from a nutritional perspective and onal and intensive attention by mothers with more of the esources spent on the child (Caldwell, 1979). Mother's and not father's, here is held as the most important in ng the health status of the child.

ies in developing countries of the world have confirmed sts an inverse relationship between education and infant . Caldwell and Reddy (1983) found that in countries like Sri-Lanka, Cuba, Costa-Rica and Jamaica with low income education, mortality was low. This as they say, is with increasing education, parents are more likely to with modern health services, to seek out such services for k children and to follow properly prescribed treatments. outhern India state of Kerala, Caldwell (1983) found that g women's education with accompanying female autonomy has t on health of the population at the family level. It d them to take independent responsibility in seeking re for themselves and their children.

documented by various studies, patterns of mortality in e similar to those found in other parts of the developing s (Hill and Hill, 1988). In these studies, parental n, in particular mother's education is closely related to y (Secretariat WFS, 1983).

craft et.al. (1984) have argued that although most studies indicate that mother's educational level plays a more role in child survival than that of the father, three f maternal and paternal education and paternal occupation gly associated with child survival.

well (1983), as confirmed by WFS data, has found that alone is an important mortality determinant. He found region of Nigeria where modern medicine was inaccessible vival rose steeply with schooling of the mother.

eus (1984) has found that in Lesotho education and are strongly inversely related. He found that 20 per hildren of mothers with no education died before age five red to 15 per cent of the children of mothers who had secondary school.

Kenya Mott (1982) found that primary education of the educed infant and child mortality risks by 10 per cent. education on the other hand reduced the risk by 25 per ng infants. This means that education has not only a ng effect on mortality but that increasing education is ersely correlated to infant mortality.

emo (1986) and Ocholla-Ayayo (1991) suggest that in Kenya, mortality and fertility level among women with primary n as compared to those with no education results from the t, primary education makes women more conscious of hygiene er important primary health care requirements for both es and their children, which hence enhances child survival and prevents foetal wastage.

Kichamu (1986) found that in Lamu district the low education level among the women that drove them into early marriage could be responsible for the high mortality, because of high fertility not only for Lamu but the whole coast region in general. Similar findings abound in Kenya (Mott, 1982; Ocholla-Ayayo and Muganzi, 1986). In the latter studies it was found that women in polygamous marriages had low educational attainment hence tended to marry young. This means that education as such does not lead to low or high mortality but it is what that education offers that is important.

In Kenya some studies have revealed an inconsistency to this trend. Mutai (1987) found that in Emkwen and Soin locations, women with secondary education had higher infant mortality than those of primary level education. Munala (1988) studying infant mortality in Kakamega also found out that for Kabras division in Kakamega district, mothers with primary education had the highest infant mortality rate and not those with no education as most studies have shown. These findings could be based on erroneous data and not demonstrating the true effect of education.

Other studies have shown that mother's education goes hand in hand with other health determinants. These include improved income, urbanization, type of occupation and social class (Nyamwange, 1982; Anker and Knowles, 1983).

Although increasing education is closely associated with better health, other health factors like immunization, attendance of ante-natal clinic and type of assistant at birth have been found to be directly related to child survival. Education may encourage women to attend ante-natal clinics and take their children for immunization, but whether a child is immunized or not or the mother attended an antenatal clinic or not can determine whether a child survives or dies.

According to UNICEF (1984) primary immunization is a major intervention for child survival and development. It leads to reduction of morbidity and mortality, and also acts as a means of enhancing growth by breaking the cycle of disease and malnutrition. The report goes on to stress that without immunization, 3 out of every 100 children born will die from whooping cough, four for every 100 from tetanus and one for every 200 will be disabled by polio. In a study carried out by UNICEF (1988), it was found that in Kwale district measles alone was found to account for 10 percent of post-neonatal deaths.

UNICEF (1989) notes that since the launching of the Expanded Programme on Immunization (EPI) in 1974, the number of infants deaths has continued to decrease yearly in all countries as the level of immunization coverage against whooping cough, diphtheria, TB and polio increases. For instance immunization coverage in Kenya was poised to reach 80-90 percent by 1990, an indication of raised levels of child wellbeing.

Nonetheless, where services are not available, most children will not complete the full course of immunization (UNICEF, 1984). The danger of uncompleted immunization is likely to be, increased resistance of the disease to later treatment and hence deaths among children may remain high or increase.

Immunization of children and its effect in reducing deaths among them, is closely related to pregnancy care in particular attendance of ante-natal clinic. Lincolin and Chen et. al. (1981) have found that, in Bangladesh immunization of pregnant women against tetanus can prevent deaths caused by tetanus during neo-natal period and reduce total deaths by half. This is significant as Lewenburg et. al. (1987) note that, measles and tetanus are the principal determinants of infant and child mortality.

Abu Zeid and Dun (1985) argue that, a large portion of reproductive mortality among Egyptian women as well as of neo-natal and infant mortality, could be avoided using currently available ante-natal services. This is because ante-natal care not only reduces the risk of contracting killer diseases like measles and tetanus, but by encouraging good feeding habits among pregnant women, it leads to reduction of the risk of suffering anaemia both among mothers and the infants.

The Central Agency for Public Mobilization of Statistics (1987) notes also that, in Egypt women who received medical care during pregnancy are less likely to suffer infant loss. In this study, poor health conditions during pregnancy were found to be associated with higher mortality among infants.

Odhiambo (1991) has found that attendance by the woman of an ante-natal clinic during pregnancy resulted in lower mortality index compared to non-attendance. This corroborates Ondimu (1987) findings that attendance of ante-natal clinic by the mother is the most important factor in explaining variations in child mortality.

Certain diseases which are a result of poor sanitary conditions such as tetanus play a great role in infant mortality. In Colombo municipality Meegama (1986) found that neo-natal tetanus contributed a lot to high infant mortality. The infection of the naval occurred at the time of severing the umbilical cord. This usually occurs if the attendant at birth uses an unsterilized implement to cut the cord.

The role of Traditional Birth Attendants (TBAs) in reducing child deaths has been documented in various studies. In Sri Lanka Meegama (1980) has found that, the presence of trained midwives or birth attendants and use of sterilized implements to cut the umbilical cord and similar measures to improve sanitation result in lower neo-natal deaths.

Abu Zeid and Dun (1985) note that in Egypt, although there was a positive association between mortality and availability of medical personnel and facilities, availability of a trained TBA showed a negative association with neo-natal mortality. These findings are supported by the results of a study by the Central Agency for Public Mobilization and Statistics (1987) in the same country which show that, much of maternal and newborns mortality is due to unsafe Daya (TBAs) practices, and failure to refer complicated cases to the health units.

According to WHO (1986), the training of traditional birth attendants under whom most of the births in many developing countries occur, can reduce the risk of mortality and morbidity, resulting from poor midwifery practices. This training will also improve the positive contributions of the TBAs to maternal health, family planning and other essential components of primary health care.

Immunization, ante-natal care and training of TBAs is usually coupled with other primary health care programmes like oral rehydration therapy, use of clean toilet facilities, family planning, breast-feeding, use of clean water, proper food preparation and adequate nutrition. This is what has led to drastic declines in infant and child mortality in countries like China, Republic of Korea, Sri Lanka and Thailand (UNICEF, 1989).

In spite of present economic hardships, there is need to continue building the infrastructure of public health care to move toward universal immunization. It is also essential to inform and support all parents in the use of today's knowledge about oral rehydration therapy and knowledge on birth spacing, so that they can take control of their own lives and health. This should also be coupled with equipping women with formal education and also promoting their economic independence so as to reduce poverty, itself a major cause of poor health among children.

2.2 THEORETICAL STATEMENT

In the preceding section i.e. literature review, we have shown through the evidence of various studies that infant and child mortality is a function of many factors. Those factors constitute the backbone of our theoretical and operational models in this study. In this study, the theoretical statement is as follows:

"Infant and child survival in Upper Matasia sub-location is likely to be affected by environmental, socio-cultural, socio-economic and health factors which can operate either directly or indirectly, independently or jointly".

2.3.0 THEORETICAL FRAMEWORK

Although much progress has been made in the study of mortality during the past few decades particulary during the 1980's, most of the works have tended to use fertility related concepts, making it difficult for most of the researchers to put a distinction between mortality determinants on one hand and those of fertility on the other. This study utilizes a model developed by Mahadevan et. al. in 1986. The model has concepts and terminologies that are specifically related to mortality. To avoid the confusion that arises when using the term intermediate and proximate determinants which are more related to fertility the model has developed the terms ''Life Affecting Variables'' and ''Imminent Variables'' to specifically refer to mortality determinants.

Life affecting variables, or in short (LAVs), are first broadly classified under the heading of situations and sequential events from the stage of polity-cum-policy through several other factors, institutions and stages of development of life. These are further subdivided/classified into one or more sub-sections of LAVs depending upon the requirements of clarity, communication and empirical feasibility.

Imminent variables in this model are those that, are thought to be more significant or have greater and immediate influence on mortality.

This model logically begins with polity and policy followed by natural environment and culture through interventions, family, marital status, parents, conception and pregnancy, perinatal stage, norms regarding child care, natural calamity, infections, morbidity patterns, health and life of infants and ultimately death.

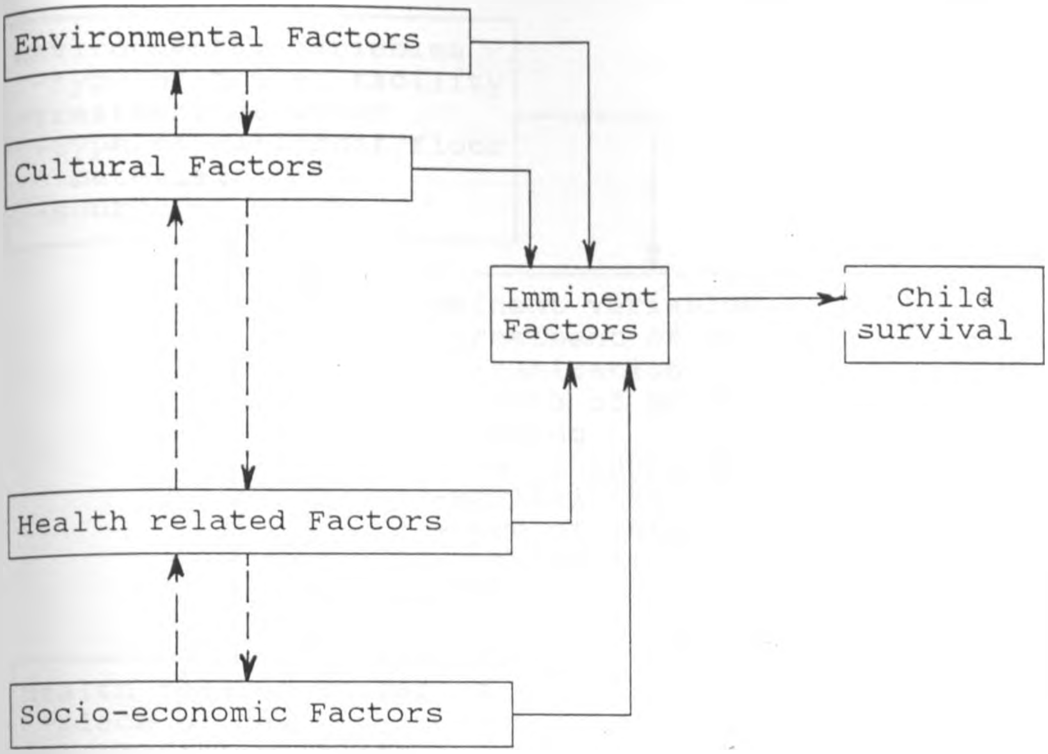
The model is flexible and assumes that, at a certain stage the number and diverse nature of the variables is less and at another stage it is more; and again that some of the factors are likely to cut across different stages. Therefore, they need to be repeatedly mentioned to show their influence at these different stages.

The model has a number of advantages that make it appropriate for our kind of study. Among them is that, it incorporates both micro and macro variables whose influence on the health and consequent death of the child is diverse. Again it clearly recognizes the fact that several LAVs either similarly or in a dissimilar manner may influence mortality in any society. It is this element of dissimilarity that makes the model appropriate for our study. The dissimilarity element is important to this study as the manner of operation of mortality determinants varies from place to place. For instance the effect of education or any socio-cultural factor like breast-feeding in one society may not necessarily be similar in another society even if it is the same level of education or length of breast-feeding.

Nonetheless, the model has one main shortcoming that of incorporating far too many determinants of mortality which may make it hard to isolate the key mortality determinants. However, the author of the model recommends that a group of relevant and related variables can be considered from the list of variables mentioned in the model and their influence on mortality can be examined. This means that the model is flexible and allows each researcher to identify those variables that are relevant in his/her study as dictated by the kind of society and environment he /she is studying.

Since the model incorporates far too many variables,(for a detailed discussion on the model refer to Mahadevan et. al., 1986); we have as the author himself recommends, chosen to examine the relationships between those variables that are thought to be relevant to the kind of environment and society under study.

FIGURE 1.2 CONCEPTUAL MODEL FOR STUDYING CHILD SURVIVAL



Source: Modified Mahadevan et. al. (1986) model

* The doted lines mean that the relationship is implied.

2.3.1 CONCEPTUAL HYPOTHESES

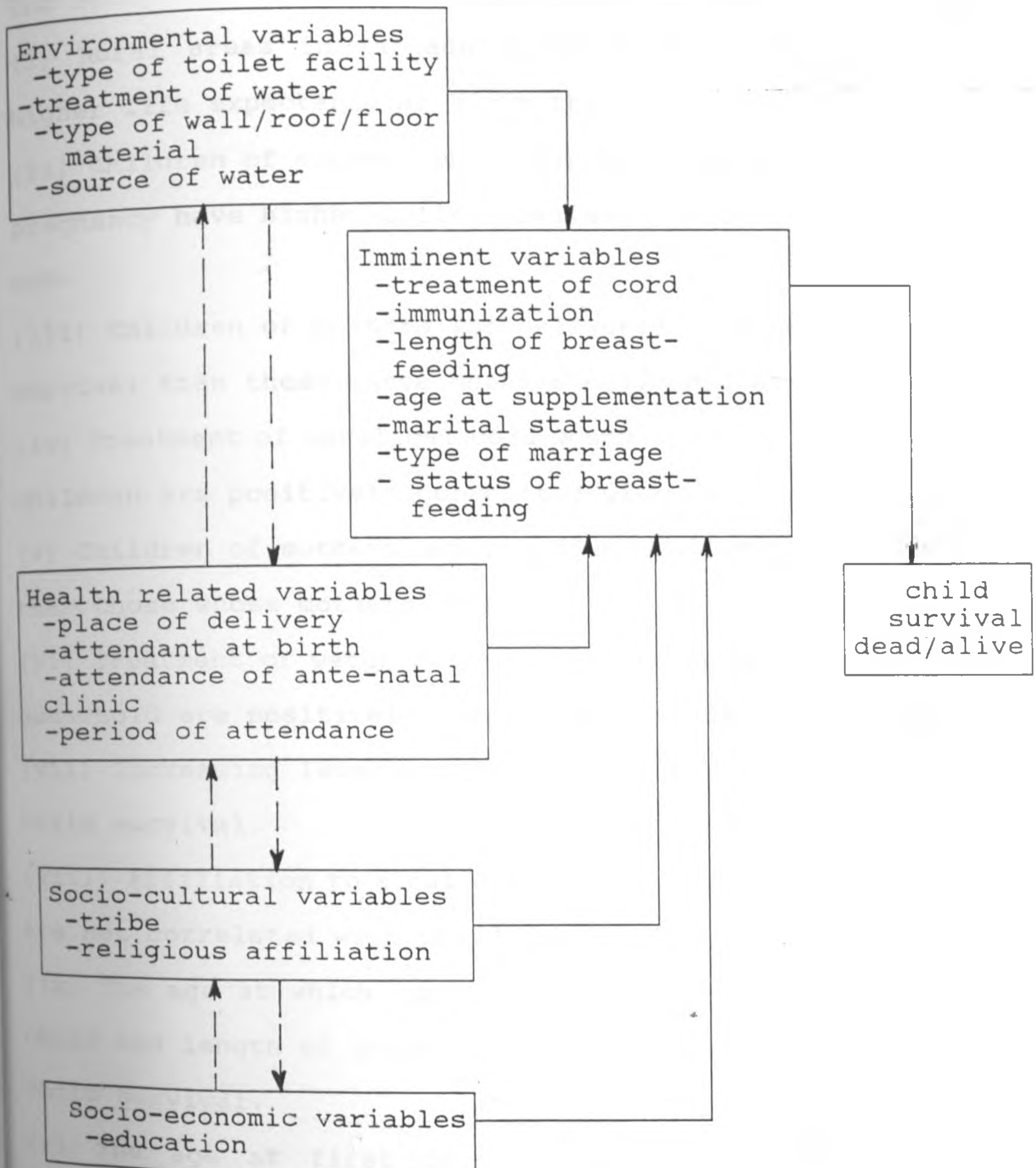
1. Child survival in Upper Matasia sub-location is likely to be determined by environmental factors.

2. Socio-cultural factors are likely to have an impact on child survival in Upper Matasia sub-location.

3. Health related factors are likely to have an impact on child survival in Upper Matasia sub-location.

4. Child survival in Upper Matasia sub-location is likely to be determined by socio-economic factors.

FIGURE 1.2 OPERATIONAL MODEL FOR STUDYING CHILD SURVIVAL



* The doted lines mean that the relationship is implied

2.3.2 OPERATIONAL HYPOTHESES

The study will be based on the following operational hypotheses;

(i) Rural areas in Kajiado district have lower q(2) and hence higher life expectancy at birth than urban areas.

(ii) Children of mothers who attended an ante-natal clinic during pregnancy have higher child survival than those whose mothers did not.

(iii) Children of mothers who delivered in a hospital have higher survival than those whose mothers delivered at home.

(iv) Treatment of umbilical cord wound at birth and immunisation of children are positively correlated with child survival.

(v) Children of mothers using a flush toilet have higher survival than those whose mothers do not.

(vi) Treatment of water before use and source of water used in the household are positively correlated with child survival.

(vii) Increasing level of education is positively correlated with child survival.

(viii) Affiliation to a religious group and the tribe of the mother are not correlated with child survival.

(ix) The age at which supplementary feeding is introduced to the child and length of breast-feeding are positively correlated with child survival.

(x) The age at first marriage and type of marriage are not positively correlated with child survival.

2.4 INDEPENDENT VARIABLES

Health variables:

-Attendance of ante-natal clinic

-Period of attendance of ante-natal clinic

-Place of delivery

-Type of assistant at birth

-Treatment of cord

-Immunization

Socio-cultural Variables:

-Marital status

-Mother's tribe

-Age at first marriage

-Type of marriage

-Status of breast-feeding

-Length of breast-feeding

-Age at supplementation

Socio-economic Variables:

-Education level of mother

Environmental Variables:

- House's wall material

-House's roof material

-House's floor material

-Toilet facility

-Source of water in dry season

-Source of water in wet season

-Treatment of water

Dependent variable

Infant and child survival.

2.5 Definition of Variables

Socio-cultural factors

Age at supplementation: This is the number of months that a child was aged when the mother first gave him/her of supplementary foods i.e. food given to an infant in addition to breast milk. It is measured in intervals of three months.

Length of breast-feeding: This refers to the number of months that a mother fed her child on breast milk, regardless of whether other foods were given. This is measured in intervals of twelve months.

Age at first marriage: This is the age at which a woman was first married regardless of the number of times that she has been married. Although reasons for marrying at a particular age may be economic, social or biological, cultural reasons stand out as more important.

Marital status: In the case of census data women are categorised into single, married, widowed and divorced/separated categories. However, in the case of the survey data, women who are married were also asked on the type of marriage they belong to. This is divided into monogamous and polygamous.

Religion: The religion in this study was either a woman belongs to a protestant or catholic church or whether she was a moslem or was affiliated to a traditional religion.

Socio-economic Variables

Education: This is the highest level of education that a woman has attained. In the case of census data, women are categorised as either having no education, primary education or secondary plus level of education. However in the case of survey data, women's level of education is categorised as: No education, primary, secondary and college and university level of education.

Health factors

Attendance of ante-natal clinic: An ante-natal clinic is a place that women who are pregnant go for the monitoring of the growth of the pregnancy and for treatment related to pregnancy. This refers to attendance of a woman of an ante-natal clinic during her last pregnancy. Women were asked to state whether they attended or did not attend an ante-natal clinic.

Period of attendance of ante-natal clinic: Women who had attended an ante-natal clinic were asked to state the month during their pregnancy that they first attended. After the first attendance it is assumed that they continued to attend. Some women may have attended the clinic throughout the pregnancy whereas others attended the clinic during the first three months, others from the fourth month whereas others attended the clinic from the seventh month of the pregnancy.

Place of delivery: This refers to the place where the woman delivered her last child. This could either have been in hospital, at home or dispensary.

Type of attendant at birth for home deliveries: This refers to the person who helped the mother to deliver for those births that occurred at home. This could either have been a Traditional Birth Attendant, husband, sister, grandmother or friends. Some women may have delivered without assistance(alone).

Treatment of cord: This refers to what was put on the severed umbilical cord wound in the case of the deliveries that occurred at home. This could either have been methylated spirit, ghee, soil or saliva. In some cases nothing may have been put on the wound.

Immunization status: This refers to whether a woman took her child for immunization or not. If the child was taken for immunization, the variable intended to capture the information on whether the immunization schedule was completed, yet to be completed or never completed.

Environmental factors

Type of toilet facility: This refers to whether the household uses a pit latrine, flush toilet or the bush.

Source of water: This refers to whether the household gets its water for use from a well, tap, pond, bore hole, river or stored rain. These sources of water are both for the wet and dry seasons.

Treatment of water: This refers to whether the water is boiled, sieved or treated with chemicals before use.

Type of materials used in construction Houses: This refers to the materials that have been used to construct the roofs, walls and floors of houses. In the case of the roofs these could be iron sheets, tiles or thatch. In the case of walls this could be mud and stick with broken walls, mud and stick with smooth walls, quarry stones or timber. Floor material could either be cement or mud.

Infant and child survival

By infant and child survival it is meant, whether an infant or a child survives (lives) or dies. An infant is anybody below the age of one (12 months). A child on the other hand is anybody aged between one year and below five years of age. In this study, in the case of survey data, infant and child survival is measured by mortality index. This is the ratio of observed to expected deaths per individual woman in the sample. On the other hand, in the case of census data the probability of a child dying by exact age two i.e. q(x), life expectancy at birth i.e. e_0 and infant mortality rate (IMR) are used to measure child survival.

CHAPTER THREE

METHODOLOGY OF DATA COLLECTION AND ANALYSIS

3.1 Introduction

Africa as well as other developing parts of the world in general, and Kenya in particular, is faced with a variety of problems of data collection and often the quality of the data used for mortality estimates and other demographic parameters, is suspect. Some of the conventional sources of data such as vital registration and population registers are lacking leading to use of non-conventional sources of data which are prone to many errors.

There are a number of implications arising out of these data deficiencies: Since most mortality measures in Africa are estimates, they have quite a wide margin of error; details of timing in these estimates are missing because the data are often aggregates of events and exposure; the data cannot be used to evaluate the impact of health interventions as they are collected by retrospective enquiries and hence lack continuous monitoring; and data on which estimates of child mortality are based are different and of better quality than those on which estimates of adult mortality are based (Hill and Hill, 1988). These implications are serious for the reason that data from which mortality estimates are to be derived, should be accurate if measures to improve the health status of the population and consequently lower mortality levels, are to be fruitful.

In spite of the problems that face data collection and the quality of the data and the consequent implications that follow, most developing countries, in need of demographic data for its various uses, have made vital registration, censuses, and sample surveys an important component of their countries' overall development plans, thus their importance cannot be ignored.

Besides government aided sample surveys, individuals funded by some large organisations and institutions of higher learning have also undertaken surveys in the country. This study falls in the latter category.

3.2.0 Methods of data analysis applied to the 1979 population census data of Kajiado district

In this section we present the methodology used to analyze the 1979 population census data. Since this is a secondary set of data, we have only highlighted the information from the census that is used in this study. The procedures followed in the collection, analysis and publication of census data are not included here.

3.2.1 Use of Census Data

General compulsory registration of births and deaths in Kenya is fairly a recent phenomenon. Although registration was made mandatory for Europeans in 1904 and Asians in 1928, it was not until 1960 that the law was extended gradually, district by district throughout the whole country. These efforts resulted in only 22 percent of deaths being registered by the 1970s.

Nonetheless, these data collected since 1904, cannot yield direct estimates of mortality as they covered only a section of the population and most of this population was mobile.

In 1980, the UNFPA and the Kenyan government signed an agreement for Civil Registration Demonstration Project (CRD) expected to cover all the districts but implemented in stages. This was in response to the need of improving and extending vital registration in the country. The project has so far covered 15 districts, but is yet to yield substantial results in terms of data quality and coverage, though indications of the coverage rates of between 60 percent and 80 percent in some districts is encouraging. Many districts including Kajiado, fall in the category that is yet to realize substantial results.

This insufficiency and non-availability of data i.e. vital registration, that can be used to derive direct estimates of child mortality indices, has led demographers to develop indirect methods for estimation to enable countries faced with problems of data have estimates to use for the planning for provision of health, other social services and other uses. These indirect techniques largely rely on censuses and sample surveys data. Although these techniques do not improve the quality of the data, they yield fairly good estimates that reflect the mortality conditions of a country or its regions.

In the 1979 census schedule, just as in other censuses, questions were put to the respondents to solicit information related to deaths within the household. As concerns infant and child mortality, women were asked to state the number of children ever born to them alive i.e. live births; how many of those ever born were living at home and elsewhere; the number that had died and also the age of the respondent (woman) on the night of the census. Information was also collected on education; marital status and place of residence of the woman. These data on the number of children ever born, children who have died among those ever born, and total female population with their ages, aids in the estimation of infant and child mortality.

This study uses the Trussell's technique, developed in 1975 as a modification of the Brass mortality estimation method developed in 1968 to analyze census data. The Brass method has been used in many studies in Kenya yielding fairly good and reliable estimates of infant and child mortality.

3.2.2 The Brass Method

This method was first developed by Brass in 1964 and was later modified by Brass and others in 1968.

Brass was the pioneer of the procedure of converting proportions dead of children ever born reported by women in age groups 15-19, 20-24, 25-29..........45-49 into estimates of the probability of a child dying before attaining a certain exact childhood age.

The method utilizes information on children surviving among children ever born to women in reproductive ages 15-49. The use of the method according to Brass is based on a number of assumptions.

These assumptions are:

1). By allowing for the effects of distribution of the births in time, the proportion of dead children can be converted into conventional measures of mortality expressing their average experience. This then is to say that, the proportions of children surviving and dead classified by the five year age group of mothers (or the duration of marriage), can provide estimates of the probabilities of dying between birth and various childhood ages.

2). That fertility and mortality conditions have remained constant for quite a long time, hence making it possible to estimate the proportions who survive to exact age 1,2,3,5,10,15.......... 35, from the proportion reported as surviving among children ever born to mothers in different child bearing ages.

3). That the risk of death is a function only of the age of the child, and not other factors such as child's birth order and mother's age, which are equally important mortality determinants. This is a serious limitation, for in practice it has been found that, mortality risks among infants and children are higher among young mothers, which suggests that the age of the mother is a crucial child mortality determinant. This is why q(i) values of women aged 15-19 years are disregarded as they tend to be higher. q(10) also is neglected because older women tend to forget long past experiences and hence their responses may blur the true picture of mortality. In essence q(1) and q(10) imply that the age of the mother is an important mortality determinant, and if it is alone left to operate in any analysis of child mortality, it masks the importance of other equally important mortality determinants. For these reasons q(2), q(3) and q(5) values are preferred because they are considered more reliable. In this study only q(2) values have been considered.

4. The relation between the proportion dead D(i) and life-table mortality measure q(x), is primarily influenced by age pattern of mortality, because it is this pattern that determines the distribution of children of a group of women by length of exposure to the risk of dying (U.N, 1983).

Although Kenya's fertility and mortality conditions have been changing, a fact that can rule out the use of Brass's method, this change has not been so monumental as to skew the distribution of births over time or affect the constancy of births and mortality, demanded in the use of the method.

There are several notations utilized in this method which need definitions. These are:

D(i) - proportion dead among children ever born to women in successive five year age groups. From this Brass developed a procedure to convert D(i) values into q(x) estimates. In this case q(x) = 1 - l(x) the probability of dying between birth and exact age x. To estimate q(x) one needs a multiplier K(i) which is selected according to the value of P(1) and P(2). P(i) is the average parity reported by women in age group (i) whereas K(i) the multiplier adjusts for non-mortality factors determining the value of D(i). To get q(x) one multiplies K(i) value with D(i) i.e. q(x)

$= K(i)*D(i)$.

3.2.3 The Trussell Technique

This method is a modification of the Brass technique for estimation of infant and child mortality. Trussell used model fertility schedules developed by Coale and himself, to generate multipliers used for mortality estimation.

In this study we use Trussell's multipliers for west model. The selection of this model is based on the fact that little is known about mortality conditions in Kajiado district and hence, this model is recommended in this situation for its generality, and also because it conforms to the standard model. Kichamu (1986) used the North model multipliers to estimate q(2) values for the district and hence for comparison purposes and to avoid duplication the west model is applied in this study. We have used q(2) (the probability of dying by exact age two), infant mortality rate (IMR), and life expectancy at birth (e_0) parameters, to be calculated at district and divisional level by three differentials of education, marital status, and place of residence, to show the district's mortality conditions.

The Trussell technique utilizes the following information for child mortality estimation :

1) children ever born classified by five year age group of the mothers

2) children dead classified by five year age group of the mothers

3) the total female population (FPOP) classified by five year age groups.

3.3.1 Computational Procedure

step 1 : Calculation of average parity per woman, $P(i)$

This is denoted as $p(i)$ where (i) refers to age group of the mother.

$$P(i) = CEB(i)/FP(i) \quad (1)$$

CEB denotes the number of children ever born by women in age group (i) whereas $FP(i)$ is the total number of women in age group (i) irrespective of their marital status.

step 2 : Calculation of proportion of children dead for each age group of the mother, D(i)

This is denoted as the ratio of reported children dead to reported children ever born. Thus;

$$D(i) = CD(i)/CEB(i) \quad (2)$$

$CD(i)$ is the number of children reported dead by women in age group (i).

Step 3 : calculation of multipliers

The west model life table coefficients provided in manual x, table 47 page 77 are utilized. In general;

$$K(i) = a(i) + b(i)\ P(1)/P(2) + c(i)\ P(2)/P(3) \quad (3)$$

$$\text{Now } q(x) = K(i)*D(i) \quad (4)$$

3.3.2 Calculation of mortality levels and construction of life table

By making use of q(2), q(3) and q(5) a life table for each of the divisions in the district and by the three differentials of education, place of residence and marital status is made.
p(x) = 1-q(x). q(x) is the probability of dying at a certain age, which has already been calculated in the earlier stages, whereas p(x) is the probability of surviving i.e. not dying.

Step 1 :

p(x) values for all the age groups in the age range 15-49 are calculated using the formula above i.e. p(x) = 1 - q(x). However, x = 2, 3 and 5 are utilized for the life table construction.

Step 2 :

By using the Coale- Demeny life tables, west model, lower and upper levels of p(x)'s are obtained. The sex ratio at birth here was taken as 1.05.

Step 3 :

This involves the use of interpolation to obtain implied level. The formula is given as;

$$IL = \text{low. lev.} + \frac{(\text{upp. lev.} - \text{low lev})}{\text{upper } p(x) - \text{lower } p(x)} (\text{actual } p(x) - \text{lower } p(x)).$$

where IL stands for interpolated level of mortality.

Step 4

This entails getting the interpolated p(x) by obtaining levels from the Coale & Demeny West model life table for both sexes five year survivorship probabilities from Manual X, using the formula,

$$\text{Inter.p}(x) = \text{low.p}(x) + \frac{(\text{upp.p}(x)-\text{low.p}(x))(\text{ave.lev}-\text{low. lev})}{(\text{upp.lev.} - \text{low. lev.})}$$

3.3.3 Construction of life table

Using p(x) values, the other values of the life table are obtained:

a) $l_x = p(x)*l(x-n)$. This is the number of survivors at exact age x. It is found by multiplying the number of survivors at the preceding age with p(x). Usually we begin by assuming that the number of survivors at age 0 are 100,000 and then go ahead to derive the number of survivors in other ages.

b) $_nd_x = lx - l(x+n)$. It is the number of deaths at ages between x and x+n.

c) $_nL_x$ is the person years lived between exact ages x and x+n. It is computed according to the various age groups.

For age group 0-1 i.e. $_1L_0= 0.5*(l0+l(1))$,

For age group 1-4 up to 74.9 it is $_5L_x= 2.5*(lx+l(x+n))$ and

For age group 75+ i.e. L75+=l(75) log 10 l(75)

d) Tx is the total person years lived after exact age x. It is found by summing up the person years lived below the age group.

e) e(x) is life expectancy at exact age x. It is obtained by the formula;

e(x)= Tx/lx

3.3.4 Calculation of reference period

The reference period in a situation where mortality is changing smoothly is an estimate of the number of years before the survey date to which the child mortality estimates q(x) in step 4 refer to. t(x) is also estimated by means of an equation whose coefficients were estimated from simulated cases using linear regression. The coefficients are provided in the appendix II. The equation used in the estimation of t(x) was;

$$t(x) = a(i) + b(i)\ (P(1)/P(2)) + c(i)\ (P(2)/P(3)) \quad (6)$$

To get the exact number of years and months to which the q(x) refer to, the figure obtained here is multiplied by 12.

step 2: computation of q(x)s' to which the period computed refer:

The first thing is to obtain an interpolated mortality level for each of the q(x)s' computed earlier in the construction of the life table. The formula is given as;

$$IL = low.lev. + \frac{(upp.\ lev - low.\ lev.)}{upper\ p(x) - lower\ p(x)}(actual\ p(x) - lower\ p(x))$$

where IL stands for interpolated level of mortality.

For each of the interpolated mortality levels q(x)s' are calculated by interpolation. The formula used is;

$$Inter.p(x) = low.p(x) + \frac{(upp.p(x) - low.p(x))(ave.lev - low.lev)}{(upp.lev. - low.\ lev.)}$$

The interpolated q(x) for each mortality level referring to a particular period or year are used to draw mortality trends graphs for each Division in the district.

3.5.0 Methodology of Collection and Analysis of Survey Data From Upper Matasia Sub-location

3.5.1 Introduction

In this section we make an attempt to describe the various stages of the sample survey. This include description of study area, study population, sample design and implementation, methodology of data collection and analysis and problems encountered at the field. Methods of data analysis described are cross-tabulation, Chi-square and multiple regression analysis.

The research aimed at collecting data through interviewing and questioning of women in the age range 15-49 in Upper Matasia sub-location, who had ever had a child, about their socio-cultural, health, environmental and socio-economic characteristics. This was done to determine the impact of these factors on the survival of the children.

In the design of the survey due care was taken in the development of operational definitions of the variables of interest. According to Mahadevan et. al. (1986) and Mosley (1984) a necessary step in the design is the operational definition of variables and specification of the major structural definitions to incorporate in the analysis. The purpose of this is to ensure that in measuring and interpreting the relationship between variables, one can identify the particular direction of causation of each and also control measurement errors.

Due care was taken in the selection of the sample population, which ensured that we got the population of women with the required characteristics and hence one which is representative of the sub-location, within statistically acceptable degrees of bias. Before the commencement of the research (data collection), the questionnaires were carefully pretested to ensure that the objectives of the study were achieved.

3.5.2 Upper Matasia Sub-location

Upper Matasia sub-location, is located in Ngong North location of Ngong division of Kajiado district. It is adjacent to Ngong Township, a characteristic which makes the area residents have an easy access to the city of Nairobi.

The district development plan shows that, this area is a high agricultural potential zone. This has enabled the area's residents to engage in cultivation of food crops mainly vegetables and fruits, which find a ready market in the nearby Ngong Township and areas further out, mainly the city of Nairobi.

The area's residents also engage in animal keeping- pigs, cattle and poultry. The proximity to the city ensures that, the farm produce such as eggs find a ready market.

Our selection of this area for study was motivated by the fact that since this area is adjacent to the city, its population may be sharing in the city's socio-economic development. The area beside the above fact is dominated by in-migrants, people who have bought land there. Since these people are likely to be from Nairobi they are more likely to exhibit urban characteristics. This population is not only likely to want to share in the city's socio-economic development, it is also likely to lead a way of life that is conducive to furthering child survival.

3.5.3 THE STUDY POPULATION

The population covered in this study is that of females aged between 15 and 49 years. The rationale behind the selection of the above group as the target population is that, it covers the child bearing ages and hence, also at the risk of losing through death the same children that they give birth.

More important however is the fact that, the methodology used to estimate mortality indices utilizes the population of women in this age range.

In general, however, a survey of selected households was undertaken, and particular information that could help identify factors affecting child survival was sought. A unique feature of the study population is that it is composed of people from various tribes and hence diverse cultures. Again it is a population that has been exposed to the influence of urban way of life, due to its proximity to the city of Nairobi.

3.5.4 Sample Design and Implementation

The calculation of mortality estimates from survey data requires that the sample size be large. Nonetheless, the selection of the sample size is dictated by the size of the universe from which it is taken, the time and the financial resources at the disposal of the researcher.

The time and financial resources at our disposal for this research were quite limited. The population of women in the age group 15 to 49 in this area is also small. We however hoped to reach a sample size of 320 women in this study, deemed sufficient for the mortality estimates.

The selection of the sample for this study utilized the procedure outlined by Blalock et al (1968). They propose that one can choose a sample size by using the standard error of the proportion ''P'' of the population that he elects to choose.

To obtain the standard error the formula given by S.E (P)= SQRT (pq/n), is utilized. In this case SQRT denotes square root and n sample size. It should be noted here that p+q= 1.

In this study we set ''P'' to be equal to 0.5. We also selected a level of significance of 0.05. Thus the confidence interval is 95 per cent. This then gives a sample size with confidence limits around 0.40 and 0.60.

To find ''n'' which is the only unknown in the above formula, the formula given by $n = (2)^2 pq/(2 \text{ S.E.}(p))^2$ is utilized. Nonetheless, Blalock has noted a general formula for obtaining the sample size. This is given by $n = 1/K^2$. K is the desired interval about the proportion. P = 0.5 at a desired confidence interval.

The sampling procedure for the study was a modification of the stratified multi-stage cluster design, based on the National Sample Survey and Evaluation Programme (NASSEP) frame of 1980-1984. However, for the reason that we modified this procedure and lack of d time, we only discuss the procedure used in our study.

first stage in the selection of the sample was to divide -location into various strata of villages. These were nd Kufuri. Secondly, we listed all eligible women in the ea (sub-location) assigning each a unique number. This was by undertaking a census in the sub-location with the help elevant sub-location's administrative personnel, mainly the t chief and village elders. By eligibility here we meant oman falls in the age range 15 and 49, had a child and had esident of the sub-location for not less than six months. e second stage involved creation of total eligible women in ata who were to be interviewed. This was done to ensure ere was proportionate representation of each strata in the mple selected. This proportion of the total eligible women stratum, was created by taking total women in the stratum iding by total eligible women in the sub-location. This on was then multiplied by the sample size , in our case ere were 612 eligible women in the sub-location. For the Kahara, there were 314 whereas Kufuri had 298 eligible In order to determine the proportion of eligible women for ratum the procedure outlined above was followed. This 164 and 156 eligible women in Kahara and Kufuri ively, and hence a total of 320 women.

final stage was that of getting the particular women for w as up to the second stage, what has been done is to get ber of women eligible from each strata. This was done by simple random sampling. All the eligible women whom we had already listed and assigned unique numbers, had these written in small pieces of paper, which were then wrapped up. These were then thoroughly mixed and then the required number selected, without replacement. This as Moser and Kalton (1971) assert, gives a fairly unbiased sample.

3.5.5 Problems Encountered In The Field

The problems that were faced in the field related basically, to the actual interview and reaching the target population, in particular, the actual women for interview.

The research operation encountered problems from the weather. The research was carried out during an unexpected rain season, which made it difficult for the interviewers to reach most of the respondents in time, as the distance between the various respondents was large due to the spatial distribution of settlement. This led to the research taking a longer period, an extra three weeks over the three months, than expected.

Non-response was the most common problem encountered in the research. There were two main types of non-response. The first related to non availability of the respondents for interview. In our case, there were three women one from the stratum Kahara and two from Kufuri, who were not at home at the time the interviewers went there, in spite of several visits.

The second type of non-response related to refusal to answer questions. 17 women from the stratum Kahara refused to be interviewed after rumours circulated in the area that, a group of University of Nairobi researchers (not this researcher) was recruiting people into a satanist religion. This however happened when the research was almost over and affected only those 17 homesteads. There were also a number of questions which went unanswered. For instance 30 women never answered the question on the place of delivery of their children, and 27 never answered whether they went to an ante-natal clinic during pregnancy. However, such non-responses are minimal and cannot affect analysis of data related to those questions, given the number that answered.

3.6.0 Analysis of Survey Data

A number of methods are used to analyze the survey data each relevant to a particular area of analysis. The results presented in this study refer to the conditions prevailing in the sub-location, between January 1988 and February 1993. The estimates of mortality obtained from the survey, therefore relate to children who were born and died in between this period.

3.6.1 Cross-Tabulation

Cross tabulation is used in studying the association and distribution between two variables. In our study, it was used to show us how women in the sample are distributed in the various categories of the variables under study.

In order to measure the extent of association as well as statistical test of hypotheses, that a relationship does not exist, the use of Chi-square is made.

The use of Chi-square is to measure the hypothesis that, two variables of a cross tabulation are independent. Generally, two variables by definition are independent, if the probability that a case falls into a given cell, is simply a product of the marginal probabilities of the two categories defining a cell. The probability under independence of an observation falling into cell ij is estimated as;

$$p\ (\text{row} = i \text{ and column} = j) = \frac{(\text{count in row } i)(\text{count in column } j)}{N}$$

To obtain the expected number of observations in cell (ij), the probability above is multiplied by the total sample size.

$$E_{ij} = N\,\frac{(\text{count in row } i)}{N}\,\frac{(\text{count in row } j)}{N}$$

$$= \frac{(\text{count in row } i)\ (\text{count in row } j)}{N}$$

The Pearsons Chi-square (X^2), is a statistic which is more often used to test if, the row and column variables are independent. This statistic is calculated by summing over all the cells, the squared residuals by expected frequencies.

$$X^2 = \Sigma\ \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

In order for us to produce an estimate of how likely (or unlikely) this calculated value is, if the two variables are in fact independent, the calculated Chi-square is compared to the critical points of the theoretical Chi-square distribution.

It should be borne in mind that, the value of the Chi-square depends on the number of rows and columns in the table being examined and therefore, the degrees of freedom for the table should be known. The degrees of freedom are defined as the number of cells of the tables that can be arbitrarily filled when the row and column totals (marginals) are fixed. For an RXC table, the degrees of freedom are (R-1)*(C-1), since (R-1) rows and (C-1) column cells must be chosen so that the marginal totals are maintained.

In our study, we have made use of the SPSS /PC^{+} Package. In this package, if the observed significance level of the test is small enough i.e. less than 0.05 or 0.01, the hypothesis that the variables are independent is rejected.

The application of Chi-square is subject to the fulfilment of certain conditions. These are;

(i) experimental data should be independent of each other

(ii) that sample data must be drawn from the target population.

(iii) that data must be expressed in original units.

(iv) that sample contains at least 50 observations.

(v) that there is no less than five observations in any cell.

3.6.2 The Trussell-Preston Method

In order to arrive at mortality estimates from the survey data, a method developed by Trussell and Preston (1982) has been used. This method is used to calculate the mortality index, which relates the observed mortality experience of a woman and her expected mortality experience. It is therefore a ratio i.e. ratio of observed to expected deaths. It is also a standardised ratio with respect to either marital duration or age of mothers.

Trussell and Preston have developed this method to overcome problems of deficiency of data on, in particular problems of, death registration in developing countries. The method utilizes child mortality data obtained from reports by mothers on the number of children ever born to them, and out of these the number that are still living collected through surveys or census exercises.

The essential feature (of this method) is to construct an index of child mortality for women, and compare the values of the index among different groups of women. This index is calculated for each woman, in that each of them has her own index. This is done by multiplying each woman's number of live births by the expected proportion of deaths. The ratio is defined as observed divided by Expected deaths. This ratio will then be used as the index of mortality experience for each mother, throughout the analysis.

The principle of the index construction rests on the idea that the proportion of children who have died, can be used as a measure of the mortality of children of women, after adjusting for the effects of marital duration or age of the mothers. The mortality index is constructed therefore as the ratio of the actual proportion of a woman's children who have died, to the proportion expected for an ''average'' woman in the population of the same marital duration or age.

The actual calculation of the index is done by dividing the number of her dead children, by the expected number of dead children. This expected number of dead children henceforth denoted as EPDj, is obtained by multiplying the number of births by the expected proportion of dead children. This has created a problem, that needs to be resolved before further calculation is done. This is the estimated proportion of children born alive who are now dead. This proportion depends on the general mortality conditions in the population, as well as upon the distribution of exposure times of her children to the risk of mortality as measured by the mother's marital (marriage) duration or age. The problem of expected proportion of dead children who were born alive, is usually resolved by using selected standards of mortality to be taken from the Coale and Demeny model life tables.

Nonetheless, since appropriate and suitable life tables for this rural set of Kenya are not available, application of another procedure to estimate proportion of dead children will be undertaken. In our case this will be by use of the values q(1), q(2), q(3), q(5), q(10), q(15) and q(20) for the division in which the sub-location falls. Estimates of mortality for the area in the period between 1969 and 1979 show that there was only a slight, almost negligible decline in mortality. In 1969 the q(2), q(3) and q(5) values were 0.081864, 0.078893 and 0.115499 respectively. In 1979 they had declined to q(2) (0.079989), q(3) (0.07632) and q(5) (0.08327) (Kichamu, 1986).

However, the past decade witnessed a very slow decline in mortality. This is because of the recently identified mortality determinants like malnutrition, which are harder to control in comparison to environmental factors that, were largely responsible for high mortality in the sixties and seventies. This is to say that, mortality conditions have remained almost the same or changed slightly in the past decade. On the basis this assumption, the use of the 1979 mortality estimates to calculate mortality index will not produce estimates that, are far from the real situation. Further, CBS (1983) estimates for the future for all districts in the country, which are the only recent projections available, have assumed this constancy in mortality conditions since 1979.

Another issue that has to be resolved is that of the age range of women to be included in the analysis. There is a temptation to include all the women who have ever had a child in the analysis. However, for two very important reasons only women in the child bearing ages should be covered. Although some of their children may be in adulthood, this does not seem to present a problem and hence women in ages 15-49 are used because:

a) The majority of children of women in the child bearing ages are very young. Since this is a child mortality study, the analysis excluded women who are above age 50 whose children are usually in their adulthood. Again by considering women in this age range, the recent child mortality experience of the area is captured.

b) The age pattern of mortality risks that has been observed universally shows that, a vast majority of deaths recorded to children will have occurred at young ages. In fact three-quarters of all deaths to persons under age 30, can be expected to occur to children under age five (U.N, 1985). Since these deaths are concentrated in infancy and early childhood and because, as we have noted most of the children of women in child bearing ages are very young, our targeting of the women in the 15-49 age range yields the most recent experience of mortality not only at the young ages, but to a large extent reflect the general mortality situation of the area. The formula for its estimation is:

M_{ij} = Di/Bi*PDj whereby;

M = Mortality index or ratio

Di = reported number of children dead for each woman i

Bi = reported number of children ever born for woman i

PDj = estimated proportion of dead children for women in group j (however in our study this is replaced by q(x)).

The index of mortality is also equivalent to the ratio of the proportion of children dead for woman i, divided by the proportion of dead children for all women in age group i. In our study, it is this mortality ratio that is utilized as the dependent variable in the regression equation, whereas the various child survival factors are independent variables.

$$M_{ij} = A + B_1 * X_{i1} + \ldots\ldots B_i * X_{ij} + B_n * X_{nj} + E_i$$

Ei is the difference between the true mortality ratio and estimated mortality ratio for woman i.

The greatest limitation with this equation is that the variance of the mortality index M_{ij} differs over age because younger women have fewer births. In average terms, the number of births result in large variances for the proportion dead for the younger women. Nonetheless, this consistent change in the variance over age means that when all women are included in the equation, the assumption of equal variances for the residuals Ei does not hold. In essence, the variance of each individual is a function of the common variance of the mortality index.

If all variables in the regression equation are divided by the standard error (S.E the square root of the variance) of the mortality for each woman i, the inequality of the variances of the residuals should be removed. In that case the following equations arise;

$$M_{ij}/S.E = A/S.E+B_1*X_{i1}/S.E+...B_i*X_{ij}/S.E+B_n*X_{in}/S.E+E_i/S.E$$

To this equation denote;

$$Yi = M_{ij}/S.E,\ Z_{ij}/S.E,\ Z_{ij} = X_{ij}/S.E$$

$$ei = Ei/S.E$$

This equation then becomes,

$$Yi = a+ B_1* Z_{i1}+....+B_i*Z_{ij}+....+B_n*Z_{in}+e_i$$

$$\text{Variance (ei)} = \text{Var.(ei/S.E)} = 1/S.E^2\ (\text{Var.(ei)})$$

This weighting has the effect of removing the inequality because the variance of ei is known to be related to the index. The variance is therefore minimised by solving the equation.

3.6.3 Multivariate Regression Analysis

In the application of regression analysis, the study aims at estimation of coefficients of mortality determinants by the variable of interest, whilst controlling for others. Multivariate regression analysis therefore, helps in isolating a certain factor from the analysis so as to see the effect of the factors left to operate on the dependent variable. The formula is given by;

M_{ij} = $A + \Sigma\Sigma B_i * X_{ij} + E_i$ in whose case;

A = the constant term

B_i = the regression coefficients for the independent variable i

E_i = the error term assumed normally distributed (after weighting factors by numbers of births with mean zero)

X_{ij} = variable

M_{ij} = mortality index for the i^{th} woman in the j^{th} category

In this study the computation of the regression coefficients of the equation and the correlation coefficients and the statistical measures used in the analysis have been done by use of SPSS/software. This package has been proved to produce the best relationship for variables when step wise regression is used. This is an advantage that will benefit this study. For instance this is evident in the assumption that in the construction of the regression equation, all variables (criterion and predictor together) jointly follow a multivariate normal distribution. Since this is a mathematical model, of prediction no real data can follow a multivariate normal distribution exactly. In this case, where significant interaction effects are present, the use of linear model yields predicted values of the dependent variable which in effect do not "fit" any of the cases. Among the methods that have been proposed for handling this complication, is stepwise regression. It can not only identify this problem (significant interaction), but it can also improve the regression model developed.

Another problem that has to be resolved is that of the variance of estimators - estimated regression coefficients, in evaluating the relative importance of the independent variables. In this respect, coefficients with large standard errors are unreliable and may differ greatly from sample to sample. This can be resolved by avoiding identification of variables as important for prediction based on their individual significant t - values.

Intercorrelation among variables is another problem associated with variance of estimators. If there is correlation between independent variables then the parameter estimates are correlated too. It has been found that in a case of high inter-correlation among independent variables, the coefficients become unreliable among other effects.

In estimation of variance of the regression coefficients for the i^{th} independent variable, the formula applied is,

$$S^2_{Bi} = \frac{S^2}{(1-R_i^2)\ (N-1)\ S_i^2}$$

In this case, R_i^2 is the squared multiple correlation when the i^{th} independent variable is considered the dependent variable and the regression equation between it and other independent variables calculated. If R_i^2 value is large, the i^{th} independent variable is almost a function of a combination of the independent variables or is almost a linear function. There is the proportion of variability not explained by other variables. This proportion of variability not explained by other variables is called TOLERANCE. This is given by the formula $1-R_i^2$ From the equation, for a fixed sample and standard error S, the smaller the tolerance the larger the standard error of the coefficient. Nonetheless, small tolerance values can at times cause computational problems also.

In regression analysis it is important to keep in mind what the independent and dependent variables are. In our study the dependent variable will be the ratio of observed to expected deaths i.e. mortality index.

3.6.4 Testing of Statistical Significance

A t-test is a method used to determine the goodness of the fit between the sample mean and the population mean. The t-statistic is calculated using the formula;

t= x-u/s*sqrt(n-1) in whose case,

s = the sample standard deviation.

n = sample size

n-1 = degrees of freedom

x = observed data or random variable

u = population mean

In the use of the t-statistic the following rules apply:

a) The variable should be an interval measure

b) The form of distribution should be normal

In the t-statistic, the null hypothesis is given as,

H_0 : $b0=b_1=b_2=b_3=.........=b_n=0$ and the alternative hypothesis as; H_1 : $b_0+b_1+b_2+b_3+b_n+0$

If the observed significance level t-value is greater than the table value at observed number of degrees of freedom and level of significance, then the H_0 is accepted and hence the H_1 rejected. Nonetheless , as in the Chi-square test one can directly test the hypothesis from the computer printout. In this case, if the observed significance level is less than the test value (usually 0.01, 0.025, 0.05, 0.005 or 0.001) then the null hypothesis is rejected and the alternative hypothesis accepted. A case of independence occurs when the observed significance is greater than the test levels, in whose case, the null hypothesis is accepted and the alternative hypothesis rejected.

3.6.5 Problems Associated With Multiple Regression Analysis

Multicollinearity is the most common problem in multiple regression analysis. Multicollinearity is a condition of inter-correlation of independent variables i.e. a condition in which independent variables overlap with one another. This is a problem as when it arises, the individual influence of independent variables on the dependent variable becomes insignificant and hence unreliable. If such an overlapping is great, then it means the reliability of the regression coefficients is lessened.

This intercorrelation can be measured by the simple correlation coefficient between the variables. In this case, the assumption of ordinary least square regression method that the disturbance terms are normally distributed, with zero expectation and that they have the same variance in whose case homoskedaistic are violated.

3.6.6 Solution of Problems in Multiple Regression

We have made use of the dummy variable technique. The problem of multicollinearity is likely to arise in the use of dummy variable technique. This is likely to happen in a case where dummy variables are all included in the regression and the dummy includes all possibilities. For instance, suppose the regression equation includes dummy variables representing age at introduction of supplementary feeding i.e. where d is 1 when the mother introduced supplementary feeding to her baby when it was aged between 1 and 4 months old, and 0 if otherwise so that 1-4 months=1, 5-8 months=0, 9-12 months=0 and 13+ months =0. If all dummy variables of age at supplementation are included in the regression equation, there will be perfect multi-collinearity. To avoid this problem of linear dependence, one reference category is left out of the equation. This is in line with Kupper (1978) and Intrilligator (1978) suggestion that one of the dummy variables be dropped to resolve the problem of multi-collinearity.

The problem of variance of the error term has already been resolved in the selection of the sample as simple random sampling was used. This ensures that the variance of the error term is normally distributed. Again, since our sample size is more than 30, the normality assumption presents no problem. There could be a problem only if it was less than 30. However, our sample size however, is 300.

3.6.7 Dummy Variable Technique

A dummy variable or indicator according to Kleinbaum and Kupper (1978) is, any variable in a regression equation that takes on a finite number, for the purpose of identifying different categories of the nominal variable. It only relates to the property that, the actual values taken on by such variables (usually values like 0, 1 an -1) describe no meaningful level of the variable, but rather act only to indicate (or designate) the categories of interest.

In defining a dummy variable, one simple rule is followed: If the nominal independent variable of interest has K-categories, one must define exactly K-1 dummy variables to index categories, provided that the regression equation contains a constant term (intercept). This condition has been fulfilled in this study.

In this study, the independent variables that are used comprise of scaled continuous variables (age); variables with some ordering between the different categories (duration of breast-feeding) and some with no ordering between categories (type of marriage, house's floor material). The categorical variables are introduced into the regression equation through dummy variable.

As already defined, for a K-category variable of the nominal variable one category is selected and called the reference category. Therefore, for each of the (K-1) other categories, a dummy or indicator variable is defined, and it takes the value 1 for individuals who fall in that category and zero if otherwise (those not falling in the category) (Kupper & Kleinbaum, 1978). For example, if we chose age at supplementation 1-4 MONTHS as the reference category and define K=3 as;

5-8 MONTHS (ASUPP1)	=	1 0	5-8 MONTHS OTHERWISE
9-12 MONTHS (ASUPP2)	=	1 0	9-12 MONTHS OTHERWISE
13+ MONTHS (ASUPP3)	=	1 0	13+ MONTHS OTHERWISE

Therefore, the variable age at supplementation is represented in the regression by a set of dummy variables defined in this case as ASUPP1, ASUPP2, and ASUPP3.

In order to determine the effect of this, the fitted values from the regression are;

Y_i = b0+b1*ASUPP1i+b2*ASUPP2i+b3*ASUPP3i in whose case ASUPP1i, ASUPP2i and ASUPP3i are values for ASUPP1, ASUPP2, and ASUPP3 for respondent i.

In the case of individuals who introduced supplementary feeding when the baby was aged between 1 and 4 months; ASUPP1i=ASUPP2i=ASUPP3i=0. The predicted mean is, (Y/ASUPP=1)=b0 the intercept of regression. For individuals introducing supplementary feeding when the child is aged between 5 and 8 months ASUPP1=1 and ASUPP2=ASUPP3=0. Thus the predicted mean is,

(Yi/ASUPP=2=b0+b1). For other categories of age at supplementation the predicted means are obtained as;

(Yi/ASUPP=3=b0+b2)

(Yi/ASUPP=4=b0+b3)

The constant term b0 (intercept) is the fitted mean for the reference category and the slope bj is the difference in the fitted mean between category J+1 and the reference category. Nonetheless, note that two or more variables can be included with each having a reference category.

CHAPTER FOUR

CHILD MORTALITY DIFFERENTIALS IN KAJIADO DISTRICT

4.0 INTRODUCTION

Demographers are preoccupied with the study of mortality differentials for various reasons but among these three stand out as most important. Firstly, the study of mortality differentials helps to provide information for assessing inequalities among people with respect to length of life and health. Secondly, it aids in the identification of under-privileged segments of the population who experience higher mortality levels, for whom policies and programs geared toward improving health conditions and chances of survival should be targeted. Finally, by giving a clear overview of the mortality conditions, the study of mortality differentials improves the understanding of mortality determinants and their interrelationships. This according to the U.N (1985), forms the basis of which proper policy measures for reducing mortality are selected and improved.

In this study we have considered the mortality differentials by education, marital status and place of residence. These have provided a general overview of child mortality conditions in Kajiado district.

Studies of mortality differentials use the probabilities of dying at certain ages as indicators of child mortality. These probabilities are q(1), q(2), q(3), q(5), q(10), q(15) and q(20). Although all these indices can depict mortality conditions of an area only q(2), q(3) and q(5) the probability of dying by exact ages 2, 3 and 5 respectively, are considered as reliable. In this study we utilize q(2) values to compare and explain mortality differentials in Kajiado district.

4.1.0 Illustration of obtained mortality estimates

In this section, we use the Kajiado district data to show how the mortality estimates results presented in this chapter, were obtained.

Step 1 : Calculation of average parity per woman

This is denoted as P(i) where (i) refers to age group of the mother.

$$P(i) = CEB(i)/FP(i) \quad (1)$$

For Kajiado district P(1), which refers to the parity of women in age group 15-19 is; P(1) = 3898/7910 = 0.492793

Step 2 : Calculation of proportion of children dead for each age group of the mother

This is denoted as the ratio of reported children dead to reported children ever born. Thus;

$$D(i) = CD(i)/CEB(i) \quad (2)$$

Using the district data for illustration the D(1) value referring to women in age group 15-19 is; D(1)= 2443/3898= 0.062596

Step 3 : calculation of multipliers

The west model life table coefficients provided in U.N Manual X, table 47 page 77 are utilized. In general;

$$K(i) = a(i) + b(i)\ P(1)/P(2) + c(i)\ P(2)/P(3) \quad (3)$$

Now q(x) = K(i)*D(i)   (4)

For Kajiado district K(1) referring to age group 15-19 is;

K(1)= 1.1415-2.707*0.227954+0.7663*596995= 0.981908

since q(i)= K(i)*D(i), q(1) will be 0.981908*0.062596 which then gives 0.061464. This translates to 61 children deaths per 1,000 births by the first birthday.

4.1.1 Calculation of mortality levels and construction of life table

By making use of q(2), q(3) and q(5) a life table for each of the divisions in the district and by the three differentials of education, place of residence and marital status, is made.

p(x) = 1-q(x). q(x) is the probability of dying at a certain age which has already been calculated in the earlier stages whereas p(x) is the probability of surviving i.e. not dying.

Step 1 :

p(x) values for all the age groups in the age range 15-49 are calculated using the formula above i.e. p(x) = 1 - q(x). However x = 2, 3 and 5 are utilized for the life table construction. The following table shows q(x) and p(x) values for Kajiado district.

x	q(x)	p(x)
2	0.0715	0.9284
3	0.0788	0.9211
5	0.0935	0.9064

Step 2 :

By using the Coale- Demeny life tables, west model, we obtain lower and upper levels of P(x)'s. The sex ratio at birth here was taken as 1.05. The values provided in the table below were taken from Manual X (U.N, 1983). For Kajiado district using p(x) values read from Coale and Demeny are shown below;

Table 4.0: p(2), p(3) & p(5) values for Kajiado district

x	p(x)	lower level	upper level
2	0.9284	0.9205	0.9345
3	0.9211	0.9147	0.9301
5	0.9064	0.8899	0.9076

Source: Compiled by author based on the 1979 population census

step 3 :

This involved the use of interpolation to obtain implied level. Table 4.1 below summarises the interpolated mortality levels for x= 2, 3 and 5 in Kajiado district.

Table 4.1: Interpolated mortality levels for Kajiado district

x	lower level	upper level	lower p(x)	upper p(x)	IL
2	18	19	0.9205	0.9345	18.5645
3	18	19	0.9147	0.9301	18.4132
5	17	18	0.8899	0.9076	17.9301

Source: Compiled by author based on 1979 population census.

From here the average mortality for Kajiado district is obtained as;

Aver.Mort.lev. = (18.5645+18.4132+17.9301/)3= 18.3026

Step 4

This entailed getting the interpolated p(x) by obtaining levels from the Coale & Demeny West model life table for both sexes five year survivorship probabilities from Manual X, using the formula,

$$\text{Inter.p(x)} = \text{low.p(x)} + \frac{\text{(upp.p(x)-low.p(x))(ave.lev-low.lev)}}{\text{(upp.lev. -low. lev.)}}$$

For Kajiado district interpolated mortality level for p = 1 is;

Inter. $p(1) = \dfrac{0.93265+(0.94343-0.93265)(18.3026-18)}{19-18} = 0.9359$

The table below shows the calculated interpolated p(x) values for Kajiado district

Table 4.2: Interpolated p(x)s' for Kajiado district

Age x	l(x) level 18	l(x) level 19	Actual p(x)
0	1	1	1
1	0.93265	0.94343	0.935912
5	0.90766	0.92454	0.912768
10	0.89916	0.91763	0.904749
15	0.8927	0.91234	0.898643
20	0.88278	0.90395	0.889186
25	0.86927	0.89243	0.876278
30	0.85455	0.87989	0.862218
35	0.83797	0.86569	0.846358
40	0.81838	0.84864	0.827537
45	0.79411	0.82693	0.804042
50	0.76265	0.79777	0.773278
55	0.71989	0.7572	0.731181
60	0.66235	0.70117	0.674098
65	0.58377	0.62337	0.595754
70	0.48151	0.51969	0.493064
75+	0.35517	0.3887	0.365317

Source: Compiled by author based on 1979 population census

4.1.2 Construction of life table

Using p(x) values, the other values of the life table were obtained:

a) l_x = p(x)*l(x-n). This is the number of survivors at exact age x. Using the district's data for illustration;

l(1)= 0.93591*100000= 93591

b) $_nd_x$ = lx - l(x+n) is the number of deaths at ages between x and x+n. Using Kajiado district data for illustration;

$_1d_4$ = 100000-93591=6408.

c) ${}_nL_x$ is the person years lived between exact ages x and x+n. It is computed according to the various age groups. Using the district data for illustration;

(i) age group 0-1 i.e. 1L0= 0.5(100000+93591)= 95513.86

(ii) age group 1-4 up to 74.9 it is;

5L1= 2.5*(93591+91276)= 368116.1

(iii) age group 75+ i.e. L75+=36531 log10(36531)=166682

d) For Kajiado district the total person years lived T(x) at age 1 being sum of the persons years lived below age one are 6,038,030.

e) e(x) is life expectancy at exact age x. It is obtained by the formula; e(x)= Tx/lx. For Kajiado district the life expectancy at birth is;

e_0= 6038030/100000= 60.38030. A child born in Kajiado district is therefore expected to live for 60.4 years.

4.1.3 Calculation of reference period

t(x) = a(i) + b(i) (P(1)/P(2)) + c(i) (P(2)/P(3)) (6)

For Kajiado district x= 2;

t(x)= 1.3062+5.5677*0.227953+0.2962*0.598995= 2.752203.

The value 2.752203 is now converted into exact years and months. This shows that it is 2 years and (0.752203*12) months before the survey. This translates to 2 years and 9.026436 months before the survey was carried. This means that the q(x)s' refer to the period September 1976.

step 2: computation of q(x)s' to which the period computed refer:

The first thing done was to obtain an interpolated mortality level for each of the q(x)s' computed earlier in the construction of the life table. The formula is given as;

$$IL = low.lev. + \frac{(upp.lev-low.lev.)(actual\ p(x)-lower\ p(x))}{upper\ p(x)\ -lower\ p(x)}$$

For Kajiado district, x= 2 it is,

$$IL= 19 + \frac{0.928455 - 0.93453}{0.9477 - 93453} = 18.53872$$

The data in the table below is for the whole of Kajiado district.

Table 4.3: Interpolation of mortality levels

x	q(x)	p(x)	lower p(x)	upper level	lower level	inter level
1	0.061463	0.938536	0.93265	0.94343	18	18.54603
2	0.071545	0.928455	0.93453	0.9477	19	18.53872
3	0.078879	0.921120	0.91479	0.93011	18	18.41325
4	0.093575	0.906424	0.90766	0.92454	18	17.92682
5	0.111138	0.888861	0.89916	0.91763	18	17.44239
6	0.131615	0.868384	0.87222	0.89270	17	16.81270
7	0.136093	0.863906	0.86076	0.88278	17	17.14290

Source: Compiled by author based on 1979 population census

For each of the interpolated mortality levels q(x)s' are calculated by interpolation. The formula used is;

$$Inter.p(x) = low.p(x) + \frac{(upp.p(x)-low.p(x))(ave.lev-low.lev)}{(upp.lev. -low. lev.)}$$

For Kajiado district x= 1,

$$inter.\ p(1)= 0.93265 + \frac{0.53872(0.94343-0.93265)}{19-18} = 0.938457$$

To get q(x) the general formula 1-p(x) is used. Therefore;

q(1)= 1-0.93847= 0.061542. This q(1) corresponds to interpolated mortality level 18.53872. The table below shows the q(x)s for interpolated mortality level 18.53872.

Table 4.4: Interpolated q(x)'s for interpolated mortality level 18.53872

x	l(x) lev. 19	l(x) lev. 18	actual l(x)	q(x)
1	0.94343	0.93265	0.938457	0.061542
2	0.93453	0.92058	0.928095	0.071904
3	0.93010	0.91479	0.923037	0.076962
5	0.92454	0.90766	0.916753	0.083246
10	0.91763	0.89916	0.909110	0.090889
15	0.91234	0.89270	0.903280	0.096719
20	0.90395	0.88278	0.894184	0.105815

Source: Compiled by author based on 1979 population census

The interpolated q(x) for each mortality level referring to a particular period or year, helped us to draw mortality trends graphs for each Division in the district. The q(x)s in interpolated mortality level 18.53872 refer to the period 1976.978 or september 1976. Table 4.5 shows q(x)s for Kajiado district and the exact year that they refer to.

Table 4.5: q(x)s' for Kajiado district and period to which they refer

Period	q(1)	q(2)	q(3)	q(5)	q(10)	q(15)	q(20)
1978.557	0.061461	0.071802	0.076850	0.083123	0.090754	0.096575	0.105660
1976.978	0.061542	0.071904	0.076962	0.083246	0.090889	0.096719	0.105815
1974.695	0.073968	0.088068	0.094697	0.102713	0.112170	0.119316	0.130140
1972.059	0.068175	0.080498	0.086393	0.093633	0.102253	0.108798	0.118831
1969.225	0.085181	0.102836	0.110887	0.120352	0.131408	0.139696	0.152014
1966.344	0.080830	0.097074	0.140573	0.113490	0.123931	0.131782	0.143531
1963.494	0.088700	0.107496	0.115993	0.125902	0.137454	0.146096	0.158876

Source: Compiled by author based on 1979 population census

Fig. 2 : MORTALITY TRENDS FOR KAJIADO DISTRICT

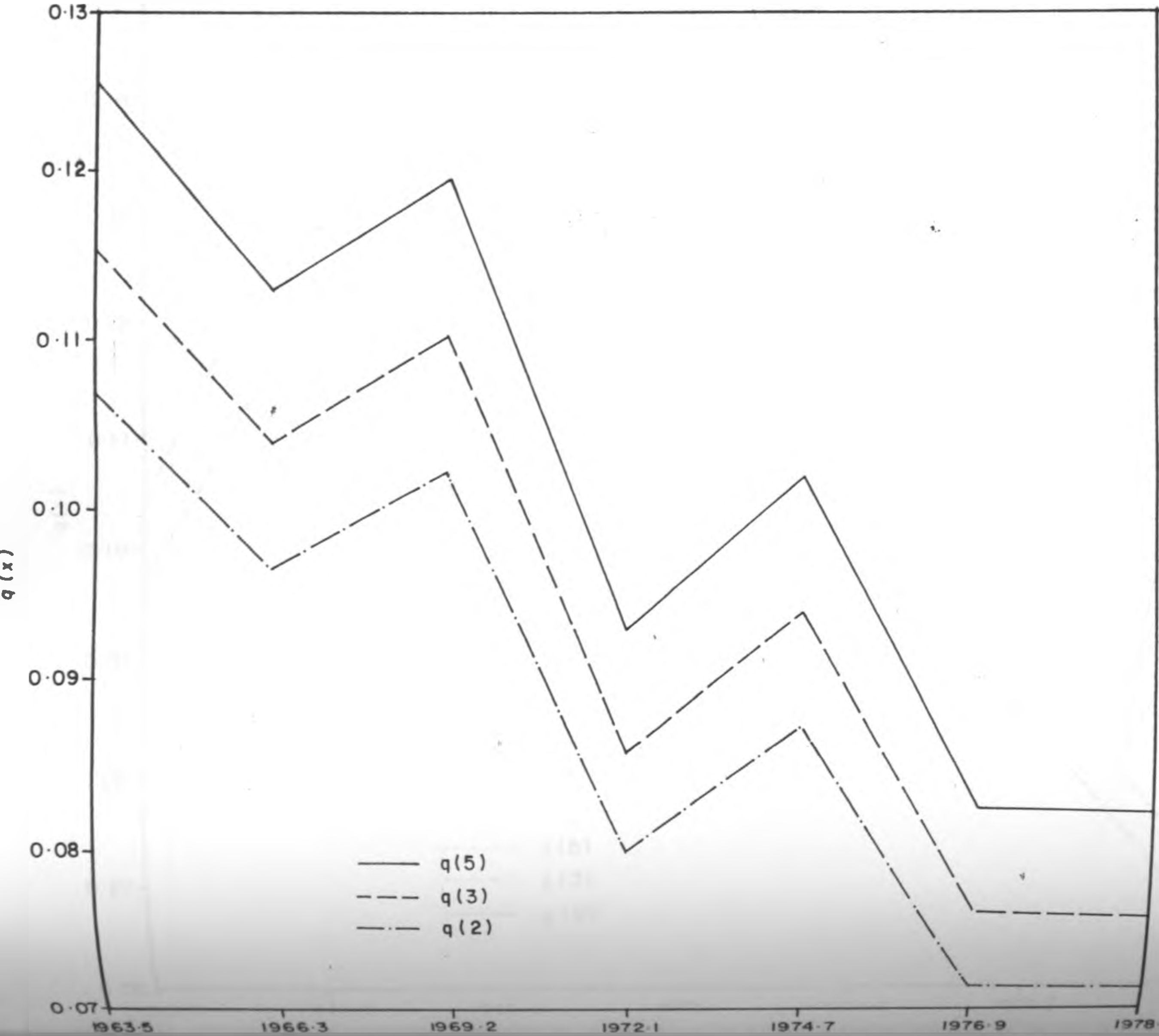


Fig. 3 : MORTALITY TRENDS FOR LOITOKITOK DIVISION

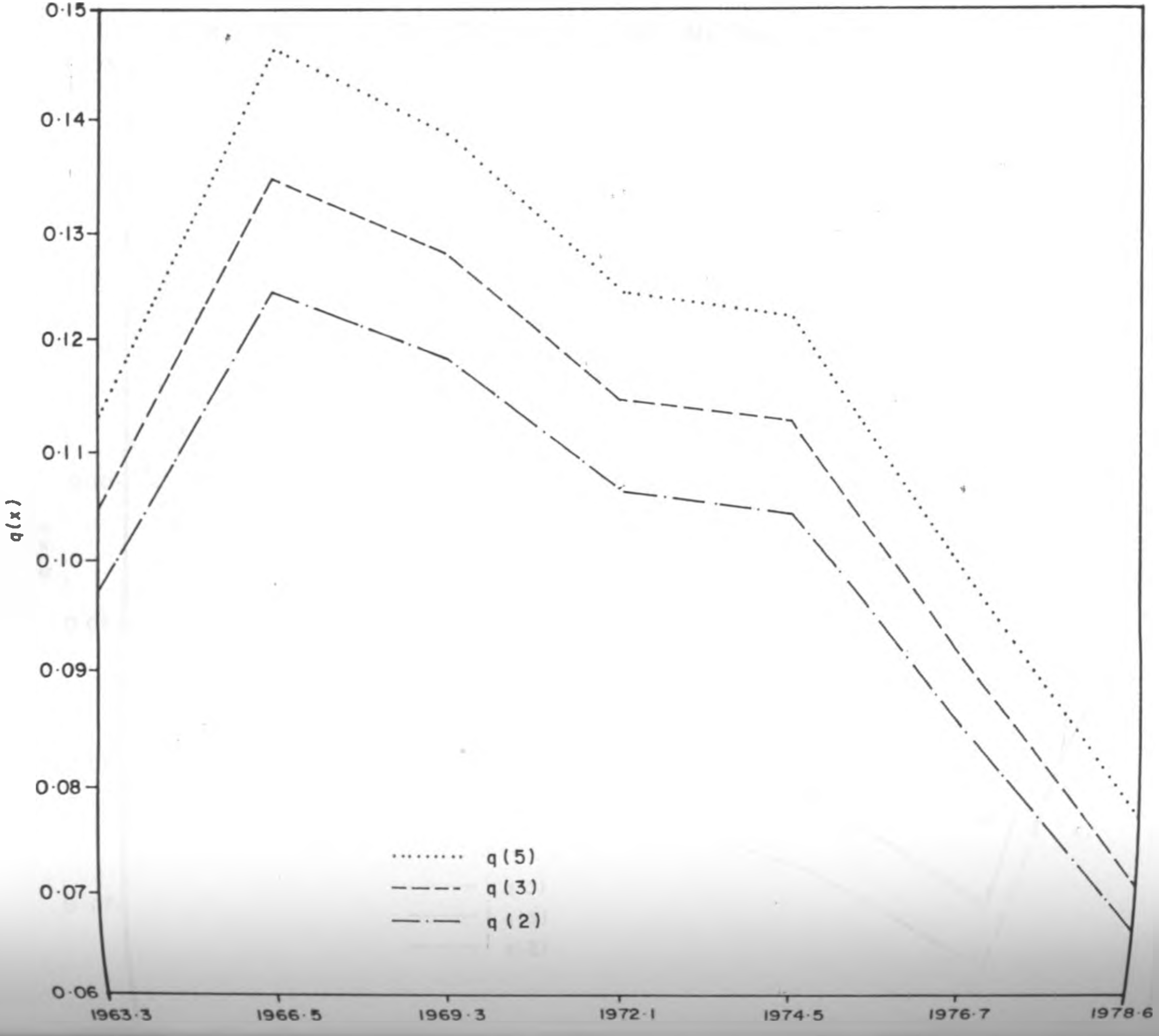


Fig. 4 : MORTALITY TRENDS FOR NGÔNG DIVISION

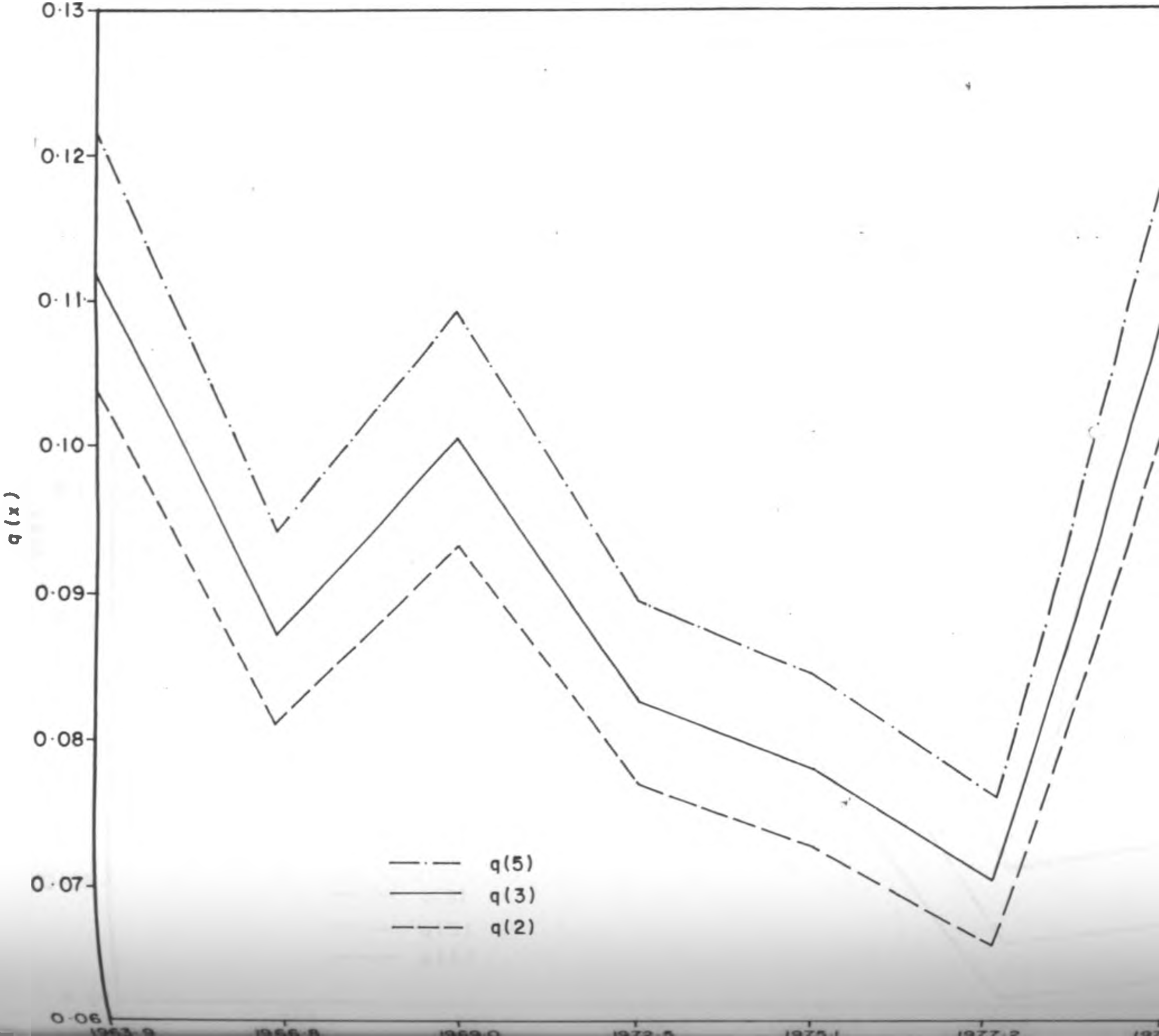
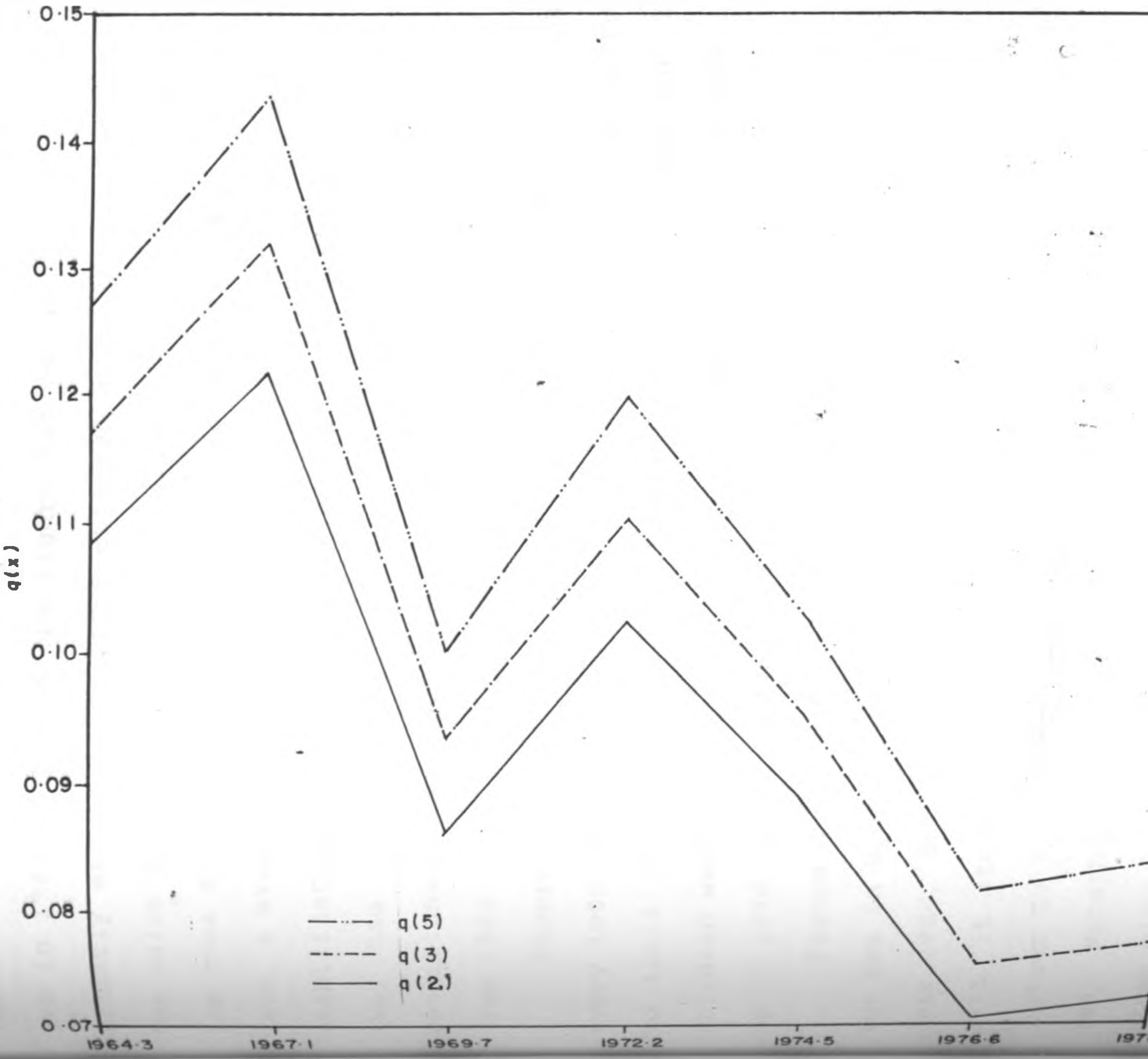


Fig. 5 : MORTALITY TRENDS FOR CENTRAL DIVISION



ality Trends in Kajiado District

e 2 with mortality trends for Kajiado district shows 5 children for every 1000 live births, were dying by age 63. By 1966 the figure had declined to 97.1, but rose and stood at 102.8 children dying by age two in 1969. however fell to 80.5 children deaths at age two in 1972 gain to 88.1 in 1974. Nonetheless, beginning September eady decline began and mortality conditions moved toward ion as the late 1976 value of 71.9 children deaths at age only slightly changed to 71.8 in 1978. Mortality for Kajiado district in general show a fluctuating trend

e 3 shows that, in Loitokitok division 96.5 children for live births were dying by age two in 1963 and increased deaths in 1966. However, from 1969 when the 118.4 ere dying, there is a steady decline which is maintained , when a steep decline is witnessed.

e 4 shows that, in late 1963 104 children were dying by Ngong division. This figure declined to 81.3 deaths in but rose again to 93.6 deaths in 1969. However by stood at 77.5 children deaths, and by 1975 had declined 66.5 children deaths for every 1000 live births at age theless, unlike the other divisions, Ngong experienced a in mortality in 1977 which does not show any indication ng.

Figure 5 with mortality trends for Loitokitok division shows that, her mortality level began rising in 1964 when the q(2) value stood at 108.5 children for every 1000 live births dying by age two. However, after rising to 122 children deaths in 1967, it began to decline sharply and reached 85.9 children deaths in 1969, after which it rose to 102.5 children deaths in 1972. It began to decline sharply and reached a low 70.7 children deaths in 1976. The slight increase to 72.6 children deaths in 1978, indicates however that mortality conditions are stabilizing.

The likely reasons that can explain the emerging trends are however beyond the scope of this study. This is so because to explain the emerging trends, one needs data relating to socio-economic, health, socio-cultural and environmental conditions of the times in question, data that is unavailable to us.

4.2 The Results of Mortality Differentials

The data for all cases shows that, 72 children die by age two per 1000 live births in Kajiado district. Kichamu (1986) using Trussell's North model variants estimated q(2) at 80 whereas Kibet (1981) who used Brass's coefficients found the estimate to be lying between 61-90. Kichamu (1986) estimated child mortality (q(2) value) for the district in 1969 at 82 deaths per 1000 live births. There is therefore a marked decline of about 10 deaths during the inter-censual period which is significant, in the light of the government efforts to reduce mortality.

There exists an intra-district - divisional, variation in child mortality in the district. Loitokitok Division had the highest q(2) value of 84 children dying per 1000 live births whereas Ngong Division with a value of 66 children dying per 1000 live births had the lowest. Central Division had a q(2) value of 70.7.

Life expectancy at birth for the whole district is estimated at 60.4 years whereas its infant mortality rate is estimated at 64. Central Division had a life expectancy of 60.1 while its IMR stood at 66 deaths per 1000 live births. Inter-divisional comparison shows that, Ngong Division had the highest life expectancy at birth of 62.4 years, and the lowest IMR of 55. Loitokitok Division has the lowest life expectancy in the district of 58.4 years and also the highest IMR standing at 74.

4.3 Mortality Differentials by Education Level

The table below shows mortality levels by the education level of the mother in the district. The q(2) values show the number of children dying by age two per 1000 live births.

Table 4.6.0: q(2) values by education level

Edu. level	Kajiado	Loitokitok	Ngong	Central
No Education	17	74	67	70
Pri. Education	73	71	68	79
Sec. Plus	57	89	47	58

Source: Compiled by author based on 1979 population census

Table 4.6.1 shows Infant Mortality Rates (IMR) and Life expectancy at birth (e_0) by education in Kajiado district.

Table 4.6.1: IMR and e_0 by educational level

	No education		Pri. education		Sec. Plus	
	IMR	e_0	IMR	e_0	IMR	e_0
Kajiado	38	66	49	63.8	43	65
Loitokitok	76	57.9	67	59.8	62	57.1
Ngong	47	64.2	49	63.7	34	67.2
Central	66	60	52	63.1	41	65.5

Source: Compiled by author based on 1979 population census

The results in Table 4.6.0 for q(2) by education level do not confirm conclusively the hypothesis that education is negatively associated with mortality

The results for the whole district show that the No Education category has the lowest q(2) values, followed by the Secondary category with the Primary Education category having the highest q(2) value. In Loitokitok Division the secondary plus women have the highest q(2) values, followed by the No education category whereas the primary education category have the lowest.

In Ngong and Central Divisions the women with secondary plus education have the lowest q(2) value. However in the primary education category q(2) values for Central Division are higher than those of No education category, whereas in Ngong Division they are more or less equal.

IMR and e_0 values are however more conclusive, and seem to confirm the negative relationship between education and mortality.

Except for the whole district data where children of women with No education have the highest e_0 and the least IMR, and in Ngong Division where children of primary education level mothers have the lowest life expectancy, in overall increasing education is associated with low mortality, when IMR and e_0 are considered.

4.4 Mortality Differentials by Marital Status

The table below shows q(2) values for the various marital status categories in Kajiado district.

Table 4.6.2: q(2) values by marital status

	Single	Married	Widowed	Divorced/ separated
Kajiado	86	67	66	74
Loitokitok	120	74	69	77
Ngong	52	60	78	95
Central	57	66	61	68

Source: Compiled by author based on 1979 population census

The table below provides IMR and e_0 values by marital status in Kajiado district by divisions.

Table 4.6.3: IMR and e_0 values by marital status

	Single		Married		Widowed		Divorced/Separated	
	IMR	e_0	IMR	e_0	IMR	e_0	IMR	e_0
Kajiado	61	61	62	60.7	75	58.1	64	60.3
Loitokitok	72	58.7	60	61.3	81	56.9	76	57.8
Ngong	41	65.4	53	63	63	60.6	50	63.4
Central	76	57.9	67	59.7	77	57.7	67	59.7

Source: Compiled by author based on 1979 population census

The results on marital status lack a clear pattern. Ngong Division has the lowest q(2) value in the district in the single women category, and Loitokitok the highest. In the married category Ngong has also the lowest q(2) value with Loitokitok the highest again. In the widowed category Central Division has the lowest value whereas Ngong has the highest. In the Divorced/separated category Central has the lowest q(2) value and Loitokitok the highest.

Variation among the various marital status categories has no definite pattern. The results of the district data show that children of single women have the highest q(2) value, followed by those of divorced/separated women then those of the married while of children of widowed mothers have the lowest q(2) value of 66 children dead per 1000 live births. Loitokitok Division follows the same pattern.

In Ngong division children born to single women have the lowest q(2) value, followed by those born to married women. Children born to divorced/separated women have the highest mortality level. In Central division children born to single women, have the lowest mortality level followed by those born to widowed women then those of married women, with children born to women in the divorced/separated category having the highest level.

Table 4.6.3 on IMR and e_0 values shows that children born to single women in Ngong division have low IMR and hence high e_0 in the whole district. In this category however Central has the highest IMR and e_0 values. Children born to married women in Ngong division again have the highest e_0 and lowest IMR. Central Division has the highest IMR and lowest e_0 in this category. Children of women in the widowed category in Loitokitok have the highest IMR and lowest e_0, whereas those of women in this category in Ngong have the lowest IMR and highest e_0 for the whole district. This however is a general reflection of higher life expectancy in Ngong and not an indication of higher survival among the children of women in this category. In the divorced/separated category Ngong has the lowest IMR and highest e_0 whereas Loitokitok has the highest IMR and lowest e_0.

There is lack of a clear pattern in IMR and e_0 values, just as in the q(2) values. The results for the whole district show that children of single mothers have the lowest IMR and highest e_0, followed by those of the married then those of the divorced/separated, whereas those of the widowed have the highest IMR and lowest e_0. In Loitokitok division children of widowed mothers have the highest IMR and lowest e_0, followed by those of the divorced/separated, whereas those of the married have the lowest IMR and highest e_0. In Ngong division children of single mothers have the lowest IMR and highest e_0, followed by the divorced/separated, whereas those of the widowed have the highest IMR and lowest e_0. In Central division children of widowed mothers have the highest IMR and lowest e_0 followed by those of the single whereas the children of divorced/separated and the married have the same IMR and e_0 values.

4.5 Mortality Differentials by Place of Residence

Table 4.6.4 provides a summary of results of q(2) values by place of residence in Kajiado district.

Table 4.6.4: q(2) values by place of residence

Place	Urban	Rural
Kajiado	92	72
Loitokitok	84	84
Ngong	101	86
Central	91	68

Source: Compiled by author based on 1979 population census

The table below provides summarized results of IMR and e_0 values in Kajiado district by place of residence,

Table 4.6.5: IMR and e_0 values by place of residence

	Urban		Rural	
	IMR	e_0	IMR	e_0
Kajiado	73	58.4	64	60.4
Loitokitok	67	59.7	51	63.2
Ngong	58	61.7	55	62.4
Central	77	57.7	64	60.4

Source: Compiled by author based on 1979 population census

In all the divisions rural areas have lower q(2) values than the urban areas. Ngong division has the highest mortality level in the urban category and Loitokitok the lowest. In the rural category Central division has the lowest mortality level whereas Ngong has the highest.

The results show that rural areas have lower IMR and hence higher e_0 than the urban areas. Central division emerges as an area of high mortality and Ngong as in the other mortality differentials, is an area of low mortality. However, there is little difference between rural and urban areas in terms of life expectancy at birth, indicating therefore that, generally the area has a low mortality level.

4.6 Discussion Of The Results

The results derived from the 1979 census data show that, Kajiado district has relatively low child mortality compared to other districts in Rift Valley province and others in the country. In spite of this low mortality level intra-district variation - divisional, in child mortality exists. The 1979 population census results have shown that Ngong Division has the lowest child mortality followed by Central Division with Loitokitok having the highest. This variation can be explained by the regional variation in socio-economic development among other factors. Ngong and Loitokitok Divisions are the only areas with land suitable for agricultural production. Between them they share the only 7 per cent agricultural potential land of the district.

Nonetheless, whereas Ngong had the lowest child mortality level Loitokitok had the highest. In the latter division this can be attributed to more emphasis on cash crops-cotton and coffee-production, at the expense of food production. Studies done in other parts of the country have shown that areas where more emphasis has been placed on the production of cash crops than food crops, mortality has tended to be higher (Owino, 1988; Munala, 1988; Omurundo, 1990 & Odhiambo, 1991). Owino and Odhiambo found that areas surrounding Awendo-Sony sugar belt in South Nyanza and Kisii districts, had higher mortality levels than areas with no over-emphasis on cash crop production. Munala (1988) and Omurundo (1990) found the same to be true in Mumias sugar belt of Kakamega district. However for the case of Loitokitok although there is no heavy production of cash crops as the land is limited, it appears that the little that is there is more under cash crops than food crops.

Economic activities that provide employment are unequally distributed in the district. Central division is home to the famous Magadi soda company and also Athi Portland cement company. The surrounding areas' population could be benefitting from employment in these companies by raising their standard of living, hence increasing their chances of survival. Ngong division is also adjacent to Nairobi which ensures that it shares in the city's socio-economic development hence its lower mortality level.

Another possible explanation for the intra-district variation in mortality levels is, the distribution and utilization of health facilities. Central has the highest number of hospitals and dispensaries. It has one district hospital and one private hospital (at Magadi soda company). Ngong and Loitokitok divisions have the same number of health facilities. Although Loitokitok has a sub-district hospital, it could not be meeting the demands of the sparsely distributed population a large part of whom live far away from the hospital, hence its' high mortality. Ngong division's low mortality in relation to its number of health facilities can be explained by the utilization levels. Table 2.7 below shows the level of utilization of health facilities in the divisions of the district.

Table 4.7: Utilization of health facilities in Kajiado district

	Under utilized	Fairly utilized	Over utilized	Total
Ngong	4 (50%)	3 (31.5%)	1 (12%)	8
Central	8 (44.4%)	6 (33.3%)	2 (22.2%)	18
Loitokitok	5 (62.5%)	3 (37.5%)		8

Source: District Development Plan 1984-1988

In relative terms as Table 4.7 shows, Central and Loitokitok divisions have the highest level of under-utilization of facilities whereas Ngong has the lowest. The low utilization of facilities in these areas however is attributed to sparse distribution of the population, and poor communication between the population settlements and health facilities. In these areas, the provision of mobile health services, has contributed greatly toward meeting the health needs of the population in the past, but they are now hampered by limited financial allocations. Another factor responsible for poor utilization of health facilities especially in Central and Loitokitok Divisions is, poor understanding among the population of the need for better standards of hygiene for both the person and the immediate environment, such as the migratory life style of the pastoralists, poor accessibility to clean water and nearest health facility, considering the vastness of the district and sparse population.

According to the District development plan of the 1989/93 plan period only 35 percent of households have access to safe water, 25 percent have safe latrines and actually use them, 18 percent of the community is served by a waterborne sanitation and 35 percent have adequate health housing. These could also be unequally distributed leading to variation in mortality levels.

According to a 1986 socio-cultural study of the district, poor housing and the condition of the immediate ''boma'' contributes to poor health conditions among the pastoralists. This is so because poor ventilation and unclean surroundings encouraged pests that spread such diseases as trachoma. Other available health statistics for 1987 show that 73 percent of the deliveries in the district took place at home and that only 53 percent of the women received tetanus toxoid immunization during their pregnancy. This means that most of the births occur in poor conditions which are conducive to fatalistic diseases among infants especially tetanus. This could be the reason for high mortality in Central and Loitokitok Divisions whose, populations have remained largely pastoral.

The marital status child mortality variation in the district, is inconsistent with findings in other areas of the country, where mortality differentials studies have been undertaken. The low mortality among children of widowed women in Kajiado district, unlike other areas in the country, could be due to strong communal support systems for the widowed especially in Loitokitok and Central Divisions. In Ngong the high mortality among children of the widowed could be due to, breakdown in traditional support systems as modernization sets in. IMR and e_0 values show that children born to widowed women, generally have high mortality and lower life expectancy at birth. This underscores the important role played by the male parent in, providing for the family at these early days of childhood, before the societal support begins (when the child is slightly bigger). Until then it may be assumed that, the baby can live out of the mother. The low mortality levels among children of single and divorced or separated women in Ngong division can be attributed to economic independence of these women as a result of education unlike in the remote divisions of the district where, education levels among women are likely to be lower. Again in these areas, strong cultural practices highly prohibit single motherhood and divorcees. Such women are viewed as deviants and social outcasts and hence may not get societal support for their children.

The place of residence differential is also inconsistent with the country's general trend, and also with studies in other developing countries. In all divisions of the district rural areas emerge as low mortality zones when q(2) values are considered, as compared to urban areas. In this differential Ngong emerges as an area of high mortality in spite of its proximity to Nairobi which as Kichamu (1986) opined was responsible for the district's low level of mortality as the district's population is able to share in the city's socio-economic development. For Ngong division high population density in her rural areas as compared to other areas of the district could be the reason for its higher mortality in this category. Again Ngong division has a relatively larger urban population as compared to other divisions which given the poor health and other basic infrastructure, could be the reason for higher mortality in its urban areas. Again this higher mortality in the urban areas could be a reflection of higher incidence of reporting on children dead among the urban population than in rural areas, where culture prohibits any talk on the dead. The low infant mortality rate and higher life expectancy, unlike the q(2) values in Ngong division as compared to other divisions, in general shows that, most deaths at age two are a result of poor environmental conditions reflected in the absence of clean and safe drinking water, congested living quarters and poor sanitation. These take advantage of the children's weakened bodies as this is a period that most of them are completing the weaning process. In general however, the high mortality in urban areas could be a reflection of poor distribution of health facilities, poor sanitation, and also that, rural areas could be enjoying a better provision of food supplies and better living conditions than urban areas.

The education mortality differential has confirmed that, high education is associated with low mortality. In relative terms, the secondary level education women have the highest life expectancy and the lowest child mortality levels. However, in most cases there seems not to be much difference between the primary education and No education categories. This could be possibly a reflection of higher reporting of dead children among the primary education women, and poor reporting among the no education category who could still be tied to traditional norms that prohibit any talk about the dead. This could be the case in Loitokitok division where the no education category registered a lower mortality level compared to the secondary plus category. It is therefore erroneous data that can be blamed and not anything to do with education, in this isolated cases of inconsistent results.

4.7 Summary and Conclusion

In this chapter we set out to estimate infant and child mortality for Kajiado district by divisions and differentials by education, marital status and place of residence. We utilized the Trussell's west model coefficients in the computation of the estimates. The overall child mortality level, q(2) for Kajiado district is 72 children dead per 1000 live births by age 2. Loitokitok division has the highest (84) followed by Central (71), with Ngong having the lowest mortality level (66).

The findings on marital status as far as q(2) values are concerned, differ with the country's general pattern, evidenced in studies done in other parts of the country. Children born to widowed women were found to have the lowest mortality in the district. In Ngong division children born to single women had the highest life expectancy and also a very low mortality level, perhaps a reflection of economic independence among these women. The life expectancy for children born to single women in Ngong was the highest in any marital status category in the district i.e. 65.4 years followed by those born to divorced/separated with a life expectancy of 63.4 and then those of the married women in the same division, who had a life expectancy of 63 years. Children born to widowed women in Ngong again lead among the divisions with a life expectancy of 60.6 years. This is a reflection of a low mortality level in the division.

The place of residence mortality differentials findings show that unlike the country's general trend, rural areas in Kajiado district enjoy lower mortality levels and higher life expectancies than the urban areas, although the difference between them is not large. The high mortality among the urban population reflects a higher reporting on the children dead in the population than in rural areas.

Children of women with secondary plus education in most parts of the district, have the highest life expectancy. For instance in Ngong division they had 67.2 years of life expectancy, in Central 65.5 and in Loitokitok 61.2 years. Except for the district results generally high education leads to high life expectancy.

Graphical analysis of q(2) values has shown that, Kajiado district as a whole has experienced a decline in mortality. Loitokitok and Central divisions have also experienced a decline in mortality levels and this continues well after 1978. However, Ngong's division mortality level continues to rise even after 1977.

CHAPTER FIVE

DETERMINANTS OF CHILD SURVIVAL IN UPPER MATASIA SUB-LOCATION

5.0 Introduction

This chapter presents the results of cross-tabulation and multiple regression analysis. In the cross-tabulation analysis, environmental, socio-economic, socio-cultural and health factors are cross-tabulated with mortality index of the mother. The number of children dead per woman in each category of the factors is derived and comparison made between them. The nature of the relationship between mortality index and the independent factors is determined by the derived Chi-square. In this study the Chi-square is tested at 0.05 level of significance to show the strength of relationship between the various independent variables and mortality index. If the calculated value exceeds the table value, this will indicate an independent relationship i.e. in statistical sense, an independent relationship means no significant relationship. This means no statistically significant relationship. On the other hand, a calculated value which is lower than the table value will indicate a dependent relationship.

In multiple regression analysis, only factors found to be closely associated with the number of children dead per woman in the cross-tabulation analysis are, included in the analysis.

5.1 The Results of Cross-tabulation and Chi-square Analysis

In this section we present the results of cross-tabulation and Chi-square analysis. The various independent variables are cross-tabulated with mortality index and the nature of the relationship established through the derived Chi-square.

5.2 Health Determinants of Child Survival

The health variables considered in the analysis are: Attendance of ante-natal clinic, Period of attendance, Place of delivery, type of attendant at birth, Immunization and Treatment of cord.

a) Attendance of ante-natal clinic and mortality index

Table 5.2.0 below shows the mortality index by attendance of ante-natal clinic. 90 per cent of the women reported that they had attended an ante-natal clinic during their last pregnancy whereas 10 percent said they had not.

Table 5.2.0: Mortality index by attendance of ante-natal clinic

*C.D	Attended	Never Attended	Total women
0	140	11	150
1	108	11	119
2	19	5	24
3	3	3	6
Mort. index	1.29	1.61	
	270	30	300

Source: Compiled by author based on field survey (1993)

*C.D : Children dead

The results show that children of women who did not attend an ante-natal clinic during pregnancy, had a higher mortality index than those of mothers who attended an ante-natal clinic.

The observed significance level, in the test of the relationship between attendance of ante-natal clinic and number of children dead is 0.0017. At 0.05 significance level of test the number of children is very closely related with attendance of ante-natal clinic by woman during pregnancy. The results underscore the importance of ante-natal care in determining the survival of the child to be born, after birth. Mothers who attended an ante-natal clinic must have been immunized against certain child killer diseases like polio and tetanus and also taught on good pregnancy care, balanced diet, personal hygiene and good child care, factors that are crucial to survival of the child, especially during the early days of life of the baby.

b) Period of attendance of ante-natal clinic and mortality index

Table 5.2.1 below gives the results on the period that a woman first visited the ante-natal clinic and mortality index.
The results show that, women who attended an ante-natal clinic during pregnancy throughout the pregnancy period, had the lowest mortality index. There is however no difference between those women who attended the ante-natal clinic for the first time between the first and third month of the pregnancy, and those who attended the clinic between the seventh and ninth month of their pregnancy. Those attending the clinic for the first time between the fourth

and sixth month of the pregnancy, had also a relatively lower mortality index than those attending in these months. In general, the results show that children of women who attended an ante-natal clinic throughout the pregnancy period, have a higher probability of survival than those who attended the clinic for the first time, in between the various periods of pregnancy.

The observed significance level in the test of relationship between period of attendance of clinic and children dead is 0.1423. At 0.05 significance level of test the null hypothesis is accepted indicating that, the number of children dead does not depend on the period the mother attended the ante-natal clinic during the pregnancy. The results of the cross-tabulation however, underscore the importance of pregnancy care on child survival.

Table 5.2.1: Mortality index by period of attendance of ante-natal clinic

C.D	Throughout	1-3 months	4-6 months	7-9 months	Total women
0	5	26	78	32	141
1	3	18	61	27	109
2	1	3	12	4	20
3	0	0	3	0	3
Mort. index	0.76	1.39	1.25	1.39	
Total women	9	47	154	63	* 273

Source: Compiled by author based on field survey (1993)

* 27 women did not report on whether they attended ante-natal clinic or not.

c) Place of delivery and mortality index

Table 5.2.2 shows mortality index by place of delivery of the child. 53.3 per cent of the women reported that they delivered their baby in hospital, 29.7 said they delivered at home whereas 8.7 per cent reported for delivery at a dispensary. 8.3 per cent i.e. 30 of the women never indicated where they delivered their baby.

Table 5.2.2: Mortality index by place of delivery

C.D	Hospital	Home	Dispensary	Total women
0	93	24	8	125
1	53	51	12	116
2	8	9	6	23
3	1	5	0	6
Mort. index	1.13	1.69	1.68	
Total	155	89	26	270

Source: Compiled by author based on field survey (1993)

The results show that, women who delivered in hospital have the lowest mortality index whereas those who delivered at home had the highest. Nonetheless, there is not much difference between the mortality index for women who delivered at home and those who delivered in a dispensary. This can possibly be due to lack of properly trained personnel in the dispensaries who may not be in a good position to handle emergency deliveries especially when this is coupled with lack of proper facilities for delivery. The low mortality index among women who delivered in hospital is associated with cleaner delivery environment, better and qualified delivery personnel and also facilities, which are largely lacking at home and dispensaries.

The observed significance level in the test of relationship between place of delivery, and number of children dead of 0.0014 is smaller than the significance level of test of 0.05. This shows that there is a very close association between number of children dead and place of delivery.

d) Type of attendant at birth and mortality index

Table 5.2.3 shows mortality index by type of attendant at birth for those deliveries that occurred at home.

Table 5.2.3: Type of attendant at birth and mortality index

C.D	TBA	Grand-mother	Husba-nd	Friend	Sister	Alone	Total women
0	7	12	1	2	0	4	26
1	21	16	2	2	4	7	52
2	3	3	0	0	1	2	9
3	1	1	1	0	1	1	5
Mort. index	1.13	1.60	2.80	2.57	1.83	1.83	
Total	32	32	4	4	6	14	92

Source: Compiled by author based on field survey (1993)

The results show that women who were helped to deliver by their husbands had the highest mortality index - 2.80 followed by those who were helped by friends with a mortality index of 2.57. Those who were helped to deliver by a TBA had the lowest mortality index of 1.13. Most of the TBAs have been trained to handle deliveries at home and they can maintain a standard of cleanliness in the deliveries that can ensure that the child is not disadvantaged in survival terms at birth. Those who were helped by their sisters to deliver had an equal mortality index as those who were not helped by anybody (delivered alone).

In general the results show the importance of delivering at a health centre under the care of a qualified person and in contamination free environment. Since most of the births at home occur under unqualified personnel and in environments that are likely to be conducive to disease carrying organisms, the mortality index for all the categories in this variable is high.

Traditional birth attendants are likely to be trained and hence in comparison with other categories, more able to deliver the child in a relatively cleaner environment and also more able to handle any emergencies associated with births. This confirms the Misra et. al. (1983) argument that if traditional birth attendants are provided with some gloves and disinfectants they can be able to prevent most of the deaths as a result of neo-natal tetanus and in the process increase child survival.

The observed significance level in the cross-tabulation of number of children dead by type of attendant at birth is 0.0016. At 0.05 significance level of test the number of children dead is dependent on attendant at birth.

e) Treatment of cord and mortality index.

Table 5.2.4 shows results relating to how the umbilical cord wound was treated after severing the cord from the baby.

Table 5.2 4: Mortality index by treatment of umbilical cord wound

C.D	Spirit	Soil	Nothing	Total women
0	7	3	16	26
1	17	5	30	52
2	2	1	6	9
3	1	0	4	5
Mort. index	1.67	4.92	1.54	
Total women	27	9	56	92

Source: Compiled by author based on field survey (1993)

The results show that women who put soil on the wound of the umbilical cord had the highest mortality index in comparison with those who did nothing who had the lowest mortality index of 1.54. Those who put spirit registered a mortality index of 1.67.

The high mortality index registered by women who put soil after severing the cord is possibly due to the likelihood that soil may contain disease causing organisms, some of which may cause neo-natal tetanus a major contributor to early childhood deaths.

In the cross-tabulation of treatment of cord and number of dead children a significance level of 0.0028 was observed. Therefore at 0.05 significance level of test the number of dead children is dependent on the manner in which the umbilical cord is treated.

f) **Immunization status and mortality index**

The results in table 5.2.5 show mortality index by the immunization status of the child.

Table 5.2.5: Immunization status of children and mortality index

C.D	Never completed	Yet to complete	Complete	Not immunized	Total women
0	1	22	122	6	151
1	5	9	96	9	119
2	1	2	16	5	24
3	0		3	3	6
Mort. index	2.69	1.00	1.26	1.97	
Total women	7	33	237	23	300

Source: Compiled by author based on field survey (1993)

The results indicate that women who took their children for immunization but never completed the schedule had the highest mortality than those who never took their children for immunization. Since the body was not properly or totally protected against childhood diseases it could not withstand later attacks of the diseases against which the immunization had been meant for. Again the diseases may have developed resistance to the immunization drugs due to the non-completion of the dose.

Nonetheless, women who had never taken their children for immunization had relatively a higher mortality index than those whose children are yet to complete immunization and those who have completed. The observed significance level is 0.0003. At significance level of test 0.05 this implies there is a very close dependent relationship between number of children dead and immunization. The number of children dead therefore depends on whether a woman took her child for immunization and completed the schedule, began immunization but never completed, yet to complete schedule or has never taken her child for immunization. These results underscore the importance of immunization in preventing major child killer diseases, and ensuring that the child survives this most vulnerable years of infancy.

5.3 Socio-cultural Determinants of Child Survival

a) Tribe of mother and mortality index

Four tribes were found to be living in the sub-location. The Kikuyu comprised 74.7 per cent of the sample population, the Maasai 18.7 per cent, the Luo 2.7 per cent and the Kamba four per cent. This attests to the high rate of in-migration to the area that continues to see a reduction in the proportion of the indigenous people - the Maasai.

Table 5.3.0 below shows the mortality index -the number of dead children per woman, for each of the tribes above.

The Kikuyu have the lowest mortality index followed by the Maasai, then the Luo and then the Kamba. Most studies have shown that people who migrate from areas of high or low mortality tend to portray the same mortality levels in their areas of destination (Nyamwange, 1982). The Luo and the Kamba come from areas that have been identified as relatively high mortality zones and this can explain why they have high mortality. The Kikuyu who are the other migrants on the other hand come from areas of low mortality hence their low mortality in the sub-location.

Table 5.3.0: Mortality Index by mother's Tribe

CD	Kikuyu	Maasai	Kamba	Luo	Total Women
0	121	24	2	4	151
1	81	24	4	10	119
2	18	6	0	0	24
3	4	2	0	0	6
Mort. index	1.13	1.47	2.15	3.66	
Total	224	56	6	14	300

Source: Compiled by author based on field survey (1993)

Nonetheless mere membership in a tribe with low or high mortality does not mean that one will show the same level automatically; rather it is the practice or non-practice of traditions related to child care, nutrition and other intermediate factors that play a more crucial role. The observed Chi-Square significance level which is 0.1220, in the cross-tabulation between tribe and number of children dead is greater than significance level of the test and therefore, the number of children dead is not dependent on the tribe of the mother. As we have seen in the literature review, membership in a certain tribe will only affect mortality if the tribe upholds certain life endangering practices. These are reflected in the manner of treatment of children especially sex preferential treatment in feeding and seeking medical attention for children among others. If these are absent there may be no differences in mortality levels between tribes.

b) Marital status and mortality index.

Table 5.3.1 shows mortality index by the various marital groups.

Table 5.3.1: Marital status and mortality index

C.D	Married	Single	Divorced/ Separated	Widowed	Total Women
0	106	34	6	5	151
1	84	21	5	9	119
2	19	2	2	1	24
3	5	1	0	0	6
Mort. index	1.19	1.93	1.47	0.68	
Total women	214	58	13	15	300

Source: Compiled by author based on field survey (1993)

The widowed had the lowest mortality index while the single had highest. Unlike in the census data where higher mortality in the division was reported among the widowed, these results show that children of the widowed have a higher survival rate. This can be explained by the area's high socio-economic status in that, even in the absence of a male parent the children can continue to lead a relatively better life than in other areas where, the father's income has been found to be crucial to child survival. The high mortality index among the single women can be explained by their relatively younger ages, which means inexperience in child care and also poor economic status, as most could be school dropouts as a result of pregnancy, hence unable to secure better jobs. Most end up doing jobs like housekeeping or farmhand that cannot allow them time to take care of their children, in particular breast-feeding. The income from these kind of jobs cannot also enable them to afford a balanced diet for their children, and provide them with other necessities especially health.

The observed significance of 0.6570 is more than the significance level of the test and hence at 0.05 level of significance, the hypothesis that the two variables are independent is accepted. This is to say that a child does not die just because its mother is married, single, divorced/separated or widowed.

c) **Age at first marriage and mortality index.**

The table below provides the mortality index by the various ages at first marriage.

The results clearly show the adverse effects of early and late marriages. This as we have noted can be dictated by socio-cultural, demographic, socio-economic or biological factors. These notwithstanding, women who marry late -after age 35 have the highest mortality index of 1.96 followed by women marrying at ages between 15 and 24 whereas those who marry in the middle ages 24-34 have the lowest mortality index of 0.73. For the young ages it means the pelvic bones are not developed enough to withstand the demands of birth whereas for the older women the bones have become too constricted for a normal delivery to occur. This results not only in child's death but at times the mother's also. Young women are also likely to be inexperienced in matters relating to child care. The observed significance level is 0.6059. Thus age at first marriage does not significantly affect child survival.

Table 5.3.2: Age at first marriage and mortality index

C.D	15-24	25-34	35+	Total women
0	97	11	9	117
1	62	20	16	98
2	19	1	2	22
3	3	1	1	5
Mortality index	1.21	0.73	1.96	
Total women	179	34	28	242

Source: Compiled by author based on field survey (1993)

d) **Type of marriage and mortality index**

Two types of marriages were identified in the study - monogamy and polygyny. Table 5.3.3 shows the number of dead children per woman by marriage type.

Table 5.3.3: Type of Marriage and Mortality Index

C.D	Monogamy	Polygyny	Total women
0	96	10	106
1	56	28	84
2	14	5	19
3	4	1	5
Mort.index	1.13	1.50	
Total women	170	40	214

Source: Compiled by author based on field survey (1993)

Children of polygynous marriages have a lower survival rate as indicated by the high mortality index of 1.50 whereas those of monogamous marriages with a mortality index of 1.13, have higher survival.

The observed significance level in the cross-tabulation between type of marriage and number of children dead is 0.0972. Therefore at 0.05 level of significance of the test, the number of children dead per woman does not depend on the type of marriage.

However, belonging to a certain marriage type does not automatically lead to death just because that marriage type is associated with higher deaths.

According to Mott (1982), children in polygamous unions are likely to receive less attention from their parents, as the children in the homestead are many and their mothers are likely to be disadvantaged socially and economically. Ocholla-Ayayo and Muganzi (1986) have stated that these women are likely to be of lower educational attainment or they may be divorcees or widows who have remarried. Again polygamy may be associated with cultural quest for more children. According to studies done, since high fertility means shorter birth intervals mortality is likely to be higher. These results have confirmed the results of other studies (Ocholla-Ayayo, 1991; Mott, 1982) among others, that children of polygamous marriages have higher mortality than those of monogamous marriages.

e) Mortality index and religion

Table 5.3.4 below shows the mortality index by religious group.

3.4: Mother's religion and mortality index

	Catholic	Protestant	No Religion	Total women
	46	101	4	151
	34	82	3	119
	9	14	1	24
	1	5	0	6
ty	1.21	1.30	2.95	
	90	202	8	300

Compiled by author based on field survey (1993)

catholic and protestant have lower mortality index in on to women who do not belong to any religion who have a index of 2.95. The lowest mortality index however is e catholics. Odhiambo (1991) has also found that in sub-location of Kisii district, the catholics had a lower index than women not belonging to any religion.

he test of relationship between religious group and number ren per woman the observed significance is 0.9343. at 0.05 significance level of test the number of children a very high level of independence with religious group. does not however die because its mother belongs to a eligion but rather, it is what the religion has to do with re and nutrition that is perhaps more important in ng this.

-feeding and mortality index

e 5.3.5 reports on the mortality index and breast-feeding ther a woman breast-fed her child or not.

.5: Mortality index and breast-feeding

	Never Breast-fed	Breast-fed	Total women
0	12	139	151
1	11	108	119
2	2	22	24
3	0	6	6
dex	2.44	1.25	
men	25	275	300

Compiled by author based on field survey (1993)

results show that women who never breast-feed have a rtality index, than those who breast-feed. Nevertheless, r of women who breast-feed is very high i.e. 91.7 per cent ed to 8.3 per cent of those who did not breast-feed, of .e. These results hence underscore the importance of eding in lowering children deaths as documented by various mong them those by Gray (1981), Cunningham (1981) and and Jelliffe (1978), as quoted by Mosley and Chen (1984). observed significance level in the cross-tabulation of eding and number of children dead is 0.2234. This shows .05 significance level of test the number of children dead ndent of breast-feeding.

of breast-feeding and Mortality index

table below shows the length of breast-feeding and the children dead for various breast-feeding durations.

.6: Length of Breast-feeding and Mortality index

	1-12 months	13-24 months	25-36 months	37+ months	Total women
	27	70	28	26	151
	27	61	22	9	119
	5	11	4	4	24
	1	4	1	0	6
	1.61	1.33	0.99	1.29	
	60	146	55	39	300

Compiled by author based on field survey (1993)

results show that increasing length of breast-feeding is to lower mortality index. Women breast-feeding for a period of i.e. between 1 and 12 months have the highest index of 1.61 whereas those breast-feeding for a ly longer period i.e. 25 and 36 months have the lowest index of 0.99.

results concur with the contention of Sandra Huffman and Lamphere (1983), as quoted by Mosley and Chen (1984), that it is often assumed that breast-feeding affects only urvival its effects as manifested in birth spacing, child frequency and severity of infections and maternal bonding e child's health beyond the first year of life. This means east-feeding for longer periods up to 36 months increase ival chances of the children.

observed significance level in the cross-tabulation of breast-feeding and children dead is 0.5923. This value han the significance level of the test of 0.05 and hence r of children dead per woman is independent of breast- Nonetheless, other factors associated with length of eding such as age at supplementation, and the type of tary food may affect the relationship between it and .

supplementation and mortality index

e 5.3.7 shows women's mortality index by age at tation.

.7: Age at supplementation and mortality index

	1-4 months	5-8 months	9-12 months	13+ months	Total women
	105	20	4	22	151
	92	21	2	4	119
	21	2	0	1	24
	4	2	0	0	6
y	1.34	1.55	0.56	0.93	
	222	45	6	27	300

ompiled by author based on field survey (1993)

results show that women who introduce supplementary foods children at a relatively early age have a higher mortality han those who do so later. Women who introduce tary feeding to their children when the children are 5-8 months have the highest mortality index followed by o introduce supplementary foods to their babies when they d between 1-4 months. The lowest mortality index was ed among women who introduced supplementary feeding to ildren when they were aged between 9-12 months.

se introducing supplementary feeding to their children when re aged 13 months and over, had also a relatively lower y index i.e. 0.93. Early supplementation feeding to the hich is not coupled with good feeding leads to higher y. The child may be fed on poorly cooked food or nated food that increases the probability of infection with fatal diseases (Barbara and Sandra, 1983).

e observed significance level in the test of relationship age at supplementation and children dead was 0.0833. At gnificance level of test the number of children dead is re almost dependent on age at supplementation.

io-economic Determinants of Child Survival

ly one socio-economic variable - education of the mother, sidered in the analysis.

ble 5.4.0 below shows the mortality index by the various on levels of the mothers. The results show that increasing f education is negatively related with mortality i.e. with ing level of education the mortality index decreases.

4.0: Education and mortality index

	None	Primary	Secondary	College/ University	Total women
	15	75	45	16	151
	32	63	24	0	119
	11	8	4	1	24
	5	1	0	0	6
ty	1.46	1.44	1.14	0.46	
	63	147	73	17	300

Compiled by author based on field survey (1993)

highest mortality index is among women with no education those with college or university education have the lowest y index. The almost equal mortality index among women with tion and those with primary education is, possibly due to that, the latter have not abandoned traditional child care s that may be detrimental to child survival.

observed significance level of test in the crosstabulation education and number of children dead is 0.0012. These concur with studies done in Kenya and other developing s on the relationship between education and mortality, that n in particular mother's education is a crucial factor in th of the child and hence childhood mortality (Mott, 1982; , 1983; Timaeus, 1984; Mahadevan et. al., 1986;) among

onmental Determinants of Child Curvival

ronmental factors considered in the analysis are: used to make the house's wall, roof and floor; type of cility, source of water during dry and wet seasons and of water before use.

s wall material and mortality index

e 5.5.0 shows mortality index by the type of material used ucting the wall of the house.

.0: House's wall material and mortality index

ud stick ith roken alls	Mud Stick with smooth walls	Stoned	iron sheets	Timber	cow-dung with broke walls
31	4	29	30	56	1
26	3	16	30	39	5
3	1	3	4	11	2
3	0	0	1	2	0
1.39	1.85	1.16	1.65	0.95	3.64
63	8	48	65	108	8

ompiled by author based on field survey (1993)

results show that, children of women living in houses with nd stones as the wall material, had relatively lower index than those living in houses with either cow-dung ks, mud and stick with smooth walls or corrugated iron The highest mortality however is among the children of ving in cow-dung with stick and broken walls. These confirm Chowdhury (1982) Farah (1981) and Adlakha (1970), d by Mahadevan et. al. (1986), contention that materials construction of the house, type of housing etc., cause y differentials.

observed significance level in the test of relationship type of wall material and children dead is 0.4395. At 0.05 ance level of test the number of children dead has an ent relationship with type of wall material.

's roof material and mortality index

le 5.5.1 shows mortality index by the type of materials the roof of the house.

5.1: Type of roof material and mortality index

	Iron sheets	Tiles	Thatch	Total women
	136	8	7	151
	108	3	8	119
	20	1	3	24
	5	0	1	6
ty	1.28	0.53	2.33	
	269	12	19	300

rce: Compiled by author based on field survey (1993)

en living in houses with iron sheets as their roof material d 89.7 per cent of the sample, those living in tiled roofed ere 4.0 per cent and those living in grass thatched hoses cent.

e results of the crosstabulation show that, children of
ving in tile roofed houses had higher survival as indicated
r lower mortality index i.e. 0.53 in relation to the other
es. Children of women living in grass thatched houses had
ther hand the highest mortality index. This clearly shows
e type of housing and type of materials used in the
ction of the house are crucial in determining child survival
an et. al.,1986). It is possible that, grass thatched
re associated with poor environmental conditions like poor
ion, which can be favourable to disease causing organisms,
n affect children who are more vulnerable, adversely.

e observed significance level in the crosstabulation between
roof material and children dead is 0.5633. This means that
ber of children dead is does not depend on type of roof
at 0.05 significance level of test.

e's floor material and mortality index

ble 5.5.2 below gives the results on type of floor material
ality index per woman. There were only two types of floor
s identified in the study - Concrete (cement) and mud.

5.2: Mortality index by type of floor material

D	Cement	Mud	Total women
0	64	87	151
1	56	63	119
2	8	16	24
3	1	5	6
ity	1.31	1.32	
vomen	129	171	300

Compiled by author based on field survey (1993)

results show that there is not much difference in y conditions between the two types of floors. The women in houses with cement as their floor material had a y index of 1.31 and those living in mud floored houses This can be indication that whether a woman lives in a loored house or a mud floored one mortality conditions do ge to either worse or better.

re is an independent relationship between number of dead and type of floor material. The observed ance level of test is 0.3292.

of Toilet facility and mortality index

le 5.5.3 gives mortality index by the type of toilet in the household. 75.7 per cent of the women said they it latrine, 19 per cent reported using the bush or garden 3 per cent said they used a flush toilet.

5.3: Mortality index by type of toilet facility

	Pit latrine	Bush/garden	Flush	Total women
	134	7	10	151
	73	40	6	119
	17	7	0	24
	3	3	0	6
ty	1.08	2.41	0.82	
	227	57	16	300

Compiled by author based on field survey (1993)

results on Table 5.5.3 show that women who used the den as their toilet facility had the highest mortality nereas those using the flush toilet had the least mortality These results underscore the importance of safe faecal in the health of the family and consequently the survival child. Women using bush/garden expose their children to al diseases, as the water and food in the household may be ated by flies carrying particles of faeces that have been ly disposed. Anker and Knowles (1983) note that survival e higher among households using water closets and lowest in ds using fields. They suggest that in households with toilet facility diseases were less likely to be ted.

observed significance at 0.05 significance level of test .5. This is therefore to say that the number of children a dependent relationship with type of toilet facility in ehold. Several studies have had similar findings. In a ican study, Jarret (1970) as quoted by Mahadevan et. al. found out that there was a very strong correlation between d mortality and use of toilet facility.

a (1983) and Saunders and Warford (1976),as quoted by n et. al. (1986), have also emphasized that there is a elationship between water-cum-environment and mortality. er have enumerated several waterborne diseases among them isposal diseases (hookworm and other worms). These are a f poorly disposed faeces coming into contact with drinking food. These cause diarrhoea among children which leads to appetite, weakening the child's ability to fight common iseases such as measles, polio etc.

e of water during dry season and mortality index

source of water is associated with type of toilet facility researchers treat them as belonging to one category i.e. m environment (Mahadevan et. al., 1986). Table 5.5.4 below ortality index by source of water during the dry season. entage distribution of women by source of water during the on shows that most of the women get their water from the 53.3 per cent of the total sample population, 10 per cent e hole, 6.3 per cent from stored rain, 13 per cent from the 6.3 from the well and 1 per cent from the pond.

5.4: Mortality index and source of water during dry spell

	Pond	Well	River	Bore-Hole	Stored rain	Tap	Total women
	0	20	15	14	11	90	151
	2	23	19	13	7	56	119
	1	6	4	3	1	9	24
	0	0	1	0	0	5	6
ty	5.02	1.72	1.39	1.62	0.63	1.17	
	3	49	39	30	19	160	300

Compiled by author based on field survey (1993)

results show that in relative terms women who got their rom a well, bore-hole, river and pond, had a higher y index than those who got their water from a tap and ain. The frequency notwithstanding, women who got their om a pond during the dry spell had the highest mortality ereas those who used stored rain water had the lowest y index followed by those got their water from a tap. d water is more likely to be contaminated with mud which ain water-borne-disease causing organisms, as it is likely ater that has stagnated in a particular place since the rain season. On the other hand those storing rain water aking caution by using good storage facilities and perhaps it, ensuring therefore that it is not contaminated during od it is under storage. The relatively lower mortality ong women who used tap water, is due to its chemical t as required by the health regulations, that anything for onsumption has to meet certain set safety standards.

e observed significance level in the test of relationship number of children dead and source of water during dry s 0.5299. This value at 0.05 significance level of test hat the number children dead is independent with the source r during the dry spell.

ce of water during wet season and mortality index

ble 5.5.5 shows the results of mortality index and source uring wet spell. 4.4 per cent of the women get their water well, 1 per cent from a river, 1.3 per cent from a bore).9 from stored rain and 32.3 per cent from a tap during the ll. No woman reported getting her water from the pond the wet season.

.5.5: Source of water during wet spell and mortality index

	Well	River	Bore hole	Stored rain	Tap	Total women
	6	1	2	82	58	149
	4	2	2	83	27	118
	2	0	0	15	7	24
	0	0	0	1	4	5
ity	2.17	1.43	1.47	1.47	0.95	
	13	3	4	181	96	* 297

Compiled by author based on field survey (1993)
are three missing cases

e results show that women who drew their water from the well the wet spell had the highest mortality index, whereas those their water from the tap had the lowest. There is not much ce between women who got their water from the river on one those who used water from a bore hole and rain water. ver and borehole water during the wet spell may be ated as the rain may have washed down dirt into the river ore hole. Rain water is also contaminated unless it is before use and hence the higher mortality index.

erally, use of tap water, as during the dry season, is ly associated with childhood deaths during the wet season. of tap water and its influence in child mortality has been d in other studies too. Jarret (1970), as quoted by n et. al. (1986), in a Pan American study found that there ry strong correlation between childhood deaths and use of ter.

ording to Anker and Knowles (1983) most diseases are ne and therefore the purer and less contaminated the water he less likely people are to become sick. In this regard, rates are higher in households using pipe as they are ble to keep themselves and their immediate environment than in households using river or lake water. Similar have been realized in other studies Mata (1983), Mahadevan Saunders & Warford (1976), as quoted by Mahadevan et. al.

observed significance level in the test of relationship number of children dead and source of water during the wet 0.0043. At significance level of test 0.05, this value hat the number of children dead is highly dependent on

f water during the wet spell, hence corroborating and
ng the results of the study and also other studies above.

ment of water and mortality index

e 5.5.6 shows how mortality index varies by treatment of fore use. 15.7 per cent of the women in the sample that they treated their water by boiling, 0.6 per cent sieved their water, whereas 83.7 reported that they did their water. This high level of non-treatment of water the reason that a large number of women use tap water. ose who said they never treated their water, 37.7 per cent did not do so because they used tap water, 40.3 per cent re was no need. These women may have judged that the water d was safe. 6.7 per cent of the women on the other hand did not know of water treatment.

5.6: Treatment of water and mortality index

	Boiling	Sieving	Chemicals	No treatment	Total women
	26	0	1	124	151
	18	1	0	100	119
	3	0	0	21	24
	0	0	0	6	6
ty	1.20	1.32	0.00	1.34	
	47	1	1	251	300

Compiled by author based on field survey (1993)

results show that women who did not treat their water in have the highest mortality index, whereas those who treated ter had the lowest. There is however no big difference women who do not treat their water and those who sieved ter. This lack of significant difference is due to the t, sieving does not kill or remove disease causing s in the water. It only removes soil particles and other cannot pass through the sieve. In the final analysis the as good as untreated.

he crosstabulation of number of children dead by treatment the observed significance level is 0.9024. At 0.05 ance level of test the two variables are independent of one Barret and Rowland (1979), as quoted by Mosley et. al. have found that in Cameroon the significant factor is not of food prepared but the conditions under which it is , and un-boiled water used to prepare foods and wash was heavily contaminated with faecal califorms and e levels of bacteria, which affect child mortality ly. In agreement with Barret and Rowland (1979) among this study has confirmed that, use of boiled water is ed with a lower mortality index.

e Results of Multiple Regression Analysis

this section we make an attempt to present the results of regression analysis. Section 5.6.1 presents the on of the dummy variables which were included in the . These are variables which in the cross-tabulation 5.2 to 5.5) were found to have a close relationship with index.

inition of Variables in the Regression Analysis

This is the age of the child at the time of introduction of supplementary feeding. It has the following categories:

Supplement introduced at age of 1-4 months.

This is the reference category with dummy variable 0

Supplement introduced at age of 5-8 months

Supplement introduced at age of 9-12 months

Supplement introduced at age of 13+ months.

This is the type of marriage. It has only two categories:

Monogamy. It was the reference category with dummy variable 0

Polygamy.

This refers to mother's level of education. It has the following categories:

No education. This was considered as the reference category with dummy variable 0

Primary education

Secondary education

College or university education.

This refers to the source of water used in the household, during the wet season. It has the following categories:

Well. The category "well" was considered as the reference category with dummy variable 0.

River

Borehole

Stored rain water

Tap.

This is the toilet facility in the household. It has the following categories:

Pit latrine

Bush/garden. This was considered as "the reference category with dummy variable 0.

Flush toilet.

This refers to attendance of ante-natal clinic by a woman during her last pregnancy. It has two categories:

Attended clinic or "YES" category

Never attended clinic or "NO" category. It was considered as the reference category with dummy variable 0.

This refers to the place that a woman delivered her last child. It has the following categories:

Hospital

Home. This was considered as the reference category with a dummy variable 0

Dispensary.

This refers to the person who attended a woman at the last the birth. It has the following categories:

Traditional Birth Attendant or TBA

Grandmother

Husbands. It is considered the reference category with dummy variable 0.

Friend.

Sister

Delivered with no assistance or "ALONE" category.

This refers to how the umbilical cord wound was treated after the cord was severed from the baby's body. In short what was put on the wound. It had the following categories:

Spirit

Soil. It is considered the reference category with dummy variable 0

Nothing.

This refers to the immunization status of the children. It has the following categories:

"NEVER COMPLETED" category. It was considered as the reference category with dummy variable 0

"YET TO COMPLETE" category

"YES COMPLETE" category

"NOT IMMUNIZED" category.

ne Results of Regression Analysis

the multiple regression we utilized step-wise method. The r included each variable into the equation following a sequence. The computer also determined, on its own, the inclusion of the variables into the equation. In every analysis, each of the additional variables was included in ation on the merits of the amount of unexplained variation ortality index it accounted for. The regression analysis d only two equations. The first equation had only one e- toilet facility in the household, "bush/garden"-TFAC2. n number two had treatment of cord and toilet facility. The are presented in table 5.6. The final equation obtained

J2= 1.04985+0.25569(TFAC2)+0.15747(TRCOR2).

ows that the type of toilet facility- "bush/garden" and nt of cord - category, "soil" have a positive effect on the of children dead per woman.

ilet facility showed a positive effect on mortality index mpared with the reference category. Children of women using n/garden as their toilet facility had lower survival than sing either pit latrine or flush toilet. Children of women ush/garden are likely to suffer from gastro-enteritis and igestive diseases, due to contamination of faeces with g water and food. Studies done elsewhere have shown that causing organisms are more likely to spread faster in a ere faecal disposal is improperly done (Mata, 1983; Meegama

eatment of cord is also positively associated with mortality
hen compared with the reference category. Women who put
the wound of the severed umbilical cord are likely to, in
cess, introduce disease causing organisms directly into the
ream of the child hence exposing him or her to the risk of
ting neo-natal tetanus. This has been confirmed in a study
(Misra et. al., 1980).

e total variation in mortality index explained by the two
es was 10.00 per cent. This implies that they are the only
nants which had a significant effect on mortality index.
type of toilet facility has a greater impact on mortality
s it explains 7.56 per cent of the variation in mortality

ter this we set out to investigate what would happen to the
n if toilet facility was excluded from the analysis. When
e of toilet facility was excluded from the equation, health
es - treatment of cord and immunisation, denoted as TRCOR2
UST1, were the only ones found to have a greater impact on
ty index as they were the only ones included in the
n. The final equation obtained was;

J2= 1.24777 + 0.19045(TRCOR2) + 0.11311(IMMUST1).

e results show that the impact of treatment of cord with
mortality is positive. Children whose umbilical cord wound
n treated with soil were found to have a higher mortality
ose treated with spirit. This higher mortality is due to

that soil is likely to contain disease causing organisms ain are introduced directly into the child's blood system , exposing it to the risk of contracting neo-natal tetanus. ldren who had been taken for immunisation but never ed the schedule were found to have the highest mortality er categories of the variable immunization status. As the in the equation above show, the impact of uncompleted tion schedule on mortality is positive. A child who is not munized cannot be able to withstand attacks from diseases munization was meant for, as these may have now developed nce to the drugs.

6: Regression equation coefficients of dummy variable technique

ole	1	2
	0.27492	0.25569
2		0.15747
	0.07558	0.10001
ant	1.06236	1.04985

Computer printout by author (1993)
ues in the table above are significant at 0.05 significance
test

mary and Conclusion

this chapter we have used cross-tabulation to show the nship between various mortality determinants and mortality We have also used the Chi-square to show the type of nship between the independent variable and the dependent e (mortality index).

om the results of cross-tabulation and Chi-square analysis, evident that health variables in particular immunization, f delivery, type of attendant at birth, attendance of ante- clinic and treatment of cord are more closely related with of children dead. Socio-economic factors in this case, on also have a close association with the number of children r woman. Except for type of toilet facility and source of uring wet spell, other environmental factors, have little or ationship with the number of children dead per individual All socio-cultural factors have also been found to have no icant relationship with child survival.

ne close association between number of children dead and factors is because, health factors are directly related to dy and its ability to withstand attacks from diseases that use death.

ne closest association was registered by immunization with an ed significance of 0.0003. The importance of immunization children lies in its ability to prevent all of the child diseases, from claiming the child's life. Thus if left ected, the chance of death from even mild attacks of say s or polio can be fatal. The importance of education in the of the child and reduction of mortality has been documented ious studies, and this has been confirmed in this study.

ne highest degree of independence with children dead was ered by religion with an observed significance level of followed by treatment of water, with an observed cance of 0.9024.

have also presented the results of multiple regression s and attempted an explanation of the results obtained. The of regression analysis was to determine which of the es had a greater impact on mortality index.

e type of toilet facility in the household (Bush/garden) and nt of cord (Soil) were found to have a positive effect on y. When type of toilet facility was excluded from the s, health variables, treatment of cord using soil and tion (Yes but never complete) were found to be more cant in explaining the variation in mortality index.

roughout the multiple regression analysis, the age at entation, type of marriage, maternal education, source of ring the wet season, attendance of antenatal clinic, place very, attendant at birth and immunization status did not y significant relation with the ratio of observed to d deaths per individual woman.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

oduction

s chapter seeks to achieve three objectives. First, it conclusions, based on the findings of the study. , it makes fundamental recommendations that are important y planners, both at regional and national levels. Finally, ights opportunities for further research that emerge from y.

lusions

t deaths at young ages are largely as a result of poor ental conditions which are reflected in the absence of d safe drinking water, poorly constructed and unhygienic es, and congested and poorly ventilated living places. ctors in particular the first two, are responsible for many among infants from diarrhoeal diseases. However these ental factors do not operate in isolation. Other important ants of child survival include health, socio-economic and ltural factors.

to the multiplicity of child survival determinants, this ought as its main objective to investigate the impact of ltural, health, socio-economic and environmental factors on survival. Since most of these key child survival ants operate at household level, a household survey was ecessary.

study was based on the assumption that infant and child in Upper Matasia sub-location was likely to be influenced ronmental, socio-cultural, socio-economic and health These factors could operate either directly or ly, independently or jointly. It attempted therefore to ate the relationship between these factors and child

order to generate mortality differentials results, we the Coale and Trussell indirect technique of estimating y on the data. In the case of household survey data, we of the Preston and Trussell (1982) method to calculate y index for each woman in the sample. This ratio of to expected deaths was used as the dependent variable in bulation analysis and multiple regression analysis in an to find out the relationship and effect of the independent s on it.

first objective of this study was to determine infant and ortality levels, trends and differentials in Kajiado . This was intended to give a general picture of mortality istrict. The hypothesis linked to this objective was that reas in Kajiado district are likely to have lower q(2) nd hence higher life expectancy at birth than urban areas. n the findings, the study concludes that due to better conditions, sanitation and good food supply, rural areas ver mortality levels and hence higher life expectancy than urban areas.

The second objective was to determine the impact of socio-cultural factors on child survival. The hypothesis linked to this objective was that socio-cultural factors are likely to have an impact on child survival in Upper Matasia sub-location. However, from the findings the study concludes that although socio-cultural factors which include marital status, mother's tribe, age at first marriage, breast-feeding, length of breast-feeding and age at supplementation are important mortality differentials, they do not have a significant impact on the number of children dead per woman.

The third objective was to determine the effect of health factors on child survival. The hypothesis related to it stated that, health factors are likely to have an impact on child survival. Based on the findings the study concludes that except for period of attendance of ante-natal clinic, other health factors including immunization, attendance of ante-natal clinic, place of delivery, type of assistant at birth for home deliveries and treatment of cord influence the number of children dead per woman and are important mortality differentials. This is due to the fact that, health variables are directly related to the body and its ability to withstand attacks from diseases that can cause death.

The fourth objective was to investigate the impact of environmental factors on child survival. The hypothesis related to it stated that child survival in Upper Matasia sub-location is likely to be determined by environmental factors. From the findings we conclude that the number of children dead per woman depends on the type of toilet facility in the household and source of water during the wet spell. However, other environmental factors including type of materials used to make the house's floor, wall and roof, source of water during the dry season and treatment of water although exhibiting great mortality variations among their categories, do not have a significant impact on child survival.

The fifth objective of the study was to determine the impact of socio-economic factors on child survival. The hypothesis related to this objective stated that, increasing level of education is positively correlated with child survival. This study, on the basis of the findings concludes that education, in particular maternal education, is an important determinant of child survival.

6.2 Recommendations for Policy Planning

This study has provided information on the effect of mortality determinants on child survival. Nonetheless, it is important to note that the effect of these factors is not individual. Hence in the planning for programmes to improve the health of a population, there is need to incorporate them into a single intervention programme, because although their effect may be to a large extent individual, the interaction among them however little, makes the success of a programme that considered only one of them impossible. This is because its effect could be dependent on another determinant of mortality. It is in view of the importance of having an integrated approach to solving health problems that the following recommendations are made.

(1) Education: Maternal education has been found to be associated with lower mortality . This study recommends that apart from improving and increasing formal education facilities, efforts should be made to change people's attitude, through public education campaigns, toward female education especially in remote parts of the district in particular Loitokitok and Central divisions. Although communal education in matters related to health, personal hygiene and nutrition taught in ante-natal clinics has been found to be more important in promoting improved child health, it is women with formal education who are more likely to grasp this information and be more willing to accept and use it than those with no formal education. In a nutshell, the study recommends that efforts should be made by the government through the respective government's departments - ministry of education, culture and provincial adminstration to increase female enrolment in schools and also be strict in matters related to child marriages. The later practice has been found to contribute to poor health among children due to the effects of mother's age.

2. Health: (i) Immunization: Completed immunization schedule of children has been found in this study to be related to a lower ratio of observed to expected number of children dead per woman. This study recommends that the Kenya Expanded Programme on Immunization (KEPI) of the Ministry of Health and

other immunization programmes especially those of Non-Governmental Organizations be intensified in the area to ensure that, this all important prevention of the child against killer diseases, reaches as many children as possible. The government or any Non Governmental Organisation should consider establishing a child care centre in the sub-location as the one in Ngong is far from most people in the sub-location.

(ii) Since immunization is associated with provision of family planning services the government should consider training the providers of these services on how best to pass the information based on the culture of the people of the area. In doing so they should be conscious of the government's two pronged approach to population growth management i.e. through birth spacing and reduction of mortality. In this way they will be able to encourage pregnant women to go for ante-natal care services and also to take their children for immunization. The training of the family planning service providers should also involve education on treatment of water before use and use of properly constructed and hygienic toilet facilities and other health matters.

(iii) Among the protestants, mortality was higher than those of catholics an indication that some protestant sects encourage faith healing to the exclusion of medical intervention. Those affiliated to traditional religions had higher mortality an indication that they could be resorting to traditional medicine. Health service providers should also be equipped with knowledge on the cultural and religious aspects of the population, so as to encourage them to go to and take their children to hospital for treatment when sick, in the light of the findings on religion and mortality. This education should aim at changing people's attitudes toward the cause of disease and remedial steps to be taken.

(iv) Another area of equal concern is that of attendance of ante-natal clinic. The importance of this in reducing child death has been noted in this study. Although the number of women in the study sample attending ante-natal clinic is high, there is need to improve on the quality of the services provided and also bringing the clinics nearer to the people. There is need for such a clinic at Kahara shopping centre to save many women who go looking for the service at Ngong township which is far, time. This will also encourage more to go for the service.

(v) There is need for provision of maternity services in the area. More than half of the deliveries in Upper Matasia sub-location, occur at home and in dispensaries. The latter are not equipped to handle deliveries and the nearest hospital for the sub-location with a maternity wing is in Nairobi as the district hospital is quite far. In view of the importance of delivering in hospital in relation to child survival, we recommend that the government or any Non-Governmental Organization envisage possibilities of establishing a maternity hospital within easy reach of the residents of the sub-location preferably in Ngong township. This is due to its relatively well established infrastructure - electricity, roads and telecommunications.

(vi) Training of Traditional Birth Attendants: Most of the births occurring at home - 32 per cent were found to be delivered with the help of TBAs. This category of medical personnel is important especially in handling emergency deliveries where a hospital is far, or there is no transport to rush an expectant mother to hospital. This study recommends that they be provided with better and adequate training. Basic hygienic delivery facilities such as surgical blades, gloves and disinfectants should also be provided to the trained TBA, who again should be registered and legally identified as health service providers protected by law, to ensure that they carry out their work with minimal hinderance.

(3) Water: Water projects in the area should be expanded to cover the whole sub-location in light of the importance of clean drinking water on the health and survival of children. This is also in line with the government goal of providing piped water to every household by the year 2000.

6.3 Recommendation for Future Research

Although a research may meet its stated objectives, it may not be exhaustive in answering all the questions related to a certain problem. Nonetheless, it may also generate more questions that may need answers too. This study has not been exhaustive in answering questions related to child survival and it has opened up new areas that can be a basis for further research. The following are areas that deserve attention in future research:

(i) There is need for more micro-level studies as this one. An analysis of data generated by such investigations will yield results on the main determinants of mortality and their manner of operation. Recent policies related to health have shifted attention toward provision of community based health services that are preventive oriented. Such micro-level studies will by so doing identify key health factors that can be incorporated in programmes intended for specific health problems and in particular areas, bearing in mind the resources in the area that can be utilized in solving the problem.

(ii) There is need for research on the mechanism through which socio-cultural factors (tribe and religion) and socio-economic (education) operate through biological factors to determine age at first marriage. The research should investigate why for instance in spite of growing awareness in society through mass media and education marriage in the Maasai community continues to take place at relatively very young ages. This young age at marriage as we have noted in this study is responsible for lower child survival among certain groups of people. The results from such studies will therefore help in creating programmes geared toward increasing age at marriage and also help legal experts set an ideal legal age at marriage which is at the moment not in the constitution.

(iii) Although education is positively associated with child survival, the actual manner of operation of education is unknown. There is therefore a need for a study that will not only capture women's level of education and how their children survive, but also incorporate operational definitions and a technique of analysis that can bring out its actual way of operation in affecting child survival. Such questions as the effect of education in increasing women autonomy and also in promoting independent decision making among married women in matters related to child's health should be included in the investigation. In particular, questions like "Does an educated woman wait for her husband to decide if the child should be taken to hospital when sick, the nature of food to be eaten" and the like could form the basis for gauging the particular way that education acts to increase child survival.

(iv) There is also need to investigate how religion operates to influence child survival. This study has found that women belonging to the catholic and protestant faiths have relatively lower mortality index than those who do not subscribe to any religion. This calls for a study that investigates the mechanisms through which religion operates to affect child survival. This will reveal what there is in religion that contributes to improving child survival.

(v) There is need to investigate the causes of the steep rise in mortality levels in Ngong division from early 1977. This investigation will among other things reveal if the increase was long-term or it is part of the fluctuating trend - rise and fall, exhibited in previous years. The 1989 population census data can provide the data for this analysis.

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APPENDIX I - QUESTIONNAIRE

A. RESPONDENTS INFORMATION

A.1 Name of household.......................................

A.2 Location ....

A.3 Name of the interviewee..................................

A.4 How old are you?
1. 15-19 2. 20-24 3. 25-29 4. 30-34 5.35-39
6. 40-44 7. 45-49

A.5 For how long have you lived here? (years)............

A.6 What tribe do you belong ?
1. Kikuyu 2. Maasai
3. Luo 4. Luhyia
5. Others (specify).............

A.7 i) What is your marital status ?
1. Married 2. Single
3. Divorced/Separated
4. Widowed
(if single move to Q A.8)
ii) If married at what age were you first married?
....
iii) If married what is the type of marriage ?
1. Monogamy 2. Polygamy
3. Other (specify)..................

A.8 What religion are you affiliated to ?
1. Catholic 2. protestant
3. Moslem 4. None
5. Other (specify)................

A.9 What is the highest level of education that you have attained ?
1. std. 1-4 2. std. 5-8
3. form 1-2 4. form 3-4
5. form 5-6 6.College 7. University
8. Adult education 9. None

A.10 Father's education (use above code)

B Health Factors

B.1 Did you attend an ante-natal clinic at your last pregnancy?
1. Yes 2. No

Yes what time during the pregnancy did you attend the
e-natal clinic ?
Throughout the period
1-3 month 3. 4-6 month
7-9 month

No why?
Clinic is far
Does not know of ante-natal clinic
Long lines at clinic
No need
Others(specify)....................

. Where did you deliver your children in the following
order?
t............. 2nd................ 3rd...............
h............. 5th............... 6th...............
the same procedure for additional children)

). Where did you deliver your last child ?
Hospital 2. Home
Dispensary
Others (specify).......

NOT in hospital/dispensary (i) Who helped in the delivery?
Traditional birth attendant
Grandmother 3. Husband
Strangers 5. Sister
None (alone)

was the cord treated if the delivery was not in
ital?
Put spirit 2. Ghee 3.Dettol 4. Put soil
Put cow dung 6. Did nothing

e you ever taken your child for immunization? (If yes MUST
ow the card)
Yes but never completed
Yes but yet to complete
Yes complete
No

If Yes did you take your last child for immunization?
Yes 2. No

What is the immunization status of your children in order
birth?(Write Yes or No)

.... 2nd........... 3rd..........

.... 5th........... 6th..........

the same procedure for additional children)

NO why ?
Does not know about immunization
Centre is far from home
Using traditional medical care
No need for immunization
Waiting for the child to big enough
Long queues at the health centre
Other reasons.....................................
....
....
....

When your child falls sick (abruptly especially at night)
o you take him/her for treatment;
Hospital 2. Dispensary
Gives medicine from shop
Does nothing
Takes him/her to a traditional healer

) If Hospital/Dispensary where is it located?
....

o-cultural variables affecting child survival

you breast-feed your second last child?
No 2. Yes

No why?
The child died
mother was/is sick
Mother was/is busy
Other (specify)..........

Yes i) how long did you breast-feed your second last child ?

1- 6 2. 6-12 3. 12- 18 4. 18-24 5. 24-30 6. 30-36
38+ months

How long do you plan to breast-feed your baby (if she is
east-feeding) ? (code as in i above)

often (if she is breast-feeding) do you breast-feed your
ild ?
2, 3, 4, 5, 6, 7, 8, 9, 10 times a day

t times do you breast-feed ? (tick as is appropriate)
7-9 am 2. 9-12 noon 3. 12-3 pm
3-5 pm 5. 5-7 pm 6. 7-9 pm
9-12 mid night 8. 12-1 am

Any time the child demands
. Any time I am free

t kind of food did you feed on while breast-feeding your
ild ?
Meat 2. Milk 3. vegetables
Maize 5. Bananas
others(specify).........................

what age did you introduce supplementary food to your
ond last child ?(in months)
1-2 2. 2-4 3. 4-6
6-8 5. 8-10 6. 10-12 7. 12+

did you terminate the breast-feeding of your child (wean)?
Refusing to give breast-milk
Using bitter materials
Slow withdrawal and introduction of other food

t type of food did you use in weaning
r child ?
Maize flour 2. Milk 3. Meat
Wheat flour 5. Rice 6. Eggs
Potatoes 8. Bananas 9. Beans/Peas
. Vegetables 11. Other (specify)...................

en you are not at home who feeds and takes care of the baby?
Maid
Baby's elder sister/brother
Grandmother
Other(specify).............

hat type of utensils did you use to give supplementary and
eaning food to the baby ?
Cup 2. Feeding bottle
Others (specify)......................

ow did you clean the baby's feeding utensils ?
using soap and hot water
using soap and cold water
using cold water only 4. no cleaning

id you notice any visible changes after weaning
1. Yes 2. No
If No skip to section D)

f **Yes** what changes did you notice ?
. change of hair colour
. diarrhoea 3. loss of appetite
. swollen stomach
.others(specify)............................

D. Environmental variables affecting the child survival

D.1 What are the materials with which the walls of your house made ?
1. mud and stick with broken walls
2. mud and stick with smooth walls
3. stoned (quarry stones) 4. corrugated iron sheets 5. timber
6. other (specify)....................

D.2 What are the materials with which the roof of your house made ?
1. iron sheets 2. tiles 3. concrete 4. wood 5. thatch
6. cow dung

D.3 What are the materials with which the floor of your house made ?
1. concrete 2. mud 3. cow dung
4. wood

D.4 How many of the following does your house have;
(Write exact number including the kitchen)
a) rooms? 1. 1-2 2. 3-4 3. 4-5 4. 6-7 5. 9-10 6. 10+
b) windows? 1. 2-4 2. 5-7 3. 8-10 4. 10+
c) doors? 1. 1-2 2. 3-4 3. 5-6 4. 7-8 5. 9-10 6. 10+

5 What is the type of the toilet facility that you have?
1. pit latrine
2. bush/garden
3.flush toilet

D.6 Where do you get the water that you use for drinking and cooking during i) dry season ;
1. pond 2. well 3. river 4. borehole 5. stored rain 6.tap
7. other (specify)...............

D.6 ii) wet season (use the above code in i)

D.7 i) Where do you store the water that you use for drinking/cooking ?
1. clay pot 2. plastic bucket 3. metallic container

D.7 ii) Does the container have a tap ?
1. Yes 2. No

D.8 i) How do you treat the water before drinking it ?
1. boiling
2. sieving
3. use chemicals
4. No treatment

D.8 ii) If **No** treatment why ?
1. uses tap water 2. there is no need

3. does not know of water treatment

E. Birth and mortality history

Please provide the following information on all your children (ever born)

E.1 At what age did you get your last child (in complete years)
(If Never had a child move to Q E.6) ....

E.2 How many of your children are living with you?

1. Males 2. Females

E.3 How many are living elsewhere?

1. Males 2. Females

E.4 Have you had a child in the past 12 months?
1. Yes 2. No

E.5 If **Yes** what was the nature of birth?
1. Single
2. Twins
3. Triplets
4. More than triplets

E.6 What was the last pregnancy outcome?
1. Live birth
2. Abortion
3. Still birth

E.7 Might you now be pregnant?
1. Yes 2. No

E.8 i) Have you ever given birth to a child (live birth) who later died?
1. Yes 2. No

If **Yes** please provide the following information for all the children that you have ever lost through death?

Name of child	Sex	Date of birth (mon/year)	Mother's age at birth	Age of child at death	Date of death (mon/year)

APPENDIX II- LIFE TABLES FOR KAJIADO DISTRICT

Coefficients for estimation of child mortality multipliers,
Trussell variant, when data are classified by age of mother.
West model

Age grp	i	a(i)	coefficients b(i)	c(i)
15-19	1	1.1415	-2.707	0.7663
20-24	2	1.2563	-0.5381	-0.2637
25-29	3	1.1851	0.0633	-0.4177
30-34	4	1.172	0.2341	-0.4272
35-39	5	1.1865	0.308	-0.4452
40-44	6	1.1746	0.3314	-0.4537
45-49	7	1.1639	0.319	-0.4435

Estimation equations:

k(i) = a(i)+b(i)(P(1)/P(2))+c(i)(P(2)/P(3))

q(x) = k(i)D(i)

COEFFICIENTS FOR ESTIMATION OF THE REFERENCE PERIOD t(x),
TO WHICH THE VALUES q(x) ESTIMATES FROM DATA CLASSIFIED BY AGE REFER
WEST MODEL

Age grp	i	d(i)	e(i)	f(i)
15-19	1	1.097	5.5628	-1.9956
20-24	2	1.3062	5.5677	0.2962
25-29	3	1.5305	2.5528	4.8962
30-34	4	1.9991	-2.4261	10.4282
35-39	5	2.7632	-8.4065	16.1787
40-44	6	4.3468	-13.2436	20.199
45-49	7	7.5242	-14.2013	20.0162

Estimation equations:

k(i) = d(i)+e(i)(P(1)/P(2))+f(i)(P(2)/P(3))

KAJIADO DISTRICT

Age grp	i	FP(i)	CEB(i)	CD(i)	P(i)	D(i)	k(i)
15-19	1	7910	3898	244	0.492794	0.062596	0.981908
20-24	2	6808	14709	1078	2.161817	0.073288	0.976211
25-29	3	5369	19442	1614	3.621159	0.083016	0.950165
30-34	4	4103	20739	2000	5.054594	0.096437	0.970328
35-39	5	3232	18706	2098	5.787748	0.112157	0.990927
40-44	6	2522	14881	2000	5.900476	0.1344	0.979287
45-49	7	1861	10783	1510	5.794197	0.140035	0.97185

P(1)/P(2) = 0.227954 P(2)/P(3) = 0.596996

Age grp	x	q(x)	p(x)	lower l(x)	upper l(x)	lower mort.lev.	implied level
15-19	1	0.061464	0.938536				
20-24	2	0.071545	0.928455	0.92058	0.93453	18	18.56452
25-29	3	0.078879	0.921121	0.91479	0.93011	18	18.41325
30-34	5	0.093575	0.906425	0.88998	0.90766	17	17.93014
35-39	10	0.111139	0.888861				
40-44	15	0.131616	0.868384				
45-49	20	0.136093	0.863907				

Mean mortality level = 18.30263

Age x	l(x) level 18	l(x) level 19	Actual
0	1	1	1
1	0.93265	0.94343	0.935912
5	0.90766	0.92454	0.912768
10	0.89916	0.91763	0.90475
15	0.8927	0.91234	0.898644
20	0.88278	0.90395	0.889187
25	0.86927	0.89243	0.876279
30	0.85455	0.87989	0.862219
35	0.83797	0.86569	0.846359
40	0.81838	0.84864	0.827538
45	0.79411	0.82693	0.804042
50	0.76265	0.79777	0.773278
55	0.71989	0.7572	0.731181
60	0.66235	0.70117	0.674098
65	0.58377	0.62337	0.595754
70	0.48151	0.51969	0.493064
75+	0.35517	0.3887	0.365317

LIFE TABLE FOR KAJIADO DISTRICT

Age x	nqx	npx	l(x)	ndx	nLx	Tx	e(x)
0	0.064088	0.935912	100000	6408.765	95513.86	6038030	60.3803
1	0.024729	0.975271	93591.24	2314.396	368116.1	5942516	63.49436
5	0.008785	0.991215	91276.84	801.8818	454379.5	5574400	61.07135
10	0.006749	0.993251	90474.96	610.5923	450848.3	5120020	56.59047
15	0.010524	0.989476	89864.37	945.6976	446957.6	4669172	51.95799
20	0.014516	0.985484	88918.67	1290.777	441366.4	4222214	47.484
25	0.016045	0.983955	87627.89	1406.027	434624.4	3780848	43.14663
30	0.018394	0.981606	86221.86	1585.974	427144.4	3346224	38.80946
35	0.022238	0.977762	84635.89	1882.132	418474.1	2919079	34.48985
40	0.028392	0.971608	82753.76	2349.527	407895	2500605	30.21742
45	0.038262	0.961738	80404.23	3076.395	394330.2	2092710	26.02736
50	0.05444	0.94556	77327.84	4209.724	376114.9	1698380	21.96337
55	0.07807	0.92193	73118.11	5708.303	351319.8	1322265	18.08396
60	0.11622	0.88378	67409.81	7834.395	317463.1	970945.3	14.40362
65	0.172369	0.827631	59575.41	10268.97	272204.6	653482.2	10.96899
70	0.259088	0.740912	49306.44	12774.72	214595.4	381277.6	7.732815
75+	1	0	36531.72	36531.72	166682.2	166682.2	4.56267

LOITOKITOK DIVISION

Age grp	i	FP(i)	CEB(i)	CD(i)	P(i)	D(i)	k(i)
15-19	1	2370	1177	69	0.496624	0.058624	0.984025
20-24	2	1818	3991	344	2.19527	0.086194	0.978024
25-29	3	1493	5521	552	3.697924	0.099982	0.951453
30-34	4	1154	5945	649	5.151646	0.109167	0.971352
35-39	5	912	5408	712	5.929825	0.131657	0.991884
40-44	6	727	4457	670	6.130674	0.150325	0.980232
45-49	7	590	3541	519	6.001695	0.146569	0.972782

P(1)/P(2) = 0.226225 P(2)/P(3) = 0.593649

Age grp	x	q(x)	p(x)	lower l(x)	upper l(x)	lower mort.lev.	intplted level
15-19	1	0.057687	0.942313				
20-24	2	0.0843	0.9157	0.90584	0.92058	17	17.66895
25-29	3	0.095128	0.904872	0.89862	0.91479	17	17.38664
30-34	5	0.10604	0.89396	0.88998	0.90766	17	17.22512
35-39	10	0.130588	0.869412				
40-44	15	0.147354	0.852646				
45-49	20	0.142579	0.857421				

Mean mortality level = 17.4269

Age x	l(x) level 17	l(x) level 18	Actual l(x)
0	1	1	1
1	0.92137	0.93265	0.926185
5	0.88998	0.90766	0.897528
10	0.87985	0.89916	0.888093
15	0.87222	0.8927	0.880963
20	0.86076	0.88278	0.87016
25	0.84525	0.86927	0.855504
30	0.82836	0.85455	0.839541
35	0.80944	0.83797	0.821619
40	0.78742	0.81838	0.800637
45	0.76074	0.79411	0.774986
50	0.72724	0.76265	0.742357
55	0.68261	0.71989	0.698525
60	0.62398	0.66235	0.64036
65	0.54516	0.58377	0.561643
70	0.44486	0.48151	0.460506
75+	0.32358	0.35517	0.337066

LIFE TABLE FOR LOITOKITOK DIVISION.

Age x	nqx	npx	l(x)	ndx	nLx	Tx	e(x)
0	0.073815	0.926185	100000	7381.457	94832.98	5836278	58.36278
1	0.030942	0.969058	92618.54	2865.784	362736.6	5741445	61.99024
5	0.010511	0.989489	89752.76	943.4153	446405.3	5378709	59.92806
10	0.008029	0.991971	88809.34	713.0527	442264.1	4932303	55.53811
15	0.012262	0.987738	88096.29	1080.257	437780.8	4490039	50.96741
20	0.016843	0.983157	87016.03	1465.62	431416.1	4052259	46.5691
25	0.01866	0.98134	85550.41	1596.363	423761.2	3620842	42.32408
30	0.021346	0.978654	83954.05	1792.105	415290	3197081	38.08132
35	0.025538	0.974462	82161.95	2098.263	405564.1	2781791	33.85742
40	0.032038	0.967962	80063.68	2565.117	393905.6	2376227	29.67921
45	0.042103	0.957897	77498.57	3262.912	379335.5	1982322	25.57882
50	0.059044	0.940956	74235.65	4383.17	360220.3	1602986	21.59321
55	0.083268	0.916732	69852.48	5816.468	334721.2	1242766	17.79129
60	0.122927	0.877073	64036.02	7871.754	300500.7	908044.5	14.18022
65	0.180073	0.819927	56164.26	10113.67	255537.1	607543.8	10.81727

70	0.268053	0.731947	46050.59	12344.01	199392.9	352006.7	7.643913
75+	1	0	33706.58	33706.58	152613.8	152613.8	4.527715

NGONG DIVISION.

Age grp	i	FP(i)	CEB(i)	CD(i)	P(i)	D(i)	k(i)
15-19	1	2526	838	59	0.33175	0.070406	1.068902
20-24	2	1985	3659	239	1.843325	0.065318	1.016788
25-29	3	1582	5390	352	3.40708	0.065306	0.970505
30-34	4	1261	6241	465	4.949247	0.074507	0.983005
35-39	5	1113	6504	651	5.843666	0.100092	1.001066
40-44	6	832	5269	585	6.332933	0.111027	0.988779
45-49	7	503	3146	421	6.254473	0.133821	0.981366
P(1)/P(2) =		0.179974	P(2)/P(3) =		0.541028		

Age grp	x	q(x)	p(x)	lower l(x)	upper l(x)	lower mort. lev.	intpltd level
15-19	1	0.075257	0.924743				
20-24	2	0.066415	0.933585	0.92058	0.93453	18	18.93226
25-29	3	0.06338	0.93662	0.93011	0.94462	19	19.44866
30-34	5	0.073241	0.926759	0.92454	0.94065	19	19.13774
35-39	10	0.100199	0.899801				
40-44	15	0.109781	0.890219				
45-49	20	0.131327	0.868673				

Mean mortality level = 19.17289

Age x	l(x) level 19	l(x) level 20	Actual l(x)
0	1	1	1
1	0.94343	0.95372	0.945209
5	0.92454	0.94065	0.927325
10	0.91763	0.93531	0.920687
15	0.91234	0.93117	0.915595
20	0.90395	0.92429	0.907466
25	0.89243	0.91476	0.89629
30	0.87989	0.90439	0.884126
35	0.86569	0.89261	0.870344
40	0.84864	0.87814	0.85374
45	0.82693	0.85913	0.832497
50	0.79777	0.83247	0.803769
55	0.7572	0.7944	0.763631
60	0.70117	0.74027	0.70793
65	0.62337	0.66377	0.630354
70	0.51969	0.55922	0.526524
75+	0.3887	0.42407	0.394815

LIFE TABLE FOR NGONG DIVISION.

Age x	nqx	npx	l(x)	ndx	nLx	Tx	e(x)
0	0.054791	0.945209	100000	5479.106	96164.63	6237903	62.37903
1	0.018921	0.981079	94520.89	1788.384	373254.9	6141739	64.97758
5	0.007159	0.992841	92732.51	663.8578	462002.9	5768484	62.20563
10	0.00553	0.99447	92068.65	509.1188	459070.5	5306481	57.63613
15	0.008878	0.991122	91559.53	812.8951	455765.4	4847410	52.94272
20	0.012316	0.987684	90746.64	1117.597	450939.2	4391645	48.39457
25	0.013572	0.986428	89629.04	1216.485	445104	3940706	43.96684
30	0.015588	0.984412	88412.56	1378.163	438617.4	3495602	39.53739
35	0.019077	0.980923	87034.39	1660.397	431021	3056984	35.12387
40	0.024883	0.975117	85374	2124.322	421559.2	2625963	30.75835
45	0.034508	0.965492	83249.67	2872.78	409066.4	2204404	26.47943
50	0.049937	0.950063	80376.89	4013.78	391850	1795338	22.33649
55	0.072943	0.927057	76363.11	5570.153	367890.2	1403488	18.37913
60	0.10958	0.89042	70792.96	7757.526	334571	1035598	14.62854
65	0.164718	0.835282	63035.44	10383.04	289219.6	701026.7	11.12115
70	0.250149	0.749851	52652.39	13170.92	230334.7	411807.1	7.821241
75+	1	0	39481.48	39481.48	181472.4	181472.4	4.596393

CENTRAL DIVISION.

Age grp	i	FP(i)	CEB(i)	CD(i)	P(i)	D(i)	k(i)
15-19	1	3074	1883	116	0.612557	0.061604	0.85164
20-24	2	3000	6659	495	2.219[illegible]7	0.074335	0.950476
25-29	3	2293	8531	710	3.720454	0.083226	0.953364
30-34	4	1688	8553	886	5.066943	0.103589	0.981732
35-39	5	1207	6794	735	5.628832	0.108184	1.005887
40-44	6	963	5155	745	5.353063	0.14452	0.995373
45-49	7	768	4096	570	5.333333	0.13916	0.987336

P(1)/P(2) = 0.275968 P(2)/P(3) = 0.596612

Age grp	x	q(x)	p(x)	lower l(x)	upper l(x)	lower mort. lev.	intpltd level
15-19	1	0.052464	0.947536				
20-24	2	0.070654	0.929346	0.92058	0.93453	18	18.62838

25-29	3	0.079345	0.920655	0.91479	0.93011	18	18.38286
30-34	5	0.101697	0.898303	0.88998	0.90766	17	17.47076
35-39	10	0.108821	0.891179				
40-44	15	0.143851	0.856149				
45-49	20	0.137398	0.862602				

Mean mortality level = 18.16067

Age x	l(x) level 18	l(x) level 19	Actual l(x)
0	1	1	1
1	0.93265	0.94343	0.934382
5	0.90766	0.92454	0.910372
10	0.89916	0.91763	0.902127
15	0.8927	0.91234	0.895855
20	0.88278	0.90395	0.886181
25	0.86927	0.89243	0.872991
30	0.85455	0.87989	0.858621
35	0.83797	0.86569	0.842423
40	0.81838	0.84864	0.823242
45	0.79411	0.82693	0.799383
50	0.76265	0.79777	0.768292
55	0.71989	0.7572	0.725884
60	0.66235	0.70117	0.668587
65	0.58377	0.62337	0.590132
70	0.48151	0.51969	0.487644
75+	0.35517	0.3887	0.360557

LIFE TABLE FOR CENTRAL DIVISION.

Age x	nqx	npx	l(x)	ndx	nLx	Tx	e(x)
0	0.065618	0.934382	100000	6561.809	95406.73	6005396	60.05396
1	0.025696	0.974304	93438.19	2400.997	367270.1	5909989	63.25025
5	0.009056	0.990944	91037.19	824.4551	453124.8	5542719	60.88411
10	0.006952	0.993048	90212.74	627.2028	449495.7	5089594	56.41769
15	0.010799	0.989201	89585.54	967.419	445509.1	4640098	51.79517
20	0.014884	0.985116	88618.12	1319.029	439793	4194589	47.33331
25	0.01646	0.98354	87299.09	1436.976	432903	3754796	43.01071
30	0.018865	0.981135	85862.11	1619.763	425261.2	3321893	38.6887
35	0.02277	0.97723	84242.35	1918.192	416416.3	2896632	34.38451
40	0.028981	0.971019	82324.16	2385.871	405656.1	2480216	30.12743
45	0.038893	0.961107	79938.29	3109.048	391918.8	2074560	25.95201
50	0.055198	0.944802	76829.24	4240.815	373544.2	1682641	21.90105
55	0.078935	0.921065	72588.42	5729.74	348617.8	1309097	18.03451
60	0.117344	0.882656	66858.68	7845.469	314679.7	960478.9	14.36581
65	0.17367	0.82633	59013.21	10248.81	269444	645799.1	10.9433
70	0.260614	0.739386	48764.4	12708.71	212050.2	376355.1	7.717825
75+	1	0	36055.69	36055.69	164304.8	164304.8	4.556974

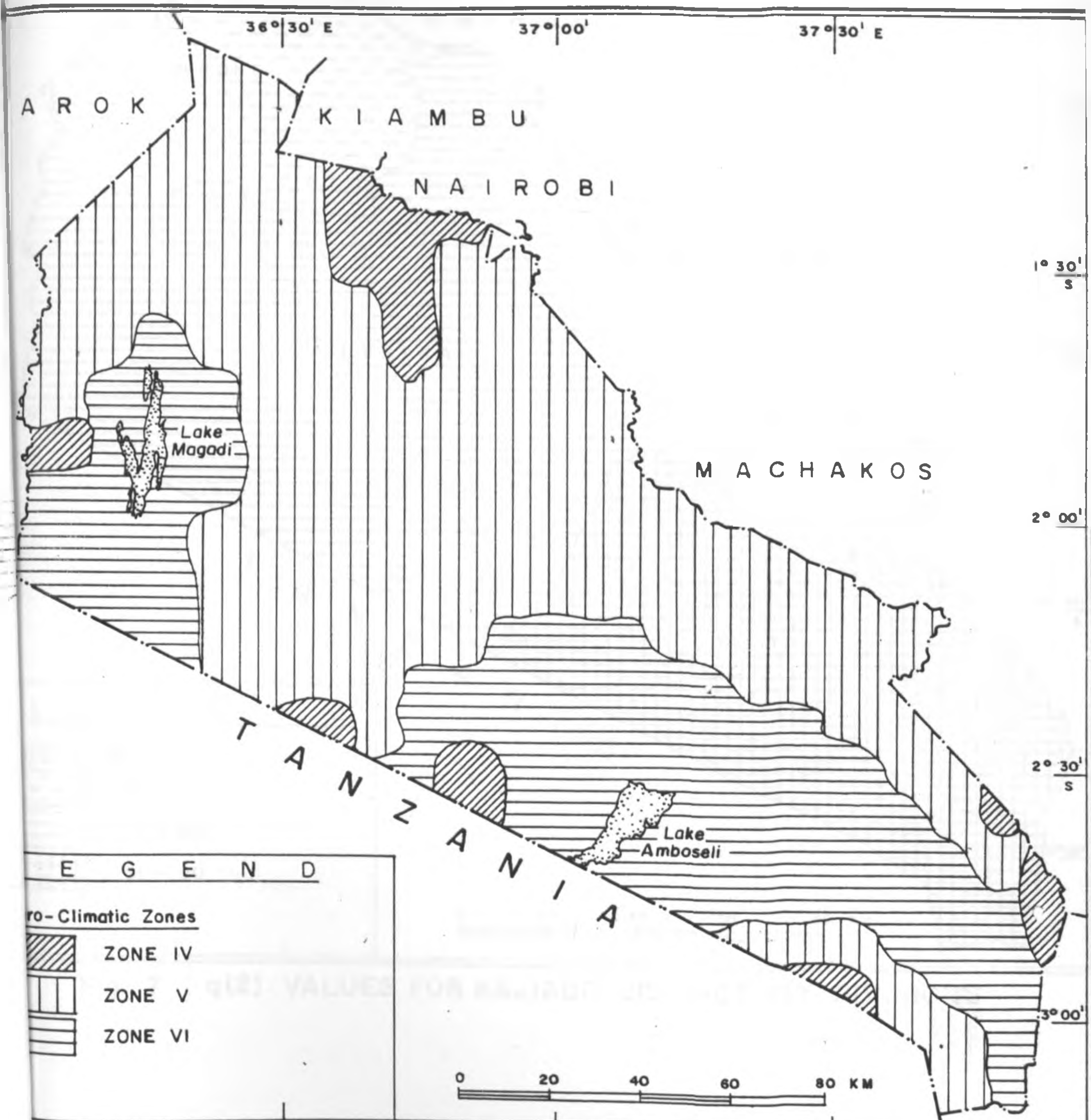

Fig. 6 : KAJIADO DISTRICT : AGRO-CLIMATIC ZONES

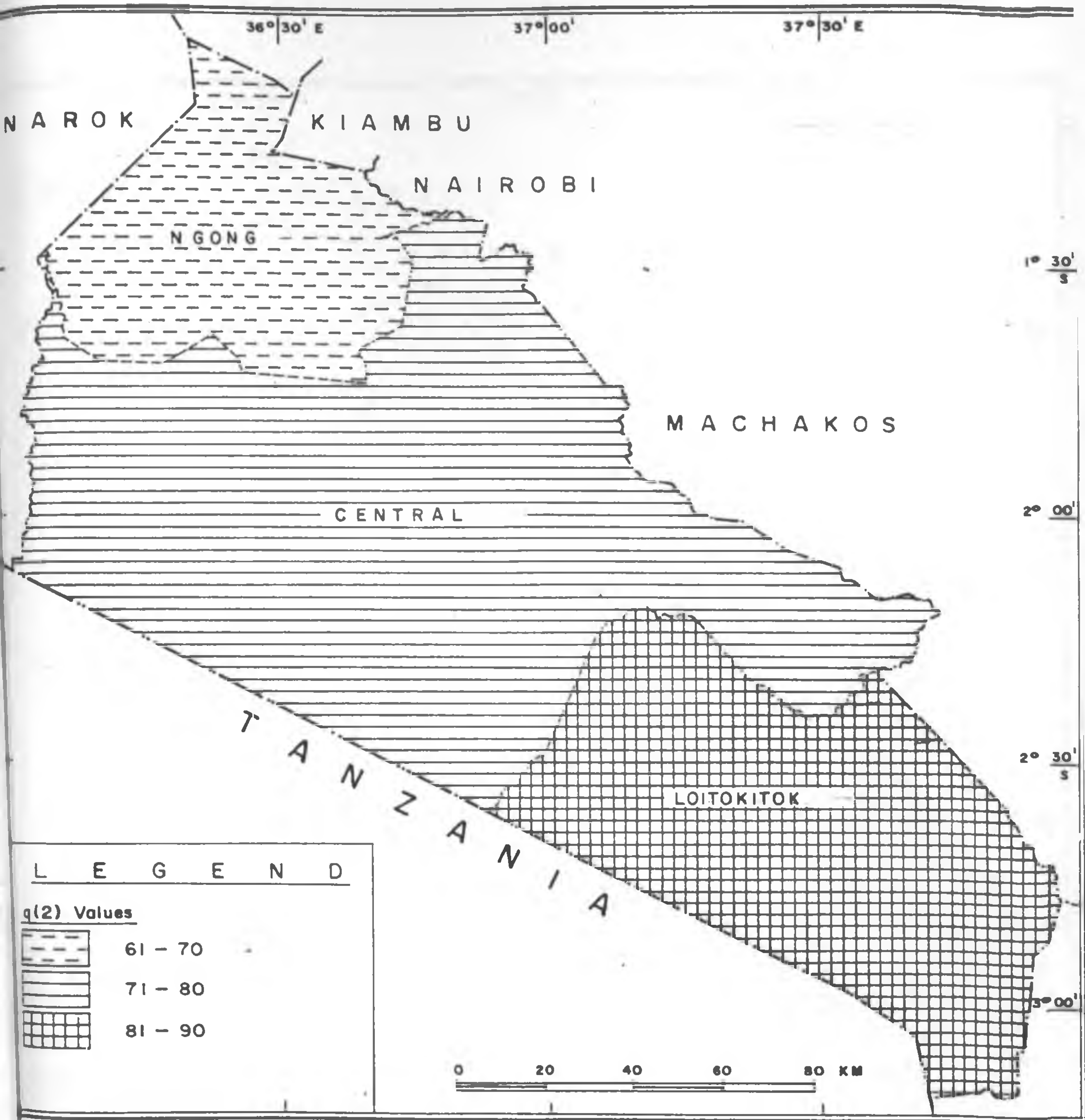

Fig. 7 : q(2) VALUES FOR KAJIADO DISTRICT BY DIVISIONS

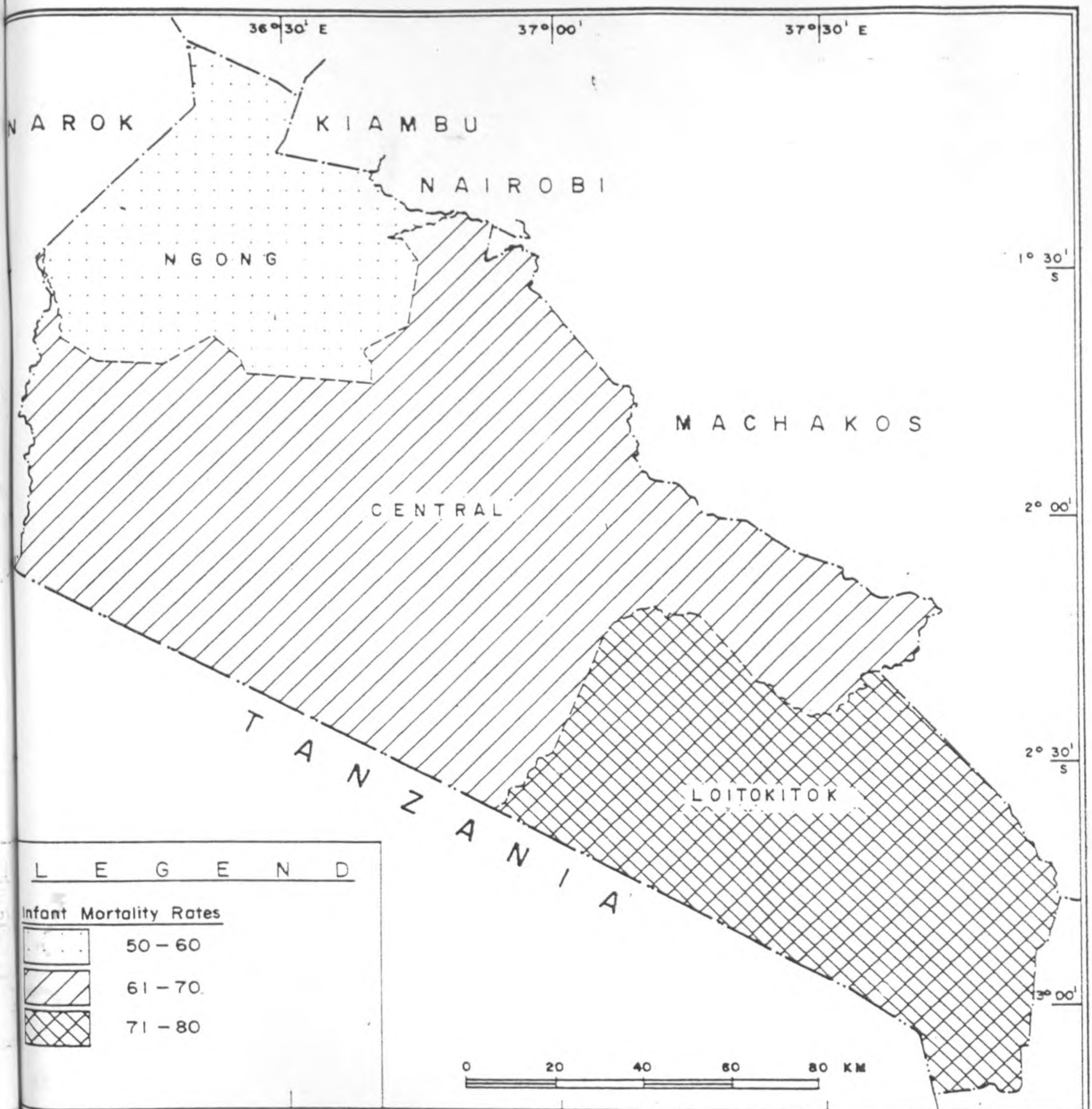

Fig. 8 : INFANT MORTALITY RATES FOR KAJIADO DISTRICT